FEMALE GENITOURINARY ONCOLOGY SPECIAL FEATURE: REVIEW ARTICLE

The role of CT, PET-CT, and MRI in ovarian cancer

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ABSTRACT

New treatment developments in ovarian cancer have led to a renewed interest in staging advanced ovarian cancer. The treatment of females with ovarian cancer patients has a strong multidisciplinary character with an essential role for the radiologist. This review aims to provide an overview of the current position of CT, positron emission tomography-CT, and MRI in ovarian cancer and how imaging can be used to guide multidisciplinary team discussions.

INTRODUCTION

Of all gynecological malignancies, ovarian cancer has the highest mortality rate. For a long time, no structural improvement of long-term survival for advanced-stage ovarian cancer patients had been reported.[1] 5-year overall survival ranges between 35 and 49%,[1–6] and approximately 15% survive the 10-year mark.

A contributing factor to the generally poor survival of patients with ovarian cancer is that most females present with advanced-stage disease (75%), meaning that metastatic spread to the peritoneum has already occurred.[7] One of the most important prognostic factors for these patients is whether all macroscopic tumor is removed during cytoreductive surgery (CRS).[8] This extensive surgical procedure is performed either upfront (upfront or primary CRS) or after neoadjuvant chemotherapy (interval CRS). The role of neoadjuvant chemotherapy is to reduce the tumor burden and increase the likelihood of complete cytoreduction in more extensive cases.[9,10] Recent developments have added new therapeutic options for gynecologic oncologists to consider in the first-line treatment of ovarian cancer. Anti -VEGF therapy (anti vascular endothelial growth factor) showed improved progression-free survival (PFS) by 4 months in patients with International Federation of Gynecology and Obstetrics (FIGO) III ovarian cancer patients after incomplete CRS and FIGO IV ovarian cancer patients.[11] PARP inhibitors (Poly ADP-ribose polymerase) showed a remarkable improvement in PFS in selected patients with BCRA-associated ovarian cancer after response to platinum-based therapy.

In addition, the OVHIPEC trial showed that patients undergoing interval CRS with Stage III ovarian cancer, can benefit from hyperthermic intraperitoneal chemotherapy (HIPEC) with a prolonged recurrence-free survival and overall survival than surgery alone.[12] Currently, OVHIPEC-2 has started to evaluate the effect of HIPEC on overall survival in patients with FIGO Stage III epithelial ovarian cancer who are treated with primary CRS (with no or <2.5 mm residual disease after CRS).[13] Together with advances in upper abdominal surgical procedures and radical surgery,[9,14,15] these new therapeutic options will substantially improve the outcome of patients with advanced-stage ovarian cancer.

However, the recent developments demand a more stringent patient selection to provide a tailored treatment for each patient. Imaging can provide detailed information regarding the extent of the tumor and the location of peritoneal metastases. This is essential for the gynecologic oncologist to determine which therapeutic strategy is more appropriate. This review aims to provide an overview of the current role of imaging in advanced-stage ovarian cancer and how imaging can be used to guide multidisciplinary team (MDT) discussions.

STAGING OVARIAN CANCER

Of all malignant tumors originating from the ovaries, epithelial ovarian carcinoma (EOC) occurs most often (≈95%); other tumors include germ cell and sex-cord stromal cell cancer. EOC can be categorized into high grade serous, low grade serous, mucinous, endometrioid, clear cell, transitional, and epithelial-stromal subtypes. Of all

subtypes of EOC, high-grade serous is the most common and accounts for the most deaths of all ovarian cancers (70–80%).[16] The FIGO is a surgical staging system and provides the internationally recognized standard for staging ovarian cancer[17] (Table 1). Advanced stage disease is defined as FIGO Stage IIb-IV, which means that cancer has spread on or into the adjacent pelvic peritoneal tissues, extended to the upper abdomen or outside the abdominal cavity.

In addition to the FIGO and TNM classification, several scoring systems have been developed to predict the most important prognostic factor; whether complete removal of all visible disease during surgery is feasible. The main five scoring systems to predict the completeness of CRS in literature are based on the surgical exploration of the abdominal cavity; Peritoneal Cancer Index (PCI), Predictive Index Value (PIV), Eisenkop, Espada, and Kasper.[18] The PCI and the PIV are used most frequently in literature and showed AUCs of 0.69–0.92 and 0.66–0.98 for predicting complete or optimal CRS.[18]

The Peritoneal Surface Oncology Group International has named the PCI the international standard for peritoneal surface malignancies[19] The PCI divides the abdomen into 13 regions. According to the largest diameter of the PM, the PCI is scored in each region as; 0 (no tumor), 1 (tumor 0 > 0.5 cm), 2 (tumor 0.5–5 cm) and 3 (tumor > 5 cm). The PCI score ranges from 0 to

39. PCI is widely adopted in colorectal cancer to guide treatment decisions.

However, according to a survey of the European Network of Gynaecological Oncology Trial, surgical staging by laparoscopy is still only used in a minority of selected patients. In addition, only a minority of centers base their decision to proceed with CRS on a scoring system.[19] This is because staging peritoneal disease with laparoscopy has several disadvantages; it is an invasive procedure with a small but significant risk of complications, and assessment of all regions of the abdominal cavity can be hindered by adhesions or tumor.

This means that if imaging can accurately depict peritoneal metastases in a patient friendly and non-invasive manner, then it could play an important role in selecting patients in which complete CRS is possible.

Prediction models derived from CT findings have been extensively researched with limited success.[20] Fortunately, several articles reported that MRI has a good diagnostic performance for detecting peritoneal metastases using surgical scoring systems.[20–22] Currently, two large multi center trials (MISSION and MROC) are ongoing to confirm whether MRI can accurately select patients for whom a complete/optimal CRS is feasible.[23,24] If these trials show that MRI can accurately predict the extent of

Table 1. 2013 FIGO stage classification for ovarian cancer[17]

FIGO stage	(TMN)	description
I		Tumor confined to the ovaries or fallopian tubes.
- A	T1a N0 M0	A: unilateral
- B	T1b N0 M0	B: bilateral
- C	T1c N0 M0	C: in one or both ovaries or fallopian tubes with (1) intraoperative surgical spill, (2) a ruptured capsule, or (3) malignant cells in the peritoneal washing or ascites
II		Primary peritoneal cancer or tumor in one or both ovaries or fallopian tubes with
- A	T2a N0 M0	A: Extension and/or implants on the uterus and/or fallopian tubes/ovaries
- B	T2b N0 M0	B: Extension to other pelvic intraperitoneal tissues
III		Primary peritoneal cancer or tumor in one or both ovaries or fallopian tubes with
- A	T3a NX M0	A: (1) tumor positive retroperitoneal lymph nodes, (i
) up to 10 mm in largest diameter or (ii) larger and/or (2) microscopic PM above the pelvic brim		
- B	T3b NX M0	B: macroscopic PM beyond the pelvis up to 2 cm in largest diameter
- C	T3c NX M0	C: macroscopic PM beyond the pelvis more than 2 cm in largest diameter
IV		Distant metastases excluding PM
- A	TX NX M1	A: tumor positive pleural effusion
- B	TX NX M1	B: Parenchymal metastases and metastases to extra abdominal organs (including inguinal lymph nodes and lymph nodes outside of the abdominal cavity)

Table 2. T.R.U.S.T. criteria indicating a contraindication for primary CRS and triage to neoadjuvant chemotherapy[15]

- Lymph node enlargement above the renal hilum (larger than 10 mm short axis)
- Tumor involvement of the stomach or duodenum
- Tumor involvement of the pancreas
- Tumor involvement of the celiac trunk, hepatic artery, gastric artery
- Extensive tumor involvement of the mesentery and/or small bowel

CRS, cytoreductive surgery.

disease in the abdomen. In that case, current imaging guidelines will need to change to implement MRI as a non-invasive triaging tool in females with advanced oavarian cancer.

TREATMENT OPTIONS FOR OVARIAN CANCER

Early-stage ovarian carcinoma is treated with a staging procedure to establish the extent of the disease. During this staging procedure, the uterus, ovaries, fallopian tubes, greater omentum, and, if applicable enlarged pelvic and para-aortic lymph nodes are removed, and peritoneal biopsies are obtained from designated sites. Following the pathology result, adjuvant chemotherapy is indicated.

The cornerstone of advanced-stage ovarian cancer treatment is CRS. Macroscopic complete resection leads to the best survival benefit and should be the intent of surgery. A maximum effort of CRS resulting in a residual disease of no more than 1 cm across is typically referred to as "optimal CRS." It is known to lead to a significant survival benefit in cases where complete cytoreduction cannot be achieved.[8,25–27] Whether complete CRS is feasible is determined by the extent of peritoneal involvement and involvement of crucial structures. Surgery, therefore, starts with an open exploration of the peritoneal cavity to assess the extent of the disease. If cytoreduction is deemed feasible, surgery generally includes a hysterectomy, bilateral salpingo-oophorectomy, omentectomy, resection of all peritoneal tumor sites including a peritonectomy, and if necessary (partial) resection of all affected organs and pelvic and para-aortic lymphadenectomy (only in the presence of suspicious lymph nodes[28]). Whether CRS is feasible depends on local surgical policies and surgical experience. However, the extent of peritoneal involvement can be described systematically by the PCI, which has shown to be highly predictive of surgical outcomes.[29–31]

Following upfront CRS, six cycles of platinum and taxane-based chemotherapy are advised in advanced ovarian cancer. Alternatively, neoadjuvant chemotherapy (three cycles) interrupted by interval CRS may be administered to reduce the tumor burden and increase the chance to preserve organs, and increase the chances of complete CRS in extensive cases.[9] Also, patients at an older age and with a poor performance status may benefit from neoadjuvant chemotherapy to help reduce surgery-related morbidity and mortality.[32] However, the role of neoadjuvant chemotherapy regarding its potential survival benefit is under debate as after four trials, the matter remains inconclusive.[9,10,33,34] The much-anticipated TRUST trial may help resolve this issue.[15]

A recent randomized controlled trial reported an 11.8-month increase in overall survival after complete interval CRS with HIPEC compared to complete CRS alone in patients with advanced-stage ovarian cancer with FIGO Stage III.[12] The role of HIPEC for patients undergoing primary CRS is currently under investigation.[13,35] A meta-analysis of 37 studies revealed an improved overall survival of HIPEC in addition to CRS and chemotherapy for both primary and recurrent ovarian cancer.[36] Developments for chemotherapy or targeted therapy in the first-line setting, like dose-dense chemotherapy, the addition of bevacizumab, and intraperitoneal therapy, have yet to show superior to the current standard but are considered acceptable alternatives in selected cases.[37–39] For patients with a BRCA mutation, promising results were reported with olaparib which reduced the risk of disease progression or death by 70% compared to placebo at 3 years and has been implemented in current guidelines.[40]

CURRENT ROLE OF IMAGING IN ADVANCED-STAGE OVARIAN CANCER

Most females with ovarian cancer experience non-specific symptoms (*e.g.* abdominal pain or discomfort, urinary frequency, weight changes). Therefore, ovarian cancer is often diagnosed on CT while searching for a cause of non-specific symptoms or to evaluate the abdomen after worrisome ultrasound findings.

For the primary tumors, location, size, and invasion of nearby structures can influence treatment decisions. Presence of malignant nodes can also significantly impact the treatment strategy, especially malignant suprarenal lymph nodes, which could be a contra indication for surgery. The extent of peritoneal metastases can also be a contra indication for surgery. The ESMO-ESGO guidelines describe essential features that may contraindicate CRS. These are summarized in Table 2 ; involvement of small bowels, stomach, pelvic wall, and ureter, *e.g.* could result in a suboptimal CRS.[41] The T.R.U.S.T. trial investigators set criteria that contraindicate primary CRS, which are also helpful as a reference for radiologists Table 3). For radiologists, a structured report can help to effectively communicate these important imaging findings, as shown by Chandramohan et al.[42] This structured report incorporates findings relevant to estimating the FIGO stage and operability.

Although CT is most commonly used to stage ovarian cancer patients, MRI and positron emission tomography (PET)-CT are increasingly used in specialized centers to stage advanced cases. These functional imaging modalities may provide additional information to determine whether a complete CRS is possible and guide further treatment, as mentioned below.

Computed tomography (CT)

On CT imaging, ovarian cancer typically presents as thick-walled cysts with septations. The CT report should address the location, size, and invasion of nearby structuresTable 4. For the nodal status, each lymph node's size, shape, and border should be evaluated. For evaluating the abdominal nodal status lymph nodes, a short axis cut-off of 1 cm is often used to detect a malignant lymph node. However, CT has a disappointing diagnostic performance for detecting malignant abdominal lymph nodes

Table 3. ESGO 2017 recommendations for contraindications for CRS

- **Diffuse deep infiltration of the root of small bowel mesentery**
- Diffuse carcinomatosis of the small bowel involving such large parts that resection would lead to a short bowel syndrome (remaining bowel < 1.5 m)
- Diffuse involvement/deep infiltration of:
- Stomach/duodenum
- Head or middle part of the pancreas
- Involvement of coeliac trunk, hepatic arteries, left gastric artery
- Central or multisegmental parenchymal liver metastases
- Multiple parenchymal lung metastases (preferably histologically proven)
- Non-resectable lymph nodes
- Brain metastases

CRS, cytoreductive surgery.

Figure 1. MRI staging example of an 80-year-old female after three courses of neoadjuvant chemotherapy. T_2 weighted (a) shows a suspicious dark thickening of the mesenteries (arrowheads), which showed diffusion restriction and contract enhancement on b1000 diffusion-weighted (b) and gadolinium-enhanced T_1 weighted (c) imaging. At CRS, millimetric depositions were found on the mesenteric surface. A CT of 3 weeks earlier showed a similar pattern (arrowheads); however, with CT alone, no confident distinction can be made between ascites, fibrosis or PM. Therefore, the involvement of the mesenteries was not mentioned in the original CT report. CRS, cytoreductive surgery.
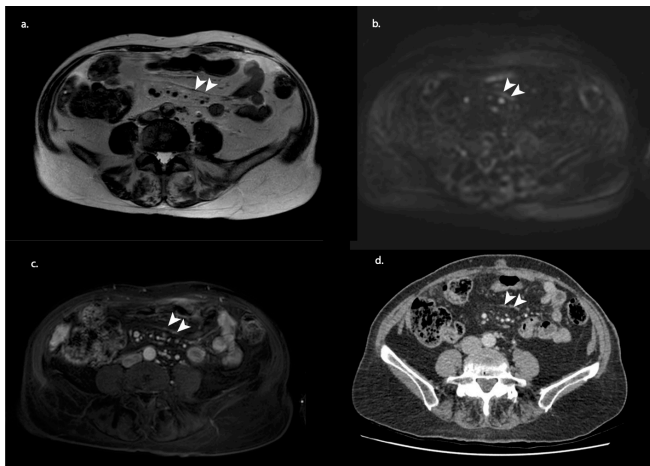
with a sensitivity of 41% and specificity of 89%.[43] This means that the decision to perform an infrarenal lymphadenectomy should not be solely based on CT imaging but also on pre-operative findings.[43] Interestingly, for malignant cardiophrenic lymph nodes, size criteria seem to be more useful; a short-axis diameter of >7 mm had a positive predictive value of 86%.[44] The presence of malignant abdominal lymph nodes is not the only feature that is being underestimated with CT. CT also structurally underestima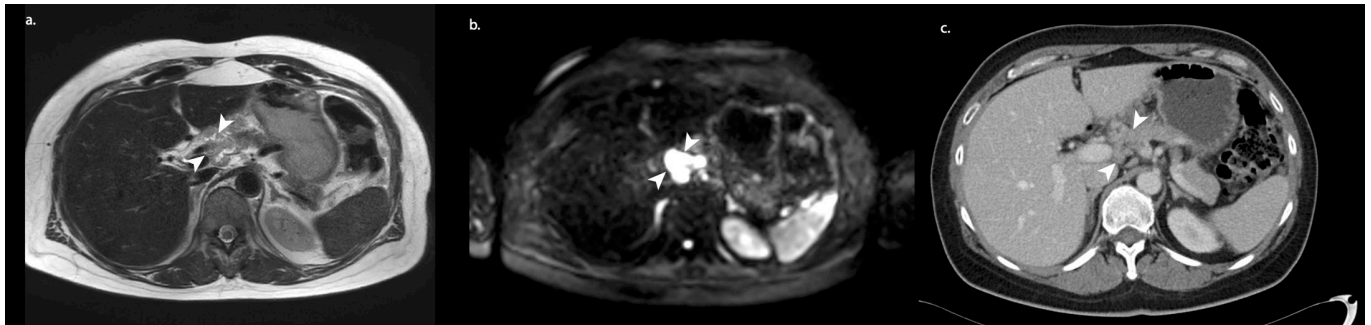tes the presence of peritoneal metastases. In a recent meta-analysis, CT had a pooled sensitivity, specificity, and diagnostic odds ratio for the detection of PM for region-based studies of 68% (CI, 46–84%), 88% (CI, 81–93%), and 15.9 (CI, 4.4–58.0), respectively.[45] Especially, the involvement of gastrointestinal organs and the mesentery can be difficult to recognize on CT. The presence of ascites can further impede an accurate overview of PM on CT images. However, CT seems to be relatively accurate in predicting diaphragm and omental involvement. Due to these shortcomings of CT, CT cannot accurately predict a (sub)optimal cytoreduction. Axtell et al demonstrated that CT has a sensitivity of 79% and specificity of 75% for predicting an optimal cytoreduction..[46] Other studies showed similar disappointing results for the performance of CT for predicting surgical outcome.[47,48] The PCI is structurally underestimated on CT images, and therefore it is not recommended to report the PCI in the CT report.[49] CT results should be used cautiously when deciding between primary CRS and neoadjuvant chemotherapy.[46] However, interpreting the literature on CT in ovarian cancer is challenging because the diagnostic performance of CT features varies significantly between studies, probably reflecting variations in surgical/radiological practice, experience, and technique.

In current clinical practice, determining response to chemotherapy is done by subjective measures on CT images because Response Evaluation Criteria in Solid Tumors v. 1.1 (RECIST 1.1) is of limited prognostic value for ovarian cancer as it is not associated with PFS nor overall survival.[50,51] Therefore, RECIST is often supplemented by serum cancer antigen 125 (CA125) response. It should be noted that neither response assessment methods should determine eligibility for interval CRS as 73% of patients with RECIST stable disease and 49% of patients with no CA125 response received complete or optimal interval CRS.[50]

Positron emission tomography with 2-deoxy-2-fluorine-18-flu-D-glucose (^{18}FDG-PET)

^{18}FDG-PET imaging is not recommended for primary detection of ovarian cancer. In the ESGO/ISUOG/IOTA/ESGE Consensus Statement on pre-operative diagnosis of ovarian tumors, it stated that PET-CT cannot differentiate reliably between borderline and benign tumors. In addition, due to the low FDG uptake in clear cell and mucinous invasive subtypes PET-CT has a disappointing diagnostic performance for detecting the primary ovarian tumor. On the other hand the specificity of FDG-PET-CT for ovarian cancer is 78% due to false-positive results in endometriosis and hydrosalpinges.[52] Another known pitfall is the FDG uptake in the late follicular to early luteal cysts in pre-menopausal females.[53] There is also no clear cut-off value for maximum standardized uptake value for differentiation between benign and malignant ovarian tumors, although in general, there is higher FDG uptake in malignant lesions compared to benign or borderline lesions.[54] Therefore, in ovarian FDG uptake in pre-menopausal females, the patient's menstrual status, phase, ultrasound features, and tumor markers should be considered. Despite these drawbacks, PET-CT outperforms CT in detecting malignant lymph nodes, peritoneal metastases, and recurrent disease.[55–57] Yuan et al reported similar results that FDG-PET-CT was more accurate than CT or MRI in detecting

Figure 2. MRI staging example of a 56-year-old female after three courses of neoadjuvant chemotherapy. On diffusion-weighted imaging (b), a conspicuous lesion (arrowheads) is found in the area of the hepatic hilum. On T_2 weighted imaging, the lesion can be distinguished as malignant. With CT (2 weeks earlier) alone, this large lesion largely "fades" into its surroundings, making it difficult to spot and was therefore not mentioned in the original CT report. This extensive disease in the liver hilum, among others, rendered the patient inoperable.

malignant lymph nodes. FDG-PET-CT had a sensitivity of 73% and a specificity of 97%, whereas those for CT were 43 and 95%, respectively, and those for MRI were 55 and 88%, respectively.[58] In a recent meta-analysis, [18]FDG-PET had a pooled sensitivity, specificity, and diagnostic odds ratio for the detection of PM for region-based studies of 80% (CI, 57–92%), 90% (CI, 80–96%), and 36.5 (CI, 6.7–199.5), respectively.[45] Although this is better than CT, the problem with [18]FDG-PET is its radiation exposure, higher cost, and limited depiction of small (peritoneal) tumor volumes. Especially, the limited depiction of small tumor volumes hinder accurate staging of (small) peritoneal disease. This means that PET-CT is accurate in predicting the presence of peritoneal disease but fails to detect small peritoneal metastases. This was also confirmed in a recent study of Lopez-Lopez et al, which suggested that the main utility of ^{18}F-FDG-PET-CT is to evaluate a possible metastatic extraperitoneal spread of the disease in the work-up.[59]

Another indication for FDG-PET-CT seems to be to detect recurrent disease. A meta-analysis showed that PET-CT compared to CT and MRI is relatively accurate in detecting recurrent disease with a sensitivity and specificity of 91 and 88%, respectively.[60] Lymph nodes were the most frequent site of relapse.[61] Another advantage of PET-CT is that post-treatment changes, like fibrosis, do not show FDG uptake. This means that PET-CT may play a role in the follow up of females with the suspicion of recurrent disease.

In the future, PET/MRI may be an option for hybrid molecular anatomic imaging due to its high soft-tissue contrast and lower radiation dose. Also, other PET radiotracers, like such as ^{11}C-methionine (MET) and 3′-deoxy-3′−[18]F-fluorothymidine (FLT),) might further improve the diagnostic performance of PET-CT.[62] Although most data are from animal studies, new radiotracers can potentially improve the staging of ovarian cancer. However, these radiotracers are not yet used in clinics, and more research is needed to clarify their role in the diagnostic work-up of ovarian cancer patients.

Magnetic resonance imaging (MRI)

The characteristics of ovarian cancer on MR imaging are partly similar to CT; cystic lesions with septa and solid components. A septal or wall thickness of >3 mm, nodularity, papillary projections of >4 cm, and necrosis are features linked to ovarian cancer.[63] Additional features of malignancy include involvement of pelvic organs or sidewall; peritoneal disease; ascites; and lymphadenopathy. A recent meta-analysis showed that MRI had a sensitivity of 91% and specificity of 85% for the diagnosis of ovarian cancer.[64] This means that MRI outperforms CT and PET-CT for detecting ovarian cancer. MRI dynamic contrast-enhanced and diffusion-weighted MRI may therefore be used as a second-line tool after ultrasonography to further differentiate between benign, malignant, and borderline masses.[65]

However, like all imaging modalities, identifying abdominal malignant lymph nodes remains a problem for MRI with a sensitivity and specificity of 77 and 91%, respectively.

One of the advantages of MRI is the use of functional imaging techniques like diffusion-weighted (DWI) sequences to depict small peritoneal metastases (Figure 1). Several studies demonstrate that DWI-MRI is reliable to depict and quantify peritoneal metastases using the PCI.[66,67] If the ongoing large multicenter studies (MISSION and MROC) confirm these promising results than this could lead to a paradigm shift in the diagnostic work-up of ovarian cancer patient[23,24] (ref). MRI could become the standard imaging tool for advanced ovarian cancer to select those patients in which a completer CRS is possible. In order to detect all small peritoneal metastases on DWI images. it is essential to avoid the high signal in normal bowels and feces. Therefore, the use of pineapple juice prior to the examination is strongly advocated. Patients need to drink at least 1 liter pineapple juice 1 h prior to the examination to make sure that its manganese content results in a low signal on DWI images within the bowels. In this way, peritoneal metastases are more easily detected on DWI images. In addition to subjective evaluation of DW-MRI, a more quantitative approach using quantitative Kurtosis variables and apparent diffusion coefficient values could help in

discriminating benign and malignant ovarian lesions.[68] No concrete quantitative MR criteria are widely adopted in the daily clinic. Another advantage of MRI is that ascites does not hamper with visibility of nodular peritoneal metastases unlike CT. This might explain the promising results of MRI in staging the peritoneal disease. In the same meta-analysis which compared CT, PET-CT, and MRI for detecting peritoneal metastases, MRI had the highest pooled regionwise sensitivity and specificity of 92 and 84%, respectively.[45] The additional value of MRI was also demonstrated in a study by Michielsen et al, which showed that MRI was superior to CT for primary tumor characterization and staging and the prediction of whether the extent of peritoneal metastases made a suboptimal resection feasible. In this study, MRI had a sensitivity of 94%, a specificity of 97.7%, and overall accuracy of 95% for predicting a suboptimal resection.[69] Three other prospective cohort studies showed similar results; MRI was accurate in predicting surgical outcome, reporting area under the curves (AUCs) of 0.88–0.95 (Figure 2). Two multicenter studies are currently ongoing to define the role of MRI in females with advanced ovarian cancer.[23,24] If these studies confirm the promising results, then a paradigm shift is imminent; females with advanced ovarian cancer could be individually stratified to their appropriate treatment according to their clinical and MR risk factors.

Future prospective

There are some promising studies that suggest that FDG-PET-MRI is superior to DW-MRI in estimating total spread of carcinomatosis in gynecological cancer.[70] By combining the two functional imaging techniques, PET-MRI has the potential to be most accurate in peritoneal and lymph node metastases. In addition, it may help differentiate borderline from malignant ovarian tumors.[71] However, cohort studies are small and PET-MRI is not widely available. More research is needed to clarify the role of MRI-PET in the work-up of ovarian cancer patients.

To further support the subjective image assessment by the radiologist, emerging advanced image analysis methods, like radiomics and artificial intelligence, may expose high-order imaging patterns that correlate with survival or genetic signatures. For example, Rizzo and colleagues demonstrated that from ovarian masses of 101 high-grade serous ovarian cancer patients, certain radiomic features from CT were associated with incomplete CRS and disease progression within 12 months.[72] Similarly, an MRI radiomic model was associated with ovarian cancer stage and overall survival ; it could provide survival estimations with high accuracy. Vargas and colleagues showed that by segmenting all detectable sites of ovarian cancer, inter site heterogeneity could be characterized by radiomic features associated with overall survival and incomplete CRS.[73] Other studies have also demonstrated associations between radiomics features and response to immunotherapy and histological subtypes.[74,75] With complex feature selection techniques using deep-learning methods of CT imaging, a radiomic model was predictive of PFS and showed AUCs of 0.77–0.83 in the test and two validation cohorts.[76] These studies show that it is possible to extract diagnostic and prognostic information from CT and MRI images which could help guide treatment strategies and provide an objective response to therapy for future clinical trials. This new field of radiology is rapidly evolving, and these new exciting ways of interpreting data could revolutionize the work-up of ovarian cancer patients in the future.

CONCLUSION

CT will remain the first step in the diagnostic work-up of ovarian cancer. However, due to new developments, especially in MRI, radiologists can now report imaging features that help the gynecologist to select patients where a complete cytoreduction can be achieved. To this end, MRI may shift from a problem-solving to a more central imaging tool for females with advanced ovarian cancer. MRI could help to individualize the treatment of females with ovarian cancer, and thus hopefully lead to a structural improvement of long-term survival for females with ovarian cancer. Currently, there is no universal definition of whether a CRS is feasible and it depends on patient features, local treatment policies and surgical experience of the surgical team. Therefore, MDT meetings will remain the cornerstone in treating females with ovarian cancer.

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