



## Current considerations for the surgical management of gallbladder adenomas

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### Abstract

Gallbladder adenomas are rare lesions (0.5%) associated with potential malignant transformation, particularly with gallbladder adenomas that are  $\geq 1$  cm in size. Early detection and management are crucial for preventing lethal carcinoma development. These polyps can often be distinguished from the more often nonneoplastic cholesterol pseudopolyps (5%-10%), which are benign. Ultrasonography is the first-line tool for initial diagnosis and follow-up when indicated. The question is whether cholecystectomy is always necessary for all adenomas. The management of gallbladder adenomas is determined according to the size of the tumor, the growth rate of the tumor, the patient's symptoms and whether risk factors for malignancy are present. Adenomas  $\geq 1$  cm in size, an age  $> 50$  years and a familial history of gallbladder carcinoma are indications for immediate laparoscopic cholecystectomy. Otherwise, ultrasound follow-up is indicated. For adenomas 6-9 mm in size, the absence of  $\geq 2$  mm growth at 6 months, one year, and two years, as well as an adenoma sized  $< 5$  mm without existing risk factors indicates that no further surveillance is required. However, it would be preferable to individualize the management in doubtful cases. Novel interventional modalities for preserving the gallbladder need further evaluation, especially to determine the long-term outcomes.

**Key Words:** Biliary diseases; True neoplastic polyps; Gallbladder adenomas; Benign biliary tumors; Gallbladder polyps; Extrahepatic biliary neoplasms

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**Core Tip:** Gallbladder adenomas are rare benign neoplastic lesions associated with malignant potential. Thus, early management is essential to prevent transformation. They are usually detected incidentally by imaging. Current imaging modalities can ensure a reliable diagnosis in vague cases. The management includes either laparoscopic cholecystectomy or ultrasound surveillance.

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## INTRODUCTION

Gallbladder polyps affecting 5%-10% of the adult population, consist of nonneoplastic cholesterol pseudopolyps in the vast majority of cases and they are usually discovered incidentally[1]. Adenomas or true neoplastic polyps are rare benign lesions that represent 0.5% of gallbladder neoplasms and 3%-9% of gallbladder polyps[2-5]. However, they can have malignant potential according to their size, which leads to gallbladder cancer with poor prognosis (a 5-year overall survival of 5%-8%)[6]. The malignant transformation process follows the dysplasia-carcinoma in situ-invasive carcinoma sequence[7]. The transformation is related to the adenoma's size, and the transformation rate can be as high as 5% when the size of the adenoma is  $\geq 10$  mm and is up to 40% when the size of the adenoma is  $\geq 20$  mm[2,6,8]. The early-stage diagnosis of gallbladder cancer is important for optimizing therapeutic management[9,10]. It is obvious that timely cholecystectomy prevents the progression of any adenoma, but whether timely cholecystectomy is necessary in all patients or constitutes overtreatment in some patients remains unclear[11]. Indications for immediate laparoscopic cholecystectomy include an adenoma size  $\geq 10$  mm or the presence of specific imaging findings, an age  $> 50$  years and a familial history of GB carcinoma[11-15]. Otherwise, ultrasound follow-up is indicated in patients under 50 years of age who have adenomas that are  $< 10$  mm in size and who do not have any predisposing genetic factors[7,16-19]. A follow-up is not considered necessary for patients who have an adenoma that is  $< 5$  mm in size and who do not have any significant family history[16-19].

The initial diagnostic approach is based on plain abdominal ultrasound. The distinction of adenomas from cholesterol pseudopolyps is a challenging task. The use of computed tomography (CT), magnetic resonance imaging (MRI), and current ultrasonic modalities, including simple endoscopic or enhanced contrast endoscopic, high resolution, and novel of three dimensions ultrasound, increase the diagnostic accuracy[6,15,18]. Various scoring system models can accurately predict true adenomas and should be developed[20-24].

The risk of malignant transformation of adenomas is correlated with age  $> 60$  years; the presence of gallstones  $\geq 3$  cm for at least twenty years; a polyp size equal to or greater than 10 mm; patient origin from Asia, mainly India[25]; chronic infection by *Salmonella*[7] or *Helicobacter pylori* (*H. pylori*)[26]; a body mass index greater than 30 kg/m<sup>2</sup>; a diagnosis of schistosomiasis[27]; a diagnosis of primary sclerosing cholangitis; a polyp with a broad basis; and a thickened gallbladder wall greater than 4 mm and/or the presence of an abnormal gallbladder wall layer[7,15,18,28]. *H. pylori* may not be associated with gallbladder adenoma or gallstone formation[29]. However, the most reliable risk factor for malignant transformation of gallbladder adenomas is size, regardless of the presence or absence of other factors[30].

Minimally invasive procedures for polypectomy alone, in which the gallbladder is preserved and is functional, have recently gained increasing interest[31]. These methods include: (1) Ultrasound-guided radiofrequency for adenoma ablation[32-34]; (2) endoscopic cholecystostomy under ultrasound guidance, which serves as a bridging procedure to endoscopic polypectomy through the gallbladder wall[35,36]; (3) laparoscopic-assisted transumbilical gastroscopy for gallbladder-preserving adenoma resection[37-39]; (4) peroral choledochoscopic gallbladder-preserving adenoma resection[40, 41]; and (5) transgastric endoscopic gallbladder preserving surgery[42]. However, there are still no adequate data available, and these novel approaches require expertise and further evaluation, including further evaluation of the long-term outcomes. Additionally, some skepticism exists about the use of these methods in the current era of laparoscopic cholecystectomy, which is a minimally invasive procedure.

## DIAGNOSIS

For gallbladder pathology assessment and differentiation of malignant from benign lesions, the most applicable diagnostic technique worldwide in clinical practice is ultrasound[43-45], and CT[46] and MRI are the second most applicable diagnostic techniques[6,47,48]. However, ultrasound alone is not accurate enough[49]. Further reliability can be obtained with additional CT scans, or better yet, MRI, and this highlights the misdiagnosis bias and can prevent unnecessary operations and thus overtreatment[50]. When a strong possibility of malignancy exists clinically, MRI should be the first-line imaging modality. Contrast-enhanced or endoscopic ultrasound (EUS) is valuable when the equipment is available [28]. High-frequency ultrasound in combination with color Doppler ultrasound constitutes a valuable diagnostic modality with high diagnostic accuracy for gallbladder adenomas (sensitivity of over 90% and specificity of 100%)[51]. High-resolution ultrasound is considered particularly reliable for the assessment of the gallbladder wall layering[49]. In sus-

picious cases, EUS provides high-resolution images, and the combination of EUS with fine needle aspiration ensures the safe diagnosis of malignant transformation of adenomas[52].

During the recommended ultrasound follow-up of small gallbladder adenomas, a growth rate  $\geq 2$  mm is considered a risk factor for malignant transformation, indicating that there should be no delay in pursuing cholecystectomy[53,54]. In general, a size of 10 mm is considered the limit for operative intervention, while a size of 7 mm is an indication for waiting and ultrasound follow-up[55].

The tumor markers CA19-9, CEA, CA125, and CA242 may be elevated in patients with gallbladder carcinoma, and measurements of these markers can contribute to the early diagnosis of gallbladder carcinoma[56]. In patients with an adenoma  $\geq 11$  mm in size, increased CA19-9, CEA, and CA72-4 levels constitute strong indications of malignant transformation[57].

## SURGICAL MANAGEMENT

The therapeutic management of gallbladder adenomas remains somewhat debated. The European Association for Endoscopic Surgery and other Interventional Techniques, the European Society of Gastrointestinal Endoscopy, the International Society of Digestive Surgery - European Federation and the European Society of Gastrointestinal and Abdominal Radiology have set guidelines[58], and these guidelines have recently been updated[15]. The recommended management depends on whether symptoms are present and the size and the rate of adenoma growth[28]. However, due to the rarity of gallbladder adenomas, there are few large studies, and the current studies have provided low-quality data and thus somewhat unreliable recommendations. In addition, obtaining new knowledge and following the current guidelines are crucial for the correct treatment of gallbladder adenomas[28].

Cholecystectomy is strongly recommended for adenomas  $\geq 10$  mm in size, those that are associated with symptoms, regardless of size, and those with a growth rate of  $\geq 2$  mm within two years. Monitoring is recommended for patients with smaller lesions, regardless of whether the patient is or without risk factors[15,28,58]. The assessment and definition of risk factors is a multidisciplinary task[20,37,58].

For patients with adenomas 6-9 mm in size without growth or a small size increase  $\leq 2$  mm during the scheduled follow-up at 6 months, one year, and two years, follow-up should be terminated[8,15,28,58]. Cholecystectomy is recommended for patients who are fit for surgery if any risk factor for malignancy is found at the initial diagnosis of adenomas that are 6-9 mm in size, and surgery should be performed after patients are reassured and consent is obtained[6,15,28,58].

For patients with adenomas  $\leq 5$  mm in size without risk factors, no follow-up is necessary. Otherwise, follow-up lasting two years is recommended[11,15,19,58]. These small adenomas have a low risk of size increase, and there are no reports of malignant transformation in these types of tumors according to long-term (up to 10 years) ultrasound follow-up[59]. Subsequently, small adenoma surveillance has limited benefit and is not recommended[16]. However, when a risk factor coexists, ultrasound surveillance lasting at least 5 years is recommended, and for any 2 mm increase in the adenoma's size, imperative cholecystectomy is recommended[60].

Laparoscopic cholecystectomy is currently the gold standard for gallbladder adenomas that require interventional procedures[6,15,61]. However, if a gallbladder adenoma  $\geq 20$  mm in size exists, a surgical plan similar to that of gallbladder carcinoma will be drawn up, as long as there are not any preoperative evidence or even an indication of malignancy[62]. Laparoscopic cholecystectomy is not recommended for such patients since there is a strong possibility of malignant transformation[63]. Thus, an open surgery should preferably be carried out by a surgeon experienced in hepatobiliary surgery, who should keep in mind the following cancer management strategy.

For patients with adenomas 10-15 mm in size or with gallbladder wall thickening, it is recommended that an experienced general surgeon safely perform laparoscopic cholecystectomy, as long as there is not any preoperative evidence or even an indication of malignancy. It is of the utmost importance to avoid gallbladder perforation in any case to prevent the possible intraperitoneal spread of cancer cells in cases of initially hidden malignancy, which will eventually be discovered *via* specimen biopsy. This obligation may necessitate the conversion of laparoscopic surgery to open surgery without any hesitation due to the possible operative difficulties encountered[60,64].

In cases where a cholecystectomy specimen biopsy is used to diagnose gallbladder adenocarcinoma, the extent of subsequent surgical resection depends on the disease stage. An already performed simple cholecystectomy is an adequate treatment for stage T1a disease, and no further treatment is needed. Otherwise, for more advanced disease, an additional operation will be needed. Some of the additional operations include wide lymphadenectomy in every case, accompanied by complementary gallbladder bed hepatic resection, in patient with T1b stage; resection of the IV and V hepatic segments for patients with T2 stage; hepatic trisegmentectomy or major hepatectomy with Roux-Y hepaticojejunostomy and, if needed, adjacent organ resection for patients with T3 stage[9,65].

## CONCLUSION

Gallbladder adenomas have a low incidence but have a risk of malignancy. These patients are usually asymptomatic, and these tumors are usually detected incidentally by imaging. The management policy must be planned according to whether symptoms are present as well as the size and the rate of adenoma growth. Gallbladder removal is needed for all patients with tumors sized  $\geq 10$  mm, those patients who have a tumor 6-9 mm in size with a coexisting malignancy risk factor, those who have symptoms, those who have gallstones, and those who have had an adenoma growth rate  $\geq 2$  mm during the regular two-year ultrasound follow-up. For small adenomas  $\leq 5$  mm in size without risk factors, no follow-up

is needed. The management of gallbladder adenomas should be individualized in ambiguous cases.

## FOOTNOTES

**Author contributions:** Pavlidis TE designed research, contributed new analytic tools, analyzed data and review; Galanis IN analyzed data and review; Pavlidis ET performed research, analyzed data, review and wrote the article.

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## REFERENCES

- Tian F, Ma YX, Liu YF, Liu W, Hong T, He XD, Qu Q. Management Strategy for Gallbladder Polypoid Lesions: Results of a 5-Year Single-Center Cohort Study. *Dig Surg* 2022; **39**: 263-273 [PMID: 36696883 DOI: 10.1159/000529221]
- Inzunza M, Irarrazaval MJ, Pozo P, Pimentel F, Crovari F, Ibañez L. Gallbladder polyps: correlation and agreement between ultrasonographic and histopathological findings in a population with high incidence of gallbladder cancer. *Arq Bras Cir Dig* 2023; **36**: e1732 [PMID: 37162074 DOI: 10.1590/0102-672020230002e1732]
- Alyanak A, Aslan F. Gallbladder Polyp and Cancer Evaluation After Cholecystectomy: A Retrospective Observational Study. *Cureus* 2022; **14**: e28089 [PMID: 36127982 DOI: 10.7759/cureus.28089]
- Foley KG, Riddell Z, Coles B, Roberts SA, Willis BH. Risk of developing gallbladder cancer in patients with gallbladder polyps detected on transabdominal ultrasound: a systematic review and meta-analysis. *Br J Radiol* 2022; **95**: 20220152 [PMID: 35819918 DOI: 10.1259/bjr.20220152]
- Li Y, Tejirian T, Collins JC. Gallbladder Polyps: Real or Imagined? *Am Surg* 2018; **84**: 1670-1674 [PMID: 30747692]
- McCain RS, Diamond A, Jones C, Coleman HG. Current practices and future prospects for the management of gallbladder polyps: A topical review. *World J Gastroenterol* 2018; **24**: 2844-2852 [PMID: 30018479 DOI: 10.3748/wjg.v24.i26.2844]
- Kjær MK, Erritzøe LW, Helgestrand UF, Nolsøe CP. Follow-up programmes for gallbladder polyps. *Ugeskr Laeger* 2023; **185** [PMID: 37539809]
- Kalbi DP, Bapatla A, Chaudhary AJ, Bashar S, Iqbal S. Surveillance of Gallbladder Polyps: A Literature Review. *Cureus* 2021; **13**: e16113 [PMID: 34350077 DOI: 10.7759/cureus.16113]
- Pavlidis ET, Galanis IN, Pavlidis TE. New trends in diagnosis and management of gallbladder carcinoma. *World J Gastrointest Oncol* 2024; **16**: 13-29 [PMID: 38292841 DOI: 10.4251/wjgo.v16.i1.13]
- Szpakowski JL, Tucker LY. Outcomes of Gallbladder Polyps and Their Association With Gallbladder Cancer in a 20-Year Cohort. *JAMA Netw Open* 2020; **3**: e205143 [PMID: 32421183 DOI: 10.1001/jamanetworkopen.2020.5143]
- Metman MJH, Olthof PB, van der Wal JBC, van Gulik TM, Roos D, Dekker JWT. Clinical relevance of gallbladder polyps; is cholecystectomy always necessary? *HPB (Oxford)* 2020; **22**: 506-510 [PMID: 31481314 DOI: 10.1016/j.hpb.2019.08.006]
- Politano SA, Hamiduzzaman N, Alhaqqan D. Diseases of the Gallbladder and Biliary Tree. *Prim Care* 2023; **50**: 377-390 [PMID: 37516509 DOI: 10.1016/j.pop.2023.03.004]
- Pickering O, Pucher PH, Toale C, Hand F, Anand E, Cassidy S, McEntee G, Toh SKC. Prevalence and Sonographic Detection of Gallbladder Polyps in a Western European Population. *J Surg Res* 2020; **250**: 226-231 [PMID: 32106001 DOI: 10.1016/j.jss.2020.01.003]
- Konstantinoff KS, Feister KF, Mellnick VM. RadioGraphics Update: New Follow-up and Management Recommendations for Polypoid Lesions of the Gallbladder. *Radiographics* 2023; **43**: e220189 [PMID: 36757883 DOI: 10.1148/rg.220189]
- Foley KG, Lahaye MJ, Thoeni RF, Soltes M, Dewhurst C, Barbu ST, Vashist YK, Rafaelsen SR, Arvanitakis M, Perinel J, Wiles R, Roberts SA. Management and follow-up of gallbladder polyps: updated joint guidelines between the ESGAR, EAES, EFISDS and ESGE. *Eur Radiol* 2022; **32**: 3358-3368 [PMID: 34918177 DOI: 10.1007/s00330-021-08384-w]
- Seguin CL, Davidi B, Peters MLB, Eckel A, Harisinghani MG, Goiffon RJ, Knudsen AB, Pandharipande PV. Ultrasound Surveillance of Small, Incidentally Detected Gallbladder Polyps: Projected Benefits by Sex, Age, and Comorbidity Level. *J Am Coll Radiol* 2023; **20**: 1031-1041 [PMID: 37406750 DOI: 10.1016/j.jacr.2023.05.015]
- Kang SK. Weighing the Trade-Offs of a Revised Approach to Small Gallbladder Polyps. *J Am Coll Radiol* 2023; **20**: 1042-1043 [PMID: 37422160 DOI: 10.1016/j.jacr.2023.06.006]
- Son JH. [Recent Updates on Management and Follow-up of Gallbladder Polyps]. *Korean J Gastroenterol* 2023; **81**: 197-202 [PMID: 37226819 DOI: 10.4166/kjg.2023.038]
- Babu BI, Dennison AR, Garcea G. Management and diagnosis of gallbladder polyps: a systematic review. *Langenbecks Arch Surg* 2015; **400**:

- 455-462 [PMID: 25910600 DOI: 10.1007/s00423-015-1302-2]
- 20 **Zhang D**, Li Q, Zhang X, Jia P, Wang X, Geng X, Zhang Y, Li J, Yao C, Liu Y, Guo Z, Yang R, Lei D, Yang C, Hao Q, Yang W, Geng Z. Establishment of a nomogram prediction model for long diameter 10-15 mm gallbladder polyps with malignant tendency. *Surgery* 2021; **170**: 664-672 [PMID: 34090677 DOI: 10.1016/j.surg.2021.04.035]
- 21 **Fujiwara K**, Abe A, Masatsugu T, Hirano T, Sada M. Effect of gallbladder polyp size on the prediction and detection of gallbladder cancer. *Surg Endosc* 2021; **35**: 5179-5185 [PMID: 32974780 DOI: 10.1007/s00464-020-08010-8]
- 22 **Wang Y**, Peng J, Liu K, Sun P, Ma Y, Zeng J, Jiang Y, Tan B, Cao J, Hu W. Preoperative prediction model for non-neoplastic and benign neoplastic polyps of the gallbladder. *Eur J Surg Oncol* 2024; **50**: 107930 [PMID: 38159390 DOI: 10.1016/j.ejso.2023.107930]
- 23 **Tang C**, Geng Z, Wen J, Wang L, You Q, Jin Y, Wang W, Xu H, Yu Q, Yuan H. Risk stratification model for incidentally detected gallbladder polyps: A multicentre study. *Eur J Radiol* 2024; **170**: 111244 [PMID: 38043381 DOI: 10.1016/j.ejrad.2023.111244]
- 24 **Choi JH**, Lee J, Lee SH, Lee S, Moon AS, Cho SH, Kim JS, Cho IR, Paik WH, Ryu JK, Kim YT. Analysis of ultrasonographic images using a deep learning-based model as ancillary diagnostic tool for diagnosing gallbladder polyps. *Dig Liver Dis* 2023; **55**: 1705-1711 [PMID: 37407319 DOI: 10.1016/j.dld.2023.06.023]
- 25 **Chavan S**, Rathi P. Gallbladder Polyp: Review and Proposed Algorithm for Management. *J Assoc Physicians India* 2022; **70**: 11-12 [PMID: 35062812]
- 26 **Lim KPK**, Lee AJL, Jiang X, Teng TZJ, Shelat VG. The link between Helicobacter pylori infection and gallbladder and biliary tract diseases: A review. *Ann Hepatobiliary Pancreat Surg* 2023; **27**: 241-250 [PMID: 37357161 DOI: 10.14701/ahbps.22-056]
- 27 **Emara MH**, Mahros AM, Rasheda AMA, Radwan MI, Mohamed B, Abdelrazik O, Elazab M, Elbatae H. Schistosomal (bilharzial) polyps: Travel through the colon and beyond. *World J Gastroenterol* 2023; **29**: 4156-4165 [PMID: 37475844 DOI: 10.3748/wjg.v29.i26.4156]
- 28 **Aziz H**, Hewitt DB, Pawlik TM. Critical Analysis of the Updated Guidelines for Management of Gallbladder Polyps. *Ann Surg Oncol* 2022; **29**: 3363-3365 [PMID: 35419760 DOI: 10.1245/s10434-022-11701-2]
- 29 **Zhang J**, Zhang Y, Chen Y, Chen W, Xu H, Sun W. Helicobacter pylori is not a contributing factor in gallbladder polyps or gallstones: a case-control matching study of Chinese individuals. *J Int Med Res* 2020; **48**: 300060520959220 [PMID: 33045881 DOI: 10.1177/0300060520959220]
- 30 **Hajibandeh S**, Ashar S, Parry C, Ellis-Owen R, Kumar N. The risk and predictors of gallbladder cancer in patients with gallbladder polyps: A retrospective cohort study with an insight into confounding by indication. *J Gastroenterol Hepatol* 2023; **38**: 2247-2253 [PMID: 37926936 DOI: 10.1111/jgh.16399]
- 31 **Liu H**, Lu Y, Shen K, Zhou M, Mao X, Li R. Advances in the management of gallbladder polyps: establishment of predictive models and the rise of gallbladder-preserving polypectomy procedures. *BMC Gastroenterol* 2024; **24**: 7 [PMID: 38166603 DOI: 10.1186/s12876-023-03094-7]
- 32 **Yue W**, Dong G, Qing Y, Sun L, Li N. Safety and Efficacy of Ultrasound-Guided Radiofrequency Ablation in the Treatment of Gallbladder Polyps. *Acad Radiol* 2024 [PMID: 38290887 DOI: 10.1016/j.acra.2024.01.016]
- 33 **Zhao H**, Chen Y, Zhang Z, Shang M, Cai Y, Ge J, Min X, Wu X, Zhao S, Chen B. Ultrasound-guided percutaneous microwave ablation of gallbladder polyps: A case report. *Medicine (Baltimore)* 2023; **102**: e36622 [PMID: 38134113 DOI: 10.1097/MD.00000000000036622]
- 34 **Chen SA**, Feng ZN, Li S, Zhang YC, Sun XL, Liu ZH, Liu MN, Jin SZ. EUS-guided gallbladder polyp resection: A new method for treatment of gallbladder polyps. *Hepatobiliary Pancreat Dis Int* 2019; **18**: 296-297 [PMID: 30497886 DOI: 10.1016/j.hbpd.2018.11.004]
- 35 **Shen Y**, Cao J, Zhou X, Zhang S, Li J, Xu G, Zou X, Lu Y, Yao Y, Wang L. Endoscopic ultrasound-guided cholecystostomy for resection of gallbladder polyps with lumen-apposing metal stent. *Medicine (Baltimore)* 2020; **99**: e22903 [PMID: 33120842 DOI: 10.1097/MD.00000000000022903]
- 36 **Ge N**, Sun S, Sun S, Wang S, Liu X, Wang G. Endoscopic ultrasound-assisted transmural cholecystoduodenostomy or cholecystogastrostomy as a bridge for per-oral cholecystoscopy therapy using double-flanged fully covered metal stent. *BMC Gastroenterol* 2016; **16**: 9 [PMID: 26782105 DOI: 10.1186/s12876-016-0420-9]
- 37 **Zheng Q**, Zhang G, Yu XH, Zhao ZF, Lu L, Han J, Zhang JZ, Zhang JK, Xiong Y. Perfect pair, scopes unite - laparoscopic-assisted transumbilical gastroscopy for gall-bladder-preserving polypectomy: A case report. *World J Clin Cases* 2021; **9**: 9617-9622 [PMID: 34877298 DOI: 10.12998/wjcc.v9.i31.9617]
- 38 **Li M**, Wu H, Wei S. New-Style Laparoscope and Endoscope Cooperative Gallbladder-Preserving Surgery for Polyps. *J Coll Physicians Surg Pak* 2016; **26**: 91-95 [PMID: 26876392]
- 39 **He XJ**, Chen ZP, Zeng XP, Jiang CS, Liu G, Li DL, Li DZ, Wang W. Gallbladder-preserving polypectomy for gallbladder polyp by embryonic-natural orifice transumbilical endoscopic surgery with a gastric endoscopy. *BMC Gastroenterol* 2022; **22**: 216 [PMID: 35505286 DOI: 10.1186/s12876-022-02269-y]
- 40 **Tao L**, Wang H, Guo Q, Du Y. Gallbladder polyp removal by hot biopsy forceps under direct visualization using a novel peroral choledochoscope. *Gastrointest Endosc* 2023; **98**: 1030-1031 [PMID: 37394039 DOI: 10.1016/j.gie.2023.06.065]
- 41 **Tang BF**, Dang T, Wang QH, Chang ZH, Han WJ. Confocal laser endomicroscopy distinguishing benign and malignant gallbladder polyps during choledochoscopic gallbladder-preserving polypectomy: A case report. *World J Clin Cases* 2020; **8**: 6358-6363 [PMID: 33392318 DOI: 10.12998/wjcc.v8.i24.6358]
- 42 **Zhang Y**, Mao XL, Zhou XB, You NN, Xu SW, Zhu LH, Ye LP. Feasibility of transgastric endoscopic gallbladder-preserving surgery for benign gallbladder diseases (with video). *Surg Endosc* 2022; **36**: 2705-2711 [PMID: 35075524 DOI: 10.1007/s00464-021-08890-4]
- 43 **de Sio I**, D'Onofrio M, Mirk P, Bertolotto M, Priadko K, Schiavone C, Cantisani V, Iannetti G, Vallone G, Vidili G; SIUMB experts committee. SIUMB recommendations on the use of ultrasound in neoplastic lesions of the gallbladder and extrahepatic biliary tract. *J Ultrasound* 2023; **26**: 725-731 [PMID: 37147558 DOI: 10.1007/s40477-023-00788-2]
- 44 **Jenssen C**, Lorentzen T, Dietrich CF, Lee JY, Chaubal N, Choi BI, Rosenberg J, Gutt C, Nolsøe CP. Incidental Findings of Gallbladder and Bile Ducts-Management Strategies: General Aspects, Gallbladder Polyps and Gallbladder Wall Thickening-A World Federation of Ultrasound in Medicine and Biology (WFUMB) Position Paper. *Ultrasound Med Biol* 2022; **48**: 2355-2378 [PMID: 36058799 DOI: 10.1016/j.ultrasmedbio.2022.06.016]
- 45 **Riddell ZC**, Corallo C, Albazaz R, Foley KG. Gallbladder polyps and adenomyomatosis. *Br J Radiol* 2023; **96**: 20220115 [PMID: 35731858 DOI: 10.1259/bjr.20220115]
- 46 **Satoh T**, Kikuyama M, Sasaki K, Ishiwatari H, Kawaguchi S, Sato J, Kaneko J, Matsubayashi H. Detectability on Plain CT is an Effective Discriminator between Carcinoma and Benign Disorder for a Polyp >10 mm in the Gallbladder. *Diagnostics (Basel)* 2021; **11** [PMID: 33668755 DOI: 10.3390/diagnostics11030388]

- 47 **Wennmacker SZ**, de Savornin Lohman EAJ, de Reuver PR, Drenth JPH, van der Post RS, Nagtegaal ID, Hermans JJ, van Laarhoven CJHM; Collaborator Group. Imaging based flowchart for gallbladder polyp evaluation. *J Med Imaging Radiat Sci* 2021; **52**: 68-78 [PMID: 33422451 DOI: 10.1016/j.jmir.2020.12.003]
- 48 **Yu MH**, Kim YJ, Park HS, Jung SI. Benign gallbladder diseases: Imaging techniques and tips for differentiating with malignant gallbladder diseases. *World J Gastroenterol* 2020; **26**: 2967-2986 [PMID: 32587442 DOI: 10.3748/wjg.v26.i22.2967]
- 49 **Costa AG**, Guerrero VL, Monforte MNG, González NB, Monzonis AR, Maroto BC, Borobia FG. Is ultrasonography accurate for the diagnosis of gallbladder polyps? A review of cholecystectomy specimens from patients diagnosed with gallbladder polyps over a 14-years period. *Cir Esp (Engl Ed)* 2023; **101**: 701-707 [PMID: 37748643 DOI: 10.1016/j.cireng.2023.02.009]
- 50 **Sabour S**. Ultrasonography for diagnosis of gallbladder polyps: Methodological issues on accuracy and reliability. *Radiography (Lond)* 2020; **26**: 272-273 [PMID: 32402705 DOI: 10.1016/j.radi.2020.04.013]
- 51 **Li Y**, Wang Y, Chi M. The diagnostic value of high-frequency ultrasound combined with color Doppler ultrasound versus surgical pathology in gallbladder polyps. *Am J Transl Res* 2021; **13**: 7990-7996 [PMID: 34377280]
- 52 **Hashimoto S**, Nakaoka K, Kawabe N, Kuzuya T, Funasaka K, Nagasaka M, Nakagawa Y, Miyahara R, Shibata T, Hirooka Y. The Role of Endoscopic Ultrasound in the Diagnosis of Gallbladder Lesions. *Diagnostics (Basel)* 2021; **11** [PMID: 34679486 DOI: 10.3390/diagnostics11101789]
- 53 **Han JW**, Choi YH, Lee IS, Choi HJ, Hong TH, You YK. Gallbladder polyps growth rate is an independent risk factor for neoplastic polyps. *United European Gastroenterol J* 2022; **10**: 651-656 [PMID: 36087036 DOI: 10.1002/ueg2.12274]
- 54 **González-Gómez S**, Paez H, Karen CG. Risk Factors and Recommendations for Follow-Up of Gallbladder Polyps. *AJR Am J Roentgenol* 2022; **219**: 1005 [PMID: 36069723 DOI: 10.2214/AJR.22.27959]
- 55 **Middleton WD**, Fung C, Dahiya N, Szpakowski JL, Corwin MT, Fetzer DT, Gabriel H, Rodgers SK, Tublin ME, Walsh AJ, Kamaya A. Survey Study on the Experience, Practice Patterns, and Preferences of the Fellows of the Society of Radiologists in Ultrasound for Evaluation and Management of Gallbladder Polyps Detected With Ultrasound. *Ultrasound Q* 2022; **38**: 96-102 [PMID: 35221317 DOI: 10.1097/RUQ.0000000000000597]
- 56 **Sinha SR**, Prakash P, Singh RK, Sinha DK. Assessment of tumor markers CA 19-9, CEA, CA 125, and CA 242 for the early diagnosis and prognosis prediction of gallbladder cancer. *World J Gastrointest Surg* 2022; **14**: 1272-1284 [PMID: 36504513 DOI: 10.4240/wjgs.v14.i11.1272]
- 57 **Ozer N**, Sozutek A, Sahin A, Seker A, Gene IC, Yugruk A. The Role of Ca 19-9, Ca 72-4, Cea and Cholesterol Levels in Predicting Malignancy in Gallbladder Polyps. *J Coll Physicians Surg Pak* 2021; **31**: 1422-1427 [PMID: 34794281 DOI: 10.29271/jcsp.2021.12.1422]
- 58 **Wiles R**, Thoeni RF, Barbu ST, Vashist YK, Rafaelsen SR, Dewhurst C, Arvanitakis M, Lahaye M, Soltes M, Perinel J, Roberts SA. Management and follow-up of gallbladder polyps : Joint guidelines between the European Society of Gastrointestinal and Abdominal Radiology (ESGAR), European Association for Endoscopic Surgery and other Interventional Techniques (EAES), International Society of Digestive Surgery - European Federation (EFISDS) and European Society of Gastrointestinal Endoscopy (ESGE). *Eur Radiol* 2017; **27**: 3856-3866 [PMID: 28185005 DOI: 10.1007/s00330-017-4742-y]
- 59 **Rafaelsen SR**, Otto PO, Pedersen MRV. Long-term ultrasound follow-up in patients with small gallbladder polyps. *Dan Med J* 2020; **67** [PMID: 33046206]
- 60 **Valibouze C**, El Amrani M, Truant S, Leroy C, Millet G, Pruvot FR, Zerbib P. The management of gallbladder polyps. *J Visc Surg* 2020; **157**: 410-417 [PMID: 32473822 DOI: 10.1016/j.jvisurg.2020.04.008]
- 61 **Jang SI**, Cho JH, Lee DK. [Recent Updates on Diagnosis, Treatment, and Follow-up of Gallbladder Polyps]. *Korean J Gastroenterol* 2020; **76**: 102-107 [PMID: 32969359 DOI: 10.4166/kjg.2020.76.3.102]
- 62 **Akbulut S**, Sahin TT. Comment on gallbladder polyps: Correlation of size and clinicopathologic characteristics based on updated definitions. *Int J Surg Case Rep* 2021; **83**: 105947 [PMID: 34015684 DOI: 10.1016/j.ijscr.2021.105947]
- 63 **Pavlidis ET**, Pavlidis TE. The Role of Open Cholecystectomy in the Current Era of Laparoscopic Surgery and the Trainee Experience. *Am Surg* 2018; **84**: e106-e107 [PMID: 30454425]
- 64 **Björk D**, Bartholomä W, Hasselgren K, Edholm D, Björnsson B, Lundgren L. Malignancy in elective cholecystectomy due to gallbladder polyps or thickened gallbladder wall: a single-centre experience. *Scand J Gastroenterol* 2021; **56**: 458-462 [PMID: 33590795 DOI: 10.1080/00365521.2021.1884895]
- 65 **Kim BJ**, Newhook TE, Tzeng CD, Ikoma N, Chiang YJ, Chun YS, Vauthey JN, Tran Cao HS. Lymphadenectomy and margin-negative resection for biliary tract cancer surgery in the United States-Differential technical performance by approach. *J Surg Oncol* 2022; **126**: 658-666 [PMID: 35578764 DOI: 10.1002/jso.26924]



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