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Free Papers

701.1

Immunomodulation by ablation in locally advanced pancreatic cancer: percutaneous irreversible electroporation versus MR-guided stereotactic body radiotherapy: preliminary immune monitoring results of the CROSSFIRE trial

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Purpose: To obtain evidence for a systemic antitumor immune response following percutaneous CT-guided Irreversible electroporation (IRE) and MR-guided stereotactic-body-radiotherapy (SBRT) in LAPC.
Material and methods: Peripheral blood samples of 40 patients (IRE, n=20) (SBRT, n=20) were collected at baseline, 2 weeks, and 3 months. We determined frequency and activation state of immunosuppressive (regulatory T-cells (Treg)) and immunopermissive (Helper T-cells (CD4+)/ Cytotoxic T-cells (CD8+)/Natural Killer cells/Effector Memory cells) lymphocytic subsets by flowcytometric analysis.
Results: Transient downregulation of systemic Tregs (p=0.001) and simultaneous upregulation of PD-1 on CD4+ T-cells (p=0.02) and Ki67 on CD8+ T-cells (p=0.04) is consistent with T-cell activation, 2 weeks after IRE. Expression of other checkpoints (TIM3, LAG3, CTLA4) remained low, arguing against T-cell exhaustion. IRE induced upregulation of PD-1 on CD4+ (p=0.02) and CD8+ (p=0.04) T-cells correlates significantly with increased OS. Non-significant trend of Treg downregulation 3 months after SBRT treatment (p=0.08). SBRT induced significant upregulation of Ki67 on both CD4+ (p=0.02) and CD8+ (p=0.005) T-cells 2 weeks after treatment, consistent with activation.
Conclusion: Findings after IRE show decreased immunosuppression by Treg downregulation through acute cytoreduction after 2 weeks. Together with antigen release this allows for T-cell expansion/activation, as reflected by positive correlation between PD-1 upregulation and OS. Selective upregulation of PD-1 indicates receptivity to drug induced PD-1 blockade. SBRT's delayed cytoreductive effect neutralizes tumor induced immune suppression after 3 months without simultaneous effector T-cell activation. However, SBRT's direct inflammatory effects induce transient T-cell activation after 2 weeks. Findings support combination of IRE and SBRT with immunotherapeutic drugs at different time points in patients with LAPC.

701.2

Impact of an augmented reality navigation system (SIRIO) on bone percutaneous procedures: a comparative analysis with standard CT-guided technique

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Purpose: To evaluate the impact of an augmented reality navigation system (SIRIO) for percutaneous biopsies and ablative treatments of bone lesions, compared to standard CT-guided technique.
Material and methods: Bioptic and ablative procedures on bone lesions were retrospectively analyzed. All procedures were divided into SIRIO and CT-guided groups and in <2cm and >2cm groups. Number of CT-scans, procedural time and patient's radiation dose were reported for each group. Sensitivity and specificity were also obtained for bioptic procedures.
Results: One-hundred-ninety-three procedures on bone lesions were evaluated: 142 biopsies and 51 ablations. Seventy-four biopsy procedures were performed using SIRIO and 68 under standard CT-guidance; 27 ablative procedures were performed using SIRIO and 24 under standard CT-guidance. A statistically significant reduction in number of CT-scans, procedural time and radiation dose was observed for percutaneous procedures performed under SIRIO guidance in both <2cm and >2cm groups. Higher diagnostic accuracy was found for all SIRIO-assisted biopsies than CT-guided ones. No significant differences in complication rates were observed between SIRIO and Non-SIRIO groups.
Conclusion: The use of an augmented reality navigation system significantly reduces the number of CT-scans, procedural time and patient's radiation dose in CT-guided percutaneous bone procedures. An improvement in diagnostic accuracy was also achieved in SIRIO-assisted biopsies.

701.3

Safety and efficacy of holmium-166 radioembolization in hepatocellular carcinoma: the HEPAR Primary study

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Purpose: The aim of this prospective clinical phase I/II study was to establish the toxicity profile of holmium-166 (166Ho)-radioembolization (average absorbed dose of 60Gy) in patients with hepatocellular carcinoma (HCC).
Material and methods: The primary endpoint was the rate of unacceptable toxicity, defined as total bilirubin increase grade 3 or higher (CTCAE v.4.03) in combination with ascites and low albumin (REILD), or any serious adverse event (SAE) that was related to study treatment. Secondary endpoints included efficacy (according to mRECIST), alpha fetoprotein response, dosimetry, quality of life and liver function. Clinical and laboratory follow-up took place at three and six weeks, and three and six months. Patients included had measurable and liver-dominant disease and no curative treatment options.
Results: Thirty-one patients BCLC stage B (71%) and C (29%) were included, of whom 87% had multifocal disease and median diameter of the largest tumor measured 56mm (range 15-195mm). Unacceptable toxicity related to study treatment occurred in three patients (spontaneous bacterial peritonitis (n=2) and cholangitis). No REILD was encountered. New or worsened toxicity included fatigue (71%), back pain (55%), ascites (32%), dyspnea (23%), nausea (23%) and abdominal pain (23%), mostly grade 1. At three and six months follow-up, 54% and 84% of the target liver lesions showed complete or partial response. Median overall survival was 14.9 months (95% confidence interval 10.4 months-not reached). Median AFP levels declined with 67% (nadir). No significant decline in quality of life was observed.
Conclusion: 166Ho-radioembolization is a safe treatment option for HCC patients. Response data support further evaluation in adequately powered studies.

701.4

Rate of freeze impacts the survival and immune responses following cryoablation in melanoma

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Purpose: Cryoablation is immunogenic and could be used as an in vivo vaccination tool. The purpose of this study was to investigate the impact of rate of freeze on survival and immune responses in a murine model of melanoma.
Material and methods: Two hundred and sixty-one B16F10 melanoma-bearing mice were assigned to three different experimental groups: a) non-treated, b) cryoablation by slow freeze, c) cryoablation by fast freeze. Flow cytometry analyses were performed in tumors and lymph nodes post-cryoablation to investigate the immune cells. Balance of necrosis/apotosis was investigated by H&E and activated-caspase-3. A fraction of mice post ablation were subjected to survival analyses, and long-term tumor-free survivors were re-challenged to determine if cryoablation has generated a tumor-specific immunological response.
Results: Cryoablation by fast freeze was superior to slow freeze in controlling the tumor loco-regionally, and significantly prolonged the survival. Increased levels of tumor necrosis was observed in tumors treated with fast freeze as compared to slow freeze treatment, corroborating the survival data. Re-challenge experiments proved that fast freeze generated tumor-specific immunologic memory that extended the survival of mice after melanoma re-challenge versus naïve mice. Fast freeze elicited better immunogenic responses over slow freeze, with increased CD8+T-cell subsets and CD4+conventional T-cells in the tumor draining and non-draining lymph nodes.
Conclusion: Fast freeze seems superior to slow freeze in the treatment of tumors, yielding significantly better survival and immune responses. Thus, cryoablation with fast freeze can be used as an in vivo vaccination tool for enhanced antitumor efficacy in combination with targeted immunotherapies.

701.5

Application of trans-arterial radioembolization in uncommon pathologies: exploratory outcomes from the CIRSE Registry for SIR-Spheres Therapy (CIRT)

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Purpose: Trans-arterial radioembolization (TARE) may be beneficial in metastatic liver cancers beside colorectal cancer. Using the data from the European prospective multi-centre observational study CIRSE Registry for SIR-Spheres Therapy, we evaluated the outcomes of TARE in uncommon indications.
Material and methods: Patients were enrolled prospectively between Jan 2015 and Dec 2017. Eligible patients were adults treated with TARE with Y90 resin microspheres. Baseline characteristics and treatment-related data were collected; follow-up data was collected every 3 months for 24 months including overall survival (OS), (hepatic) progression-free survival [(hepatic-)PFS] and safety data.

Results: 98 patients from 18 hospitals received TARE for liver metastases from melanoma (n=32), pancreatic cancer (n=32), gastric cancer (n=11), cancer of unknown primary (n=10), lung cancer (n=7) and sarcoma (n=6). TARE was applied as first-line treatment in 35 (35.7%) cases, primarily in melanoma (74.3%). 64.3% received prior locoregional treatments (21.4%) and/or prior chemotherapy lines (58.2%): 1 (15.3%), 2-5 (31.6%) and ≥6 (11.2%). In total, 113 TARE treatments were performed, with 13.3% receiving 2 treatments and 1% 3. Investigator-assessed treatment intent was primarily palliative (73.5%) or tumour reduction (20.4%). Median OS, PFS and hepatic-PFS for melanoma was 14.6 months (95% CI 7.3-21.4), 3.7 months (2.4-7.6) and 7.3 (2.6-11.7), respectively. For the pancreatic cohort, these figures were 5.6 months (95% CI 4.1-6.6), 3.3 months (2.2-4.8) and 4.1 (2.3-5.6). Adverse events were observed in 50 (51%) patients, with 6 being grade 3 or higher.
Conclusion: The results from this large prospective multi-centre cohort will be discussed considering current literature to explore potential benefits of TARE in alternative applications.

703.1

Ga-68 prostate-specific membrane antigen positron emission tomography / computed tomography-guided percutaneous transgluteal prostate biopsies

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Purpose: We aimed to evaluate the efficacy and safety of Ga-68 PSMA-PET/CT-guided transgluteal prostate biopsy from PSMA-expressing prostate lesion.
Material and methods: Patients with clinical suspicion of PCa either biopsy-naïve or negative TRUS-guided biopsy (TRUS-GB) were recruited prospectively. All the patients underwent whole-body Ga-68 PSMA-PET/CT-imaging, and PET-positive patients underwent PET-guided prostatic biopsies through the trans-gluteal approach. An automated-robotic-arm was used for placing the needle to target prostatic lesions. The location of tracer uptake in the prostate, SUVmax, miPSMA score, visual analysis score (VAS) for pain, procedure-related complication, and histopathology were documented
Results: A total of 71 patients (biopsy-naïve 37; TRUS-GB 34) were enrolled. Of these, 49 patients had PET-positive lesions (29 biopsy-naïve, 20 TRUS-GB) and subjected to PET/CT-guided prostatic biopsy. All but two biopsies were technically feasible. These two patients had non-representative samples, and rebiopsy was representative. The diagnosis of PCa was established in 48/49 (97.9%) patients. The TRUS-GB group had PCa in 19/34 (55.8%) patients. A few minor complications (hematuria, hematospermia, and gluteal pains) were noted in five patients. The mean VAS was 2.5 ±1.8 (> 5 in four). None of the patients developed post-procedural infection.
Conclusion: Transgluteal PSMA-PET/CT-guided prostatic biopsy is technically feasible, safe, and has an excellent diagnostic yield. This is a highly practical approach in patients with prior negative TRUS-guided biopsies. It also negates the chance of inoculation of the prostate with rectal flora, thus reduces the morbidity due to bacterial infection.
The findings pave the way for the use of PSMA-PET/CT and guided prostate biopsy in early diagnosis of PCa.

703.2

Novel tunable polymer embolic agent for locoregional therapy of hepatocellular carcinoma (HCC): a pre-clinical study

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Purpose: Transarterial chemoembolization (TACE) for the treatment of HCC remains a promising but challenging approach. Specifically, TACE formulations have had ongoing issues with rapid drug release, heterogenous distribution, and poor depth of penetration. We developed a tunable biodegradable radiopaque in situ forming implant (BRISFI) that can overcome the aforementioned limitations. In this study, we characterized the effect of solvent polarity on occlusion depth and used the optimal solution to evaluate the BRISFI distribution in a HCC model.
Material and methods: BRISFIs were formulated by dissolving a polymer and mixture of organic solvents. Occlusion depth was measured for multiple BRISFI formulations after injection into the portal vein of a non-tumor bearing rat (n=4/group) (Jeganathan, ACS 2019). As a proof-of-concept, a trans-carotid, hepatic artery embolization was performed with the least polar BRISFI in a rat orthotopic N1S1 HCC model (n=4). Pre/post-embolization angiograms were assessed. Ex vivo microCT was performed to assess BRISFI tumor accumulation.
Results: Decreasing solvent polarity of the BRISFI led to a significant ($p<0.05$) decrease in minimum portal vein vessel diameter occluded (675±20 to 170±25 μm). Successful hepatic artery delivery and embolization to angiographic stasis was achieved using the least polar BRISFI in the tumor bearing rats. MicroCT demonstrated a 11-fold increase of BRISFI accumulation in tumor compared to non-tumor bearing liver lobes.
Conclusion: This preliminary study shows the feasibility of BRISFI as a highly selective transarterial tumor embolization agent in a rat HCC model. Future studies will compare its therapeutic efficacy to Lipiodol and Drug eluting bead TACE strategies in larger animal models.

703.3

Conventional transarterial chemoembolization combined with systemic therapy versus systemic therapy alone as second line treatment for unresectable colorectal liver metastases: randomized controlled trial

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Purpose: The combination of conventional transarterial chemoembolization (cTACE) and systemic therapy has potential to treat chemotherapy refractory unresectable colorectal liver metastases (CRLM). This study aimed to compare survival of the combination versus systemic chemotherapy alone.
Material and methods: This was a single-centre randomized controlled trial of patients with unresectable CRLM which progressed after first line treatment. Patients were randomised on a 1:1 basis to either systemic chemotherapy with or without cTACE without further stratification. Primary outcome was progression-free survival (PFS). Secondary outcomes were overall response rate, disease control rate, conversion rate to liver resection, overall survival and adverse events. Power calculations led to 168 patients to be randomised.
Results: Of 180 patients recruited 168 patients were randomised. Eighty-five patients in arm A received systemic chemotherapy plus cTACE and 83 in arm B systemic chemotherapy alone. Median PFS was longer in arm A versus B (6.67 vs. 3.80 months, HR 0.67, [95%CI:0.49-0.91]; P=0.009) but did not translate into prolonged overall survival (18.4 vs. 14.8 months, HR=0.92 [95%CI:0.62-1.36]; P=0.669). Overall response rates and conversion rate to liver resection were not different between arms (20.0% vs. 21.7%, P=0.7988; 17.6% vs. 15.7%, P=0.73). The disease control rate was higher in arm A than arm B (67.1% vs. 50.6%, P=0.030). Adverse events more than cTCAE Grade 3 were not observed during treatment.
Conclusion: Systemic chemotherapy plus cTACE is a safe and effective option as second line treatment for unresectable colorectal liver metastases. It could delay the liver lesion progression, and improved PFS significantly.

703.4

Higher dose to the tumor gives survival advantage in HCC BCLC B2 patient performing TARE respect to TACE

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Purpose: Evaluate the difference in overall survival (OS) among patients performing trans-arterial chemo- (TACE) or radiation- (TARE) embolization of hepatocarcinoma in a BCLC-B2 patient population (using Bolondi classification: BCLC B, Child-Pugh (CP) 5 or 6, Performance Status (PS) 0, outside Milan criteria and without portal vein thrombosis).
Material and methods: Patients performed DEB-TACE and TARE. The injected activity was calculated based on expected dose to the lungs, normal liver and tumor on 99m-MAA SPECT-CT images. Tumor was delineated on CT /MRI. Cox model was used for multi-variate analysis.
Results: 47 patients were included in the study: 30 TARE (19 with Sir-spheres and 11 with Thera-sphere) and 17 TACE. Median OS was 12.7 mo (range 2-46 mo). TARE and TACE groups were homogeneous per age 67.4±11.6 and 65.3±10.8 years (p=0.54), alpha-feto-protein 173±458 and 127±145 (p=0.73), albumin 3.64±0.49 g/dl and 3.56±1.04 g/dl (p=0.82) and CP 76% and 50% of CP-5, respectively. Bilirubin was lower in TACE 0.8±0.38 mg than in TARE 2.01±1.32 mg (p<0.01). Median OS were 14.1 vs 9.3 months for TARE and TACE (Log-rank=0.25). Cutoff values for dose were 122 Gy for Sir-spheres and 187 Gy for Thera-spheres defining two groups with a median OS of 16.0 mo (16 pts with high doses) and 10.7 months (l4 pts with low doses) (p=0.036). The high-dose group has a higher (p=0.029) median OS than TACE group. Cox-model identified only dose cut-off as prognosticator (p=0.033).
Conclusion: The TARE high dose group has significantly higher (p=0.029) median OS than low-dose and TACE group.

Posters

Kidney

P-1

Alterations of T cells and expansion of memory helper cells after cryoablation in patients with renal cell cancer

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Purpose: Little is known about the possible stimulatory effect of Cryoablation (CA) on the cellular immune system. In this prospective pilot study, we investigated lymphocyte profiling in patients with RCC in local limited stage after CA.
Material and methods: Lymphocyte counts and their subsets (Bcells, Thelper cells, cytotoxic Tcells, NKcells) were analyzed in peripheral blood of seven patients (4 men, 3 women) with a median age of 77years (range: 66–87) before CA and compared with follow-up counts three months later. Wilcoxon test for dependent samples was used for statistical analysis.
Results: Total counts of lymphocytes and lymphocyte subsets did not differ between baseline and follow-up. However, analysis of these subsets showed an increase of median transitory Bcell numbers from 0.8/µl (range: 0.2 – 3.6) to 3.4 (0.0 – 6.1; p=0.046). In the subset of CD4+helper Tcells, effector memory cells without and with RA-expression expanded from 79/µl (36 – 164) to 85/µl (46 – 198; p=0.046) and 0.8/µl (0.1 – 10.7) to 2.4/µl (0.3 – 15; p=0.028), respectively, while Fox p3 positive CD4+cells decreased from 17/µl (9 – 28) to 7 (4 – 12); p=0.028). In addition, more activated Thelper cells (CD4+ CD69+: 6/µl (2 – 16) to 14/µl (4 – 20; p=0.028) and cytotoxic Tcells (CD8+ CD69+: 12/µl (4 –22) to 21/µl (12 – 56; p=0.028) could be detected after CA.
Conclusion: These data suggest that CA leads to expansion of memory CD4+ cells and activation of cytotoxic T lymphocytes as well as helper cells implying an additional antitumor immunological effect in patients with renal cell carcinoma.

P-2

A comparative analysis of ablative treatment of renal tumors in a solitary kidney

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Purpose: To compare different ablative procedures assessing safety, efficacy, functional outcomes and local tumor control for the treatment of renal T1a lesions in a solitary kidney.
Material and methods: Sixty percutaneous ablative procedures of renal T1a lesions, in 25 patients with solitary kidney, were retrospectively analyzed: 26 (43.3%) Radiofrequency (RFA), 26 (43.3%) Cryoablation (CRA) and 8 (13.4%) Microwave ablations (MWA). Biopsy was performed for all lesions. Efficacy, complications rate, Disease Free Survival, Cancer Specific Survival, Overall Survival and renal function were evaluated for each procedure.
Results: Mean age of patients was 65.6 years; mean tumor size was 19.3mm. The mean RENAL nephrometry score was 5.5 and PADUA score was 8.6. Lesion dimensions, RENAL score and PADUA score significantly correlated with the procedure employed with a p-value of 0.019, <0.01 and <0.01, respectively. The treatment was effective in 96.7% of cases. Only 3 patients showed peri-procedural major complications. In one-year follow-up 10 recurrences (16.7%) were documented; all were successfully re-treated, in 8 cases using CRA. Analysis of renal function showed no significant changes between pre- and post-ablation creatinine levels. No statistically differences were observed comparing the outcomes of the three ablative techniques.
Conclusion: In our comparative analysis, no significant differences in complications rate, renal function and oncologic outcomes were found between the three ablative procedures in a solitary kidney. For complex lesions, larger and with endophytic growth pattern, CRA remains the modality of choice. The preserved renal function plays a crucial role in patient expectancy and quality of life, rather than the re-treatment of a possible residual tumor.

P-3

Long term follow-up after CT-guided ablation of renal cell carcinomas: oncological outcomes

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Purpose: To assess technical efficacy and oncological outcomes of RFA treatment in biopsy-proven renal cell carcinoma (RCC).
Material and methods: This single center retrospective study reviewed all electronic medical records of patients who underwent radiofrequency ablation at our institution between October 1, 2007 through December 2014 for treatment of kidney tumors. The end date of this study was set to 31st of March 2020. The five year local recurrence free survival (LRFS), disease free survival (DFS) metastasis free survival (MFS) and overall survival (OS) are presented using the Kaplan-Meier curves.
Results: A total of 82 biopsy-proven RCCs in 77 patients were treated with CT guided RFA in 79 sessions. Median tumor diameter of treated RCCs was 27 mm (range 11-60). Technical success was achieved in 78 (98.7%) treatments whilst primary and secondary efficacy rate was 84.1% and 93% respectively. Eight Patients showed local tumor progression and metastasis were found in five patients. 5-year LRFS, DFS, MFS and OS were 89%, 87%, 97% and 91% respectively.
Conclusion: percutaneous RFA of localized RCC-proven renal masses provided high efficacy rates on an intention to cure basis. Long-term follow-up demonstrated durable oncological outcome.

P-4

Safety and oncologic efficacy analysis of percutaneous cryoablation of intraparenchymal renal tumors

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Purpose: To evaluate the safety and oncologic efficacy of percutaneous cryoablation (CA) in the treatment of intra-parenchymal renal tumors.
Material and methods: Between February 2009 and August 2019, 31 consecutives patients with 31 entirely intra-parenchymal renal tumor were treated with MR-guided CA in our institution and were retrospectively included. Patient, tumor, procedure, and follow-up data were collected and analyzed. Local recurrence–free (LRFS), metastasis-free (MFS), disease-free (DFS), cancer-specific, and overall (OS) survivals were computed.
Results: Twenty patients (64.5%) were males and 11 (35.5%) females. Median age was 69 years (IQR: 63–79). Technical efficacy was achieved in all cases. Seven (7/31; 22.6%) minor complications were noted. Patient showed a significant glomerular filtration rate (GFR) decline between their basal and nadir values (mean basal GFR 65.9±22.4 ml/min vs mean nadir GFR 52.8±26.0 ml/min, p<0.001), but only two showed a clinically significant renal function decline. Five-year estimates of DFS, primary and secondary LRFS, and MFS were 45.4% (95%CI: 28.2-73.0%), 63.8% (95%CI: 46.9-87.0%), 88.9% (95%CI: 77.8-99.0%) and 75.2% (95%CI: 57.1-99.9%), respectively. No patients died due to renal tumor evolution. One patient died 52 months after CA due to CA-unrelated causes.
Conclusion: Percutaneous CA for intraparenchymal renal tumors offers good oncologic outcomes with acceptable complication rates and renal function decline.

P-5

MRI-guided percutaneous cryoablation of small renal masses: automated 3D margin assessment using intraoperative MR-MR image fusion and correlation with local outcome

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Purpose: To evaluate treatment margins of magnetic resonance imaging (MRI)-guided percutaneous cryoablation of small renal masses (SRMs) and determine correlation with local outcome.
Material and methods: Retrospective analysis was performed on 31 patients who underwent percutaneous MRI-guided cryoablation for 33 SRMs (size: 0.9-4.5 cm). Tumors and corresponding ice-ball volumes were segmented on intraprocedural pre- and post-ablation MR images using Software Assistant for Interventional Radiology (SAFIR) software. After MRI-MRI anatomical co-registration, 3D ablation margins were automatically quantified. Minimal ablation margin was defined as the smallest three-dimensional distance between the tumor and ice-ball surface, where negative values indicate incomplete coverage. Local tumor progression (LTP) after cryoablation was assessed on follow-up imaging.
Results: Median follow-up was 16 months (range: 1-58). Local control after cryoablation was achieved in 27 tumors (82%), while LTP occurred in 6 (18%). Minimal ablation margin was significantly smaller for cases with vs. without LTP (-6.9±3.5 vs. 2.6±1.7 mm, P<.001). No LTP was observed in patients with a minimal margin >0 mm. Cases with LTP had significantly larger tumor diameters vs. those without LTP (4.1±0.5 vs. 2.9±0.9 cm, P=.003). All negative treatment margins occurred in tumors >3cm. No significant differences were found for other baseline parameters.
Conclusion: Minimal treatment margin appears a strong predictor of outcome after MRI-guided cryoablation of SRMs. Radiologically complete coverage (smallest margin >0 mm) was associated with absence of local recurrence. Intraoperative use of automated 3D margin analysis can be a valuable tool in predicting therapy success during percutaneous renal cryoablation procedures.

P-6

Percutaneous microwave ablation of renal cell carcinomas: mid and long-term results

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Purpose: Percutaneous ablation is an established technique for the treatment of small localized renal tumors. Although microwave ablation offers theoretical advantages over the other ablation techniques, there is a lack in literature concerning the mid and long term results. The aim of our study was to assess the effectiveness, safety and mid and long term efficacy of microwave ablation in T1a and T1b renal tumors.
Material and methods: Institutional retrospective research identified 58 patients who underwent computed tomography guided, percutaneous microwave ablation for localized, biopsy proven (T1N0M0) renal cancer. Mean patient age was 71.2 years. Tumor stage was T1a in 66.7% and T1b for 33.3 % of the cases. The mean maximum tumor size was 3.4 ± 1.1 cm. Contrast-enhanced computed tomography or magnetic resonance imaging were used for follow-up. Patient and tumor characteristics, microwave technique, complications and pattern of recurrence were evaluated.
Results: A second ablation due to residual tumor was performed in 5/58 (8.5%) patients. The mean progression free survival time from last ablation was 85.3 months. The cumulative progression free rate for 1,6,12 and 36 months were 96%, 93%, 93% and 93% respectively. The mean survival time from the last ablation was 28 months with median equal to 16 months. Metastasis occurred in 2 (3.45%) patients. Grade 1 complications (minor hematoma requiring nothing but observation) were recorded in 4 (6.8%) patients.
Conclusion: Percutaneous microwave ablation of Renal Cell Cancer is a safe and efficacious technique for the treatment of T1a and T1b renal tumors, with low tumor recurrence rates and satisfactory long term outcomes.

P-7

Long-term outcomes of CT-guided percutaneous cryoablation for renal cell carcinoma

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Purpose: To report the long-term outcomes of CT-guided percutaneous cryoablation (PCA) for biopsy-confirmed renal cell carcinoma (RCC).
Material and methods: This single-center, retrospective study investigated all patients treated with PCA for RCC tumors; between January 2010 and February 2019. Primary outcome measures were overall survival (OS), disease-free survival (DFS), progression-free survival (PFS), cancer-specific survival (CSS). Secondary outcome measures were kidney function, complications, technical success, hospital stay, procedural time, and the identification of factors affecting the primary outcomes.
Results: Fifty-three consecutive patients with 54 lesions (T1a: 49/54; T1b: 9.3%) were included. Mean tumor diameter was 28.0±8.5mm and mean RENAL score was 7.2±2.0. Technical success was 100% (54/54 lesions) after two reinterventions for incomplete ablation. Mean time follow-up was 46.7±28.6 months (range: 3-122). Local recurrence was noted in 5 patients (9.2%). According to Kaplan-Meyer analysis OS was 98.2%, 94.2%, 71.2% and 58.2% at 1, 3, 5 and 8 years. One patient (1.9%) died of cancer and CSS was 95.8% at 8 years. DFS was 100.0%, 95.5% and 88.6%, and PFS was 100%, 94.3%% and 91.0%, at 1, 2 and 5 years. Clavien–Dindo grade II complication rate was 7.8% (5/64 procedures). There were no complications classified as grade III or greater. Mean creatinine increase was 7.1±6.3μm/L(p=0.31). No patient required dialysis during follow up. Mean procedural time was 163±45mins. Mean hospital stay was 2.2±2.2 days. Diabetes was the only independent predictor of decreased OS (HR 4.3, 95%CI 0.043-0.914; p=0.038).
Conclusion: PCA provides favorable long-term oncological and renal function preservation outcomes with acceptable complication rates in stage T1a and T1b RCC.

P-8

Microwave ablation versus cryoablation in the treatment of patients with early stage renal tumors

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Purpose: To compare safety and efficacy between microwave ablation (MWA) and cryoablation in the treatment of localized renal tumors.
Material and methods: We studied retrospectively 45 patients with renal tumors of stage IA (n=33) and IB (n=12) who underwent percutaneous ablation treatment (cryoablation: n=15,IA n=9, IB n=6 /MWA: n= 30, IA n=24, IB n=6). MWA procedures were performed under conscious sedation, whilst cryoablation sessions demanded only local anesthetic. All procedures were CT guided. Duration of MWA varied according to the ablative modality, the lesion size and the tumor stage.
Results: A total of 52 ablation sessions has been performed. All sessions were technically successful. Clinical efficacy varied according to tumor stage and ablative method (IA lesions: MWA 95,8%, Cryoablation 100%/ IB lesions: MWA 66,67%, Cryoablation 83,34%). Residual tumors have been treated with a second ablation session. Follow up protocol included CT immediately postprocedurally and either CT/MRI 1,3,6 months and one year after treatment and yearly thereafter. No major complication did occur. Post ablation syndrome was reported to 7 patients. All patients were dismissed after 12h hospitalization. Local recurrence rates came up to 13,3% for both cryoablation patients MWA patients 6 months after treatment. All of them have been treated with a subsequent ablation session.
Conclusion: Both MWA and Cryoablation are effective, minimal invasive techniques with low rate of potential complications, as well as, low rate of referred recurrences.

P-9

A review of practice in percutaneous cryoablation therapy for renal cell carcinoma: a technologist guide

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Learning Objectives: Discussing the epidemiology and mechanism of Renal Cell Carcinoma (RCC) Pre and Post Imaging findings on USG, CT & MRI Highlights the technique and principles for Cryoablation.
Background: RCC is the most common type of kidney cancer in adults. The traditional treatment was partial nephrectomy. With the help of advanced imaging, RCC is now often detected in earlier stages. Cryoablation is a technique that eventually results in tissue necrosis, has become the standard nephron-sparing option for RCC.
Clinical Findings/Procedure Details: Cryoablation is performed by inserting a cryoprobe into the tumor. The probe rapidly removes heat from the tissue by means of Joule-Thompson effect, in which rapid expansion of a gas results in a change of temperature. A heat sink is produced near the antenna tip that cools the probe to temperatures of –160°C or colder. Heat is transferred from the tissue into the cryoprobe via passive thermal diffusion. Slow freezing produces intracellular ice crystals and fast freezing induces extracellular ice crystals. Both processes induce cell death by different cellular mechanisms. In addition, freeze-thaw cycles can induce cellular dehydration, vascular thrombosis, and membrane rupture. The number of cryoablation probes inserted into a lesion can also be varied, depending on the size and shape of a lesion. In contrast to MWA and RFA, cryoablation allows direct visualization of the approximate ablation zone, can be visualized in three planes under direct visualization.
Conclusion: Percutaneous Cryoablation is a reasonable minimally-invasive treatment option for patients with RCC, providing favorable oncologic and safety outcomes compared to surgical and surveillance approaches.

P-10

Arterial embolization as a sole management of ruptured renal cell carcinoma in a patient with chronic renal failure

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Clinical history/Pre-treatment imaging: A 55-year-old male patient with end stage renal disease on hemodialysis presented with sudden left flank pain associated with significant hemoglobin drop. CT examination of the abdomen was done and revealed a large lower pole ruptured RCC with large perinephric hematoma. The patient had acquired renal cystic disease with a prior right renal cell carcinoma which was resected one year before the current presentation.
Treatment options/Results: The patient was prepared for an urgent embolization of the left kidney on the same day. Embolization of the left renal artery was successful using 3 coils (Tornado 7-3). Post coiling angiogram revealed complete devascularization of the kidney. Serial CT imaging at 1 week, 3 & 6 months showed complete necrosis of the left kidney with resolution of the perinephric hematoma. The patient was followed up for three years with no evidence of recurrence or metastatic disease.
Discussion: Patients on chronic dialysis are at increased risk of RCC due to the development of acquired renal cystic disease. Thus, regular screening is usually recommended. In this patient, the left RCC developed over short period of time and presented acutely with perinephric hemorrhage. Treatment options include surgical resection and embolization. As our patient was unfit for surgery, embolization was performed and provided adequate control without need for subsequent nephrectomy.
Take-home points: Arterial embolization is a life saving procedure in acute renal hemorrhage. Embolization can provide adequate bleeding and oncological control as a sole management in poor surgical candidates.

P-11

Multidisciplinary management of extensive renal cell carcinoma with inferior vena cava thrombosis with the use of removable cava filter (Capturex): a case report

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Clinical history/Pre-treatment imaging: The most common cause of neoplastic thrombotic infiltration of the inferior vena cava is renal cell carcinoma, with a reported rate of 4% to 10% . Despite higher risks of perioperartive complications compared to typical radical nephrectomy, surgical resection and tumor thrombectomy in patients with renal cell carcinoma and tumor thrombus offers a potential survival advantage. We present a case of a patient with massive RCC with extensive tumor thrombus involving inferior vena cava (IVC).
Treatment options/Results: Prior to surgical resection, a renal artery embolization (RAE) was performed in order to reduce the risk of intra-operative bleeding. Subsequently, we performed a combined endovascular and open surgical approach, consisting in nephrectomy, liver derotation and vena cava thrombectomy, with the support of a temporary inferior vena cava filter, positioned at the atrial-IVC junction in order to protect against thromboembolism during the procedure.
Discussion: Due to the extension of the tumor in the retrohepatic tract of the IVC up to 2 cm from the right atrium, the use of Capturex device has allowed us to perform the cavotomy more safely, reducing the high risk of pulmonary embolism. Capturex has an internal 6 Fr shaft that allowed us to insert telescopically an additional catheter through which an intraoperative phlebography was performed, without moving the filter.
Take-home points:
- The use of a novel temporary caval filter(Capturex) have reduced the risk of intraoperative thromboembolic dissemination.
- Capturex, in addition to its protective function, allow to perform other diagnostic or interventional procedure thanks to its 6 Fr working channel.

Liver

P-12

Transradial access versus transfemoral access for transcatheter arterial chemoembolization: a randomized controlled study

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Purpose: The purpose of this randomized controlled study was to assess the technical feasibility, safety and patient satisfaction of transradial access (TRA) compared to transfemoral access (TFA).
Material and methods: Patients with hepatocellular carcinoma undergoing transcatheter arterial chemoembolization (TACE) were prospectively enrolled from February 2019 to December 2019 in a single center of our hospital. A randomized process divided the patients into TRA and TFA groups. All procedures were performed by one group of experienced interventional radiologists. Primary endpoint was to analyze the rate of patients who preferred the previous access in expectant procedures.
Results: 82 patients were enrolled with 42 undergoing TRA and 40 undergoing TFA. The technical success rate was 100% with no crossover to alternative access in both groups. The rate of patients who preferred previous access in the next procedures was significantly higher in the TRA group compared with the TFA group (92.9% vs. 32.5%, p<0.001). And the TRA group showed a significantly reduced length of hospital stay (2.4 d vs. 3.2d, p=0.022). There was no significant difference between the TRA and the TFA groups for procedure time (51.88 min vs. 51.00 min, p=0.797), fluoroscopy time (13.49 min vs. 14.01min, p=0.691), and radiation dose (Air Kerma, AK) (351.10 mGy vs. 410.96 mGy, p=0.271). Both groups showed similar low rates of access site complications.
Conclusion: This study demonstrated that TRA is a preferential access for patients with a higher satisfaction and both TRA and TFA are technically feasible and safe with low rate of access site complications for transcatheter arterial chemoembolization.

P-13

Sorafenib combined with a novel chemotherapeutic idarubicin-loaded drug-eluting beads transarterial chemoembolization (TACE) treated for advanced hepatocellular carcinoma: a comparative study with doxorubicin

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Purpose: Treatment for advanced hepatocellular carcinoma (HCC) using a combination of sorafenib and conventional transarterial chemoembolization (TACE) has not produced satisfactory results. We aimed to investigate the effectiveness and safety of sorafenib plus idarubicin-loaded drug-eluting beads TACE (DEB-TACE) for such cohorts.
Material and methods: This retrospective study included 125 consecutive patients with advanced HCC, who received sorafenib combined either with idarubicin-loaded DEB-TACE (SIDA group, n = 61) or doxorubicin-loaded DEB-TACE (SDOX group, n = 64). Adverse events (AEs), objective response rate (ORR), overall survival (OS), and time to progression (TTP) were compared between two groups.
Results: The adverse events were similar for patients in both groups. The post-treatment ORR was significantly higher in the SIDA group than in the SDOX group (72·1% vs. 40·6%, P < 0·001). The 6- and 12-month OS rates in the SIDA group (93·6% and 76·8%) were significantly higher than those in the SDOX group (48·0% and 40·2%). Similarly, the corresponding TTP rates at 6- and 12-months were higher in the SIDA group (59·6% and 27·6%, respectively) than in the SDOX group (31·2% and 15·6%). The median TTP was significantly longer: 7·9 months (95% CI: 5·6–10·2 months) vs. 2·6 months (95% CI: 1·6–3·6 months) (P = 0·001). Multivariate analysis revealed that portal vein tumor thrombus (P = 0·017) and treatment type (P < 0·001) were independent predictors of OS with hazard ratios of 2·31 and 5·98.
Conclusion: The combination of sorafenib with idarubicin-loaded DEB-TACE is well-tolerated, safe, and superior than doxorubicin-loaded DEB-TACE in terms of improving survival of patients with advanced HCC.

P-14

Drug-eluting beads loaded with doxorubicin versus conventional transarterial chemoembolization for hepatocellular carcinoma after transjugular intrahepatic portosystemic shunt

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Purpose: This study aims to compare the safety and effectiveness between transarterial chemoembolization (TACE) with drug-eluting beads (DEB-TACE) and conventional TACE (cTACE) using lipiodol-based regimens in HCC patients with a transjugular intrahepatic portosystemic shunt (TIPS).
Material and methods: This retrospective study included patients with patent TIPS who underwent TACE from January 2013 to January 2019 that received either DEB-TACE (DEB-TACE group, n=57) or cTACE (cTACE group, n=62). The complications, liver toxicity, overall survival (OS), time to progression (TTP), and objective response rate (ORR) were compared between the groups.
Results: Altogether, 119 patients (50±11 years, 107 men) were evaluated. The incidence of adverse events, including abdominal pain within 7 days (45.6% vs 79.0%, P<0.001) and hepatic failure within 30 days (5.3% vs 19.4%, P=0.027), was significantly lower in the DEB-TACE group than in the cTACE group. Compared to cTACE group, the DEB-TACE group also showed mild liver toxicities in terms of increased total bilirubin (8.8% vs 22.6%), alanine aminotransferase (5.3% vs 21.0%), and aspartate aminotransferase (10.5% vs 29.0%) levels. The DEB-TACE group had better ORR than cTACE group (70.2% vs 50.0%). The median OS and TTP were longer in the DEB-TACE group (11.4 vs 9.1 months, hazard ratio [HR]=2.46, P<0.001; 6.9 vs 5.2 months, HR=1.47, P=0.045). Multivariable analysis showed that α-fetoprotein levels, Barcelona clinic liver cancer stage, and treatment allocation were independent predictors of OS.
Conclusion: DEB-TACE is safe and effective in HCC patients with a TIPS, and is potentially superior to cTACE in terms of complications, liver toxicities, OS, TTP and ORR.

P-15

Lack of standard-periprocedural medications but stable health-related quality of life: interim results on the real-life use of Irinotecan-eluting chemoembolisation in liver metastases from colorectal cancer

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Purpose: Current European guidelines for treating colorectal cancer liver metastases (CRLM) patients that are not eligible for curative treatment include transarterial chemoembolisation (TACE) using irinotecan-eluting beads among treatment possibilities. The CIrse REgistry for LifePearlTM microspheres (CIREL) is a prospective, Europe-wide, multicentre, observational study on the real-life use of LifePearlTM microspheres TACE. In an interim-analysis, the treatment intention, periprocedural medications, safety and patient-reported Health-related Quality of Life (HRQOL) were analysed.
Material and methods: The first 50 patients (>= 18 years) were treated with irinotecan-eluting beads as decided by an MDT with no further inclusion or exclusion criteria. Periprocedural medications were recorded in the recruiting centres. HRQOL was analysed using the EORTC QLQ-C30 questionnaire and scoring manual.
Results: The treatment intention for most patients (42%) was LP-irinotecan TACE as salvage therapy. 3 major groups of periprocedural medication strategies were identified. 33% of treatment sessions used opioids exclusively, otherwise antiemetic and NSAID plus either corticosteroids and intra-arterial anesthetic (32%), or antihistamines and antibiotics (29%) were used additionally. SAEs were observed in 4% during treatment sessions and in 10% of patients within the first 30 days. Function and symptom scores remained stable in 74% and 72% of patients. 62% of patients reported a stable or better global health score. In the 38% with worse global health score, 54% were salvage therapy patients
Conclusion: This interim analysis shows the predominant use of LP-irinotecan TACE as salvage therapy, confirms the acceptable toxicity profile and documents the lack of standardisation of periprocedural medications. The majority of patients reported a stable or improved HRQOL.

P-16

Percutaneous cross mesh stenting for palliative treatment of perihilar malignant biliary obstructions with a novel metallic stent: technical aspects, safety, and clinical outcome

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Purpose: Intrahepatic malignant biliary obstruction (IMBO) often extends to confluence of secondary ducts causing a limited efficacy of conventional stent-in-stent (SIS) or side-by-side (SBS) stent placement techniques. The HILZO Biliary Moving Cell is a novel metallic stent developed for SIS with a smaller cell size designed for crossing through any part of the stent to allow for drainage of more liver segments. We investigated the applicability of the HILZO stent in the palliative treatment of IMBO with secondary biliary confluences involvement.
Material and methods: 22 patients with IMBO for primary biliary tumor or metastases were included in this retrospective, single-center study. All patients underwent percutaneous cross mesh stenting (p-CMS) with ≥2 HILZO stents deployment. Technical and clinical success, complications, and stent patency were analysed
Results: Median age was 72 years (range 43 – 89). Cross mesh stenting was technically successful in all cases. P-CMS was perfomed with 2 stents in 8/22 patients, 3 stents in 11/22 patients and with 4 stents in 3/22 patients. Clinical success was achieved in 21 patients (95.4%), with a median bilirubin blood concentration that dropped from 8mg/dL to 2mg/dL after 7 days, remaining stable at one-month follow-up. Six patients had minor complications. No major complications were reported. Median follow-up was 93 days, with a 95,5% patency rate. Stent dysfunction due to tumor ingrowth occurred in 1 patient.
Conclusion: P-CMS with HILZO stents is a safe and an effective method for palliation of IMBO involving secondary confluences.

P-17

Feasibility, safety and tumor control of balloon-occluded trans-arterial radioembolization (B-TARE) for the treatment of local advanced hepatocellular carcinoma (HCC)

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Purpose: To evaluate technical feasibility, safety and tumor control rate of balloon-occluded trans-arterial radioembolization (B-TARE) treatment in local advanced, unresectable, hepatocellular carcinoma (HCC) patients.
Material and methods: Twelve Child A patients with unresectable HCC (BCLC-B) using balloon-occluded trans-arterial radioembolization (B-TARE) were included. Each patient received one session of B-TARE, in which was administered a median dose of 1.75 GBq (±0.18). Technical embolization endpoint was complete drug administration. Balloon-occluded arterial stump pressure (BOASP), adverse events (AEs), complications and post-embolic syndrome (PES) were assessed. Procedural oncological outcomes (per-patient and per-nodule) were evaluated according to RECIST 1.1 criteria on 1- and 3-month follow-up CT. Impact of balloon micro-catheter on trans-arterial loco-regional treatment was analyzed using 2D/3D dosimetry in post-procedural SPECT.
Results: Mean number of HCC nodules treated was 3.58 (±2,84) with mean diameter of 36.6mm (±19.81). Technical success was obtained for all procedures; no major complications were observed. In 2D evaluation, activity intensity peak was 987.5 (±393.8), that shows a high amount of Y90-microspheres delivered to the lesion. Regarding 3D dose analysis (expression of Absorbed Dose in Gy), mean dose <D> administered to treated lesions was 151.6 (±53.2), with low mean dose delivered to the normal liver (29.4 ±5.7).
At 3-months follow up we obtained Complete Response (CR) in 5/12 patients, Partial Response (PR) in 3 patients and 1 Stable Disease (SD). Per-nodule examination demonstrated CR in 13/43 nodules (30.2%) and PR in 25/43 (58%).
Conclusion: In our preliminary experience B-TARE seems to be a safe and effective local therapeutic option for unresectable HCC lesions, showing a high rate of local response.

P-18

Quantitative ablation margin assessment using a 3D liver model: can ablation surface coverage data contribute to better prediction of local tumor control?

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Purpose: The minimal ablation margin (MAM) has been proven to be a valuable predictor of local control after thermal ablation of liver tumors. However, a standardized way of determining this measure is currently lacking and tissue shrinkage during ablation may influence the MAM negatively. We created a 3D model out of the pre- and post-ablation scans to gain insight in the value of different quantitative ablation margin measures, such as MAM and ablation surface coverage.
Material and methods: 28 patients (age 64.8 SD: 8.7) with 45 hepatocellular carcinomas (mean size 18.8mm SD: 7.7) were included. 6/45 tumors were excluded for further analysis due to infeasible registration. By manually segmenting the tumor and ablation necrosis area, two 3D liver models were created that were merged using semi-automatic rigid registration of

pre-and post-ablation imaging. This combined model was used to determine the MAM and ablation surface coverage.
Results: The median MAM was -3.1 mm (the tumor exceeded the ablation necrosis) for 4/28 tumors that developed local tumor progression (LTP), with a median of 28.9% of the tumor surface that exceeded the ablation necrosis. MAM was –1.2 mm for those tumors that did not develop LTP, with a median of 7.7% of the tumor surface exceeding the ablation necrosis.
Conclusion: Insufficient MAM and tumor surface exceeding the ablation necrosis were found for cases that did and did not develop LTP, possibly due to tissue shrinkage. These measures were larger for LTP cases.

P-19

Higher dose to the tumor gives survival advantage in HCC BCLC B and C patient performing TARE

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Purpose: Evaluate the effect of dose to the tumor on overall survival (OS) of a population of BCLC-B and C patients performing trans-arterial radiation-embolization (TARE) of hepatocarcinoma.
Material and methods: The injected activity was calculated based on expected dose to the lungs, normal liver and tumor using 99m-TC-MAA SPECT-CT. Tumor was delineated in CT/MRI. Cox and random forest (RF) models were applied. The RF was trained on the 70% of the patients and tested on the remaining.
Results: 56 patients were treated with Sir-sphere and 52 with Thera-sphere. Median OS was 12.7 mo (range 2-73 mo). Patients characteristics were: age 64.8±10.1, alpha-feto-protein 1866.71±6190.79, albumin 3.53±0.48 g/dl, and bilirubin 1.17±0.69 mg. 52 patients were BCLC B and 56 C. 42, 35, 24 and 6 patients had respectively Child-Pugh of 5, 6, 7 and 8. 55 patients presented portal vein thrombosis and 6 metastases. Cutoff values were 122 Gy for Sir-spheres and 209 Gy for Thera-spheres defining two groups with a median OS of 15.1 mo (41 pts with high-doses) and 7.8 months (67 pts with low-doses) (p=0.0012). Cox-model identified CP (HR=2.1, p=0.004) and dose cut-off (HR=0.5, p=0.004) as prognosticators. RF model selected dose cut-off, portal vein thrombosis and CP. The AUC were 0.58 (95% CI: 0.54-0.79) for Cox model and 0.70 (95% CI: 0.51-0.89) for RF model. Median OS for low- and high-dose groups were 14.5 and 6.9 mo (Log-rank =0.00028)
Conclusion: CP and dose to the tumor lead a significantly higher median OS.

P-20

Transarterial chemoembolization of hepatocellular carcinoma in patients with previous oncologic malignancy in remission

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Purpose: To analyze whether previously diagnosed malignancy in complete remission is an independent risk factor affecting survival of patients with hepatocellular carcinoma (HCC) treated with transarterial chemoembolization (TACE).
Material and methods: 153 patients with HCC treated with TACE between 2005-2019 were enrolled in this retrospective study. Study group consists of patients with the history of single malignant tumor (n=8) and two types of malignancy (n=3) of extrahepatic origin (colorectal, lung, hypopharyngeal, bladder and prostate adenocarcinomas, lymphoma, urothelial carcinoma, ovarial granulosa cell tumor) who achieved complete remission before HCC was diagnosed. Control group consists of 142 patients without previous malignancy. Overall survival since 1st TACE (Kaplan Meier and log-rank test) was calculated in both groups. Cox regression model was used to calculate hazard ratio (HR) and 95% confidence-interval (CI) for overall survival.
Results: A total of 523 TACE procedures was performed. There was no significant difference in procedure per patient in study and control group (4 vs 3 p=0.27), tumor size (6.0 vs 6.0cm p=0.63), Child-Pugh classification (p=0.97). Overall survival in both groups did not show significant difference (29.0 vs 22.4 months respectively, p=0.57), although the patients in the study group were significantly older (74.3 vs 67.7 years p=0.03). Statistical analysis shows that history of previous malignancy is not an independent risk factor for overall survival (HR 0.86 (95% CI: 0.38, 1.97)).
Conclusion: Patients with HCC treated with TACE and a history of other malignant tumor in complete remission have non-inferior overall survival compared to patients without history of other malignancy.

P-21

Real-time MR imaging of holmium-166 microsphere distribution during SIRT in salvage patients: proof of principle

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Purpose: Selective internal radiation therapy (SIRT) is a local treatment for liver tumours during which radioactive microspheres are injected in the hepatic arterial system. To create better understanding of the distribution patterns in relation to the number of microspheres administered, we prospectively studied the microsphere distribution with radioactive holmium-166 poly(L-lactic) acid microspheres, using real-time MRI.

Material and methods: Ethical committee approval was obtained for this feasibility study, in which 6 patients with unresectable liver tumours are treated. The SIRT procedure is split up: the catheter is placed under X-ray guidance as per usual, after which the patient is moved to an MRI scanner which is positioned directly adjacent to the hybrid OR. The total activity for each of the identified catheter positions is split in predefined fractions. MRI is performed during and after the administration of each fraction. All fractions for one catheter position are injected within one hour. Quantitative imaging is performed after each fraction and converted to dose maps using Q-Suite software to establish the T/L ratio and perform voxel-based dosimetry.
Results: Recruitment is ongoing, with 5 out of 6 patients enrolled and treated successfully. The quantitative dose distributions provide promising insight into microsphere distribution in relation to the amount of microspheres administered. The intrahepatic distribution of microsphere fractions is not necessarily consistent between different fractions.
Conclusion: This study is an important first step to better understand SIRT fundamentally and this may lead to improving the therapy by increasing the T/L ratio, ultimately resulting in better patient outcomes.

P-22

Microwave vs. radiofrequency ablation for the treatment of liver metastases using a dual ablation system: prospective randomized trial

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Purpose: To prospectively compare the therapy response and safety of microwave (MWA) and radiofrequency ablation (RFA) for the treatment of liver metastases using a dual ablation system.
Material and methods: Fifty patients with liver metastases (23 men, mean age: 62.8±11.8 years) were randomly assigned to MWA or RFA for thermal ablation using a one generator dual ablation system. Magnetic resonance imaging (MRI) was acquired before treatment and 24 hours post ablation. The morphologic responses to treatment regarding size, volume, necrotic areas, and diffusion characteristics were evaluated by MRI. Imaging follow-up was obtained for one year in three months intervals, whereas clinical follow-up was obtained for two years in all patients.
Results: Twenty-six patients received MWA and 24 patients received RFA (mean diameter: 1.6 cm, MWA: 1.7 cm, RFA: 1.5 cm). The mean volume 24 hours after ablation was 37.0 cm3 (MWA: 50.5 cm3, RFA: 22.9 cm3, p<0.01). The local recurrence rate was 0% (0/26) in the MWA-group and 8.3% (2/24) in the RFA-group (p=0.09). The rate of newly developed malignant formations was 38.0% (19/50) for both groups (MWA: 38.4%, RFA: 37.5%, p=0.07). The overall survival rate was 70.0% (35/50) after two years (MWA: 76.9%, RFA: 62.5%, p=0.60). No major complications were reported.
Conclusion: In conclusion, MWA and RFA are both safe and effective methods for the treatment of liver metastases with MWA generating greater volumes of ablation. No significant differences were found for overall survival, rate of neoplasm, or major complications between both groups.

P-23

Intrahepatic cholangiocarcinoma treated with TACE with Irinotecan-eluting beads versus conventional TACE with Irinotecan: a prospective randomized trial

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Purpose: To compare efficacy and safety of TACE with Irinotecan-eluting beads (dTACE) and conventional TACE with Irinotecan (cTACE) for Intrahepatic Cholangiocarcinoma and determine whether dTACE leads to better objective response rate (ORR), disease control rate (DCR), and overall survival (OS) than cTACE.
Material and methods: This trail was approved by the institutional review board and was registered with the Chinese Clinical Trial Registry (ChiCTR1900022856). A total of 40 patients (20 patients per group) with histologically confirmed intrahepatic cholangiocarcinoma and TNM staging system II and III were randomized to receive dTACE and cTACE. The primary end point was 3-month ORR assessed with experienced radiologists by using mRECIST criteria in solid tumors. Secondary end point were overall survival and safety. Data were compared with the log-rank test and chi-square test, and survival curves were generated with the Kaplan-Meier method.
Results: Between 2019 and 2021, 40 patients were enrolled. ORR in dTACE and cTACE was 50% (95% CI: 26%,74%) and 15% (95% CI: 0%,32%), respectively (P=0.041). DCR in in dTACE and cTACE was 55% and 45%, respectively (P=0.527). Median survival for dTACE were longer than cTACE [median OS, 11.5 months (95% CI: 7.7, 14.3) vs 9.0 months (95% CI: 6.95, 11.05)] (P=0.280). Similarly, median survival for dTACE in Child-Pugh class A patients were longer than cTACE [median OS, 11.0 months (95% CI: 5.6, 16.4) vs 9.0 months (95% CI: 7.9, 10.1)] (P=0.314). The most frequent adverse events were elevation of transaminase. (20 of 20, 100% in dTACE vs 15 of 20, 75% in cTACE) (P=0.047). There was no statistically significant difference in other adverse events and complications.
Conclusion: Irinotecan-eluting beads showed promising objective response rate and overall survival when compared with cTACE with Irinotecan for Intrahepatic Cholangiocarcinoma.

P-24

Arsenic trioxide-loaded CalliSpheres: in-vitro study of drug release and antitumor activity, and in-vivo study of pharmacokinetics, treatment efficacy and safety in liver cancer

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Purpose: We aimed to investigate the arsenic trioxide (ATO) loading/releasing efficiency of CalliSpheres bead (CB), also to explore the in vitro anti-cancer activity, in vivo pharmacokinetics, treatment efficacy and safety of ATO-eluting CB in liver cancer.
Material and methods: The ATO loading and releasing efficiencies in CB were evaluated. Furthermore, cell viability, invasion, apoptosis, VEGF expression and MMP9 expression were determined in liver cancer cells treated with ATO-eluting CB or ATO solution. Rabbit liver models were established and underwent transhepatic arterial chemoembolization (TACE) with ATO-eluting CB or ATO/lipiodol emulsion, subsequently, their ATO pharmacokinetics were determined and macroscopic/microscopic examinations were conducted.
Results: In vitro, CB loaded ATO increased during 40 minutes with an optimal loading efficiency of 23.0±2.5%, and released ATO rapidly within the first 30 minutes (31.40±10.0%) then slowed down within the latter 48 hours (47.20±4.70%). ATO-eluting CB exhibited declined cell viability to some extent while similar invasive cell count, apoptosis rate, VEGF and MMP9 levels compared with ATO solution at different concentrations and timepoints. In vivo, ATO concentration was lower in plasma, but higher in tumor tissues, and necrosis was more complete in tumor tissue while milder in normal liver parenchyma after rabbit liver being embolized with ATO-eluting CB compared with ATO/lipiodol emulsion.
Conclusion: ATO-eluting CB might be a novel and promising therapeutic option in treating liver cancer.

P-25

The role of neoadjuvant chemotherapy in repeat local treatment of recurrent colorectal liver metastases: a systematic review and meta-analysis

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Purpose: To assess the additive value of neoadjuvant chemotherapy (NAC) followed by repeat local treatment of patients with recurrent colorectal liver metastases (CRLM).
Material and methods: A systematic search was performed in PubMed, Embase, Web of Science and an additional search in Google Scholar to find articles comparing repeat local treatment by partial hepatectomy and/or thermal ablation with versus without NAC. The search included randomized trials and comparative observational studies with univariate/multivariate analysis and/or matching as well as (inter)national guidelines assessed using the AGREE II instrument.
Results: The search identified 21,832 records; 172 were selected for full-text review; 20 comparative observational studies included and evaluated. Literature to evaluate the additive value of NAC prior to repeat local treatment was limited. Outcomes of NAC were often reported as subgroup analyses. Assessment of the seven studies that qualified for inclusion in the meta-analysis showed conflicting results. Only one study reported a significant difference in overall survival (OS) favoring NAC prior to repeat local treatment. However, further analysis revealed a high risk for residual bias, because only a selected group of chemo-responders qualified for repeat local treatment. All guidelines that specifically mention recurrent disease (3 / 3) recommend repeat local treatment; none provide recommendations about the role of NAC.
Conclusion: The inconclusive findings of this meta-analysis do not support recommendations to routinely favor NAC prior to repeat local treatment. This emphasizes the need to study the additive value of NAC prior to repeat local treatment of patients with recurrent CRLM in a future phase 3 randomized controlled trial (RCT).

P-26

Drug-eluting (Irinotecan) bead transarterial chemoembolization with CalliSpheres microspheres for treatment of systemic chemotherapy-refractory unresectable colorectal cancer liver metastases

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Purpose: The purpose of this study was to evaluate the therapeutic effcacy and safety of drug-eluting (Irinotecan) bead transarterial chemoembolization(DEBIRI-TACE) with CalliSpheres microspheres in the treatment of patients with unresectable colorectal cancer liver metastases (CRCLM) who had failed systemic chemotherapy.
Material and methods: A single-center retrospective analysis of patients with CRCLM treated with DEBIRI-TACE with CalliSpheres microspheres, who had failed prior systemic chemotherapy was performed from December 2015 to December 2019. Information about the therapeutic response, overall survival (OS), progression-free survival (PFS), and adverse events were collected. Cox's proportional hazards regression model was used to determining factors influencing OS and PFS.
Results: Forty-two patients with 89 treatments with DEBIRI-TACE procedures were included over our study period. The objective response rate was 57.1% (24/42), and disease control was 80.9% (34/42), respectively. The Median OS from the first treatment was 16 months (95% confidence interval [CI]:13.3 months, 18.6 months), and the median PFS was 7months (95% CI6.1 months, 7.8 months), respectively. Cox's proportional hazards regression analysis revealed that extrahepatic metastasis and synchronous metastatic disease

were independent prognostic negative factors with OS and PFS. The complication included abdominal pain, nausea/vomiting, fever, Fatigue, and elevation of transaminase in patients with DERIEI-TACE procedure could almost be resolved by adapting medical treatment.
Conclusion: DEBIRI-TACE with CalliSpheres microspheres is well tolerated and effective in patients with unresectable chemotherapy-refractory CRCLM. Furthermore, extrahepatic metastasis and synchronous metastatic disease were possibly correlated with the poor prognosis of treatment.

P-27

An accurate non-tumoral 99mTc-MAA based dose to plan safe but efficient activities in liver radioembolization

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Purpose: The manufacturers' recommended methods to calculate delivered activities in liver radioembolization (RE) are simplistic and only slightly personalized. Activity planning could also be based on a 99mTc-macroaggregated albumin SPECT/CT (MAA) using the partition model but its accuracy is controversial. This study evaluates doses in the non-tumoral (normal) and in the tumor liver compartments using the MAA imaging and post-therapy 90Y TOF-PET/CT (90Y imaging). Finally, we propose a prescription of the activity as a function of the normal liver MAA distribution.
Material and methods: 66 procedures of RE (with resin microspheres) corresponding to 171 lesions were analyzed. Tumor to normal targeted liver uptake (T/NTL), tumor dose (TD) and normal liver doses (NLD) were assessed with MAA and 90Y imaging. Secondly, activities were recalculated using the MAA distribution in the NTL compartment to reach a target dose of 50 Gy or 70 Gy.
Results: Our study demonstrated an accurate estimation of the NLD using MAA imaging ($R=0.97$, $p < 0.001$, variability = 1.9 Gy). In contrary, significant variations were found for TD ($R=0.65$, $p < 0.001$ and variability= 49.4 Gy). The MAA T/NTL ratio has a 85% positive predictive value in identifying patients who will get a 90Y T/NTL ratio above 1.5, which is likely to lead to positive therapeutic results.
Conclusion: The partition model is an imprecise model for estimating TD. However, NLD is accurately predicted with MAA imaging and could be used to safely plan the activity needed for treatment.

P-28

SIRT using partition model dose calculation: prognosis factor of overall survival

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Purpose: The aim of this study is to evaluate prognosis factors of survival after SIRT for HCC with high-activity injection calculated by partition model.
Material and methods: One hundred sixty-one consecutive patients of one tertiary center treated by SIRT for HCC were included from 2010 to 2018. Usual clinicobiological parameters (eg. biological liver function), tumor characteristics, dosimetric data and volumes (total liver, taregeted tumor and non tumoral liver) calculated from CE-CT were recorded before treatment and every 3 months. We evaluated 3 month bilirubin variation and all baseline characteristics and dosimetry data as prognosis factors of survival using CART (minimum of 5 deaths per group ; p-value < 0.05 to separate into subgroups with different OS).
Results: The mean age was 67.5 y.o. There is significant (p-value < 0.05) change of means at 3 months for total bilirubin (rising from 15.7 to 28.4), albumin and INR. The mean volumes treated were 824 ml for non tumoral liver (cumulative) and 361 ml for tumoral liver. Mean activity delivered to tumor was 2.1 GBq. The CART analysis created 6 groups, based on 4 parameters (total bilirubin variation at 3 month, volume of non-tumoral liver treated, platelets count at baseline, total bilirubin at baseline), with respective Relative Hazard Ratios of 0.29, 1.70, 1.10, 1.50, 5.71, 12.03.
Conclusion: Total bilirubin at baseline, variation of total bilirubin at 3 month, volume of non tumoral liver treated and platelets count at baseline are predictive factors of pure survival and should be taken into account during planification of high-dose SIRT using partition model.

P-29

Microwave ablation of primary and secondary liver tumors: MR elastography as response parameter

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Purpose: To determine hepatic tissue response to percutaneous microwave ablation (MWA) of liver tumors using MR elastography (MRE).
Material and methods: 27 patients (12m/15f; median:54 years±10) underwent percutaneous MWA of primary (n=8) and secondary (n=19) hepatic tumors receiving multiparametric MRI and MRE immediately prior to MWA and 24h after treatment. Mean ablation energy dose was 46kJ (±19kJ) over 7 minutes (±3 min) on average per session. 19 tumors were located in the right, 8 in the left liver lobe. Retrospective analysis of the lesions included measuring pre- and post-ablative tumor size, MAP T1/T2, apparent diffusion coefficient (ADC), diffusion and stiffness using MRE. Four regions of interest were established: whole liver, tumor itself, tumor periphery, healthy parenchyma.
Results: While total liver volume increased (+73.23ml) total liver stiffness showed no significant increase (+0.038kPa). On average, the ablation zone area was 977.9 mm2 (64.5-2932mm2), its average thickness 12.91 mm (2.8-81.0mm). Tumor stiffness increased significantly by 4.23 kPa on average. Tumor diffusion decreased by 45.04, ADC increased by 389 mm2/s, as did tumor MAP T1 (-526.9ms) and MAP T2 (-18.9ms)

values. Healthy parenchyma showed no significant increase in stiffness (+ 0.1kPa), MAP T1 (+36ms), MAP T2 (+5.5ms), diffusion (+4.57ms) and ADC (+45.38mm2/s). Pre-ablative tumor stiffness showed moderate correlation (r=0.427) with post-ablative tumor stiffness. Energy dose in kJ during ablation correlated significantly with ablation zone stiffness (r=0.417) and ablated tumor area (r=0.44).
Conclusion: MRE and MRI allow evaluating treatment response in primary and secondary hepatic tumors and may thus provide extra value in the follow-up of MWA patients.

P-30

Drug-eluting beads-transarterial chemoembolization plus microwave ablation is an effective and safe treatment strategy in treating hepatocellular carcinoma adjacent to gallbladder

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Purpose: The present study aimed to compare the efficacy and safety of drug-eluting beads-transarterial chemoembolization (DEB-TACE) plus microwave ablation (MWA) versus (vs.) surgery in treating patients with hepatocellular carcinoma (HCC) adjacent to gallbladder.
Material and methods: Totally 54 patients with HCC adjacent to gallbladder were included and divided into two groups: DEB-TACE plus MWA group (n=24) and surgery group (n=30). Treatment response, relapse-free survival (RFS), progression-free survival (PFS), overall survival (OS) and adverse events were assessed and documented.
Results: For DEB-TACE plus MWA group, complete response rate, objective response rate and disease control rate were 79.2%, 95.8% and 100.0% after one-month post treatment, respectively. In terms of survival profiles, DEB-TACE plus MWA group presented similar RFS (28.2 (95%CI: 12.5-43.9) months vs. 26.6 (95%CI: 19.2-34.1) months) (P =0.930), PFS (21.2 (95%CI: 1.6-40.8) months vs. 26.6 (95%CI: 19.2-34.1) months) (P =0.541), and OS (41.4 (95%CI: 35.0-47.9) months vs. 59.7 (95%CI: 51.7-67.7) months) (P =0.138) compared with surgery group, and further multivariate Cox's regression analysis validated that, after adjustment of confounding factors, DEB-TACE plus MWA group exhibited no difference of RPS, PFS or OS compared with surgery group. Regarding safety, the intraoperative adverse event incidence was higher in DEB-TACE plus MWA group compared with surgery group (P = 0.008), while two groups exhibited no difference of postoperative adverse event incidence (P = 0.618).
Conclusion: DEB-TACE plus MWA presents to be an optional treatment strategy in patients with HCC adjacent to gallbladder.

P-31

Simultaneous microwave ablation using multiple antennas for the treatment of liver malignant lesions

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Purpose: To evaluate efficacy and safety of percutaneous microwave ablation (MWA) using simultaneous activation of two antennas for the treatment of liver malignant lesions.
Material and methods: 45 MWA procedures of liver malignant lesions were performed, respectively 6 HCC, 31 unresectable liver metastases and 8 recurrences of already treated metastases. MWA was performed with simultaneous activation of two antennas spacing ≤2.0 cm. Microwave energy was applied at least for 10 min with a power of 65 W. Size, shape (roundness index) and volume (evaluated using the semiautomatic Lesion tool, Vue PACS, Carestream) of the ablation zone were recorded. Technical success was defined as complete target devascularization at the immediate post-procedural CT. 1, 3, 6 and 12 months post-procedure follow-up was performed and major and minor complications were reported.
Results: Mean tumor size was 4cm (2.5-7cm). Full technical success was achieved in all treated liver malignant lesions. All ablative zones were spherical or ellipsoid with antennas spacing ≤2.0 cm. Artificial dissection was performed in 6 cases due to diaphragm proximity. In 6 cases peri-procedural complications were observed: one subcapsular hemorrhage, 4 cases of biloma and one peripheral portal thrombosis. We reported 2 cases of residual disease at 1 month and 5 cases of recurrence of disease at 3 months follow-up. All recidivated lesions had a maximum size ≥4.5cm (4.5-7cm) or were already surgically treated lesions.
Conclusion: Our results provide preliminary evidence of efficacy, creating a larger necrotic area, and safety, for the low complication rate, of simultaneous MWA using multiple antennas for local control of liver malignant lesions.

P-32

Occurrence, related factors and prognostic value of vascular lake in hepatocellular carcinoma patients treated with drug-eluting bead transarterial chemoembolization

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Purpose: The present study aimed to assess the prevalence of vascular lake (VL), its associated factors and correlation with prognosis in hepatocellular carcinoma (HCC) patients treated with drug-eluting bead transarterial chemoembolization (DEB-TACE).

Material and methods: 286 primary HCC patients (with 384 treated nodules) receiving DEB-TACE treatment were recruited and their clinical characteristics were documented. Then occurrence of VL was recorded. Treatment responses were assessed according to modified response evaluation criteria in solid tumors (mRECIST) criteria. Liver function indexes and adverse events were assessed. The progression-free survival (PFS) and overall survival (OS) were evaluated, with the last follow-up date of March 2020.
Results: Patient-based and nodule-based VL occurrence rate were 17.1% and 16.4%, respectively. Larger tumor size, pseudocapsule and smaller bead size independently associated with VL occurrence. In terms of treatment response, total response status, objective response rate (ORR) and disease control rate (DCR) were elevated in VL patients compared to non-VL patients, and in VL-nodules compared to non-VL nodules. Moreover, PFS and OS were more prolonged in VL patients compared with non-VL patients, and VL independently correlated with better PFS and OS. As for liver function, the liver function indexes before and after DEB-TACE were of no difference between VL patients and non-VL patients. Additionally, incidences of adverse events were similar between VL patients and non-VL patients.
Conclusion: VL occurs in 17.1% HCC patients treated with DEB-TACE, and it is correlated with larger tumor size, pseudocapsule, smaller bead size, more favorable treatment response as well as better survival.

P-33

Evaluation of software predicting selective liver perfusion for embolization planning

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Purpose: To evaluate the accuracy of a liver embolization planning software (Liver ASSIST Virtual Parenchyma, GE Healthcare, Chicago, IL) to automatically predict perfused liver volume from any virtual injection point on an enhanced planning Cone Beam CT (CBCT).
Material and methods: Planning CBCTs acquired proximally and coupled selective CBCTs acquired more distally were retrospectively collected in patients undergoing liver intra-arterial therapies in two centers. Inclusion criteria was perfused liver parenchyma volume on the selective CBCT≥100cc, with adequate enhancement to allow manual contouring. Perfused liver parenchyma was contoured manually on all selective CBCTs, defining the ground truth volume. Virtual Perfused Volume (VPV) was obtained using the software, by selecting the virtual injection point on the proximal CBCT matching the injection point of the coupled selective CBCT. VPV and ground truth volume were compared to evaluate software accuracy, reported as relative volumetric error (%) and DICE spatial overlap coefficient (%). Results are expressed as median [interquartile range].
Results: Sixty-nine CBCT couples were included in 43 patients with an average perfused liver parenchyma volume of 458cc on selective CBCTs. Software was successful in automatically computing VPV in 65/69 cases. Relative volumetric error and DICE coefficient were 12% [5%-21%] and 80% [77%-85%], with no significant difference between centers (p=.60,.97).
Conclusion: Our study demonstrates acceptable accuracy of selective perfused liver volume prediction from proximal CBCTs. This software could help identify optimal intra-arterial treatment strategies based on a single proximal CBCT including radioembolization CBCT-based volumetry, avoiding multiple selective acquisitions, reducing the need for selective catheterization during mapping and streamlining dosimetry workflow.

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Balloon occluded TACE (B-TACE) vs DEM-TACE for HCC: a single center retrospective case control study

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Purpose: To compare oncological results and safety profile of balloon micro-catheter trans-arterial chemoembolization (b-TACE) and drug-eluting-microsphere (DEM-TACE) in patients with hepatocellularcarcinoma (HCC).
Material and methods: This is a case-control, retrospective, single-center study. Between January-2015/March-2019, 149 patients (131 males [87.9%]) with 226 HCC were treated, 22 patients (35 HCC) with b-TACE and 127 with DEM-TACE (191 HCC). Embolization protocol was standardized (sequential 100±25 and 200±25 µm microspheres). Results were evaluated by modified-response-evaluation-criteria-insolid-tumor [mRECIST] at 1, 3-6 and 9-12 months and time to recurrence after complete response [TTR] at 1 year. Cox's regression weighted with tumor dimensions was performed. Adverse events (AEs) were recorded.
Results: mRECIST oncological response at all time points (1, 3-6 and 9-12 months) for both treatments were similar, with the exception of Objective response rate at 9-12months. Objective response at 1 and 3-6 months between b-TACE vs DEM-TACE [23/35 (65.7%) vs 119/191 (62.3%), 21/29 (72.4%) vs 78/136 (57.4%) (p>0.05), respectively]. On the contrary, at 9-12 months, it was significantly higher in b-TACE subgroup than DEM-TACE (15/19 [78.9%] vs 48/89 [53.9%], p=0.05). TTR for complete response at 1 year had a better trend for b-TACE vs DEM-TACE (278.0 days [196.0-342.0] vs 219.0 days [161.0-238.0], OR 0.68 [0.4-1.0], p=0.10). The use of balloon micro-catheter reduced the relative risk of the event of recurrence by 0.63 [CI95% 0.38-1.04]; p=0.07). No significant differences were found in AEs rate.
Conclusion: b-TACE showed a trend of better oncological response over DEM-TACE with and longer TTR with a similar adverse events rate, in patients presenting with larger tumors.

P-35

In-vivo quantification of micro-balloon interventions (MBI) advantage: cohort, retrospective, bi-centric study of DEB-TACE vs b-TACE and SIRT vs b-SIRT

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Purpose: This cohort, retrospective, bi-centric study purpose was to quantify in vivo the micro-balloon role by comparing TACE and SIRT procedures performed with and without balloon-microcatheter for HCC.
Material and methods: We treated 84 patients with hepatocellular carcinoma (HCC) using trans-arterial loco-regional therapy. 53/84 patients were treated with TACE (26/53 DEB-TACE and 27/53 b-TACE). 31/84 patients were treated with SIRT (24/31 SIRT and 7/31 b-SIRT). Impact of balloon micro-catheter on trans-arterial loco-regional treatment was analyzed using: post-procedural cone beam CT (CBCT) after TACE/b-TACE, 2D and 3D dosimetry in SPECT after SIRT/b-SIRT and histological count of the bead following orthotopic liver transplantation (OLT) in the subgroup of TACE/b-TACE.
Results: Fifty-three patients were analysed in TACE group. Contrast, signal-to-noise ratio, and contrast to noise ratio were significantly higher in b-TACE subgroup than DEB-TACE. Thirty-one patients were analysed in SIRT group. b-SIRT had a better dosimetry profile both in 2D and 3D analysis. 2D evaluation showed an activity intensity peak significantly higher in b-SIRT subgroup compared with SIRT. Regarding 3D dose analysis, mean dose administered to treated lesions was significantly higher in b-SIRT group than SIRT. In specimen analysis, there was a trend for higher intra-tumoral localization of PEG microsphere for b-TACE in comparison with DEB-TACE.
Conclusion: The results of the present study quantify in vivo, thanks to the use of three different methods, the ameliorative embolization profile of oncological interventions performed with balloon-micro catheter regardless of the embolic agent employed.

P-36

Is visual estimation of liver lobe proportion sufficient to decide on the right distribution of the chemotherapeutic agent in uveal melanoma patients with liver metastasis undergoing hepatic artery infusion?

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Purpose: In uveal melanoma patients, hepatic metastases can be treated by hepatic artery infusion (HAI). If both liver lobes have to be treated separately due to anatomical variants, volume proportion of both lobes are visually estimated on angiographic images in order to decide on the correct distribution of the chemotherapeutic agent. The aim of this study was to compare the visually estimated volume proportions on angiographic images with measured volume proportions between both lobes on CT to determine a potential aberrance.
Material and methods: In this retrospective study, patients with uveal melanoma who underwent separate HAI of the right and the left liver lobe with melphalan as a chemotherapeutic agent were included. Volume measurements using syngo.via (Siemens Healthineers, Germany) of both liver lobes prior to first HAI were compared with the volume proportions described in the angiographic report by the interventional radiologist.
Results: A total of 67 patients (mean age 66.0 years ±11.4 (SD), 35 females, 32 males) who underwent HAI were eligible for analysis. Median aberrance between volume proportions measured in CT and angiography-based estimated values was 6.76 % (IQR: 3.16-11.07). In about 28 % (19 out of 67 cases) the aberrance of estimated volume proportion exceeded 10 %.
Conclusion: In uveal melanoma patients with liver metastases, the visual estimated volume proportion between right and left liver lobe matches liver volumes measured in CT. However, in cases with an atypical liver anatomy, CT volume measurement might be necessary to optimize appropriate distribution of the chemotherapeutic agent in patients scheduled for HAI.

P-37

Feasibility, safety and tumor control of balloon-occluded trans-arterial chemoembolization with Irinotecan (b-DEBIRI) for the treatment of colorectal cancer liver metastasis: preliminary results

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Purpose: To evaluate technical feasibility, safety and tumor control rate of arterial balloon-occluded trans-arterial chemoembolization (b-TACE) with irinotecan loaded Polyethylene-Glycol (PEG) embolic microspheres (b-DEBIRI) in patients with liver-limited metastatic colorectal cancer (mCRC).
Material and methods: Six patients (mean age 65 years, 4 females) with bilobar CRC liver metastases were included. Each liver lobe received one session of b-DEBIRI (100mg irinotecan pre-loaded in 2mL of 100±25µm microspheres). Technical embolization endpoint was complete drug administration. Balloon-occluded arterial stump pressure (BOASP), adverse events (AEs), complications and post-embolic syndrome (PES)

were assessed. Procedural oncological outcomes (per-patients and per-nodule analysis) were evaluated according to RECIST 1.1 criteria at 1-month follow-up with MDCT-MRI. Pre- and post-procedural tumor volumes were used to stratify patients in partial response (PR).
Results: Mean number of metastasis per patient was 10.8 (2-36) with a mean diameter of 20mm (5.2-52.1mm); mean total pre-procedural volume was 77,2cc^3 (1.8-356.7cc^3).Technical endpoint was reached in 11/12 procedures; in the remaining treatment session (a selective caudate-lobe embolization) 60% of the intended dose was administered. Average BOASP was 63.3±18.5mmHg (p<0,0001). No major AEs were recorded. PES occurred in 33% of procedures with no prolongation in-hospital stay. At 1-month follow-up all patients were in partial response (PR). Per-nodule examination demonstrated complete response (CR) in 12/65 nodules (18.4%) and PR in 53/65 nodules (81.6%) with an OR of 100%. Average tumor debulking volume was 73% (42.5-89.6%) (p<0,0001).
Conclusion: This series demonstrates technical feasibility and safety of b-DEBIRI, with evidence of local tumor control and significant tumor debulking.

P-38

Long-term outcomes post IRE for hepatic epithelioid hemangioendothelioma

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Purpose: Hepatic Epithelioid Hemangioendothelioma (HEHE) is a rare malignant neoplasm, incidence 0.1/100,000. Five year survival if left untreated is 5%. We describe long term outcomes in two patients with unresectable HEHE, managed by IRE.
Material and methods: A retrospective review of sequential patients with unresectable HEHE, treated by IRE was performed. Demographics, management, follow up and outcomes were recorded.
Results: Two patients with histologically confirmed unresectable HEHE were treated by IRE. Both patients were female, aged 36 and 37. A series of 8 IRE procedures was performed to treat 11 lesions, 4 treatments for 5 lesions in patient A, and 4 treatments for 6 lesions in Patient B. Treatment was performed under general anaesthesia. All procedures were technically successful, with no residual tumour at the ablation site on post-procedure imaging. Patient A was also administered antibiotic therapy as Bartonella genus bacterial DNA also detected on initial biopsy. No major complications occurred. Biopsies from the treated lesions in patient A at 2 years post initial procedure showed chronic inflammation with no viable tumour. Annual MRI follow up has demonstrated no recurrence at 11 years. Four year follow up for patient B has revealed no local recurrence at the site of the previously treated lesions, however a suspicious new lesion was detected and the patient is being considered for a further IRE procedure.
Conclusion: IRE is safe and effective treatment for local control of HEHE. Long term outcomes of 11 lesions in two patients has demonstrated no local recurrence at the site of treated lesions at 4 and 11 years follow-up.

P-39

CalliSpheres® drug-eluting bead versus conventional transarterial chemoembolization in the treatment of colorectal cancer liver metastases: a cohort study

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Purpose: This study aimed to compare the effect of CalliSpheres® drug-eluting bead transarterial chemoembolization (DEB-TACE) versus conventional transarterial chemoembolization (cTACE) regarding treatment response and survival profile in colorectal cancer liver metastasis (CRLM) patients.
Material and methods: There were 11 CRLM patients received DEB-TACE treatment with CalliSpheres® microspheres (DEB-TACE group) and 11 CRLM patients received cTACE treatment (cTACE group). Their clinical response status was recorded (including complete response (CR), parietal response (PR), progressive disease (PD), stable disease (SD), objective response rate (ORR) and disease control rate (DCR)). Besides, their progression-free survival (PFS) and overall survival (OS) were analyzed using follow-up data.
Results: No difference of total clinical response (P=0.153), ORR (P=0.338) or DCR (P=0.170) was found between DEC-TACE group and cTACE group. Regarding the survival profile, patients in DEB-TACE group achieved median PFS of 12.0 months (95% confidence interval (CI): 5.6-18.4 months), which was longer than cTACE group (median PFS 4.0, 95% CI: 0.9-7.1 months) (P=0.018). Meanwhile, the median OS was also longer in DEB-TACE group (24.0, 95% CI: 18.3-29.7 months) compared to cTACE group (14.0, 95% CI: 7.1-20.9 months) (P=0.040). Furthermore, multivariant logistic regression revealed that grouping (DEB-TACE vs. cTACE) was an independent predictive factor for both improved PFS (P=0.003, hazard ratio (HR): 0.110, 95% CI: 0.026-0.463) and OS (P=0.006, HR: 0.126, 95% CI: 0.028-0.559).
Conclusion: DEB-TACE treatment using CalliSpheres® microspheres achieves longer survival profile compared to cTACE treatment in CRLM patients, suggesting its potentially clinical application for CRLM management.

P-40

Prognostic biomarkers of therapy by hepatic radioembolization with Yttrium-90 spheres in colorectal liver metastases: single center experience

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Purpose: To evaluate the factors associated with survival and therpeutic response to hepatic transarterial radioembolization with Ytrio-90 spheres (TARE) in colorectal liver metastases.
Material and methods: Prospective longitudinal study. Patients with colorectar liver metastases treated by TARE, between November 2015-November 2020. Therapeutic response was evaluated at 3 and 6 months after TARE (criteria RECIST1.1). Predictive biomarkers associated with survival and therapeutic response were explored.
Results: 29 TARE were performed in 23 patients (age 59.18 ± 9.09 years, 647% men). 88.2% of the patients had received at least one line of previous systemic chemotherapy. 40.16% of the cases presented bilobar liver involvement, with a tumor load greater than 25% in 57% of the cases. The most frequent type of TARE was unilobar (71.6% cases). The average perfused volume was 967.52 ± 551.02 cm3 with an activity of 93.32 ± 56.06 mCi, absorbed dose in the tumor tissue of 156.78 ± 90.63 Gy, and an average tumor-to-normal-liver ratio (TNR) of 39.79 ± 71.40. Stabilization at 3 months (39.13%) , progression-disease (52.17%) of the cases, partial-response (17.39%) and only one case reached the complete response (4,34%). Biomarkers that showed a statistically significant association with the therapeutic response at 3 and 6 months included: creatinine, tumor-burden, TNR, blood glucose, alkaline-phosphatase and lymphocyte count ($p < 0.05$). Overall survival (OS) 13 months. Factors associated with lower-OS: perfused volume, absorbed-lung-dose, aspartate-aminotransferase, carcinoembryonic-antigen, CA-19-9, red blood cells and NLR prior-TARE, showed inverse relationship with OS($p = 0.035$).
Conclusion: Biomarkers ability to predict prognosis/therapeutic response to TARE include biochemical parameters to factors related to estimated-tumor dosimetry.

P-41

Comparison of treatment response, survival profiles as well as safety profiles between CalliSpheres® microspheres transarterial chemoembolization and conventional transarterial chemoembolization in huge hepatocellular carcinoma

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Purpose: This study aimed to compare treatment response, survival and safety profiles between drug-eluting beads transarterial chemoembolization (DEB-TACE) with CalliSpheres® microspheres (CSM) and conventional TACE (cTACE) in huge hepatocellular carcinoma (HCC) patients.
Material and methods: 71 patients with huge HCC underwent DEB-TACE or cTACE were consecutively enrolled. Treatment response was assessed at first month (M1), third month (M3) and sixth month (M6) after TACE therapy; progression free survival (PFS) and overall survival (OS) were evaluated; liver function indexes were recorded before TACE operation (M0), at first week (W1), M1 and M6 after TACE therapy; adverse events which occurred after TACE operation were recorded.
Results: DEB-TACE presented with higher objective response rate (ORR) and disease control rate (DCR) compared to cTACE. Regarding survival profiles, the short-term mortality rate was lower, and PFS as well as OS were longer in DEB-TACE group compared with cTACE group. Multivariate Cox's regression further illustrated that DEB-TACE vs cTACE was an independent protective factor for PFS and OS. As for safety profiles, patients' liver function injury was reduced in DEB-TACE group compared with cTACE group. The incidence of fever was lower and CINV were less severe in DEB-TACE group compared with cTACE group, while no difference in occurrence of liver abscess, increase of ascites or moderate pain between two groups was observed.
Conclusion: DEB-TACE with CSM presents with better treatment response, survival profiles as well as safety profiles compared to cTACE in treatment for huge HCC patients.

P-42

Successful right portal vein embolization with ONYX in oncologic patients with massive hepatic right lobe involvement

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Purpose: Evaluate feasibility and efficacy of ONYX as embolic agent in preoperative right portal vein embolisation to induce adequate left liver lobe hypertrophy before extended right hepatectomy.
Material and methods: We restrospectively considered between January 2019 and December 2020 23 patients(mean age 58,3 years; 12 males, 11 females)with radiological diagnosis(TC/RM)of extensive involvement of the only right liver lobe by cholangiocarcinoma(7), metastases (9) and HCC (16), with undamaged left hepatic lobe and future remnant liver <30%, in patients with normal liver, and <40% in cirrhotic patients. All patients underwent sonographically guided percutaneous puncture of Portal Vein, performed with a 21 G Chiba-needle,and then selective catheterisation of the main right branch and its ramifications with 5 Fr catheter and 2.7 Fr micro-catheter. In all cases we used ONYX-18.All patients underwent a CT scan before right portal vein embolisation and another CT scan 1 month after it was performed,to calculate total liver volume, tumour volu.me,future remnant liver and degree of induced compensatory left lobe hypertrophy
Results: Technical success was achieved in all patient (23)with complete embolization of the right portal vein branch.In none of the cases we observed reflux of ONYX in the left portal vein branch and no major complications happened
Conclusion: ONYX showed to be a very safe and effective embolic agent for preoperative right portal vein embolization, as it allows to get a complete embolisation of right portal branches, even smaller distal branches,with very low risk of reflux and higher probability to determine a satisfactory left lobe hypertrophy.

P-43

A comparison of adverse events among radiofrequency ablation, conventional transarterial chemoembolization (TACE) and drug-eluting bead TACE in treating hepatocellular carcinoma patients

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Purpose: Very limited investigation has been done regarding the comparison of adverse events (AEs) among radiofrequency ablation (RFA), conventional transarterial chemoembolization (cTACE) and drug-eluting bead TACE (DEB-TACE) in treating HCC patients, therefore, the present study aimed to resolve this issue.
Material and methods: Two-hundred and forty-six HCC patients with a total of 267 procedures (treatment times) treated by RFA (73 patients with 79 procedures), cTACE (86 patients with 94 procedures), or DEB-TACE (87 patients with 94 procedures) were included. Demographic and clinical data were collected. The information of AEs was also retrieved and analyzed.
Results: Total AEs incidence was notably different among the RFA group, cTACE group and DEB-TACE group, and was the highest in cTACE group (86.2%), then in DEB-TACE group (76.6%) and the lowest in RFA group (63.3%). Regarding specific AEs incidence, the incidences of fever, fatigue, and nausea were distinctive among the three groups, while, no distinctiveness was found in incidence of other AEs. Furthermore, multivariate logistic regression revealed that cTACE (versus RFA) was independently correlated with increased risk of total AEs, fatigue, and nausea/vomiting, however, the interventional therapies were not independently correlated with the risk of pain, fever or constipation. Other independent predictive factors for total AEs risk were male, bronchial asthma, and disease duration.
Conclusion: cTACE results in the highest AEs incidence compared with RFA and DEB-TACE in treating HCC patients.

P-44

Determination of risk factors for fever after transarterial chemoembolization with drug-eluting beads for hepatocellular carcinoma

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Purpose: To identify risk factors for postembolization fever after transarterial chemoembolization with drug-eluting beads (DEB-TACE) for hepatocellular carcinoma (HCC).
Material and methods: In this retrospective study, a total of 188 consecutive patients who underwent DEB-TACE between June 2017 and May 2019 with post-TACE fever were included. The patients were divided into three groups based on the severity of post-TACE fever according to the degrees of body temperature. Potential risk factors for post-TACE fever were primarily analyzed by univariate analysis and multivariate logistics regression.
Results: The univariate analysis showed that the pre-TACE blood urea, the presence of tumor thrombus in portal vein or in vena cava, albumin and small particle size microspherewere more likely to have severe post-TACE fever (P<0.001, respectively). However, in the Stepwise multiple regression analysis, the pre-TACE blood urea and small particle size were independent risk factors of severe post-TACE fever (P<0.001, respectively).
Conclusion: In conclusion, the pre-TACE blood urea and the size of the beads were independent risk factors for postembolization fever in HCC patients.Therefore, these factors should be taken into full consideration for the relief of fever.

P-45

Safety of using a transpleural approach for thermal ablation of hepatocellular carcinoma: a 9-year analysis in a tertiary centre

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Purpose: To assess the complications of percutaneous ablation for the treatment of hepatocellular carcinoma (HCC) with a focus on the safety of using a transpleural approach.
Material and methods: Retrospective single-centre cohort study of consecutive percutaneous ablation procedures for HCC performed between July 1st 2010 and June 30th 2019. Other data captured included patient demographics, technique, and complications within the first 30 days.
Results: A total of 397 lesions in 158 patients met inclusion criteria and were included in this study. A transpleural approach was used in 294/397 lesions. Complications occurred with 7 lesions, including 6 major and 1 minor complications. There was no significant difference in rates of complications between a transpleural vs subcostal approach (p=0.68).
Conclusion: This study confirms that percutaneous ablation procedures performed for HCC have an overall low complication rate. In addition, this study shows no association between complication rate and transpleural approach suggesting that treatment of lesions should be encouraged when possible to ensure that patients are being treated with a curative intent rather than being offered palliative treatments.

P-46

Clinical significance of the initial and best responses after chemoembolization in the treatment of intermediate-stage hepatocellular carcinoma with preserved liver function

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Purpose: To evaluate the clinical implications of initial and best responses during repeated TACE for HCC.
Material and methods: 726 patients with intermediate-stage HCC with Child-Pugh class A liver function between 2007 and 2016, and who were treated with TACE as the first-line. Evaluation of treatment response was based on the modified response evaluation criteria in solid tumors. OS was compared between response categories after implementation of landmark analysis.
Results: (complete response [CR] or partial response [PR]) was observed as the initial response in 78.1% of patients. Regarding the best response during the TACE series, 87.2% of patients were overall responders. The median OS of initial responders (n = 483) was not significantly different from that of subsequent responders at the 1-year landmark (stable disease [SD] after first transarterial chemoembolization but CR or PR after repeated TACE; n = 61; 46.2 vs 40.1 months, respectively; P = .145). Likewise, the median OS of initial CR patients (n = 326) was not significantly different from that of the subsequent CR group (n = 126) at the 1-year landmark (PR or SD after first transarterial chemoembolization but CR after repeated transarterial chemoembolization; 53.4 vs 46.3 months, respectively; P = .455). Multivariate Cox analyses showed that the objective responses, the initial responses (hazard ratio [HR], 0.638; P = .001), and the best responses (HR, 0.304; P < .001) had the significant prognostic significance for OS.
Conclusion: Both the initial and best responses during repeated TACE were significantly associated with OS in patients with intermediate-stage HCC and preserved liver function.

P-47

Transradial versus transfemoral arterial access in DEB-TACE for hepatocellular carcinoma: analysis of radiographic parameters

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Purpose: Transradial access (TRA) has become more popular in body intervention procedures, but has not been ubiquitously adapted. This study was designed to compare transradial to transfemoral access (TFA) in hepatocellular carcinoma (HCC) patients who underwent Drug Eluting Bead Transarterial Chemoembolization (DEB-TACE).
Material and methods: In this study, 146 DEB-TACE procedures conducted at our institute from June 2015- May 2020 were retrospectively analyzed. The TRA group included 90 procedures while the TFA group included 56. Peak skin dose (PSD), fluoroscopy time, administered contrast volume, total procedure time and equipment cost data for each procedure were evaluated for statistical differences between the two groups.
Results: All cases were technically successful without major complications. The average PSD presented with no statistical difference between TRA and TFA (1578.9 mGy vs.1383.0 mGy, P>0.05). The average fluoroscopy time also presented with no statistical difference between TRA and TFA (26.8 min vs. 24.8 min, P>0.05). The average administered contrast volume was significantly higher for TRA versus TFA (162.6 ml vs. 113.1 ml, P<0.05). Similarly, TRA also reported a significantly higher total procedure time versus TFA (139.7 min vs. 106.1 min, P<0.01). However, TRA amounted to a significantly less expensive average procedural equipment cost versus TFA ($6666.9 vs. $6393.9, P<0.01).
Conclusion: With respect to many pertinent parameters, TRA and TFA DEB-TACE had comparable results in this study. Notably, TRA was far less expensive than TFA. Given the increased patient preference for TRA as described in literature, this study's findings further bolster the rationale to utilize TRA more often, whenever viable, in the DEB-TACE treatment of HCC patients.

P-48

Chemoembolization plus radiotherapy versus chemoembolization plus Sorafenib for the treatment of hepatocellular carcinoma invading the portal vein: a propensity score matching analysis

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Purpose: A combination of transarterial chemoembolization (TACE) plus sorafenib or radiotherapy (RT) has demonstrated efficacy in patients with advanced hepatocellular carcinoma (HCC).
Material and methods: Here, the two combined treatment approaches were compared in patients with HCC and portal vein tumor thrombus (PVTT).Data from 307 patients treated with TACE plus RT (n = 203) or TACE plus sorafenib (n = 104) as first-line treatment for HCC with PVTT were retrospectively evaluated. Using the propensity model to correct selection bias.
Results: 87 patients were included from each treatment group. During follow up (median, 12 months) in the entire study population, the median progression-free survival (PFS) and overall survival (OS) were significantly longer in the TACE plus RT group than in the TACE plus sorafenib group (6.5 vs. 4.3 months, respectively; p = 0.017 and 16.4 vs. 12 months, respectively; p = 0.007). Following propensity score matching, the median PFS and OS in the two groups showed no statistically significant difference. Multivariable analysis found no significant association between PFS or OS and the treatment type.
Conclusion: In conclusion, this retrospective study of data from patients with advanced HCC with PVTT shows that PFS and OS did not differ significantly in patients treated with TACE plus RT and TACE plus sorafenib.

P-49

Transradial versus transfemoral arterial access in Yttrium-90 microspheres radioembolization for hepatocellular carcinoma

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Purpose: Transradial access (TRA) has become more popular in body intervention procedures, but has not been ubiquitously adapted. This study was designed to compare transradial to transfemoral access (TFA) in hepatocellular carcinoma (HCC) patients who underwent Yttrium-90 labeled microspheres radioembolization.
Material and methods: A total of 244 hepatocellular carcinoma patients underwent 337 radioembolization procedures at our institute from May 2014 to May 2020. The transradial access group included 188 patients (252 procedures) while the transfemoral access group had 63 patients (85 procedures). The recovery time, fluoroscopy time, contrast volume, peak radiation dose, and equipment cost for each procedure were all evaluated for statistical differences between the two groups.
Results: TRA reported significantly shorter recovery times than TFA (111.7 min vs. 165.6 min, P<0.01). Similarly, TRA presented significantly shorter fluoroscopy times (16.1 min vs. 19.7 min, P>0.05) versus TFA. TRA also showed significantly lower contrast volume usage compared to TFA (69.2 ml vs. 75.2 ml, P<0.05). No statistical difference was present in the overall radiation exposure between the two groups (880.2 mGy vs. 995.1 mGy, P>0.05). The average procedural equipment cost was significantly lower for TRA versus TFA ($1632.33 vs. $2013.12, P<0.01). Post-procedure recovery evaluation showed no major complications in TRA while TFA reported one pseudoaneurysm.
Conclusion: With respect to many pertinent parameters, TRA was evaluated as being more advantageous than TFA. The results of this study suggest that TRA should be considered more often, whenever feasible, as an option in the Yttrium-90 treatment of HCC patients.

P-50

Nomogram based on neutrophil-to-lymphocyte ratio and platelet-to-lymphocyte ratio to predict recurrence in patients with hepatocellular carcinoma after radiofrequency ablation

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Purpose: To investigate the prognostic value of pre-procedure neutrophil-to-lymphocyte ratio (NLR) and platelet-to-lymphocyte ratio (PLR), and construct a nomogram to predict disease-free survival (DFS) in patients receiving radiofrequency ablation (RFA) for hepatocellular carcinoma (HCC) within Milan criteria.
Material and methods: The data of 515 patients of HCC within Milan criteria receiving RFA were retrospectively collected. The patients were divided into two groups: the training group (n=382) and the validation group (n=133). Several preprocedural variables were analyzed in the two groups to determine the prognostic factors.
Results: The median DFS time of the training and validation group was 28.4 months and 24.5 months, respectively. Multivariate analyses showed that number of lesions, alpha-feto protein (AFP) levels, NLR and PLR were independent risk factors of DFS. According to the time dependent receiver operating characteristic curve (t-ROC), the optimal cut-off value of the NLR and PLR was 1.55 and 75.30, respectively, with sensitivity of 0.737 and 0.648 and specificity of 0.541 and 0.508, respectively. The area under curve (AUC) of the t-ROC curves for the NLR was 0.662 and PLR was 0.597. The DFS was significantly higher in the NLR≤1.55 group compared to NLR>1.55 group and the PLR≤75.30 group compared to PLR>75.30 group in both training and validation dataset. Nomogram was developed based on the prognostic factors indicated by the Cox regression to predict 1-, 2-, 3- and 5-year DFS probabilities.
Conclusion: This new nomogram based on NLR and PLR may provide good and individualized prediction of recurrence for HCC patients within Milan criteria after RFA.

P-51

Efficacy, safety and prognostic factors of ablative techniques for treatment of liver metastases

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Purpose: To evaluate the efficacy, safety and prognostic factors associated with ablative techniques in liver metastases from gastrointestinal (GI) tumours.
Material and methods: We conducted an unicentric, observational, retrospective study of patients (pts) undergoing ablative techniques for liver metastases from GI tumours between 2009 and 2014 at University Hospital A Coruña (Spain). We analysed overall survival (OS), progression-free survival (PFS) and its association with ECOG PS, RAS status and Neutrophil to Lymphocyte ratio (NLR).
Results: We included 100 techniques from 78 pts. Median age was 66.9 years (range 34-84), 56.1% males, 87% colorrectal origin (55.6% RASmt) and 53% synchronous metastases. ECOG Performance Status (ECOG PS) 0/1/2 were 22%, 76% and 2%, respectively. With a median follow up of 76 months (mo), 92.9% of pts had progression disease (87.8% liver, 6.1% distant and 58.2% both). Median OS was 35 mo (95% CI: 28.1-41.9) and median PFS was 6 mo (95% CI: 3.5-8.5). Adverse events were reported in 2% of pts., 1 of them grade 3 biliary fistula. RASmt tumors was associated with a worse prognosis: median OS 34 mo vs 46 mo (HR 0.57, p = 0.04) and median PFS 12 mo vs 5 mo (HR 0.51, p = 0.02). Patients with high NLR (>1.96) was associated with a non-significant trend worse OS: 29 vs. 42 mo (HR 1.45, p=0.15).
Conclusion: Local ablative procedures are a safe and effective option in pts with liver metastases who are not deemed suitable to a complete resection. We have identified RASmt as a prognostic factor for PFS and OS.

P-52

Predictive factors for hypertrophy of the future liver remnant after portal vein embolization: a systematic review

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Purpose: The purpose of this systematic review was to identify factors that predict the degree of liver regenration after portal vein embolization, in order to improve the selection of patients receiving portal vein embolization and more adequately stratify patients as potential surgical candidates.
Material and methods: The databases Pubmed/Medline, Embase (ovid) and SCOPUS were searched on July 24, 2019. On September 15, 2020, an update was performed using the same search strategy. The search included the MESH terms "Liver", "Hypertrophy" and "Embolization, Therapeutic". Literature screening, quality assessment and data extraction were performed by two independent reviewers.
Results: Forty-seven articles were included in final analysis, including 3341 patients. Colorectal liver metastases and cholangiocarcinoma were the most frequent diagnosis. Average predicted future liver remnant before portal vein embolization was 25.8% (range 14.9-41.0) and mean future liver remant after embolization was 35.2% (range 22.4-51.0). The included studies evaluated patient history, laboratory tests, background liver disease, tumor type and burden, prior chemotherapy, type of embolic agents, volumetry and quantitative liver function tests as potential predictors of hypertrophy.
Conclusion: The embolization volume was identified as the most important predictive factor for hypertrophy response after portal vein embolization. Fibrosis appears to have a negative effect on liver regeneration. The use of n-butyl cyanoacrylate for portal vein embolization, administration of bone marrow derived stem cells to the future liver remnant and concomitant trans-arterial embolization in patients with hepatocellular carcinoma have a positive effect on the hypertrophy response in a small number of studies.

P-53

Safety and efficacy of degradable starch microspheres transcatheter arterial chemoembolization (DSM-TACE) as a bridging therapy in patients with early stage hepatocellular carcinoma (HCC) eligible for liver transplant and child-pugh stage B

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Purpose: Current guidelines recommend a bridging therapy with LRT for patients with HCC within Milan criteria. In patients within Child-Pugh B stage, the choice of LRT is critical because LRT itself could precipitate liver dysfunction to an extent that survival is shortened rather than prolonged. Among chemoembolization interventions, DSM-TACE shows an excellent safety profile.
Material and methods: Between January 2015 and September 2020, 54 consecutive patients with early-stage hepatocellular carcinoma and Child-Pugh stage B, who had undergone DSM-TACE as a bridging therapy while awaiting liver transplantation, were eligible for the study. A total of 154 DSM-TACE was performed.
Results: 18 patients (33.3%) succeeded in achieving liver transplantation, with a mean waiting time-to-transplantation of 11.7 months. The cumulative rates of patients still active on the WL at 6 months were about 91% and 93% when considering overall drop-out and tumour-specific drop-out respectively. Overall survival was about 96% at 6 months and 92% at 12 months. 17 patients (31.5%) experienced adverse events after the chemoembolizations, with only two (3.7%) serious adverse events. According to the CIRSE Classification System for Complications, 16 patients (29.6%) experienced postprocedural clinical complications with only two (3.7%) grade 3 events.
Conclusion: In patients with HCC eligible for liver transplant within Child-Pugh B stage, life expectancy may be dominated by the liver dysfunction, rather than by the tumour progression itself. DSM-TACE is an interesting tool among LRT, because it has an excellent safety profile, maintaining an efficacy that guarantees a clear advantage on the dropout rate with respect to the non-operative strategy, thus justifying its use.

P-54

Thermal ablation of colorectal metastases close to large vessels of the liver

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Purpose: To compare the efficacy and safety of RFA and MWA in the local treatment of patients with metastatic CRR located near the large hepatic vessels.
Material and methods: The analysis of the results of ablation of 182 mets in the liver in 158 patients with CRR (83 women, 75 men, 28-86 years old) was carried out. All lesions were located no further than 5 mm from the large vascular structures – the retrohepatic part of the IVC, the trunk and tributaries of the first order of the hepatic veins, right, left and segmental branches of the portal vein. The size of the lesions was 5.2-35 mm. RFA was performed in 80 patients (101 lesions), MWA – 78 (81 lesions). All patients underwent polychemotherapy according to standard schemes after local treatment.
Results: All procedures were recognized as technically successful. There were no lethal cases. In the RFA group, „large" complications were noted in 1 patient (abscess) It was treated conservatively. There were no complications in the MWA group

(p = 0.322). 1-, 2-, 3-year local progression after RFA and MWA was 7 and 8 patients (p = 0.767); 11 and 12 (p = 0.771), 13 and 12 patients (p = 0.828).
Conclusion: The use of local thermal destruction in perivascular liver metastases treatment is a safe and effective. In terms of the number of postoperative complications and indicators of local recurrence, there is no convincing evidence of the benefits of using MWA over RFA in those patients.

P-55

Yttrium-90 ablation as rescue therapy for hepatocellular carcinoma after locoregional treatment

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Purpose: To assess the efficacy of Yttrium-90 transarterial radioembolization for persistent hepatocellular carcinoma (HCC) after previous locoregional treatment in cirrhotic patients not candidates to further surgical treatment or liver transplant.
Material and methods: This retrospective (2018-2020) study evaluates a series of 6 cirrhotic patients (median age 64.6 years, range 59-70) diagnosed with persistent or relapsing intrahepatic HCC up to 5 cm (median 1.9 cm) in challenging locations previously treated with resection, RFA, or transarterial therapies, who were treated with curative-intended selective Y-90 transarterial radioembolization with >190 Gy radiation dose. Radiation dose (Gy), number of feeding arteries, tumor margin coverage, and mean treated tumoral volume were analyzed. During follow-up (mean 70.3 weeks), toxicities, tumor response by mRECIST and EASL criteria, spleen volume, overall survival, and time to second treatment were recorded.
Results: 2/6 patients had been treated with RFA alone, 1/6 with TACE, 2/6 with a combination of RF-TACE, and 1/6 with surgical resection. 1/6 lesions presented with satellitosis. 4/6 lesions were borderline (<5 mm) according to the treated angiosome margin. A mean delivered dose of 286.5 Gy (214.5-470 Gy) was administered after previous planning with cone-beam CT. 5/6 patients achieved a complete response of the target lesion according to mRECIST and EASL criteria. 1/6 presented a progressive disease. No major clinical adverse events nor toxicities were recorded.
Conclusion: Selective Y-90 radioembolization with ablative dose is a safe, efficacious therapy for persistent HCC in cirrhotic, non-treatment-naïve patients not amenable to new locoregional procedures, with promising potentially-curative results.

P-56

Short term imaging response after CBCT-guided percutaneous microwave ablation for the treatment of liver metastases

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Purpose: To observe the treatment outcomes of angioablation, microwave ablation (MWA) performed using fluoroscopic guidance under cone beam CT (CBCT) – henceforth termed "angioablation" – in patients with metastatic liver lesions. The primary objective was to assess short-term imaging responses of the targeted lesions.
Material and methods: From September 2019 to September 2020, a total of 16 patients with secondary liver malignancies were assessed to receive angioablation, with 15 successful procedures being performed for 37 lesions. Hepatic arterial angiography was performed with subsequent dual phase CBCT with contrast for tumor localization. Using needle guidance software, the ablation applicator(s) were positioned within the target(s). Patients underwent follow-up MRI or CT imaging at 1-2 and 3-4 months. Local and overall short-term imaging response was determined using RECIST criteria.
Results: Twelve of 16 patients underwent successful angioablation procedures, with 4 having their procedures aborted due to progression of disease (2/4) or failed hydrodissection of adherent lesions (2/4). Complete ablation was achieved in 36/37 (97.3%) lesions. At 1-2 months, 28/30 (93.3%) lesions demonstrated a local complete response (CR) and 2/30 lesions demonstrated partial response (PR, 6.7%). Nine of the 12 procedures demonstrated an overall CR (75%), 1 demonstrated an overall PR (8.3%), 1 demonstrated overall SD (8.3%), and 1 demonstrated overall PD (8.3%). At 3-4 months, local response rates were 95.5% CR (21/22) and 4.5% PR (1/22). Overall response rates were 66.7% CR (4/6) and 33.3% PD (2/6).
Conclusion: Angioablation led to promising short-term imaging outcomes in patients with metastatic secondary cancers. Further studies are needed to validate our initial findings.

P-57

Analysis of the causes and nursing points of liver abscess after treatment of transcatheter arterial chemoembolization using domestic callispheres beads in treatment of primary hepatocellular carcinoma

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Purpose: To explore the causes and nursing points of liver abscess after Callispheres drug-eluting bead transcatheter arterial chemoembolization for hepatocellular carcinoma.

Material and methods: From 2017 08 to 201909, the clinical data of 6 patients with liver abscess after surgery were analyzed retrospectively, the causes of liver abscess were analyzed, and corresponding nursing measures were taken.The causes of formation of liver abscess were further analyzed and corresponding nursing measures were taken.
Results: The occurrence of liver abscess was related to previous history of minimally invasive treatment, damage of biliary mucosa or biliary obstruction, PVT thrombus, malnutrition and so on. In clinical nursing, we should strengthen the prevention of liver abscess and shock, and pay attention to high fever nursing, nutritional support and catheterization nursing. At the same time, psychological counseling should be given to patients. After active treatment and nursing, the adverse symptoms of 6 patients with liver abscess were effectively improved, the drainage of pus was reduced, and the condition of the patients controlled. All patients recovered and discharged smoothly.
Conclusion: For liver couldcer patients treated with D-TACE and risk factors of liver abscess, the clinical treatment of anti-infection, liver protection and immunity should be done according to the actual situation of the patients, and proper nursing intervention could effectively improve the prognosis.
Conclusion: For the patients with liver couldcer treated with D-TACE and risk factors of liver abscess, clinical treatments such as controlling infection, protecting liver function and improving immunity should be done, so as to give appropriate nursing intervention, these measures could effectively improve the prognosis of the patients.

P-58

Irreversible electroporation for the ablation of liver tumors in difficult to treat location

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Learning Objectives: To provide an overview of the utility of irreversible electroporation (IRE) in treating liver tumors at difficult sites close to vital structures like blood vessels and bile ducts.
Background: IRE is a novel non-thermal ablative technique used to treat tumors of liver, pancreas, kidneys and lungs with expanding indication for focal tumors in difficult locations. It has proven its efficacy as a standalone therapy or in combination with other treatment modalities for various oncological indications. IRE uses high-voltage, high-intensity electric pulses of short duration to induce irreversible pores in the cell membrane resulting in cell death and apoptosis with limited damage to extracellular matrix and connective tissue. Being a non-thermal technique, heat-sink effect is not a limitation factor. With these features IRE can be used to ablate tumors close to vital structures like blood vessels and bile ducts without causing thermal injury or serious long-term effects.
Clinical Findings/Procedure Details: Patients with neoplastic lesions in whom RFA/MWA cannot be done due to critical location can be treated with IRE. The patient selection, indications, contraindications, pre-procedural imaging findings, and post IRE follow-up are described. We also describe details of the procedure and complications of IRE.
Conclusion: Irreversible electroporation offers safe, minimally invasive and effective therapeutic option for tumors not amenable for thermal ablation or surgery due to their location. IRE is not a replacement for thermal ablative techniques but is an alternative ablative technique in specific situations.

P-59

Transhepatic portal vein embolization: anatomy, indications, and technical considerations

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Learning Objectives: Discuss portal venous anatomy and normal variants as they pertain to PVE. Recognize the indications for PVE Discuss the technical considerations related to and possible complications of PVE.
Background: Preoperative portal vein embolization (PVE) increases the size of the future liver remnant (FLR) and is associated with an overall morbidity of 21.7% and an overall mortality of 3.3% following major liver resection. However, a FLR/TELV ratio of at least 25% is recommended in patients with otherwise normal livers, with a ratio of at least 40% in patients in whom the liver is considered compromised. No absolute contraindications for PVE Methods for Calculating FLR Volumes Resected volume – tumor volume/Total liver volume – tumor volume
Clinical Findings/Procedure Details: We use a 22-gauge Chiba needle We used to place a 6-F vascular sheath into the main right portal vein or a main portal branch. Flush portography is performed with a 5-F angiographic pigtail catheter Anteroposterior, right and left anterior oblique, and craniocaudal projections. Left portal vein segments (IVa and IVb) are embolized with a Tracker microcatheter. PVA 300 to 500 µm and microcoils For right portal vein embolization (segments V–VIII), to use a 5-F reversed curve catheter to deliver PVA particles ranging from 300 to 1,000 µm and 0.035- or 0.038-inch coils COMPLICATIONS Transient hemobilia Bleeding Infection Small bowel obstruction.
Conclusion: PVE has improved the safety profile for patients who undergo partial hepatectomy for more than 20 years. The technical and clinical success rate of PVE for the induction of FLR hypertrophy is high.

P-60

Locoregional therapies for colorectal liver metastases: an update

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Learning Objectives: To review the current role of locoregional therapies in treatment of liver metastasis from colorectal carcinoma To discuss treatment options in different patients' scenarios and highlight the role of future research.
Background: Colorectal cancer is a leading cause of death worldwide. Despite advances in screening and diagnosis, colorectal cancer metastases are present at the time of diagnosis in about 20-25% of patients. Surgical excision is the first-line treatment for patients with liver-limited colorectal metastases and is associated with prolonged survival. However, many patients are not surgical candidates. Locoregional therapies are minimally invasive techniques performed by interventional radiologist. These include ablative treatments (radiofrequency ablation, microwave ablation) and transcatheter intra-arterial therapies (trans-arterial chemoembolization, and radioembolization with yttrium-90).
Clinical Findings/Procedure Details: The technique and mechanism of action for various locoregional therapies are discussed. The rationale and clinical outcomes of each technique are reviewed based on the current literature. Examples of imaging findings for different techniques are provided from our institute as well as from the literature.
Conclusion: Advances in interventional locoregional therapies provide more treatment options for patients with colorectal cancer liver metastasis, allow for more curative resections, and result in better patients' survival. Knowledge of the recent advances in colorectal liver metastases management is crucial for the interventional radiologist. Multidisciplinary decisions are essential to improve the quality of treatment and clinical outcomes.

P-61

Coeliac and hepatic arterial variants on digital subtraction angiography: a pictorial essay

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Learning Objectives: To describe various coeliac, superior mesenteric and hepatic arterial variants on conventional digital subtraction angiography.
Background: In this modern era with the availability of transarterial therapies and the development of complex hepatic and pancreatico-biliary surgeries, knowledge of coeliac, Ssuperior meseteric artery and hepatic arterial anatomy is vital to optimize the procedure timing, avoid complications and for successful outcomes. In 1955, Michel first described the classification scheme for variations in hepatic arterial anatomy. This paper aims to describe various coeliac, SMA and hepatic arterial variants on conventional digital subtraction angiography.
Clinical Findings/Procedure Details: This paper is a pictorial essay of various hepatic and coeliac artery variants. The hepatic variations are classified as per Michel classification.
Conclusion: Knowledge of coeliac, SMA and hepatic arterial anatomy is important to optimize the procedure, avoid complications and for successful outcomes.

P-62

Imaging of hepatocellular carcinoma after 90Yttrium transarterial radioembolization: what should the radiologist expect?

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Learning Objectives: Post radioembolization imaging findings for tumor response assessment, identification of potential complications and classifying benign changes in hepatic parenchyma
Background: Transarterial radioembolization[TARE] is an effective treatment for unresectable primary or secondary liver tumors [Barcelona Clinic Liver Cancer stage B and C] requiring multimodality approach including cross-sectional hybrid imaging. The reported survival is 13-18 months after successful therapy but it takes about 4 months to visualise any reduction in tumor size. Therefore, it is vital to assess tumor dosimetry, tumor response and early detection of complications- thereby, delineating any need for subsequent therapy.
Clinical Findings/Procedure Details: Post-TARE follow up imaging should focus on tumor response and detection of intra and extrahepatic complications. Parameters to evaluate response are- (1)Tumor size and volume; (2)necrosis; (3) reduced metabolic activity in FDG-PET; and (4)apparent diffusion coefficient[ADC] in DW-MRI. 90Y-PET/CT is used immediately after radioembolization for tumor dosimetry. Triphasic contrast-CT and MRI are used for morphological assessment with modified Response Evaluation Criteria in Solid tumors[mRECIST] and Choi criteria. Diffusion weighted imaging and FDG-PET provide functional information. Irradiation to non-tumorous hepatic parenchyma exhibit clinically silent perilesional pathologies including edema, inflammation, ring-enhancement , fibrosis, capsular retraction, biliary necrosis, biloma, abscess or potentially life threatening radioembolization-induced liver disease(REILD). Gastro-intestinal complications arise due to collaterals which lead to aberrant deposition of 90Y-microspheres. This is the most common extrahepatic finding. Others include radiation induced cholecystitis, pneumonitis, serositis and dermatitis.
Conclusion: After radioembolization, 2-4 monthly followup scanning is indicated due to high rate of recurrence. This presentation depicts detailed image findings for radiological assessment in the followup period.

P-63

US-guided liver ablation: feasibility assessment map

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Learning Objectives:
1. Understand the importance of careful selection of patient for liver ablation.
2. Understand the benefit of feasibility assessment map for the careful selection.
Background: Careful selection of the best or potential candidate is the first door to successful ablation. We propose a preliminary feasibility map for US-guided hepatic ablation to provide a brief reference for an operator and to further develop a consensus feasibility map in the era of artificial intelligence as follows
Clinical Findings/Procedure Details: To develop the feasibility imaging map, we selected 6 representative axial levels of liver MRI including the liver as follows: 1) Far-dome; 2) Sub-dome; 3) Supra-hilar; 4) Hilar; 5) Infra-hilar; 6) Rt inferior. In each level, we selected variable sites and illustrate technical feasibility of US- guided liver ablation according to tumor location by marking with one of 3 color-markers according to the technical feasibility. Green color was defined as "Good Candidate"; Yellow color was defined as "Potential Candidate", Red color was defined as "Poor candidate". The technical feasibility on each site was defined with consensus from four doctors who had experiences of US-guided ablation for hepatic tumors for 25, 15, 8, 8 years. We illustrated the feasibility imaging map at each level and introduced general guidelines for successful ablation at the specific level.
Conclusion: Feasibility imaging map may be a preliminary, but useful method to stratify the ablation feasibility which can contribute to clear communication with referred physicians in multidisciplinary approach and multi-center investigations to verify the best candidate for ablation.

P-64

Percutaneous transhepatic biliary drainage in palliation of malignant hilar biliary obstruction using self-expanding metallic stents with "side-by-side" technique

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Learning Objectives: Evaluate feasibility, safety and clinical efficacy of placement of self-expanding metallic stents with "side-by-side" technique in patients with malignat biliary hilar obstruction.
Background: We retrospectively considered between January 2019 and December 2020 28 patients(mean age 64,3 years; 15 males, 13 females)with jaundice and radiological diagnosis(TC/RM)of malignant biliary hilar obstruction by cholangiocarcinoma(13), gallbladder cancer(6), metastases(2), pancreatic carcinoma(5) and HCC(2).In 19 patients stents were placed in a two-times approach, in 9 patients in a single-step approach.The percutaneous transhepatic approach was performed under fluoroscopic guidance on the right side and under ultrasonographic guidance on the left side. In all cases a balloon-catheter pre-dilatation was performed before stent release.
Clinical Findings/Procedure Details: Technical success was achieved in all patients (28). Clinical success was achieved in 23 patients; in 5 patients cholangitis occurred and we observed serum bilirubin level between 3 and 5 mg/dl. We observed 1 major complication constituted by bleeding into the biliary tree due to communication between the latter and the portal system, which solved spontaneously. 4 biliary peritoneal effusions occurred, solved by ultrasonographic placement of 8 Fr drainage catheter.The mean primary stent patency period was 103 days and the mean patient survival period was 150 days.
Conclusion: Percutaneous bilateral stenting "side-by-side" is a feasible, safe and clinical effective method for palliative treatment of patients with malignant biliary hilar obstruction as it allows to relief from the symptoms associated with jaundice and so to improve significantly the quality of life of these patients and their mean survival period.

P-65

What is the best approach for biliary drainage of malignant hilar obstructions?

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Learning Objectives: To explain the different procedure techniques and discuss the best approach for drainage in the setting of hilar lesions of the biliary ducts, according to the clinical situation. To understand the role of percutaneous transhepatic biliary drainage of malignant hilar obstruction in the preoperative and palliative setting.
Background: Malignant hilar obstruction can be caused by primary cancer ('Klatskin tumour'), contiguous spread from gallbladder, pancreatic, hepatocellular carcinoma, or hepatic metastases. In resectable tumours, pre-operative drainage is aimed to minimise biliary obstruction, particularly of the future liver remnant, and to improve surgical outcome. When detected at a late stage, palliation is often the goal. Satisfactory decompression of biliary obstruction is crucial to decrease symptoms of pruritus, to lower bilirubin level so that the patient can resume palliative systemic therapy, and to treat cholangitis if present. Controversy exists over the preferred technique for biliary drainage, but usually depends on clinical situation and local expertise.
Clinical Findings/Procedure Details: Before attempting biliary drainage, ductal anatomy and liver functional volume need to be assessed with non-invasive imaging. The patient clinical status will also influence the biliary drainage strategy. When planning, decisions must be made between number of bile ducts to be drained (lobar unilateral/bilateral or multiple segment approach), temporary or definitive biliary drainage, internal/external catheter or stent type (plastic/metal), and deployment method (stent-in-stent/stent-by-stent).
Conclusion: Percutaneous biliary drainage has a role both in palliative and preoperative setting. Careful pre-procedure planning of each particular case is essential to achieve the best results out of biliary drainage of malignant hilar obstructing lesions.

P-66

Transarterial chemo-embolization of liver lesions with degradable starch microspheres (DSM-TACE): a pictorial review

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Learning Objectives: Purpose of our study is to illustrate the technical aspects, clinical indications, and outcomes of temporary chemo-embolization of liver lesions with degradable starch microspheres.
Background: Surgical resection is currently accepted as the curative first-line treatment in focal liver disease; one of the limitations of liver resection or focal ablative therapies is local spreading of tumors and unfavourable anatomical localization. Normal liver parenchyma is supplied by portal vein whereas hepatic arteries predominantly supply tumors. Selective or super-selective transarterial drug delivery increases local therapeutic concentration and reduces liver parenchyma damage.
Clinical Findings/Procedure Details: DSM-TACE is a minimal-invasive image-guided transarterial catheter-directed therapy, performed with selective and super-selective injection of an emulsion of chemotherapeutic agent with starch microspheres which reach arteriolar and pre-capillary level. Starch microspheres have a short serum half-life leading to transient arterial occlusion. The major effect of DSM-TACE is based on increase intratumoral cytostatic agent concentration, and less on ischemia. Preservation of the vascular structure facilitates repetitive treatment. Temporary occlusion reduces, compared to standard TACE, hypoxia-inducible factors, and the releases of vascular endothelial growth factor, which are promoters of neoangiogenesis, tumor proliferation, and metastatic growth. DSM-TACE could be associated with different chemotherapy agents allowing clinical indication for both primary liver disease and liver-dominant metastatic diseases such as breast and colorectal cancer.
Conclusion: Shorter ischemia and preservation of vascular access make DSM-TACE a promising option, safe and effective palliative treatment for unresectable liver disease.

P-67

Pre-operative portal vein embolization

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Learning Objectives:
1. Discuss rationale behind pre-operative Portal Vein Embolization. 2. Explain portal venous anatomy, liver volumetrics and patient selection. 3. Elaborate on procedural technique and measurement of outcomes. 4. Discuss complications and alternatives
Background: Pre-operative Portal Vein Embolization (PVE) is a useful procedure prior to major hepatic resection in patients with inadequate future liver remnant. It helps in promoting hypertrophy of the remnant liver to decrease surgical morbidity and mortality. A good knowledge of anatomic variants and appropriate patient selection criteria such as liver volumetrics, liver function, prior chemotherapy etc. is key to technical success. Knowledge of different embolization techniques, expected outcomes and management of complications is essential for performing this procedure. This educational abstract provides an overview of pre-operative Portal Vein Embolization along with a discussion of potential alternatives such as intra-arterial Yttrium-90 and the surgical procedure of ALPPS (Associating Liver Partition and Portal Vein Ligation for Staged Hepatectomy)
Clinical Findings/Procedure Details: – Case based pictoral review of portal venous anatomy and variants – Review of volumetric techniques – Technical procedural tips with pros and cons of ipsilateral and contralateral access approaches – Discussion of embolic materials used in PVE – Outcomes, complications and alternatives
Conclusion: Portal Vein embolization is a useful procedure in appropriately selected patients undergoing a major hepatic resection. Procedural success requires thorough knowledge of appropriate patient selection criteria, anatomic variants and procedural technique.

P-68

Liver ablation: basics beyond novel

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Learning Objectives: 1. To understand the importance of basics for achieving the best outcomes of liver ablation. 2. To remind the untold or forgotten tips and tricks rather than cutting-edge novel techniques.
Background: Liver ablation is accepted as one of curative treatment options for early HCC in most HCC treatment guidelines. Many novel technical advances have contributed to improving the therapeutic outcomes and guaranteeing the safety. However, many more factors regarding the basics of procedure significantly affect the best outcomes. In this educational exhibit, five important basics will be presented with comprehensive illustrations.
Clinical Findings/Procedure Details: There are five important basics for the best outcomes of liver ablation. 1. Careful selection of the best candidate is the first step to successful ablation. 2. Precise planning is the half of successful ablation. 3. Accurate procedure including punctual placement of applicators is critical. 4. Optimal ablation is the better strategy for the patiet with HCC, which will be continously recurred. 5. Learning from daily case is the essential way for the learning curve. If we keep the five basics in liver ablation, the safe and complete ablation can be guranteed in most cases.
Conclusion: Basics should be always first in liver ablation. Novel techniques can't gurantee the successful ablation if we forget the basics in our daily practices

P-69

Stereotactic percutaneous electrochemotherapy as primary approach for unresectable large HCC at the hepatic hilum

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Clinical history/Pre-treatment imaging: A 75-years old male patient. Child A (Child-Pugh-Score: 5) liver cirrhosis 4.7 x 4.5 x 3.5 cm large central HCC BCLC B involving liver segments IV / VIII and satellite HCC with 1.3 x 1.3 x 1.2 cm in segment V. Portal vein thrombosis with cavernous transformation. Close proximity of the liver artery and the central bile ducts to the HCC resulting in local cholestasis (Fig. 1).
Treatment options/Results: General anesthesia. Stereotactic navigation system (CAScination CAS-ONE IR). 6 electrodes (IGEA Cliniporator VITAE). Distance between the electrode-tips ranging from 2.1 to 3.0 cm (Fig. 2). Electroporation 8 minutes after intravenous Bleomycin injection. MWA of the satellite tumor (Segment V) was performed during the same session (Surgnova Dophi M150E Microwave Ablation System). A contrast-enhanced control scan showed complete devascularization tumor and satellite. No periinterventional adverse events. CE-MRI after 6 weeks and 6 months showed complete response with no recurrent HCC. The ablation defect in segment IV/VIII decreased in size to 3.1 x 2.8 x 2.8 cm. Local cholestasis resolved almost completely (Fig. 3).
Discussion: The primary tumour was unresectable and not suited for thermic ablation techniques such as RFA and MWA because of the close proximity to the major blood vessels and bile ducts. The tumor was too large to be treated with IRE.
Take-home points: Stereotactic percutaneous ECT has the potential to be used as a safe and effective curative treatment method for HCC with diameters of more than 4 cm, even in close proximity to critical structures like major blood vessels and central bile ducts.

P-70

Extensive portal, splenic and mesenteric venous thrombosis complication: portal vein embolization salvaged by percutaneous trans-hepatic pharmaco-mechanical thrombectomy

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Clinical history/Pre-treatment imaging: A 75 year old female with Hepatocellular carcinoma in the right lobe of the liver underwent successful right portal vein embolization for hepatic hypertrophy prior to a right hepatectomy. On follow up MRI at one month, extensive thrombosis of the entire portal system including the superior mesenteric vein and splenic vein was incidentally noted. The patient was asymptomatic in the interim and liver volumetrics did not show any hypertrophy of the future liver remnant. Given these findings the patient lost candidacy for a resection and was refered to interventional radiology for management.
Treatment options/Results: We performed a left percutaneous trans-hepatic portal venous access followed by pharmaco-mechanical thrombectomy and portal vein venoplasty/stenting to restore flow in the left portal and mesenteric veins. At the end of the procedure brisk flow was seen in the left portal vein with persistent occlusion of the embolized right portal vein. The patient was discharged on anticoagulation and on follow up CT in one month was seen to have persistent left portal venous patency along with adequate hypertrophy of the future liver remnant from 33% pre-procedure to 42%.
Discussion: This case illustrates a management strategy for non target porto-mesenteric thrombosis following portal vein embolization. Restoring portal flow is essential to preventing complications of portal thrombosis but this case shows that it can also result in delayed hypertrophy to maintain surgical candidacy.
Take-home points: This case report discusses – Management strategies for porto-mesenteric thrombosis complicating PVE – Demonstrates that FLR hypertrophy can occur following restoration of portal flow

P-71

Fatal acute right sided heart failure after stenting for malignant IVC compression

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Clinical history/Pre-treatment imaging: We present a case of 62-year-old male patient with metastatic anorectal cancer to the liver and lungs. The patient was treated by palliative chemotherapy and hepatic segmental resection two years ago. The patient developed severe bilateral lower limb edema in the last year. CT examination revealed a large metastatic lesion in the caudate lobe causing significant compression on the intrahepatic IVC.
Treatment options/Results: Palliative IVC stenting was decided. The procedure was performed under conscious sedation using a percutaneous right common femoral approach. Angiogram showed severe stenosis of the infra-hepatic IVC. Multiple trials of balloon dilatation were attempted using 20 mm x 6 cm high pressure balloon. Following that, a 20 mm x 100 mm IVC stent (Venovo) was successfully deployed into the intrahepatic IVC. Post stenting angiogram revealed fast flow of the contrast to the right atrium with no leakage or stenosis. Two days later, the patient developed sudden shortness of breath. Chest x-ray showed extensive acute pulmonary edema. Echocardiography showed acute right ventricular failure. Despite extensive medical treatment, the patient died two days later from cardiac arrest.
Discussion: Malignant compression/thrombosis of IVC can be seen in retroperitoneal tumors, renal cell carcinoma, and liver metastasis. Treatment options include surgical resection,

chemotherapy, radiation, and endovascular approaches. IVC stenting is a feasible technique with good clinical outcomes. However, the reported complications include stent migration, re-stenosis, and thromboembolic events.
Take-home points: IVC stenting is a feasible approach to treat IVC thrombosis. Sudden increase in the venous return is a recognized complication that requires rigorous post procedural monitoring.

P-72

Gelfoam occlusion of non-targeted intrahepatic arterial branch to increase tumor response in an intermediate-stage huge hepatocellular carcinoma with drug-eluting bead transarterial chemoembolization (DEB-TACE)

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Clinical history/Pre-treatment imaging: A 52 years old chronic alcoholic male patient presented with right upper quadrant abdominal pain. He underwent triphasic CT which revealed chronic liver disease with presence of a huge intrahepatic arterial hypervascular mass showing washout (~ 10.8 x 6.9 cm) suggestive of hepatocellular carcinoma (HCC) (Figure 1 A). The alfa-feto-protein level was 146 ng/ml. He was classified into BCLC Stage B with Child-Pugh (CP) score A.
Treatment options/Results: DEB-TACE was planned for the patient. The right hepatic artery angiogram showed multiple arterial-feeders supplying the tumor. There was a non-targeted segmental branch arising just before the origins of arterial feeders (Figure 1B and 2A). The non-targeted segmental branch was first occluded with gelfoam in to divert all flow towards the targeted area (Figure 2B). The chemoembolization was then performed using 75 mg of doxorubicin with 100-300 µm microspheres. On follow-up, there was complete necrosis of tumor (Figure 1C) and decrease in AFP level (2.2 ng/ml).
Discussion: TACE has been recommended as the standard treatment for intermediate-stage HCC. The complete tumor response depends on overall drug-uptake within the tumor and amount of non-targeted chemoembolisation. The non-targeted segmental branch may be occluded with gelfoam to achieve increase uptake in the target area. However, it requires careful selection of the patients and depends upon the liver function and amount of non-targeted area to avoid post-embolisation decompensation.
Take-home points: The occlusion of non-targeted intrahepatic segmental branch before chemoembolisation may improve overall efficacy of DEB-TACE in cases of huge HCC and may help to achieve complete tumor response.

P-73

Curative treatment of triple negative breast cancer liver metastasis with percutaneus hepatic perfusion

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Clinical history/Pre-treatment imaging: 62 years old female had breast protective surgery and axillary lymph node dissection(pT2N0MO adenoid cystic carcinoma) completed with 6 cycle of adjuvant anthracycline and RT.3 years later left lobe metastasectomy, fourth year left lobe hepatectomy was done but CT revealed multiple metastatases on liver again.12 weeks paclitaxel, 7 months Capecitabine and 5 cycles of CMF treatments did not work and liver only progressive liver metastasis diagnosed.
Treatment options/Results: We decided to treate liver only progressive metastatic disease with percutaneus hepatic perfusion (PHP). We did 3 sessions of PHP treatment with 2 months interval consecutively. Dynamic MR imaging revealed complete response of disease after last PHP. 12 months later follow up PET CT and liver MRI also revealed complete response.
Discussion: Triple Negative Breast Cancer (TNBC) defined by the absence of ER/PR expression and HER2 amplification; %10-20 of all breast cancers. Interval type cancers; first and third years frequently metastasis to liver or brain and there is no standardized treatment for TNBC.We knew that percutaneus hepatic perfusion (PHP) is an effective treatment for chemotheraphy resistive metastatic liver tumors like uveal malign melanom. PHP treatment use with Melphalan and multidrug resistance very rare for this chemotherapy agent .TNBC liver metastasis treatment can be difficult with conventional methods. We suggest that PHP is an effective treatment method for TNBC liver metastasis but we need a large cohort study.
Take-home points: PHP is an effective treatment for chemotheraphy resistive metastatic liver tumors We suggest that PHP is an effective treatment method for TNBC liver metastasis.

P-74

A case of recurrent hypoglycemia from hepatocellular carcinoma which was successfully treated by transarterial chemoembolization

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Clinical history/Pre-treatment imaging: A 55-year-old female presented with recurrent hypoglycemic symptoms and required intravenous glucose infusion to maintain normoglycemia in April 2013. Additional investigations

revealed raising of serum alpha-fetoprotein (10,411 IU/ml) and a 15x10-cm heterogeneous enhancing mass at right hepatic lobe, which suggestive of hepatocellular carcinoma.
Treatment options/Results: Surgical resection was considered to be too risky because of the tumor size and patient general condition. Transarterial chemoembilization (TACE) was performed. Her hypoglycemia was successfully controlled within 24 hours after the first session of TACE. After another two subsequence sessions of TACE, the tumor showed significant decrease size to 8.3x4.8 cm. Right hepatectomy was done in September 2013. A 1.4-cm recurrent HCC was detected in February 2016 without any hypoglycemic symptom. The tumor was successfully treated with radiofrequency ablation. The patient is otherwise healthy without evidence of tumor recurrence until present.
Discussion: The patients with hepatocellular carcinoma presented as hypoglycemic episode are uncommon. Hypoglycemic phenomenon was described to occur from tumor production of insulin-like growth factor II and tumor uptake of glucose. There are several treatment options for controlling hypoglycemia, including tumor resection, locoregional therapy of the tumor and medical treatments. For our patient, hypoglycemia was successfully controlled by the first session of TACE.
Take-home points:
- Although uncommon, hypoglycemia may present as an initial symptom of HCC.
- This case demonstrated the successful treatment of hypoglycemic symptoms associated with large hepatocellular carcinoma by TACE.

P-75

CT-guided stereotactic biopsy of a lesion in the hepatic hilum

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Clinical history/Pre-treatment imaging: The patient (male, 75 years old) was admitted to the emergency department (HFR Fribourg) because he fell frontally on the head, presumably due to vasovagal collapse caused by abdominal pain. The CT showed an inhomogeneous mass (51x22mm) with a hypodense center in the hepatic hilum. C-Reactive Protein and Murphy's sign were negative. The tumor board decided for a biopsy of the mass. Differential diagnosis was lymphoma/carcinoma.
Treatment options/Results: An attempt with Ultrasound guidance failed and therefore biopsy under general anaesthesia with High Frequency Jet Ventilation with the support of a CT-guided stereotactic navigation system was considered (CAS-One IR, CASCINATION AG). Preprocedural screening showed only one possible access window to the suspected lesion, which passes in close proximity to the portal vein, hepatic artery and gallbladder (Figure 1). Three cylindrical samples were taken from the suspected mass (16G co-axial system with a 18G biopsy needle).
Discussion: A small bleeding appeared on the post-biopsy CT scan due to a puncturing of a small branch of the hepatic artery (Figure 2.right), however, the following late phase (and angiography after) showed tamponade. The pathology showed a carcinoma with little differential, expressing CDX2 which means it is probably pancreatic-biliary.
Take-home points: The use of CT-guided stereotactic navigation system allows the targeting of a lesion where previous ultrasound-guided attempt has failed.

P-76

Spontaneous intrahepatic bleeding from an HCC treated with transcatheter embolization using EVOH (Onyx)

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Clinical history/Pre-treatment imaging: A 53 years old man, otherwise fit and well, presented to A&E because of acute onset of sharp RUQ pain with normal BCC and arterial pressure. Ultrasound showed multiple hepatic lesions, with no peritoneal free fluid. Nodules resulted hypervascular at CT/MRI, with the largest showing a ruptured 1 cm intralesional pseudoaneurysm. Nodules were biopsy proven HCCs.
Treatment options/Results: Because of persistent RUQ pain and in order to prevent subcapsular haematoma formation or rupture within peritoneal cavity, decision was made to primarily treat the haemorrhagic nodule with transcatheter embolization. The superselective angiograms of S7 artery of the liver well demonstrated the expanding pseudoaneurysm with contrast leakage into the heamorrhagic HCC. Several embolic agents can be used in this setting, but we decided to embolize with EVOH copolymer obtaining an effective and durable haemostatic effect.
Discussion: Spontaneous rupture is the third most common cause of death in HCC patients after tumor progression and liver failure. Thus, preventing or resolving haemorrhagic shock in such patients is the primary concern. Once the diagnosis of ruptured nodule is made, mainly with CT, surgery and transarterial embolization are the main therapeutic options with the latter less invasive but effective in haemostasis induction. Among various embolic materials (such as coils and particles) in our case we decided to use EVOH because of its filling and distal penetration properties. Haemostasis and pain control after procedure were effectively achieved.
Take-home points:
1) Silent HCCs can present after spontaneous rupture with sudden abdominal pain and hypovolemic shock.
2) TAE with Onyx is effective to treat ruptured HCC.

P-77

Microwave ablation of hepatic reactive lymphoid hyperplasia: a case report

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Clinical history/Pre-treatment imaging: A 56-year-old asymptomatic female patient underwent a routine ultrasound which showed a solitary hypoechoic lesion in noncirrhotic liver. Dynamic MRI confirmed a 2-cm-sized hypervascular lesion with washout and hypointensity in hepatobilliary phase. Laboratory tests were normal. The patient underwent biopsy of the lesion and immunohistochemical staining suggested reactive lymphoid hyperplasia (RLH).
Treatment options/Results: Due to its potential risk for malignant transformation into B-cell lymphoma, curative treatment of RLH is recommended. The patient underwent microwave ablation (MWA). The postablative course was uneventful and she was discharged the next day. MRI two months after the procedure showed a complete response according to mRECIST criteria. The last follow-up MRI 29 months after treatment showed no signs of recurrence or progression.
Discussion: The imaging findings of hepatic RLH are nonspecific and may simulate malignancy. Percutaneous biopsy is required in differentiating RLH from malignant tumors. Based on limitations of imaging and pathology, surgical resection is the advised first-line treatment for definitive diagnosis and treatment. To date, only one case treated with radiofrequency ablation was described in available literature.
Take-home points: Hepatic RLH is a very rare benign tumor that may simulate malignancy on imaging studies. Histological and immunohistochemical confirmation are required for a definitive diagnosis. Due to the potential risk for malignant transformation into lymphoma, surgical resection is recommended as first-line treatment, alternatively percutaneous ablation techniques can be used. We report a case of hepatic RLH in a 56-year-old female patient who had been successfully treated with MWA instead of surgical resection.

P-78

First usage of combined HCC treatment with balloon-occluded TACE and MW ablation in Kazakhstan: long-term (12 months) treatment results

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Clinical history/Pre-treatment imaging: 66-year-old female patient with stabilized HCC in the right lobe (St-2. T2aNxM0) after two sessions of DEM-TACE. Tumor size 6,4*6,6*6,8 cm in the segments 6 and 7. Tumor board decision was to try balloon-TACE.
Treatment options/Results: Angiography confirmed the lesion and feeding arteries were proximally catheterized by balloon microcatheter. The balloon of the catheter was inflated in this feeder and the microspheres loaded with 75 mg of Doxorubicin were injected with a good stasis at the end of the procedure.Balloon-Occluded DEB-TACE with Occlusafe was well tolerated by the patient and he was discharged at day 1. No alteration of liver function was observed. Grade 1 abdominal pain was present five days after the TACE. The MRI performed 1 month after the procedure had showed a complete devascularization of the tumoral nodule (complete response according to mRECIST). Tumor size decreased to 4,5x4,2 cm, necrotic zones. Patient was assigned to MW ablation procedure.Microwave ablation in 2 months after balloon-occluded TACE. The patient underwent a percutaneous MW ablation session by US-guided insertion of one 14G antennas (5 times 40 watts for 5 minutes) under general anesthesia. The Contrast CT was performed 1 month after the procedure and showed the complete response to the treatment (according to mRECIST). Great clinical efficacy. Next follow-up: Complete response for 12 months to combined treatment: bTACE+MWA.
Discussion: This clinical case shows the effectiveness of combined treatment of liver cancer by methods of interventional oncoradiology.
Take-home points: We recommend the combined treatment of liver cancer with minimally invasive methods of interventional radiology.

P-79

CT-guided stereotactic ablation of 5 liver metastases from gastrointestinal stromal tumor

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Clinical history/Pre-treatment imaging: A female, 76y, presented with liver metastases (n = 5) from a Gastrointestinal Stromal Tumor (GIST) with the following history: • 2014, small intestine perforation with characteristics of GIST • Diagnosis GIST, T2Nx, confirmed trough biopsy • Adjuvant Glivec following resection (3 years) • Resection of small intestine
Treatment options/Results: Percutaneous navigated ablation with the CAS-One IR system (CASCINATION AG, Switzerland) was preferred over major surgical resection to preserve the parenchyma for future treatment options. The procedure was performed in the CT suite, with the patient under general anesthesia. Respiratory motion control (high-frequency jet ventilation) was used during the navigation procedure. A trajectory for each target was navigated using a tracked mechanical arm and the needle positions were verified with CT imaging. On completion of the ablation session, a contrast-enhanced CT scan was fused with the planning CT scan and determine the tumor coverage by the ablation zone (see Figure 1).
Discussion: The decision for percutaneous ablation intended to preserve parenchyma for future treatment options, as the patient is likely to develop more metastases. Furthermore, resection would imply the removal of multiple liver sections and prolong the hospitalization and time to recovery.
Take-home points: With percutaneous navigated ablation a tissue sparing approach was chosen, to improve the patient`s quality of life and preserve options for future treatment.

Lung

P-80

Drug-eluting beads bronchial arterial chemoembolization plus intercostals arterial infusion chemotherapy is effective and well-tolerated in treating non-small cell lung cancer patients with refractory malignant pleural effusion

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Purpose: The study aimed to explore the efficacy and safety of drug-eluting beads bronchial arterial chemoembolization (DEB-BACE) plus intercostals arterial infusion chemotherapy in non-small cell lung cancer (NSCLC) patients with refractory malignant pleural effusion (MPE).
Material and methods: 17 NSCLC patients with refractory MPE treated by DEB-BACE plus the intercostals arterial infusion chemotherapy (DEB-BACE group) were recruited. Their treatment response (complete remission (CR), partial remission (PR), overall efficacy, failure) for MPE was assessed at 1 month after therapy; adverse effects were recorded; MPE progression-free survival and overall survival (OS) were calculated. Moreover, 19 NSCLC patients with refractory MPE treated by conventional chemotherapy were reviewed as control (chemotherapy group), then their medical records were collected.
Results: With respect to MPE response, DEB-BACE group exhibited increased CR (82.4% vs. 10.5%, P<0.001) and overall efficacy (100.0% vs. 52.6%, P=0.001), similar PR (17.6% vs. 42.1%, P=0.112) while less failure (0.0% vs. 47.4%, P=0.001) compared to chemotherapy group. Furthermore, OS was prolonged in DEB-BACE group (median: 13.4 (95%CI: 11.0~15.8) months) than chemotherapy group (median: 7.0 (95%CI: 4.4~9.6) months) (P=0.002). Further analyses displayed that in DEB-BACE group, CR was associated with improved ECOG score and longer MPE progression-free survival, and adverse events mainly included fever, chest distress/pain, gastrointestinal side effects, myelosuppression, rash and hemoptysis, which were all mild and tolerable.
Conclusion: DEB-BACE plus intercostals arterial infusion chemotherapy could serve as a salvage treatment option for NSCLC patients with refractory MPE.

P-81

Microspheres present comparable efficacy and safety profiles compared with polyvinyl alcohol for bronchial artery embolization treatment in hemoptysis patients

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Purpose: The present study aimed to compare the efficacy and safety profiles of microspheres versus (vs.) polyvinyl alcohol (PVA) for bronchial artery embolization (BAE) treatment in patients with hemoptysis.
Material and methods: Totally, 152 patients with hemoptysis who were about to receive BAE treatment were consecutively enrolled and divided into microspheres group (N=62) and PVA group (N=90). Technical success and clinical success were assessed after BAE procedure, and the hemoptysis-recurrence status, survival status and adverse events were recorded during follow-up.
Results: Technical success rates were both 100% in microspheres group and PVA group; clinical success rate (96.8% vs. 100.0%, P =0.165), 6-month (9.7% vs. 7.8%, P =0.681) and 1-year (9.7% vs. 8.9%, P =0.869) hemoptysis recurrence rate, 6-month (4.8% vs. 2.2%, P =0.374) and 1-year (4.8% vs. 3.3%, P =0.639) mortality were similar between microspheres group and PVA group. Furthermore, hemoptysis-free survival (P =0.488) and overall survival (P =0.321)were of no difference between two groups. In addition, all adverse events were mild, and there was no difference of adverse events between two groups (all P >0.05). These data were validated by further multivariate regression analysis.
Conclusion: Microspheres present comparable efficacy and safety profiles compared with PVA for the BAE treatment in patients with hemoptysis, providing evidence for embolic agent selection.

P-82

Efficacy and safety of 8spheres plus cisplatin versus vinorelbine plus cisplatin in locally advanced non-small cell lung cancer

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Purpose: This study aimed to evaluate the efficacy and safety between 8spheres plus bronchial arterial infusion (BAI) cisplatin and intravenous vinorelbine plus cisplatin as third-line treatments in locally advanced non-small cell lung cancer (NSCLC) patients.

Material and methods: Totally, 56 locally advanced NSCLC patients with second-line chemotherapy failure were recruited. Then, 28 patients received 8spheres plus BAI cisplatin treatment, and another 28 patients received intravenous vinorelbine plus cisplatin treatment.
Results: In general, 8sphere plus BAI cisplatin increased objective response rate (57.2% vs. 17.8%, P=0.002) and disease control rate (78.6% vs. 42.8%, P=0.003) compared with intravenous vinorelbine plus cisplatin; meanwhile, it also elevated quality of life (QOL) score (46.7±7.1 vs. 41.5±5.2, P=0.003) compared with intravenous vinorelbine plus cisplatin. Furthermore, 8sphere plus BAI cisplatin prolonged progressive-free survival (PFS) (median (95%CI): 7.9 (6.3-9.5)months vs. 4.3 (3.5-5.1)months, P<0.001) and overall survival (OS) (median (95%CI): 14.6 (11.0-18.2)months vs. 10.5 (10.2-10.8)months, P=0.029) compared with intravenous vinorelbine plus cisplatin, which was further supported by multivariate Cox's regression analysis (PFS: P < 0.001; OS: P=0.007). Additionally, subgroup analyses revealed that 8sphere plus BAI cisplatin markedly elevated treatment response, QOL and survivals compared with intravenous vinorelbine plus cisplatin in squamous cell carcinoma patients but not in adenomatous carcinoma and adenosquamous carcinoma patients. Regarding safety, 8sphere plus BAI cisplatin exhibited lower rates of gastrointestinal tract complication (P<0.001) and myelosuppression (P<0.001) than intravenous vinorelbine plus cisplatin.
Conclusion: 8spheres plus BAI cisplatin displays good efficacy and well-tolerated safety profiles in locally advanced NSCLC patients with second-line chemotherapy failure.

P-83

Technical success, clinical success of hemoptysis treatment, tumor clinical response and safety of drug-eluting bead bronchial arterial chemoembolization versus conventional bronchial arterial chemoembolization

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Purpose: This study aimed to explore the efficacy and safety of drug-eluting bead bronchial arterial chemoembolization (DEB-BACE) compared to conventional bronchial arterial chemoembolization (cBACE) in lung cancer patients.
Material and methods: Thirty-six lung cancer patients with hemoptysis who were treated by DEB-BACE or cBACE were retrospectively analyzed and divided into DEB-BACE group (N=14) or cBACE group (N=22) according to the treatment. Technical success of BACE, clinical success of hemoptysis treatment, clinical response of tumor and postoperative adverse events were assessed.
Results: There was no difference in technical success (P=1.000) and clinical success (P=0.418) between DEB-BACE group and cBACE group. Whereas DEB-BACE group achieved increased clinical response rate (P=0.021) and raised objective response rate (P=0.035) compared to cBACE group. Regarding hemoptysis relapse rate, it was slightly lower in DEB-BACE group compared to cBACE group, but without statistical significance (7.1% vs. 22.7%) (P=0.221). In terms of survival, DEB-BACE group showed prolonged hemoptysis relapse-free survival (RFS) (P=0.013), while similar overall survival (P=0.094) compared to cBACE group, which were also supported by further Cox's proportional hazards analysis. As to safety, no difference in adverse events between two groups was observed (All P>0.05).
Conclusion: DEB-BACE presents with higher clinical response, prolonged hemoptysis RFS and comparable safety profiles compared to cBACE in lung cancer patients.

P-84

Drug-eluting beads bronchial arterial chemoembolization in treating relapsed/refractory small cell lung cancer patients: results from a pilot study

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Purpose: We aimed to explore efficacy and tolerance of drug-eluting beads bronchial arterial chemoembolization (DEB-BACE) treatment in relapsed/refractory small cell lung cancer (SCLC) patients.
Material and methods: Eleven relapsed/refractory SCLC patients were enrolled and treated with DEB-BACE. Then treatment response and tumor marker levels were assessed at the 1st, 2nd and 6th month post treatment. Quality of life was assessed by EORTC QLQ-C30 scale. Progression-free survival (PFS) and overall survival (OS) were evaluated.
Results: At the 1st, 2nd and 6th month post treatment, the objective response rates were 63.6%, 54.5%, and 36.4%, respectively; and the disease control rates were 90.9%, 90.9% and 54.5%, respectively. In addition, the neuron-specific enolase (NSE) and progastrin-releasing peptide levels were reduced at the 2nd and 6th month. Quality of life assessed by EORTC QLQ-C30 scale, including subscales of general health status, functional domains, symptom domains, and single domains except for financial difficulty were markedly improved at 2nd month post treatment. Median values of PFS and OS were 5.1 (95%CI: 4.1-5.9) months and 9.0 (95%CI: 6.0-12.0) months, respectively. In addition, ECOG score and preoperative NSE level were independent predictive factors for PFS, and age as well as lesion location were independent predictive factors for OS. Adverse events were all mild and manageable with chest pain and chest stuffiness the most common.
Conclusion: DEB-BACE could be a therapeutic option for relapsed/refractory SCLC patients regarding its favorable treatment response, quality of life, survival benefit and safety profile.

P-85

Lung thermo-ablation: comparison between an augmented reality CT 3D navigation system (SIRIO) and standard CT-guided technique

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Purpose: The aim of this retrospective study is to assess safety and efficacy of percutaneous lung ablation using an augmented reality CT navigation system (SIRIO) and comparing it with the standard CT-guided technique.
Material and methods: Lung RFA and MWA were performed with a CT navigation system (SIRIO) in 52 patients and data were compared with a group of 49 patients undergoing standard CT-guided technique. The procedures were reviewed based on the number of CT scans, patients' radiation exposure, procedural time recorded, complications and 1 year follow-up.
Results: SIRIO-guided LTA showed a significant reduction in procedure time, number of required CT scans and the radiation dose administered to patients ($p < 0.001$). A slight reduction in the complication rate was observed, probably due to a better identifications of the needle direction. In terms of local disease control, SIRIO did not demonstrated a significant improvement compared to the standard CT-guidance. To our knowledge this is the first clinical experience with a cohort of 101 patients inquiring the role of an augmented reality CT 3D navigation system in the lung ablative field.
Conclusion: SIRIO proved to be a reliable and effective tool when performing CT-guided LTA displaying a significant ($p<0.001$) decrease in the procedure time and the radiation dose administered to patients.

P-86

Drug-eluting bead bronchial arterial chemoembolization versus chemotherapy in treating advanced non-small cell lung cancer: comparison of treatment efficacy, safety and quality of life

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Purpose: This present study aimed to compare the treatment response, survival profile, quality of life (QoL) and safety between drug-eluting bead bronchial arterial chemoembolization (DEB-BACE) and chemotherapy in the treatment of advanced non-small cell lung cancer (NSCLC).
Material and methods: Totally, 44 advanced NSCLC patients were analyzed retrospectively, and were divided into DEB-BACE group (n=23) and chemotherapy group (n=21). Treatment response, European Organization for Research and Treatment of Cancer QoL Questionnaire–Core 30 (EORTC QLQ-C30), progression-free survival (PFS), overall survival (OS), and adverse events were assessed during the follow-up.
Results: At month (M) 2, M4 and M6 post initial treatment, objective response rate (ORR) were elevated (all $p <0.05$), and disease control rate (DCR) tended to be higher (without statistical significance) in DEB-BACE group compared with chemotherapy group. Regarding the QLQ-C30 item scores, the scores of physical functioning, role functioning, emotional functioning, cognitive functioning, social functioning were increased, while the scores of nausea and vomiting, dyspnea, constipation were decreased in DEB-BACE group compared with chemotherapy group (all $p <0.05$). Based on survival profile, DEB-BACE group achieved better PFS and OS compared with chemotherapy group independent of TNM stage, which was also supported by further subgroup analysis and Cox's proportional hazard regression analysis (all $p <0.05$). Furthermore, two groups all exhibited mild and tolerable adverse events.
Conclusion: DEB-BACE has potential to be an additional treatment option with favorable therapeutic efficacy, improved QoL and tolerable safety for advanced NSCLC patients.

P-87

Percutaneous computed tomography-guided cryoablation in the lung: a single institution series

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Purpose: The purpose of the present study is to report a single center's experience and to evaluate the efficacy and safety of Computed Tomography (CT)-guided cryoablation (CWA) for the treatment of primary and metastatic lung lesions.
Material and methods: Institutional database research from 01/04/2019 till 01/09/2020, identified 12 patients with primary or secondary lung lesions (n=23) who were treated by CT-guided CWA and were evaluable for the 6 months follow-up. Technical and clinical success on a per tumor and per patient basis as well as complication rates were recorded. Neoplasmatic substrate included NSCLC (2 patients/2 lesions) and metastases from sarcoma (4 patients/11 lesions), pancreatic (1patient/1 lesion) and colon (5 patients/9 lesions) carcinoma. Mean patient age was 64.3 years (range 23-80) and male/female ratio was 8/4.
Results: Median size of the lesions was 1 cm (range 0.4-2.5 cm). Median number of tumors was 1.87 (range 1-4). The mean procedure time was 66.92 minutes (range 50-84 min), including local anesthesia, cryoprobe(s) placement, ablation and postprocedural CT evaluation. Median length of hospital stay was 2.5 days (range 1-8). Local recurrence-free response (local tumor efficacy) of the treated lesions at 6 months was 91.3% (21/23) and 100% following a second cryoablation treatment for recurrent tumor. The rate of pneumothorax requiring pleural catheter placement was 16.6%% (2/12 patients). Additionally there were 1 case of pleural effusion requiring nothing but observation.
Conclusion: The present study demonstrates that percutaneous CT-guided CWA constitutes a safe and effective ablation technique for primary and metastatic lung lesions.

P-88

A comparison of pneumothorax incidence between CT-guided and cone beam CT-guided percutaneous transthoracic needle biopsy in a community hospital-based practice

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Purpose: To determine if C-Arm cone beam CT (CBCT) is a viable alternative imaging guidance modality for percutaneous transthoracic needle biopsy (PTNB) in a community-based practice, and to determine the incidence of CBCT PTNB-associated pneumothorax compared to traditional CT-guided biopsy.
Material and methods: At our busy academic community hospital interventional radiology practice, C-Arm CBCT was utilized during a three-month period when our dedicated procedural CT scanner was out of service prior to installation of a new machine. This study was prompted given perceived increased incidence of pneumothorax during that time. Given this subjective experience, a retrospective analysis was carried out comparing the pneumothorax rate during this period to the preceding six-month period, when traditional CT-guidance was preferably used. For the primary analysis, patients were grouped based on imaging modality. Additional subgroup analyses based on lesion size, pleural depth, and other clinical risk factors for pneumothorax were also carried out.
Results: There was no significant association between the imaging modality used for PTNB and subsequent pneumothorax (p=.69). However, there was a significant interaction between chest tube placement and diagnosed COPD (p=.03). Additionally, all patients requiring chest tube placement were either current or former smokers. This finding approached, but did not reach, statistical significance.
Conclusion: This study did not confirm the perceived increased pneumothorax rate. However, these findings corroborate previously published literature, where complication rates between CBCT and traditional CT-guidance are reportedly comparable. Our experience demonstrates that CBCT can be successfully utilized in a community hospital setting, where limited resources prompt the need for alternative procedural approaches.

P-89

CT-guided microcoil placement for VATS resection of lung nodules

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Learning Objectives: This work aims to review the CT-guided microcoil placement procedure in the Video-Assisted Thoracoscopy Surgery (VATS) ressection of pulmonary nodules.
Background: VATS technique has become increasingly used, since ressections based on this surgical approach show reduced morbidity and shorter lenght of post-operative hospitalization.
Clinical Findings/Procedure Details: Small nodules, gradually more often detected due to constant improvements of diagnostic equipments, are difficult to palpate intraoperatively. The same occurs with those nodules that are deep in the lung parenchyma or those that have no significant solid component. Beside the nodules characteristics, there are other factors such as pleural ou parenchymal fibrotic components that preclude the palpation of the lesions. Additionally, VATS removes the surgeons tactile perception, making the ressection of some small pulmonary nodules even more difficult. In order to solve the localization of small or non-palpable nodules for ressection with VATS, many different techniques have been developed, one of those being microcoil insertions under CT guidance. In this procedure, an interventional radiologist uses a CT scanner to find the lesion. Then, a needle, pre-loaded with a soft, fiber-coated platinum thread, is inserted percutaneously into the lung. Once the needle reaches the lesion, the radiologist releases the thread, allowing the surgeons to know the exact location of the nodule.
Conclusion: Thus, this minimmaly invasive procedure contributes for a safer and shorter operative time. It also helps to treat patients sooner, the perfect complement to the effort made on early diagnosis.

Musculoskeletal

P-90

Case presentation of percutaneous biopsy using robotic assistance under computed tomography guidance

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Clinical history/Pre-treatment imaging: Percutaneous computed-tomography (CT)-guided interventions can beusedeffectively for image-guidedbiopsy and tumour ablation.However,the accuracy of CT-guided needle placement, which influences diagnostic yield, is highly dependent upon physician experience.In order to reduce the radiation dose of patients, improve the efficiency of surgery,Our navigation system successfully helps doctors solve these problems.and the following are case applications.
Treatment options/Results: Improved needle accuracy with the use of this IR assistance platform for challenging,single-pass, multi-angle needle trajectories.
Discussion: Improved needle accuracy with the use of this IR assistance platform for challenging,single-pass, multi-angle needle trajectories.
Take-home points: The computer console communicates with the robotic guide arm via an RS232 interface to move according to the physician dictated plan. The robotic guide arm possesses 5 degrees offreedom and isable toachieveneedleinsertionsup to230mmfromthegantrycentrelinetothesideoppositethat of the docked device. Those needle angles or skin entry sites outside of this range mandate installation of another floor mounted docking plate on the other side of the examination table and physical docking of the robotic on the contralateral table side. Once the robotic arm has moved to the correct location, the physician operator instructs the end effector of the robotic guide arm via the computer console to grip a plastic, gauge-specific needle guide (Fig. 1b). The physician then manually inserts the needle through the needle guide until the needle hub contacts the needle guide.Once the needle is in place, the physician instructs the robotic device to unclamp its end effector and withdraw its robotic arm from the procedural site.

P-91

The role of magnetic resonance guided high intensity focused ultrasound (MRgHIFU) in the management of hypervascular bone metastases

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Purpose: To evaluate the effectiveness of MRgHIFU treatment in pain palliation and local tumour control of hypervascular osseous metastases in combination or not with transcatheter arterial embolization(TAE)and radiation therapy(RT).
Material and methods: VAS score at baseline,3 and 6 months after treatment was assessed. Treatment response was evaluated according to the International Consensus on Palliative Radiotherapy Endpoints for Future Clinical Trials in Bone Metastases criteria.MR or CT studies before and 3±2 months after MRgHIFU were evaluated to assess tumour response according to MD Anderson criteria.
Results: Thirteen patients(15 hypervascular metastases) were treated(46%kidney, 39%thyroid and 15%liver). All lesions underwent MRgHIFU,8 lesions were previously treated with RT and/or TAE.Good results were achieved in both groups, regarding pain palliation.Patients treated only with MRgHIFU showed a significant reduction in VAS score at 3 and 6 months(p=0,0490 and p=0,0294). Therapeutic success(complete and partial response)was obtained in both groups although with no significant differences(86%vs50% at 3m and 86%vs62% at 6m– p=0,2821 and p=0,5692 respectively).MR or CT follow-up studies were available for 12 lesions,mean dimension at baseline was 89,67±34 mm for lesions treated only with MRgHIFU and 93,25±20,8 mm for the other group. In patients treated only with MRgHIFU complete response occurred in 2 cases,stability in 2 and progression in 1.In the other group there were 2 complete,1 partial response and 2 cases of stability.No differences were found between groups regarding local response.
Conclusion: MRgHIFU has the potential to serve as first-line treatment in hypervascular bone metastases considering the comparable results in terms of pain palliation and local control,alone and combined with TAE and RT.

P-92

Fluoroscopy guided uncooled microwave ablation in the treatment of osteoid osteoma

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Purpose: This study aims to evaluate the technical and clinical success of uncooled microwave ablation in the treatment of osteoid osteoma with two-dimensional fluoroscopy guidance in the operating room.
Material and methods: The clinical and imaging data of 9 patients were retrospectively evaluated. Mean patient age was 15.7 years. The mean size and volume of the lesions was 17.9x9.7x8.6 mm, 0.79±0.33cm3 and the mean nidus size was 7.32±1.96 mm with CT. MWA was performed with uncooled probe at 15 watts, 2.45 GHz, 60-110°C. Numerical pain score was recorded preoperatively, and one day and one month postoperatively. Clinical success was defined as complete pain relief without analgesics. Procedures were performed under general anesthesia in operating room and in sterile conditions.
Results: Clinical and technical success was achieved in 100% of patients. The mean volume of MWA-induced necrosis was 19.2x11.5x8.8 mm (0.87±0.52cm3), peripheral scar thickness was 3.43±0.78 mm and none of the patients had nidus enhancement on first month follow-up MRI. Fluoroscopic guidance was conducted under digital c-arm. Patients received four to twelve spot films (mean: 6.6 kVp, 2.66 mAs) over the lower extremity. The average dose rate was 3.4 mSv/h at the table top. Mean radiation exposure to the skin due to imaging was 0.02 mGy per patient per procedure.
Conclusion: This study demonstrated the effectiveness and the safety of the uncooled MWA in osteoid osteoma. The technique may effectively be used in operating room under c-arm fluoroscopy. Such hybrid approach may ensure sterility, anesthetic safety and lower radiation dose to patients.

P-93

Our experience in osteoid osteoma patients treated with computed tomography guided percutaneous radiofrequency ablation

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Purpose: Currently, percutaneous radiofrequency (RF) ablation therapy under the guidance of computed tomography (CT) is used as a popular method in osteoid osteoma (OO). The purpose of this study is to evaluate the complications and effectiveness of the procedure.
Material and methods: Fifteen patients who were treated between February 2017 and September 2020 were included in study. RF procedure was performed in the CT unit under sedation anesthesia. Archive images and file record were analyzed retrospectively. Location of the lesions, nidus width and affected area (cortical, medullary) were noted. The disappearance of the pain after the procedure was accepted as success criteria. The patients were routinely followed up daily after the procedure.
Results: There were 14 male patients in the study. The mean age were 17.5 ± 8.67 and mean diameter of the nidus of the patients were 6.80 ± 4 mm, respectively. 10 nidus were cortical, 4 were intramedullary region. Lesions femur (n=11), tibia (n=2) scapula (n=1) was settled. The pain disappeared in all patients within 48 hours following the procedure. One patient had minimal burn enrty site, which resolved in a short time. No recurrence was observed in any of the patients until now.
Conclusion: The treatment success of RF ablation for OO is high. Procedure failure and recurrence rate is low. Post-treatment pain relief, early discharge and a short return to daily life are available. RF ablation procedure has prevented surgical treatment in appropriate lesion localizations. Procedure-related complication rate is low. However, the burn during the procedure can be a serious problem.

P-94

Pain relief and local tumor control following percutaneous image-guided cryoablation for spine metastasis: a 12-years single centre experience

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Purpose: Percutaneous image-guided spine cryoablation (PIGSC) is a local treatment reported to be effective to achieve pain relief and/or local tumor control for metastases. The purpose of our study is to retrospectively assess pain relief and local tumor control for spine metastases.
Material and methods: Between May 2008 and September 2020, 41 consecutive patients (mean age 59.7 ± 24.4 (range 27-84)) were treated for 46 spine metastases in 42 procedures. Population demographics, procedural data, complications, numerical pain scale before and after procedure (1-day, 1-month and last news given by the patient) and imaging follow-up were retrospectively investigated. Clinical success was defined as a decrease of ≥ 3 points on a 10-points numerical rate scale (NPRS) for the pain relief group and a total destruction of the tumor on imaging follow-up for the local tumor control group.
Results: Among the 41 patients, 31 were treated for 36 spine metastases in 32 procedures for pain relief and 10 were treated for 10 spine metastases in 10 procedures for local tumor control. Clinical success for the pain relief group was achieved for 30/32 (93.8%) metastases, with a significantly decrease of mean NPRS from 6.2 ± 1.7 (range 3–9) before cryoablation to 1.9 ± 1.7 (range 0-7) at 1-month after cryoablation ($p<0.005$). Clinical success for the local tumor control group was achieved for 6/10 (60%) spine metastases at a median of 25 ± 19 months (range 1-48) of follow-up.
Conclusion: Percutaneous image-guided spine cryoablation (PIGSC) is effective in achieving pain relief or local tumor control for spine metastases.

P-95

Percutaneous liquid nitrogen cryoablation for bone lesions: feasibility and preliminary results

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Purpose: To assess safety and feasibility of cryoablation using a liquid nitrogen-based cryogenic system in patients with metastatic bone lesions.
Material and methods: Between January to December 2020, 9 patients (4 females, 5 males, mean age 68, range 53-75) underwent 9 cryoablations for metastatic bone tumours. Histological diagnosis included 3/9 (33%) renal cell carcinomas (RCC), 2/9 (22%) lung carcinoma, 1/9 (11%) breast carcinoma, 1/9 (11%) sarcoma, 1/9 (11%) mesothelioma and 1/9 (11%) colorectal cancer. The inclusion criteria included limited symptomatic metastasis, recurrent skeletal disease with either osteolytic or mixed osteolytic-osteoblastic features. All cases were contraindicated for other treatments, such as surgery or radiotherapy, due to comorbidity or prior irradiation. All treatments were performed in a dedicated angiography room setting in patients under general anesthesia using a liquid-nitrogen based Prosense Cryosurgical system (IceCure Medical Ltd, Caesarea, Israel) under CT guidance.
Results: The primary technical success overall was reached in 9/9 cases (100%). Two or three cycles of cryoablation were performed with a mean procedure duration time of 45 minutes (range 12-120 minutes). At a median follow up of 5 months, two minor adverse events (AEs) were reported in 2/9 lesions (22%). No major AEs or severe adverse events (SAE) were reported.
Conclusion: CT-guided cryoablation is clinically safe and feasible. Longer follow-up and a larger group of patients are needed to obtain stronger clinical outcomes.

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Radiofrequency ablation + vesselplasty in painful osteolytic primary or secondary vertebral lesions: a retrospective safety and efficacy study

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Purpose: To retrospective evaluate the safety and efficacy of vesselplasty (Vessel, Dragon Crown Medical Co., Ltd Shandong, China) after radiofrequency ablation (RFA) in symptomatic osteolytic primary or secondary vertebral lesions.
Material and methods: 15 patients (male=6, mean age 60,3 ±14.9 years old; range 23-79) with painful conventional therapy resistant dorso-thoracic primary (N=4) or secondary (N=13) vertebrae osteolyic lesions without relevant canalar invasion, were enrolled. Contrast-enhanced Magnetic Resonance (CE-MRI) and Computed Tomography (CT) spine exam were performed before and 6 months after the treatment. Visual analog scale (VAS) score has been administered before and 1 week, 1 month and 6 months after procedure; Oswestry Low Back Pain Disability Questionnaire (ODI) has been administered before and 6 months after the procedure. Technical success was defined as correct placement of the radiofrequency probe into the tumour target and subsequent completion of the vesselplasty.
Results: 17 lesions have been treated (13 lumbar, 4 dorsal) with RFA (RF3000, Boston Scientific, Marlborough, USA); subsequently, the Vessel system has been implanted with 100% technical success. No major complications occurred; 4 asymptomatic cement leakages into the intervertebral space have been registered. Preoperative mean VAS was 8.2; the mean VAS after 1 week 1 month and 6 months was 3.6, 1.8 and 1.4 respectively. Mean pre-operative ODI was 64.9% and dropped to 49.2%at 6-month follow-up. The 6-month follow-up CE-MRI did not demonstrate lesion growth.
Conclusion: RFA + Vesselplasty promise to be a safe and effective minimally invasive treatment for painful primary or secondary spinal lytic lesions; no re-growth has been demonstrated with 6-month CE-MRI.

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Percutaneous treatment strategies for aggressive hemangiomas: what the radiologist should know

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Learning Objectives: To illustrate the imaging findings of aggressive vertebral hemangiomas (AVH) To review the different percutaneous therapeutic strategies and indications for the treatment of AVH. To discuss the results and complications of minimally invasive percutaneous image-guided techniques available.
Background: The majority of VH are asymptomatic and incidentally discovered on CT or MR. Aggressive hemangioma refers to VH with extraosseous extension or significant osseous expansion and accounts for approximately 1% of VH. The ratio of fatty and vascular components (F/V) is directly correlated to evolution and aggressiveness, to the imaging features, and also to the clinical symptoms. Minimally invasive percutaneous image-guided techniques are safe and effective and commonly employed in the first-line treatment of these lesions.
Clinical Findings/Procedure Details: We describe the CT and MRI findings in VH related to aggressive behavior that will require treatment. We review minimally invasive percutaneous image-guided techniques available, including, vertebroplasty, sclerosis and combined treatment. We present our experience with the use of radiopaque gelified ethanol (RGE) as the primary treatment and in combination with other techniques.

Conclusion: The treatment of AVH requires a multidisciplinary approach. Minimally invasive percutaneous image-guided techniques are safe and effective in the treatment of AVH. In our experience, gelified ethanol sclerosis of AVH is performed with optimal outcomes in patients with back pain and neurological symptoms, and should be an alternative technique to surgery.

P-98

Role of interventional radiology in the treatment of bone tumors and pseudotumors

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Learning Objectives:
- To describe the role of interventional radiology as first-line or alternative curative treatment or for palliative purposes in both benign and malignant bone tumors.
- To illustrate relevant clinical results by reviewing a case series from our hospital.

Background: Interventional radiology (IR) can provide effective solutions with minimally invasive techniques in the first line or alternative therapeutic approach of benign and malignant bone tumors or pseudotumors. IR may have curative purposes, as is the case with infiltration of sclerosing substances, application of percutaneous ablative techniques or use of percutaneous cementoplasty (e.g., intracystic injection in aneurysmal bone cyst, percutaneous thermal ablation in osteoid osteoma, osteoblastoma, symptomatic hemangioma or single bone metastases) or palliative purposes (e.g., percutaneous thermal ablation for local control of the progression or pain in certain bone metastases).
Clinical Findings/Procedure Details: This case series aims to illustrate the different possible applications of IR in the percutaneous treatment of tumors and bone lesions, the techniques and materials used and the clinical results obtained. The included techniques are:
1. Percutaneous injection of doxycycline and/or steroids
2. Percutaneous cementoplasty
3. Percutaneous radiofrequency and microwave ablation
4. Peritumoral injections and neurolysis

Conclusion: There are numerous minimally invasive therapeutic options that interventional radiology can provide in the treatment of bone tumors and pseudotumors, which have good clinical outcomes both for curative or palliative purposes.

P-99

Ablation in bone tumors

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Learning Objectives: Pictorial assay of ablation in bone lesions for curative intent and for pain palliation.
Background: WIth recent advancemets in technology and imaging there has been significant developmets in minimally invasive ablation procedures for bone lesions. Percutaneous ablation under image guidance is safe, minimally invasive and can be performed as a day-care procedure. It has less complications, low morbidity and cost as compared to open surgery. These procedures are alternative to conventional therapies including surgery . The technical and clinical success of radiofrequency ablation (RFA) in osteoid osteoma was first reported by Rosenthal in 1992 and has now become the gold standard treatment for osteoid osteoma. The ablation is used as curative and palliative treatment for benign and malignant bone tumors.
Clinical Findings/Procedure Details: Pictorial essay of various benign and malignnt bone lesions and the role of ablation in treatmnet of these lesions and for pain palliation.
Conclusion: Percutaneous ablation under image guidance is safe, minimally invasive and can be performed as a day-care procedure. It has less complications, low morbidity and cost as compared to open surgery. Ablation procedures are used as curative and palliative treatment for benign and malignant bone lesions.

Novel therapies

P-100

Successful recanalization of non-targeted partial occlusion of the SMA by ONYX from Th9 segmental artery embolization

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Clinical history/Pre-treatment imaging: 75 y.o. Female with recent nonspecific posterior chest pain and lower limbs weakness. MRI of the spine revealed large lytic lesion with compression fracture in Thoracic 9 vertebra. Pathological diagnosis at CT-Guided Biopsy was Myeloma. Scheduled for pre-operative embolization, spondylectomy with decompression and transpedicular stabilization.
Treatment options/Results: Preoperative embolization of Th9 segmental arteries was performed with coaxial Direxion 2,4F Microcatheter (BSCi) via 5F Michaelson catheter. We used Embozene 700 µm microparticles (BSCi) for tumor parenchyma followed by Onyx-34 (Medtronic) segmental vessel occlusion. During trunk embolization, after microcatheter extraction, fragment of Onyx cast migrated into the trunk of SMA. Following positioning of 6F Mach1 guiding catheter (BSCi) in the SMA complete Onyx fragment extraction was performed by creating negative pressure with 20 ml syringe connected via manifold to 5F Sofia distal access catheter (Microvention). Post procedural period without signs of intestinal ischemia.
Discussion: Mechanical thrombextraction using thrombextractors or snares is not an option for retrieval of the migrated soft polymerized liquid agent due to potential fragmentation and distal embolization of ONYX.
Take-home points: Liquid embolic agents are highly effective, but possible complications could be treacherous. In case of non-targeted embolization as for liquid embolic agents transcatheter aspiration with distal access catheters is the method of choice. Such bailout procedures require long learning curve and better be performed by experienced interventional radiologist.

P-101

MRI and clinical validation of transperineal laser ablation of benign prostatic hyperplasia in outpatient settings: an alternative effective treatment suitable for COVID 19 outbreak

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Purpose: Transperineal laser ablation (TPLA) of the prostate is a novel, mini-invasive option for men with lower urinary tract symptoms (LUTS) due to benign prostate hyperplasia (BPH). The aim is assessing the impact of US-guided TPLA regarding urodynamic improvement and sexual function, monitoring clinical data, post-procedural complications and define imaging findings using 3T multi-parametric MRI.
Material and methods: Prospective interventional pilot study in patients affected by LUTS due to benign prostatic obstruction (BPO) treated by TPLA (SoracteLite, ECHOLASER Evo, Elesta). 44 men aged 50 or older with moderate to severe LUTS and history of refractory, intolerance or poor compliance to medical therapies were enrolled. Clinical measurements included PSA, Flow rate estimation, US post-voiding volume, sexual function, SHIM Questionnaire, Quality of Life questionnaire. Adverse events were evaluated using Clavien-Dindo scale. Volume changes were measured by 3T MRI and automatic segmentation software at 1 year follow-up.
Results: Erectile and ejaculatory functions were maintained in all patients. MRI assessed the changes over time with a 53% reduction of adenoma volume and 71% of ablated area with clinical and functional improvement in all cases. The overall adverse event rate was 7%.
Conclusion: Clinical monitoring and 3T mpMR imaging at 1-year follow-up confirms US-guided TPLA as a safe, manageable and effective treatment for LUTS. Due to its mini-invasive technique, it should be considered a problem-solving treatment for BPH patients during a COVID 19 outbreak.

P-102

Clinical and economic impact of transperineal laser ablation (TPLA) for treating focal unilateral prostate cancer

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Purpose: To evaluate the therapeutic success, complications, and economic impact of transperineal US-guided focal laser ablation by US/MRI fusion software as a primary treatment for focal unilateral prostate cancer.
Material and methods: 26 patients with newly diagnosed, histopathologically-proven, focal unilateral prostate cancer were treated with US-guided transperineal focal laser ablation (SoracteLite, ECHOLASER, Elesta) as a primary treatment. The inclusion criteria were no previous prostate treatment, a PSA level ≤20, a Gleason score ≤7, and stage ≤ T2b N0M0 with 3T multi-parametric MRI-visible index lesion (PIRADS ≥ 4). After the ablation, a 3T mpMRI of the prostate was obtained. Follow-up consisted of mpMRI at 1, 3, 6, and 12 months and a US/MRI fusion-guided biopsy at 6 and 12 months.
Results: 26 patients were successfully treated with transperineal US-guided focal laser ablation. No complications occurred. The IPSS and SHIM did not significantly change after treatment. The mean operation time was 38.2 minutes (range 32.6-42.5), the mean ablation time was 21.7 minutes (range 18.3-26.8), the mean energy deployed was 3606J (range 3212-3804), the mean hospital stay was 113 minutes (range 55-178), and the mean catheterisation time was 261 minutes (range 95-412). At the 6- and 12-month follow-up, prostate mpMRI and US/MRI fusion-guided biopsy showed neither evidence of local residual disease nor recurrence.
Conclusion: Transperineal US-guided focal laser ablation as a primary treatment for prostate cancer has shown encouraging results. Ten-year follow-up with an international registry is intended to confirm oncological long-term prostate cancer with index lesion control.

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To turn weakness into a strength – preoperative future liver remnant (FLR) augmentation with special focus on local tumor control and in-situ immunization for patient with advanced hepatocellular carcinoma (HCC) and liver cirrhosis (LC)

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Purpose: Our aim was to develop method of FLR augmentation that not only decrease patients dropout due to tumor progression but possible enable anticancer In Situ immunization during prolonged waiting period of FLR regeneration in patient with LC.
Material and methods: 3 patients with small FLR and advanced HCC and LC were treated. Selective transarterial chemoembolization with doxorubicin 50mg and short term biodegradable starch microspheres(DSM-TACE), into tumor bearing liver to be resected, was simultaneously followed by PVE of latter. Upon completion of PVE selective intratumoral immunotherapy(HIT-IT) with atezolizumab 1200mg into restored after DSM-TACE tumor arterial feeders (for selective connection with PD-L1 ligands located on tumor cells but not on normal human tissues) was done. DSM-TACE and HIT-IT was repeated one more time in all patients after postzenith decrease of T-cytotoxic cells level in peripheral blood had started. Anticancer immune response was investigated by comparison of Initial histopathology specimen with specimen obtained just before second DSM-TACE+HIT IT and finaly with specimen of resected tumor bearing liver.
Results: Predominantly T and NK cells response was observed. All patients had successfully underwent liver resection upon sufficient FLR regeneration. In all 3 cases we had achieved effective local tumor control via total or subtotal HCC necrosis. There were no severe morbidity or Immune-related adverse events (irAEs).
Conclusion: We had proposed new, aggressive but safe, method of FLR augmentation for patients with HCC and LC that could potentially preclude drop out of patients during anticipated prolonged waiting period of FLR augmentation and possible improves long-term outcomes by HCC immunoscore conversion.

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Simultanous Iisilateral DSM-TACE and portal vein embolisation (PVE) as a new method of preoperative augmentation of future liver remnant (FLR) in patients with colorectal liver metastases (CLM)

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Purpose: PVE is gold standard strategy to increase FLR at level of Kinetic Growth Rate(KGR) about 2.3 cc/day. However PVE provokes tumor progressione. Up to 30% of patient with liver malignance couldn't underwent surgery after PVE due to tumor progression and/or insufficient FLR regeneration during waiting period. Our aim was to develop method that could resolve both mentioned issues.

Material and methods: 9 patients with CLM and small FLR, in close proximity to FLR critical structures (portal and/or hepatocaval confluence), having more than three criteria of Fong Clinical Risk Score for CLM were approved for Simultaneous PVE and Transarterial Chemoembolization with Degradable Starch Microspheres (DSM- TACE). For those patients, standard PVE was simultaneously followed by oxaliplatin based DSM-TACE with short-term embolic material of the whole tumor bearing liver to be resected that allowed to achieve both tumor control and postembolic infarction in liver to be removed, as a trigger of increased FLR regeneration, without biliary tree damage.
Results: Unprecedented FLR regeneration with KGR 23.5 cc/day (range from 17.6 to 57.25 cc/day) was observed. This allow us to achieve safe FLR volume to perform hepatectomies within 2-3 weeks period to avoid chemotherapy related neutropenic window in all 9 patients even so there were no myelosuppression observed. In all CRLM about 60%(40% to 90% range) necrosis was achieved. There was no severe morbidity (including PHLF) and mortality.
Conclusion: We proposed a new method of preoperative FLR adaptation which is not only second to none in the achieving liver regeneration rate but also is the only one that allows tumor control.

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Early clinical cases with the GPX embolic device in interventional oncology

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Purpose: A clinical study is ongoing to study the use of GPX Embolic Device in the peripheral vasculature, including Interventional Oncology applications. GPX is a novel embolic agent designed for transcatheter embolization. The material is a low-viscosity fluid prior to delivery and solidifies in response to physiological ionic strength. The material is produced in two configurations, a lower viscosity GPX-LV designed for deep penetration and a higher viscosity GPX-HV designed for proximal delivery and conjunctive use with a coil. Preclinical studies have demonstrated long-term occlusion without recanalization, and desirable handling characteristics.
Material and methods: Patients requiring peripheral embolization are being recruited. Oncology applications being studied include embolization of renal/hepatic tumors, portal veins, and renal angiomyolipomas (AML). GPX-LV or GPX-HV is selected by the Investigator based on clinical need. Technical success, occurrence of adverse events, and handling/performance characteristics are being assessed.
Results: Early interventional oncology case study results will be presented, including a renal AML embolization and a portal vein embolization. In these cases, GPX exhibited good visibility and material casting in the vasculature. Target regions were fully occluded at the first angiogram (taken immediately after delivery), and the procedures were considered technical successes. In the operator handling survey, GPX offered excellent control, helping to preserve parenchyma in the AML embolization. Patients were all discharged within the expected timeframe (next day) and exhibited typical post-embolization symptoms.
Conclusion: Early clinical cases with the GPX Embolic Device in oncology have been promising, with these cases meeting the desired clinical endpoints. A larger pivotal study is planned.

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Contrast-enhanced ultrasound: a useful tool to study and monitor hepatic tumors treated with histotripsy

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Learning Objectives: We present the spectrum of imaging findings of CEUS after histotripsy of hepatic tumors.
Background: Histotripsy is a novel non-invasive, non-thermal and non-ionizing precise ablation technique for tissue destruction guided by ultrasonography. Contrast-enhanced ultrasound (CEUS) improves the detection, characterization, and follow-up of hepatic lesions.
Clinical Findings/Procedure Details: In 5 patients (1 hepatocellular carcinoma and 4 liver metastases), CEUS was performed combined with CT and MRI within 7 days before histotripsy and with MRI during the follow-up at 1 day, 1 week, 1 and 2 months after treatment. The cavitation zone didn't present contrast uptake, its margins were well defined and small vessels within the treated volume are depicted by CEUS, not seen with color Doppler ultrasonography. The cavitation volume shrinks during the follow-up. In a patient with cirrhosis, two concentric layers with different patterns of enhancement are depicted by CEUS: an inner layer of new hyperemic tissue with arterial enhancement and venous phase wash-out and outer layer of liver parenchyma hyperemia. Changes in the normal parenchyma such as conus shaped hyperemia or transient avascular areas are depicted by CEUS between the capsule and the treated lesion. CEUS may detect a residual tumor during the follow-up after histotripsy.
Conclusion: Uniqueness of the new approach of histotripsy results in a set of new imaging findings that radiologists should know and did not appear with conventional ablation techniques. CEUS depicts these findings with higher sensitivity and specificity than B-mode or Color Doppler ultrasonography.

Other organs

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Advances in interventional oncology in the management of head and neck malignancy

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Learning Objectives:
1. Review the current successes for intra-arterial therapy in head and neck cancer
2. Illustrate the current strategies employed to improve the optimal delivery of therapeutics to the target tissue
3. To discuss the limitations and future directions in this emerging field

Background: Malignant gliomas remain a challenge in oncology with most carrying a poor clinical outcome with existing therapies. Novel biologic therapies combined with advancements in neuroendovascular technologies have shown promise and have enabled endovascular selective intra-arterial (IA) approaches to delivery. Selectively targeting tumor vasculature may improve the efficacy of novel therapeutic agents and this approach has shown success in the management of retinoblastoma. Challenges remain including transportation across the blood brain barrier (BBB) and blood tumor barrier (BTB), we review modern approaches to this problem.
Clinical Findings/Procedure Details: The development of contemporary microcatheters and the evolution of innovative endovascular selective intra-arterial (ESIA) approaches to treat cerebrovascular disease, IA delivery, and more precisely ESIA infusion, has arisen as a potential delivery strategy for the treatment of brain tumors. The limited progress made in intra-arterial therapy are due to challenges in selection of the therapeutic agent, the optimal delivery (rate, location, method), and the chemosensitivity of tumours for example GBM.
Conclusion: Interventional neuro-oncology is an emerging field that applies modern techniques to the delivery of therapeutic agents to head and neck tumors. Advances in microcatheter technology have made super-selective distal intracranial arterial access reliable and safe and enable the development of novel targeted treatment strategies which may serve as an important pillar in personalized oncological management.

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Percutaneous cryoneurolysis of splanchnic nerves for the treatment of refractory abdominal pain in patients with pancreatic cancer: initial experience

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Purpose: To report our preliminary results upon feasibility, efficacy and safety of percutaneous splanchnic nerves cryoneurolysis for the treatment of abdominal pain refractory to conservative medication in patients with pancreatic cancer.
Material and methods: Institutional database research (retrospective review of prospectively collected data from April 2019 till August 2020) identified 5 patients with pancreatic cancer and pain refractory to conservative medication who underwent percutaneous cryoneurolysis of splanchnic nerves. In all patients percutaneous cryoneurolysis was performed with posterolateral paravertebral approach using a 17 Gauge cryoprobe under computed tomography guidance and local anesthesia. Self-reported pain scores were assessed before and at the last follow-up using a pain inventory with visual analogue scale (VAS) units.
Results: Mean patient age was 63.81 years (male-female: 3-2). Mean pain score prior to cryoanalgesia of splanchnic nerves was 9.4 VAS units. This score was reduced to a mean value of 2.6, 2.6 and 3 VAS units at 1, 3 and 6 months of follow-up respectively. All patients reported significantly reduced analgesic usage. No complication was reported according to the CIRSE classification system. The mean procedure time was 44.4 minutes (range 39-50 min), including local anesthesia, cryoprobe(s) placement, ablation and post-procedural CT evaluation.
Conclusion: Percutaneous cryoanalgesia of the splanchnic nerves is a minimally invasive, safe and effective procedure for pancreatic cancer pain relief. A larger, randomized trial is justified to substantiate these findings.

P-109

Percutaneous ablative treatment of adrenal metastasis using an augmented reality navigation system (SIRIO)

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Purpose: Evaluate efficacy and safety of percutaneous ablation techniques in unresectable adrenal metastasis performed using an augmented CT-guided reality navigation system, focusing on local tumor control, complications and survival outcomes.
Material and methods: Data regarding patients with adrenal metastasis, histologically proven and treated with ablation techniques, were reviewed retrospectively. All procedures were performed under SIRIO-guidance. Primary study objectives such as technical success, primary and secondary technique efficacy rates, local tumor progression (LTP) rate, LPT–free survival and overall survivals (OS) were assessed. Secondary study objectives included assessment minor and major complications.
Results: Eighteen patients (mean age of 65 yo) underwent 3 RFA (11%), 8 MWA (29%) e 17 CRA (60%). Technical success rate was 89%; primary and secondary technique efficacy rate was 79% and 93%, respectively. During follow-up, 6 cases experienced local disease progression, of which 3 treated successfully with second ablation. Residual tumor happened in 3 of 28 cases (11%) and LTP occurred in 3 of 28 cases (11%) with a mean LTP-FS of 55.7 months. Five-year OS was 77.8%, with a mean survival time of 61.9 months. Eight (28%) patients experienced major complications: 2 patients a self-limiting bleeding, 5 patients a hypertensive crisis pharmacologically managed and one pneumothorax due to a trans-pleural approach.
Conclusion: The results of our study confirm the appropriateness of percutaneous ablation techniques for the treatment of adrenal metastasis and highlight the use of an augmented reality navigation system (SIRIO) for the approach of such complex location.

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Role of interventional radiology in the management of post pancreatectomy complications

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Purpose: To evaluate the role of interventional radiology (IR) in the management of post pancreatecomy complications in terms of preventing relook laparotomies and 90 day mortality rates.
Material and methods: An audit of prospective maintained electronic medical data. Duration of study: January 2012 -December 2018. All cases which required image guided interventions for management of post pancreatecomy complications will be identified and reviewed.
Results: Pancreatectomy :758 patients, Complications – 206 patients PPH: 46/758 (6%), Intervention: 30/758 (3.96%), Primary angioembolisation : 13/ 30 (43.3%), 90 day mortality in patients with PPH: 8/46 (17.39%), 90 day mortality in primary AE group :5/13 (38.46%), preventing re-exploration:7/13 (53.85%). Intra-abdominal fluid collection : Total patients – 173/758 (22.8%), Underwent primary IR intervention – 147/173 , Percutaneous drainage – 141/147 (95.9%), Aspiration – 6/147 (4.1%). IR in preventing re-exploration-135/147 (91.84%), 90 day mortality in primary IR group-9/147 (6.12%), 90 day mortality in patients with intra-abdominal fluid collection-14/173 (8.1%), Biliary complications -31/758 (4%), Bile leak – 28/31(90%), PTBD-10/28 (35.7%) , PTBD + SEMS-5/28 (17.85%), Primary IR group- 8/31 (58%), 90 day mortality in IR group -5/18 (27.78%), 90 day mortality -8/31(25.8%), preventing re-exploration -16/18 (88.89%).
Conclusion: IR plays a vital role in the management of complications following major pancreatic surgery. It provides a minimal invasive alternative in selective patients and helps in reducing recovery time and preventing morbidity associated with re-look laparotomy. IR procedures are safe and effective and the synergistic role of interventional radiologist provides minimally invasive approach in the management of post pancreatectomy complications while reducing the need for re-operation.

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Analysis of the application value of 3D rotational DSA in prostate artery embolization

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Purpose: To investigate the application value of 3D rotational DSA in prostate artery embolization (PAE).
Material and methods: A total of 73 cases of patients with benign prostatic hyperplasia (BPH) treated with PAE were selected in the Department of Interventional Therapy, The Fifth Affiliated Hospital of Zhengzhou University from August 2016 to June 2020. All patients were accepted conventional two-dimensional DSA (2D-DSA). Subsequently, focusing on the orthotopic blood vessel image, the image was acquired by rotating the C-arm, and the acquired images were sent to the 3D workstation to complete the reconstruction of the prostate artery. All pictures were reviewed by two physicians with advanced professional titles. The number, origin, and anastomotic branch with adjacent arteries of the prostatic arteries in conventional 2D-DSA and 3D rotational DSA imaging were observed.
Results: The Kappa value of 2 doctors in the interventional department reading the film to identify the consistency of the prostate artery was 0.734. In 146 cases of internal iliac artery, 4 cases were excluded because of incomplete branches of internal iliac artery, 148 prostate arterieswere demonstrated in 142 lateral internal iliac arteries by conventional 2D-DSA and 3D rotational DSA. The 3D rotational DSAdemonstrated 143 (96.62%, 143/148), while the conventional 2D-DSA demonstrated 116 (78.38%, 116/148), the difference was statistically significant ($\chi 2=22.517$, $P<0.001$).
Conclusion: 3D rotational DSA applied in PAE surgery can more clearly identify the number and origin of prostate artery and its complex anatomical structure. Therefore, it is of great significance to improve the effect of embolization.

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High-intensity focused ultrasound for prostate cancer treatment: long-term follow-up of 1320 patients

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Purpose: To analyze long-term results of the HIFU treatment of patients with different stages of prostate cancer (PC) including localized PC, locally-advanced PC, and failure after external beam radiotherapy (EBRT) and radical prostatectomy (RPE).
Material and methods: The current analysis included the results of treatment of 1320 patients in the Samara Oncology Center between 2007 – 2021: 768 with localized PC, 498 with locally-advanced PC, 54 – after the EBRT and RPE failure. Mean follow-up is 124 months (range 6-164). The oncology follow-up consisted of the PSA evaluation, the MRI and a transrectal biopsy in the case of rising the PSA.
Results: In group with localized PC after 14 years of follow-up the progression was observed in 5.9 % of the patients; in group with locally-advanced PC in 36.7 % of the patients; in group with EBRT and RPE failure in 19.2 %. The local recurrence was diagnosed after in average of 12 (6-18) months after the initial treatment. 15 (1.1 %) patients needed to undergo a second treatment due to a local recurrence.
Conclusion: The HIFU ablation is a safe, minimally invasive treatment for a localized and a locally advanced prostate cancer, effective in 85.9 % of the cases.

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Transarterial management of locally advanced breast cancer using spherical embolic material

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Purpose: Locally advanced breast cancer (LABA) is mainly treated with systemic chemotherapy, however, the prognosis is poor. We have conducted transarterial treatment for LABA with TACE method. The purpose of this study is to confirm the clinical value of transarterial management of LABC.
Material and methods: A total of 27 previously untreated patients with LABC in stage III or IV were evaluated retrospectively. A microcatheter was advanced selective to the all branches to the breast tumor. Drug distribution was confirmed by CT during selective angiography. After infusion of anticancer drugs to target lesions, embolization was done by HepaSphere. Axillary lymph node metastases were also treated with the same manner. Treatment was repeated on demand. The primary endpoint was tumor reduction rate in 1,3,6,12 months after initial therapy. The secondary endpoint was overall survival.
Results: Average reduction rates in 1,3,6,12 month were, 33%, 55%, 60%, 61%, respectively. The adverse events which needed any therapy were not found. No additional treatment was necessary to control symptoms after TACE. Local pain, bleeding or infection were well controlled. The survival rates in 1 year and 2 years were 80.4% and 68.1%, respectively.
Conclusion: TACE for LABC is feasible and effective to reduce the size of breast tumor with less complication, consequently, prolongs patient life maintaining better QOL.

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Freezing nodal disease: local control following percutaneous image-guided cryoablation of loco-regional and distant lymph node oligometastases: a 10-year single-centre experience

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Purpose: To retrospectively assess technical feasibility, safety and oncologic outcomes following percutaneous image-guided cryoablation (PCA) of loco-regional and distant lymph-node metastases (LNMs).
Material and methods: All consecutive patients undergoing PCA of LNMs between February 2009 and December 2019 were identified using retrospective database search. Patients undergoing subsequent lymphadenectomy or lost to follow-up were excluded. Cryoablation was performed using a double-freeze protocol. Patients were followed-up at 1-, 3-, 6-, and 12-months post-treatment with contrast-enhanced MR, and at approximately 3-6 months intervals with CT or PET/CT. Technical success, technique efficacy, complications, and oncologic outcomes were analyzed.
Results: Fifty-six metachronous oligometastatic LNMs were treated in 37 sessions in 29 patients. Six patients underwent 8 re-treatments for loco-regional progression. Seventeen patients had prior surgery/radiotherapy. LNMs were defined as loco-regional (26/37 sessions) or distant (11/37 sessions). Mean LNM size was 17.4mm (range 9-36mm; long-axis). An additional visceral oligometastasis was treated in 4/11 distant LNM PCA-sessions. Technical success and primary technique efficacy were 100%. Minor complication rate was 5.4% (two transient nerve palsies). At median 23-month follow-up there were 2 instances of local tumour progression (LTP; 5.6%); 1-, 2-, and 3-year LTPFS was 100%, 94.3%, and 94.3%. Six patients died during follow-up; Sixteen experienced disease progression; and 13 (45%) demonstrated no disease progression. One-, 2- and 3-year OS was 96.2%, 90.5%, and 70%. Patients were free from systemic onco-therapy following 20 sessions (56%), with mean treatment break 19.1 months.
Conclusion: PCA of loco-regional and distant lymph node oligometastases is technically feasible, safe, and offers promising local tumour control at mid-term follow-up.

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Transradial versus transfemoral access for uterine artery embolization: analysis of radiation, cost and ancillary parameters

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Purpose: Transradial access (TRA) has become more popular in body intervention procedures, but has not been ubiquitously adapted. This study was designed to compare transradial to transfemoral access (TFA) in uterine leiomyoma patients who underwent uterine artery embolization (UAE).
Material and methods: In this study, 172 UAE procedures conducted at our institute from October 2014-June 2020 were retrospectively analyzed. The transradial access group included 96 procedures while the transfemoral access group included 76. Peak skin dose (PSD), fluoroscopy time, procedure time, materials cost and administered contrast volume for each procedure were evaluated for statistical differences between the two groups.
Results: All cases were technically successful without major complications. The average PSD presented with no statistical difference between TRA and TFA (2,498 mGy vs. 2,001 mGy, P>0.05). The average flouroscopy time also showed no statistical difference (26 min vs. 23 min, P>0.05). Similarly, the average in suite procedure time revealed no statistical difference between TRA and TFA (104 min vs. 94 min, P>0.05). The average materials cost also presented no statistical difference ($2,481 vs. $2, 061, P>0.05). Lastly, the average volume of contrast utilized between the two groups showed no statistical difference (144ml vs. 128 ml, P>0.05).
Conclusion: With respect to many pertinent parameters, TRA was evaluated as an equally efficacious alternative to TFA in UAE procedures. Given the increased patient preference of TRA over TFA as described in literature, this study's findings further augment the claim that TRA should be considered more often, whenever viable, as an option in the UAE treatment of uterine leiomyomas.

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Seven-year single centre outcomes for oesophageal stenting: retrospective analysis of 454 procedures

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Purpose: To assess factors contributing to the technical and clinical success of oesophageal stenting.
Material and methods: Retrospective single centre study of all patients whom underwent oesophageal stenting from 2011 to 2018 was collected. Information for analysis was gathered with the use of electronic patient databases and patient notes. Pathology subtype, location of lesion and types of stents used were also collected. Complications and rates of re-intervention within 30 days (immediate) and up to a year (long-term) within the procedure were evaluated. Average survival rates from insertion as well as 30-day and overall 1-year survival were analysed.
Results: Among 392 patients with oesophageal malignancy, less than 1% had immediate or long term complications post stenting. Among 31 patients with other cancers, no immediate or late complication was recorded. Among 23 patients with benign strictures, 9% reported immediate and long term complications. Among 7 patients with post-operative oesophageal leakage, there were three immediate and one long term complications. No procedure-related deaths was recorded within our patient cohort. Average time to death after palliative oesophageal stenting was 5 months for patients with oesophageal cancer and 2 months for other cancers. The technical success of oesophageal stenting was 100%, with only 2% of patients requiring re-intervention at 30 days and less than 1% at 1 year.
Conclusion: Oesophageal stenting is a safe procedure for the palliation of dysphagia caused by advanced oesophageal cancer or malignant extrinsic compression of the oesophagus. In our experience there is minimal post-procedural complication and mortality, which is comparable with published studies.

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Computed tomography-guided percutaneous core needle biopsy of pancreatic tumors

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Purpose: To evaluate the efficacy and safety of computed tomography (CT)-guided percutaneous core needle biopsies (CNB) of pancreatic tumors.
Material and methods: CT-guided percutaneous CNB of pancreatic tumors performed between September 2009 and May 2020 were retrospectively analyzed at a single-center.
Results: 99 patients (60 males and 39 females) have been analyzed with a mean age of 62.8 years (range: 35-83 years). The tumor location was: 55 in the pancreatic head/ uncinate process (55.6%), 32 in the body (32.3%), and 12 in the tail (12.1%). The mean size of the lesions was 42.4 mm (range: 10-100 mm). 69 CNB (69.7%) were performed via indirect access (36 transgastric, 13 transhepatic, 9 transhepatic and transgastric, 4 transcolonic, and 7 others) and direct transperitoneal access was used in 30 cases (30.3%). Histologic analysis was performed on all biopsies, and diagnoses were conclusive in 97% (96/99) of cases. Sensibility and specificity for detecting malignancy were 87.3% and 100%, respectively. 10 patients (10,1%) had minor complications and there was a major complication with severe acute pancreatitis and death in a patient with an adenocarcinoma stage IV (1%).
Conclusion: CT-guided percutaneous CNB is a feasible and safe method for diagnosing pancreatic malignancy.

P-118

Percutaneous cholecystostomy as a palliative treatment in end-stage malignant billiary obstruction

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Purpose: Percutaneous cholecystostomy (PC), commonly placed to treat acute cholecystitis in critically ill patients, is also being used as a palliative measure in patients with unresectable neoplasmatic end-stage disease. In the present study, we evaluate the use of PC in patients with obstructive jaundice due to malignant billiary obstruction.
Material and methods: From 2013 to 2020 patients with malignant billiary obstruction, non eligible for other theurapeutic treatment (interventional, endoscopic, surgical) underwent PC. Authors evaluated the use of PC in this patient group as far as the type of malignancy, the techniques, the complications and the primary outcomes are concerned.
Results: Out of 147 patients who underwent PC in our department during the study period, 13 were treated for obstructive jaundice due to malignant billiary obstruction. All of them were not eligible for other therapeutic methods (interventional, endoscopical, surgical) due to advanced metastatic disease or poor clinical status: 8 (63%) were diagnosed with advanced metastatic disease while the remaining 5 (37%) had pancreatic neoplasia. PCs were performed with either the trocar (n=12) or the seldinger technique (n=1). There was a 100% success rate, without any major or minor complications. In all cases remission of obstructive jaundice was observed . All patients were discharged from hospital.
Conclusion: PC is a safe and efficient method for the palliative treatment of malignant billiary obstruction cases. Due to its effectiveness and low complication risk it should be considered as a therapeutic approach in end stage patients.

P-119

Endovascular management of carotid blowout syndrome in head and neck cancer patients presenting with life-threatening haemorrhage: a case series

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Learning Objectives: To understand the definition of Carotid Blowout Syndrome, as well as its risk factors, clinical manifestations and current Interventional Radiology endovascular treatment options.
Background: Defined as rupture of the extracranial carotid arteries or their major branches, carotid blowout syndrome (CBS) is an uncommon but potentially fatal complication in patients with head and neck malignancy. CBS usually arises following surgery, and is often associated with postoperative complications. A history of prior radiotherapy is almost invariable. Surgical management can be very challenging in this condition, with the prospective surgical field often involving previously irradiated or infected tissues. Today, with advancements in techniques and in medical device technology, options for endovascular treatment have progressed hugely. We present cases involving some of these techniques.
Clinical Findings/Procedure Details: We report a case series of head and neck cancer patients who recently received endovascular treatment for CBS at our institution. Our cohort of patients all presented following massive, life threatening haemorrhage in the setting of head and neck cancer treated with radiotherapy and surgery. Treatment involved placement of covered endovascular stents across the site of vessel injury. Our patients had positive outcomes with no neurological complications and no rebleeding post-stenting to date.
Conclusion: Carotid blowout syndrome is a rare but potentially fatal complication of head and neck cancer treated with surgery and radiotherapy. Current endovascular treatment options have proved effective and safe in our institutional experience, and are life-saving procedures in the setting of massive haemorrhage.

P-120

Endovascular treatment of emergencies in oncology: overview and case reports

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Learning Objectives: Acute, hemodynamically destabilizing bleeding in cancer patients is an emergent situation that is increasingly encountered in interventional radiological practice. The most common cause of these conditions is the invasive growth of tumors into the surrounding structures, the breakdown of tumor tissue. Alternatively, acute bleeding occurs after open surgical or minimally invasive diagnostic and therapeutic procedures. Endovascular interventions have become an indispensable part of the management of these emergencies, mostly in patients with inoperable cancer.
Background: In interventional radiological practice, we most often encounter acute bleeding in patients with inoperable carcinoma of the cervix, kidney, bladder, prostate, or bleeding from the upper and lower GIT and liver. Furthermore, with bleeding and venous stenoses in lung tumors and unstoppable bleeding in the orofacial area. The advantages of interventional radiological procedures are their mini-invasiveness with less perioperative mortality and morbidity, low number of complications and rapid achievement of hemodynamic stability. At the same time, there is the potential to to intervene in conditions that are unsolvable with conventional surgical, analgesic and oncological procedures. The result is an improvement in the overall survival of the patient, an improvement in the comfort of the patient's life, or the induction of partial remission.
Clinical Findings/Procedure Details: With case studies, divided into anatomical regions, I want to point out the possibilities of endovascular treatment in emergent conditions in oncology.
Conclusion: I believe that through mutual communication and closer cooperation with the relevant medical departments and authorities, we will be able to establish mini-invasive radio interventional procedures more firmly in the healthcare system.

P-121

Pelvic congestion syndrome and embolization of pelvic varicose veins

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Learning Objectives: Describe features of PVCS with angiography. Discuss nonsurgical treatment options for PVCS caused by PVI.
Background: Chronic pelvic pain is a common presenting symptom in female patients and has been reported to account for approximately 10% of outpatient gynecologic visits. Chronic pelvic pain is defined as noncyclic pelvic pain of at least 6 months duration
Clinical Findings/Procedure Details: The venography for PVI include a diameter of at least 5 mm in the gonadal, uterine, and utero-ovarian arcade veins, free reflux in the gonadal vein, reflux of contrast material across the midline to the contralateral side through the utero-ovarian arcade, opacification of thigh or vulvar varices, and stagnation of contrast material in pelvic veins Multiple methods of therapy for PVI have been used, including medical management with hormone analogues and surgical options. Less invasive approaches to treatment include transcatheter embolization of the ovarian or internal iliac veins The ovarian veins are approached from either a femoral or a jugular route; we prefer the jugular approach. A 7-French sheath is placed into the inferior vena cava, and a 5-French guiding catheter is used to select the left renal vein. A guidewire is then manipulated caudally into the left ovarian vein, and digital subtraction venography is performed. The ovarian venous plexus is then coiled Embolizing agents include coils, sclerosants, and glue alone or in combinations.
Conclusion: Noninvasive diagnosis may be made with transvaginal duplex US or dynamic time-resolved MR angiography. PVCS due to PVI is treated with minimally invasive embolization and sclerotherapy with excellent clinical improvement.

P-122

MR angio/venography (MRA/MRV) prior to vascular oncologic interventions and follow-up

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Learning Objectives: To plan curative, preoperative or palliative vascular oncologic intervention/material with MRA/MRV, tips for interpreting 3D MR angio and source images.
Background: The better the intervention is planned, the more successful it can be. Often poor CT is the only planning modality: vessels are not exactly visible or 3 D Angio can`t be applied. Intervention needs iodinated contrast / radiation – this can be reduced during the exact planning with MRA/MRV.
Clinical Findings/Procedure Details: At least 4 phases of 3 D contrast enhanced MRA should be requested / aquired. 1. Without contrast medium for substraction purposes and to look at the lesion itself. 2. Arterial phase: anomalies of the arteries and the new/ only tumor vessels 3. Early venous phase to see bigger a/v communications because of tumor necrosis and some other early veins as renal- or portalvenous system depending of the region of interest 4. Equilibrium phase to see the bigger veins such as vena cava sup/inf., liver/ thoracic/arm/leg veins TWIST/other new sequences help to cover of the anatomy in shorter times – 2 min angio all in one MRA planning details will be povided Choosing the right embolization material(s) in the special case Plan stent length/ diameter/material details/access side eg. for vena cava ect. Image interpretation additionaly to the often very short report of an outside radiologist.
Conclusion: MRA/MRV help to plan the oncologic vascular procedures, save tabel time and radiation for the in interventionalist / patient and protect kidney fom detorioration of renal function due to low amount of cyclic Gd contrast media.

P-123

The role of an antitumor antibiotic (Bleomycin) in the treatment of low flow peripheral vascular malformations

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Learning Objectives:
- To review the indications for percutaneous treatment of low flow peripheral vascular malformations (LFPVM), the procedure, and the different sclerosing agents available
- To illustrate the vascular malformations classification and their typical clinical and diagnostic findings
- To share the outcome with visual images of a series of cases treated with Bleomycin in our center (HUiP La Fe, Valencia)

Background: Vascular malformations should be considered as a congenital endothelial malformation that results from a disruption in vascular morphogenesis. According to their hemodynamic characteristics, they can be classified as a low-flow or high-flow vascular malformation. Inflammation and fibrosis caused by damaging the endothelium is the goal of sclerotherapy, and it is particularly effective on LFPVM because most of their volume is static. For this reason, this review will focus mainly on this subgroup.
Clinical Findings/Procedure Details: Clinical scenario and imaging findings will vary depending on the LFPVM in hand. We will be discussing the importance of imaging not only to reach an accurate diagnosis but also to plan the best percutaneous approach. The percutaneous treatment has been widely demonstrated as an effective and minimally invasive option for LFPVM. A detailed description of the procedure will be given with special emphasis on Bleomycin and its advantages over other sclerosing agents.
Conclusion: LFPVM are generally treated percutaneously, therefore, it is important to be familiar with the imaging findings, the technical approach, and the different sclerosing agents available.

P-124

Role of contrast-enhanced ultrasonography (CEUS) in percutaneous biopsy of abdominal soft-tissue focal lesions not detectable at B-mode US

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Learning Objectives: Evaluate the role of contrast-enhanced ultrasound (CEUS) as a powerful tool and aid to better identify and define soft tissue tumours in abdominal cavity, otherwise not detactable by Duplex B- mode US,to allow their safer percutaneous biopsy.
Background: 12 patients(medium age 57 years-old,5 M 7 F) with radiological (TC/RM)diagnosis of focal liver lesions(7),focal lesions of the cephalic portion of pancreas(3)and malignant recurrence after duodenum-pancreatectomy in pancreatic loggia(2),have been retrospectively considered between January 2020 and december 2020.In all cases the identification of the target lesion by Duplex B-mode US was not possible and CE-US(Sonovue,sulfur hexafluoride)was employed to better delineate them and finalise their percutaneous biopsy. We considered an arterial phase(20-25 sec)and a venous phase (60-90 sec)to identify them.In all cases a 18 G vacuum-assisted needle was used.
Clinical Findings/Procedure Details: Technical success was achieved in all (12) patients and in all cases the target lesion was identified with more accuracy and the percutaneous biopsy allowed with more precision and safety. In all patients 2 samples were taken and the confirmation of diagnostic biologic material came from the histologic corroboration. In none of the cases the samplig was not possible and in none of the cases major complications such as bleeding or haemorrhage due to injury to abdominal parenchymas or great vessels occurred.
Conclusion: The elevated rate of techical success reported,the absence of major complications and the faster performance,confirm the added value of CEUS as advantageous tool to better identify and delineate abdominal soft tissue focal lesions not detactable by Duplex US to allow their safer and faster percutaneous biopsy.

P-125

Transjugular biopsy of an intravascular bowel cancer metastasis in the IVC

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Clinical history/Pre-treatment imaging: We present a 62-year-old female patient diagnosed with a stage IV colorrectal cancer and a solitary hepatic metastasis 30 months ago. He was treated with chemoterapy, right hemicolectomy and radiofrequency ablation of the hepatic lesion. In the follow-up CT scan a retroperitoneal adenopathic conglomerate with significative necrotic component near the IVC was observed. Active surveillance was decided and in a subsequent PET/CT the adenopathic component had disappeared. However, an IVC thrombus with high SUV was observed (Image 1). Multidisciplinary tumor board reccommended to perform a biopsy of the lesion.
Treatment options/Results: A percutanous intravascular biopsy of the IVC lesion was performed using a 10-French sheath and a colonoscopy biopsy forceps (Image 2) through a transjugular approach. The histopathological report revealed a metastasic origin of the thrombus.
Discussion: Intravascular metastases are a very rare form of neoplastic dissemination, especially in colorrectal cancer. This type of metastasis can be difficult to diagnose, as they can be reported as venous thrombosis because of the high frequency of deep vein thrombosis in oncologic patients. Contrast-enhanced CT scan is useful to diagnose the intravascular neoplasm but a biopsy should be performed if it's technically feasible to make the histopathological diagnosis.
Take-home points: This case show a very rare form of neoplastic dissemination (Intravascular metastasis) in a frequent type of tumor (colorectal cancer). Transjugular approach for percutaneous biopsy using a colonoscopy forceps can be a useful and safe method of obtaining histological samples in the case of intravascular lesions.

P-126

Carotid body tumor: a multidisciplinary approach and the important role of preoperative embolization

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Clinical history/Pre-treatment imaging: 68-year-old man with bulky mass left neck, asymptomatic, has referred for surgical evalutation. The computed tomography angiography (CTA) showed a soft tissue density mass (4.2x4x6.5 cm), located at the bifurcation of the left carotid artery and characterized by a homogeneous contrasting impregnation. The 3D TOF MR angiographic demonstrating enlargement of the external (ECA) and internal (ICA) carotid artery but not narrowing of the ICA and ECA. These with CT and MRI are compatible with a type III CBT (Carotid Body Tumor) according to the Shamblin classification.
Treatment options/Results: The patient underwent preoperative endovascular embolization. After selective catheterization of the external and internal carotid branches, the lesion is then embolized by inert polyethylene glycol (PEG) microspheres (HydroPearl 1 fl of 400±75 µm and 3 fl of 600±75 µm). The patient successfully underwent excision of the lesion via cervicotomy within a week from the embolization procedure, without any complication and discharged a few days after surgery.
Discussion: The CBT are the most common type of paraganglioma in the head and neck region. When classified as Shambin type III, it may require preoperative CBT embolization. PGE microspheres exhibit variable vessel

penetration, depending on the size of the particles. In fact, the use of smaller particles can penetrate more distally into the beds of tumor capillaries, but they can also increase the risk of major complications, include nerve paralysis and stroke by embolic particles.
Take-home points: Endovascular embolization is often employed in conjunction with surgical techniques in an attempt to minimize morbidity and improve changes for successful tumor resection.

P-127

Successful endovascular glue (N-butyl cyanoacrylate) embolization of acquired multiple uterine pseudoaneurysms and arterio-venous malformation in high risk choriocarcinoma

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Clinical history/Pre-treatment imaging: A 40 years old female with high-risk choriocarcinoma (FIGO score 7) developed sudden onset severe bleeding PV three weeks after the first cycle of chemotherapy. Pelvis USG with doppler (Figure 1A) revealed a large heterogeneous mass lesion having cystic spaces showing yin-yang color flow.
Treatment options/Results: Patient was taken for emergency uterine artery embolization. Super-selective cannulation of both uterine arteries were done. Right uterine artery angiogram showed an arterio-venous malformation (AVM) and multiple pseudoaneurysms (Figure 1B and C). These were embolized using 50 % glue mixed with lipiodol (Figure 1D). The left uterine was embolized using gelfoam slurry and PVA particles. Second cycle of chemotherapy was started after one week of embolization. CEMRI pelvis after 6 weeks revealed complete necrosis of tumor mass (Figure 2).
Discussion: The choriocarcinoma is a rare cause of development of acquired uterine AVM. The diagnosis of AVM can be made ultrasound (US), computed tomography or magnetic resonance imaging. N-butyl cyanoacrylate (glue) causes permanent embolization and offers few advantages over other embolizing agents in cases of AVM. A success rate of 85.7 % was seen in a study by Keepanasseril et al. in 8 GTN cases who presented with massive hemorrhage. AVM and multiple pseudoaneurysms require careful assessment so as to completely embolize all the vascular anomalies.
Take-home points: An acute episode of massive vaginal bleeding may suggest the presence of AVM or pseudoaneurysm in a known case of choriocarcinoma. Selective endovascular uterine artery embolization is a safe and life-saving treatment choice It may also contribute to tumor necrosis and regression.

P-128

A rare case of acquired uterine arteriovenous malformation due to cervical malignancy successfully managed with uterine artery embolization

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Clinical history/Pre-treatment imaging: Patient is a 35-year-old G3P3 woman with a history of stage IIIC1 squamous cell carcinoma of the cervix who is status-post external beam radiation with cisplatin and brachytherapy. Patient presented with heavy vaginal bleeding and tachycardia. Examination revealed left lower quadrant abdominal pain and active bleeding with large clots within the vaginal vault.
Treatment options/Results: Patient was brought to the operating room, however, due to difficulty in identifying a bleeding source, vaginal packing was applied and the patient was transported to the angiographic suite. Pelvic angiogram demonstrated a dilated and tortuous left uterine artery terminating into a vessel tangle consistent with left sided arteriovenous malformation. Embolization with 300-500 micron particles was performed until angiographic endpoint of stasis. Post-embolization angiography did not show any additional vascular abnormalities. Patient had an excellent recovery and was discharged 2 days later.
Discussion: Uterine AVM is a rare cause of vaginal bleeding with less than 100 cases reported. Among them, acquired uterine AVMs related to cervical carcinoma appear sparingly. Two most common treatments include hysterectomy and uterine artery embolization. Our patient had a recent severe hemorrhagic event with concurrent cervical carcinoma. Embolization proved to be an excellent option for diagnosing the cause of hemorrhage and preventing recurrent hemorrhage in an anemic patient.
Take-home points: Uterine artery embolization is both an appropriate diagnostic and therapeutic option in patients with AVM and concurrent gynecological malignancies as the pelvic anatomy is often deformed due to radiotherapy and recurrent cancerous tissue. Such cases are suboptimal for a surgical approach and may increase morbidity.

Pre-clinical and experimental

P-129

Embolisation of adrenocortical carcinoma (ACC) metastases for uncontrollable hypertension

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Clinical history/Pre-treatment imaging: A patient with metastatic Adrenocortical Carcinoma (ACC) and Cushing's syndrome was admitted with hypertensive crisis with a blood pressure of 240/120. Her previous surgical history included a right adrenalectomy and left hepatectomy and right RFA for liver metasteses. Recent CT demonstrated an increased large right pelvic soft tissue mass within the right acetabulum and ischium with a pathological fracture of the anterior column requiring urgent complex orthopaedic fixation. Despite IV infusions of Labetolol, GTN and Etomidate her BP remained high. She had a very high blood cortisol measuring 1308.
Treatment options/Results: After multidisciplinary discussion she was offered embolisation. Preoperative CT demonstrated the arterial tumour supply was from pudendal and obterator arteries. Embolisation was performed with combination of distal Interlock coils to prevent non target embolisation, 100µm Embozene and 250-355µm Contour and further proximal interlock coils. Completion angiograms showed an excellent result with a very small residual area of tumour supplied by a branch of the suprior gluteal which could not be cannulated.
Discussion: Post embolisation her BP rapidly dropped requiring only a single low dose oral antihypertensive. Her cortisol rapidly reduced to 100. She went on to have complex pelvic fixation. This case demonstrates the use of embolisation in an rare case of ACC and hypertensive crisis. Embolisation was performed to primarily reduce tumour hormone secretion rather than to recude tumour size.
Take-home points: ACC is a rare tumour that can result in hormonal syndromes including Cushing's syndrome and hypertensive crisis. Emolisation can be offered to reduce hormone secretion and treat a hypertensive crisis.

P-130

MRI-guided focused ultrasound robotic system for preclinical use

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Purpose: Magnetic resonance-guided focused ultrasound (MRgFUS) has been demonstrated as a promising treatment modality. A robotic device with 4 degrees of freedom intended for preclinical applications of MRgFUS has been developed. It employs a 1.1 MHz transducer, and thus it is suitable for percutaneous ablation of deep tissue, drug delivery, and blood brain barrier opening.
Material and methods: The performance of the device in terms of MR-compatibility, positioning accuracy, and reliability was evaluated in agar-based phantoms, excised tissue, and in vivo thigh tissue of rabbit models in both laboratory and MR environments. The positioning error was measured utilizing a specially designed structure with an integrated digital caliper. Its functionality in terms of temperature evolution during high intensity focused ultrasound (HIFU) exposures was evaluated utilizing MR thermometry.
Results: Well-defined cigar-shaped lesions arranged in discrete and overlapping patterns were produced successfully. Accordingly, in vivo experiments resulted in local coagulative necrosis without destructing healthy intervening tissues. The average positioning error was found to be 0.11 mm.
Conclusion: Overall, the device maintains high standards of animal welfare. It can be safely operated inside the scanner of any commercial MR imaging system up to 7 T to treat small animals. In the future, the device could be scaled up to manage abdominal cancer in humans.

P-131

Robotic system for transrectal MRI-guided focused ultrasound therapy of prostate cancer

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Purpose: High-intensity focused ultrasound (HIFU) provides an alternative treatment for malignant tumours, with magnetic resonance imaging (MRI) and ultrasound used for monitoring during treatment. A MRI guided robotic system for HIFU treatment of prostate cancer was developed, featuring motion in 5 degrees of freedom and equipped with a single element focused ultrasonic transducer.
Material and methods: The robotic device was assessed successfully for its MRI compatibility inside a 1.5 T scanner using three different imaging sequences. The performance of the transducer has been evaluated in a laboratory and MRI environment, on ex vivo porcine loin tissue as well as in vivo thigh tissue using a rabbit model, for its ability to create discrete lesions. MR thermometry data were acquired during sonications providing visualization of the rate of increase of temperature.
Results: In ex vivo porcine tissue, the transducer created tadpole shaped lesions indicating possible cavitational effect during formation, while in cases that probably no bubbles existed in the tissue, thermal lesions were created. The in vivo experiments demonstrated the ability of the device in achieving in situ necrosis without havoc in surrounding areas nor the occurrence of adverse effects thereby not compromising animal welfare.
Conclusion: The MRI compatibility of the system enables its placement on the table of commercial MRI scanners, of any manufacturer, up to 7 T. The ultrasonic transducer is coupled to a probe which can be placed transrectally, with the patient placed in supine position on the MRI table. The proposed robotic system can be utilised in the future for the transrectal focal treatment of prostate cancer.

P-132

Microwave-assisted chemical ablation: preliminary validation study

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Purpose: Microwave-Assisted Chemical Ablation (MACA) is a novel technology aiming to broaden the range of microwave ablation (MWA) applications by increasing the diseased tissue ablation zone size and improving its predictability, thus reducing collateral damages to healthy tissues. This preliminary study is to validate the technology and to quantify its efficiency and precision benefits through the performance of numerous ex vivo bovine liver tissues experiments.
Material and methods: Bovine liver was used for the experimental ablative procedures. A prototype MWA antenna equipped with an additional internal lumens was connected to a current production microwave generator and was used to dispense ethanol as a chemical ablation agent simultaneously to the emission of the microwave energy. Various parameters including conventional ones such as power over time were applied as well as MACA-specific ones such as volume of ethanol dispensed and ethanol elution rate were assessed. The evolution of the temperature at various locations surrounding the emission point as well as applied and reflected power were monitored over time as the ablation proceeded. The resulting ablation zones were characterized from dimensions measurements, colours and texture of the necrosed tissues.
Results: The procedures carried out using this Microwave-Assisted Chemical Ablation (MACA) technology were characterized by significant benefits such as reduced maximal temperature reached, reduced procedure time, larger ablation zones, more predictable ablation zone shape, and reduced collateral damages to healthy tissues.
Conclusion: This novel Microwave-Assisted Chemical Ablation (MACA) technology is a promising new tool for the Interventional Oncology.

Technical developments

P-133

Quantitative ablation margins for assessment of ablation completeness in thermal ablation of liver tumours

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Purpose: Complete coverage of the tumour by the ablation volume with a sufficient ablation margin is the most important factor for treatment success in thermal ablation of liver tumours. To date, ablation completeness is commonly evaluated by visual inspection in 2D and is prone to inter-reader variability. This work aimed to introduce a standardized algorithm for evaluation of the ablation margin after CT-guided thermal ablation of liver tumours, using volumetric quantitative ablation margins (QAM).
Material and methods: A QAM computation metric was developed based on segmentations of tumour and ablation volumes. The QAM metric is calculated using signed Euclidean surface distance maps with a novel algorithm to address QAM computation in subcapsular tumours. The code was verified in artificial examples of tumour and ablation spheres simulating varying scenarios of ablation margins. Applicability of the QAM metric was verified in a cohort of colorectal liver metastases treated with stereotactic microwave ablation.
Results: The applicability of the algorithm was confirmed in synthesized and clinical examples. An underestimation of tumour coverage by the ablation volume was confirmed when applying an unadjusted QAM method in subcapsular tumours. The code for the developed QAM algorithm was made publicly available, encouraging the use of this objective metric in reporting ablation completeness and margins.
Conclusion: The proposed QAM computation including a novel algorithm to address subcapsular liver tumours enables precision and reproducibility in the assessment of ablation margins. This quantitative feedback on ablation completeness opens possibilities for intra-operative decision making, refined analyses on predictability and consistency in the reporting of ablation margins.

P-134

The impact of COVID-19 on IR practice: preliminary results from a global survey

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Purpose: The COVID-19 pandemic had an unprecedented impact on clinical practice and healthcare professionals. We aimed to assess how the interventional radiology (IR) services were impacted by COVID-19.
Material and methods: 7125 CIRSE members were invited to participate. The survey was designed to assess changes in workflow and clinical management patterns. For this interim report, responses were collected between 17 December 2020 and 4 January 2021.
Results: 151 responses were obtained for this preliminary report, of which 92 were complete. 83.1% (n=98) of respondents were male and board-certified radiologists (42.4%; n=50) Most respondents reported to have been involved in the care of Covid-19 positive patients (83.9%; n=99). 36.4% (n=36) reported that the second wave starting in September was the most intense and stressful period of the pandemic, while 33.3% thought this was the case for the first wave and 27,3% reported that both waves were similar in intensity. The overall IR workload was reported to have remained stable (28.3%; n=30), mildly decreased (26.4%; n=28) or decreased a lot (22.6%; n=24). Regarding work patterns, both interventionalists and associated staff (nurses, technicians) were reported to be more frequently redeployed during the second wave (44.4% and 77.8%, respectively) than during the first wave (13.5% and 41%, respectively).
Conclusion: Interventional radiology services could not have stayed unaffected by the unprecedented health crisis that COVID 19 brought. As the second wave still evolves, we continue to collect responses aiming to develop a better understanding regarding the true impact of the pandemic on IR services and staff.

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Oncologic surgical resection with intravascular covered stent placement in patients with carotid artery encased by metastatic cancer

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Purpose: Tumor encasement of the common carotid artery (CCA) and/or the internal carotid artery (ICA) in patients with advanced head and neck tumors represents a significant surgical challenge.
Material and methods: Five patients with advanced head and neck squamous cell carcinoma (AHNSCC) invading one side of the carotid artery were retrospectively enrolled. The contrast-enhanced computed Tomography (CT) and angiography were performed to assess the severity of extrinsic tumor compression to the carotid artery. Covered stent was placed intra-arterially at least 1 cm proximal and distal beyond the area of tumor involvement. The tumor and the involved carotid artery were resected, and pectoralis major flap transfer was utilized for coverage of the great vessels supported with intra-arterial covered stent.
Results: The post-stenting demonstrated an improvement in the appearance and caliber of the affected carotid artery. Four patients experienced transient bradycardia and hypotension. All five patients underwent R0 resection. Postoperatively, the flap all had rich vascularity and healing. Three patients underwent adjuvant radiotherapy or chemoradiation. With median follow-up 6.5 months, one patient died of multiple organ failures at 6.5 months after surgery; one patient developed tracheal stoma recurrence and treated with salvaged surgery; the three other patients had no disease recurrence in their last follow-ups.
Conclusion: Surgical resection with intravascular covered stent placement could potentially achieve the maximal oncological resection without compromise carotid artery blood flow in patients with carotid artery encased head and neck cancer.

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Monitoring air leakage and pleural pressure during drainage of pneumothoraces induced by interventional radiology procedures: a pilot study

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Purpose: To better understand the pathophysiology of pleural drainage induced by interventional radiology procedures through continuous monitoring of intrapleural pressure and real-time quantification of air leakage.
Material and methods: Inclusion of all patients requiring pleural drainage for pneumothorax between March 2020 and June 2020. Implantation of an 8 or 10 French drain under CT guidance, drain connected to a digital drainage system (pressure and air leak values every 10 minutes) and suction at -20mmHg. All patients with drainage at least 24 hours, then removed according to air leak data and CT scan. Collection of data from digital device after drain removal (time to reach air leak of 20mL/min, time to reach autonomous pleural pressure regulation (APPR), recurrence of air leak, time between air leak resorption and APPR, theoretical minimum drainage time according to surgical experience (air leak under 20 ml/min for 6 hours), concerning patients and interventions. A control chest scan within one month after removal of the drain.
Results: 50 patients were retrospectively included (15 lung biopsies, 10 RFA, 25 cryoablations). Mean age was 62 years (13), mean number of lung path was 2.28 (1.05), 3 patients with a history of ipsilateral lung surgey. Mean time to reach air leak of 20mL/min was 150 minutes (376), time to reach APPR was 217 minutes (382). Theoretical minimum drainage time was 6.5 hours or less for 70% of the patients.
Conclusion: Monitoring air leakage and pleural pressure can improve the management of pneumothorax drainage in interventional radiology.

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An x-ray lead screen may be used to reduce an interventional radiologist's radiation exposure during CT-guided procedures

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Purpose: The exposure of both patient and operator to radiation is one of the limitations of CT-guided interventions and should be kept as low as reasonably possible. While various x-ray lead screens are frequently used in angiography suites, they have not gained popularity in relation to CT-guided procedures. The purpose of this study was to evaluate the efficacy of a lead screen in reducing the radiation dose to an operator during CT-guided interventions.
Material and methods: This prospective study analyzed data collected from 72 consecutive CT-guided procedures, all of which were performed with an x-ray protecting lead screen placed between the scanner and the operator. Five dosimeters were placed in the CT scanning room: on the scanner side of the screen (1), on the operator side of the screen (2), 2 meters (3) or 3 meters (5) from the gantry, and at the side of the gantry (4). Accumulated radiation doses were measured for each dosimeter.
Results: The dosimeter placed on the gantry side of the lead screen revealed highest levels of radiation (11.33 mSv), which were significantly higher than those at all other dosimeters. The radiation dose just behind the lead screen was 0.82 mSv which was almost as low as measured by dosimeters 2 meters away from the gantry at the side of CT scanner (0.83 mSv). The presence of the screen caused no discomfort for operators.
Conclusion: A lead screen does reduce an operator's radiation exposure significantly, while failing to pose any obstacles or cause any discomfort as CT-guided procedures are being carried out.

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Microwave-assisted chemical ablation: a modeling study

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Purpose: To determine the influence and importance of the various new operating parameters that can be implemented in Microwave-Assisted Chemical Ablation (MACA) procedures. Controlling these parameters to maximize the potential for broadening the range of microwave ablation (MWA) applications by increasing the diseased tissue ablation zone size and improving its predictability, thus reducing collateral damages to healthy tissues.
Material and methods: Numerous computer-assisted numerical models were obtained using a commercial 3D electromagnetic (EM) simulation software. The parameters forming the basis of the calculations included the dielectric conditions that are present when a microwave source is applied while connected to an ablation antenna equipped with an additional lumens to dispense a chemical ablation agent into the target tissues simultaneously to the emission of the microwave energy. Ethanol was used as chemical ablation agent because it possesses the dielectric and thermal properties to effect a good control over the electrical field and the resulting evolution of the ablative procedures over time. Bovine liver was used for the target medium. Similar models were calculated using typical microwave ablation equipment currently used for microwave ablation procedures (MWA).
Results: The models calculated with the Microwave-Assisted Chemical Ablation-specific parameters showed significant benefits in terms of increased ablation zone size and ablation zone shape predictability.
Conclusion: The models calculated with the Microwave-Assisted Chemical Ablation-specific parameters suggest that a judicious control over these parameters will lead to highly efficient ablation procedures and predictable ablation zones when compared to MWA as currently practiced.

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Microwave-assisted chemical ablation: a new tool in interventional oncology

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Purpose: To broaden the range of microwave ablation (MWA) applications by increasing the diseased tissue ablation zone size and improving its predictability, thus reducing collateral damages to healthy tissues.
Material and methods: This novel Microwave-Assisted Chemical Ablation (MACA) technology uses a conventional microwave generator connected to an innovative MWA antenna equipped with an additional lumens to dispense a chemical ablation agent into the target tissues simultaneously to the emission of the microwave energy. Ethanol is an example of chemical ablation agent that can be selected as it possesses the dielectric and thermal properties to effect a good control over the electrical field and the resulting evolution of the ablative procedures over time. The same lumens can be used post-ablation treatment to dispense materials to reduce pain, accelerate healing time, or boost the immune system recovery. Bovine liver was used for the experimental ablative procedures.
Results: The procedures carried out using this Microwave-Assisted Chemical Ablation technology were characterized by significant benefits such as reduced maximal temperature reached, reduced procedure time, larger ablation zones, more predictable ablation zone shape, and reduced collateral damages to healthy tissues. These benefits offer significant potential for broadening the range of microwave ablation (MWA) applications compared to current practice.
Conclusion: This novel Microwave-Assisted Chemical Ablation (MACA) technology is a promising new tool for the Interventional Oncology.

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Coaxial hepatic and renal tumor ablation: a safer technique

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Learning Objectives:
- To know the usual percutaneous ablation technique.
- To know the possible complications that might arise.
- To present a diffent technique based in Seldinger exchanges that reduces the risk and shortens the duration, using a 4 or 5 F radial sheath.
- To explain thoroughly the steps of this unusual procedure.

Background: Microwave and radiofrequency percutáneas tumor ablation are common and well known procedures performed in the majority of interventional radiology units. The procedure is done with anaesthesiologist assistance and CT or ultrasound guidance. Local anasthetic is administered in the skin and soft tissues, allowing planning the direction and angle of approaching. This aims achieving a successful puncturing of the target lesion with a small size needle, minimizing the possibility of seeding tumoral cells, unintentional puncturing of adjacent structures with a thicker needle or major bleeding.
Clinical Findings/Procedure Details: In our institution we came out with a method that goals avoiding these same issues in a safer manner. Firstly, local anaesthetic is applied as conventional procedure. After that, a 21 gauged Chiba coaxial needle is advanced until it reaches the tumor. Then we easily detach the inner needle back handle, retrieve the outer coaxial part and place a 4 o 5 F radial sheath through the needle. Both the needle and the inner part of the sheath are retrieved. Eventually the ablation needle passes through the sheath towards the tumor.
Conclusion: Co-axial technique is a safe procedure to place RF or MW device in the middle of the tumor lesion

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Interventional radiology services in COVID-19 patients: a single center experience

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Learning Objectives: To demonstrate our experience regarding strategies and detailed processes evolved after the pandemic outbreak in the management of COVID-19 patients whilst performing necessary interventional procedures.
Background: As SARS-COV2 remains a fluid situation, our institution has been the greatest in our country to hospitalize COVID- 19 patients. In a minority of our COVID-19 / suspected COVID-19 patients did emerge the need of an urgent interventional procedure. Therefore, a crucial goal to be achieved was to adapt our services (both diagnostic and interventional) to combat COVID-19. Adoption of finalized protocols in accordance to ECDC and CIRSE guidelines has been followed in order to avoid disease spread and facilitate both patients' and involved personels' safety.
Clinical Findings/Procedure Details: Steps to avoid disease spread: 1. Separate CT room with a private material storage room and isolated hallways for COVID-19 patients. 2. MDT to confirm procedure's urgent nature (avoid non-essential procedures). 3. Bedside ultrasound-guided procedures to be preferred, when applicable. 4. Thorough training of involved personel in the use of all Personal Infection Prevention Mesasures (full PPE intraprocedurally, disinfection measures postprocedurally etc). 5. Reduce staff participation to minimum (radiographer, interventional radiologists, fully-trained nurse). The majority of interventional procedures were effusion & abscess drainages, cholecystostomies, and few biopsies. All procedures were characterized by technical success and no major or minor complications have been noticed. Involved staff remained negative in repetitive SARS-COV2 testing so far.
Conclusion: As pandemic remains uncontrolled, developing of protocols in IR units is essential, in order to adapt operational processes rapidly and fascilitate both patient's and staff safety.

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