**Name of journal: World Journal of Gastroenterology**

**ESPS Manuscript NO: 2380**

**Columns: BRIEF ARTICLE**

**Gallbladder polyps: Factors affecting surgical decision**

Sarkut *et al.* Gallbladder polyps

Pinar Sarkut, Sadik Kilicturgay, Ali Ozer, Ersin Ozturk, Tuncay Yilmazlar

**Pinar Sarkut, Sadik Kilicturgay, Ali Ozer, Ersin Ozturk, Tuncay Yilmazlar,** Department of General Surgery, Uludag University School of Medicine, Gorukle, Bursa 16059, Turkey

**Author contributions:** Kilicturgay S and Yilmazlar T designed and supervised the study; Ozer A and Sarkut P participated in data collection; Ozturk E and Sarkut P performed statistical analysis; Sarkut P, Kilicturgay S and Ozer A wrote the manuscript; and all authors read and approved the manuscript before submission to the journal.

**Correspondence to:** **Pinar Sarkut, MD,** Department of General Surgery, Uludag University School of Medicine, Gorukle, Bursa 16059, Turkey. [pinartasar@gmail.com](mailto:pinartasar@gmail.com)

**Telephone:** +90-532-4814960 **Fax:** +90-224-4428398

**Received:** February 18, 2013 **Revised:** March 19, 2013

**Accepted:** April 28, 2013

**Published online:**

**Abstract**

**AİM:** To determine the factors affecting the decision of surgery, and the efficiency of ultrasonography (US) in detecting gallbladder polyps (GP).

**METHODS:** The data of 138 patients who underwent cholecystectomy between 1996 and 2012 in our clinic with the diagnosis of GP were retrospectively analyzed. Demographic data, clinical presentation, principal symptoms, ultrasonographic and histopathologic findings were evaluated. Patients were evaluated in individual groups according to the age of the patients (older or younger than 50 years old) and polyp size( bigger or smaller than 10 mm) and characteristic of polyps(pseudopolyp or real polyps). 2 test was used for statistical evaluation of data.

**RESULTS:** The median age was 50 (26-85) and 91 of them were female. Of 138 patients who underwent cholecystectomy with GP diagnosis, only 99 had polyp histopathologically. 77 of them had pseudopolyps and 22 had true polyps. Twenty one patients had adenocarcinoma. Of these 21 patients, 11 were male, median age was 61 (40-85) and all malign polyps with diameters were bigger than 10 mm (*P <* 0.0001). 112 of 138 patients whom surgery were performed had ultrasonographically polyps with diameters less than 10 mm. 22 of other 26 patients who also had polyps with diameters bigger than 10 mm, had true polyps. The sensitivity of US was 84.6% in polyps with diameters bigger than 10 mm (*P <* 0.0001), however it was only 66% in polyps with diameters less than 10 mm.

**CONCLUSION:** The risk of malignancy was high in the patients over 50 years old who had solitary polyps with diameters bigger than 10 mm.

© 2013 Baishideng. All rights reserved.

**Key words**: Gallbladder; Polyps; Ultrasound; Cholecystectomy; Malignancy

**Core tip:** Early stage gallbladder cancers can often be detected as polyps in imaging studies. The aim of this study is to determine the factors affecting surgery via analyzing the malignancy incidence of gallbladder polyps(GP) and the efficiency of ultrasonography in detecting gallbladder polyps. Of 138 patients with GP on imaging, 99 had polyps and 21 had adenocarcınoma histopathologically. Of these 21 patients, all malign polyps were solitary and had a diameter more than 10 mm. In our study, the risk of malignancy correlated wıth age over 50 years old, solitary polyp and polyp diameter of more than 10 mm.

Sarkut P, Kilicturgay S, Ozer A, Ozturk E, Yilmazlar T. Gallbladder polyps: Factors affecting surgical decision.

Available from: URL:

DOI:

**INTRODUCTION**

Gallbladder polyps (GP) present as masses protruding from gallbladder mucosa. They are found in 0.3% to 12% of healthy individuals[1]. The actual prevelance is unknown, but today, GPs are diagnosed more frequently due to the widespread use of abdominal imaging techniques. GPs are usually asymptomatic and diagnosed incidentally during radiological examinations done for any other reason. GPs are classified as pseudopolips and true polyps. Pseudopolyps consist of cholesterol polyps/cholesterolosis, adenomatous polyps, adenomyoma, inflammatory polyps and hyperplastic polyps; and these are all benign lesions. True polyps are grouped into benign (adenoma), premalignant (dysplastic polyps) and malignant (adenocarcinoma)[2]. Cholesterol polyps are the most commonly seen polyps of all gallbladder poyps. Therefore, most of the polyps are benign lesions. Occasionaly, early stage gallbladder cancers can be detected as a polyp in imaging studies. The prevalence of malignant polyps of GPs can even reach 27%[3]. In patients greater than fifty year old, the presence of polyps larger than 10 mm has been reported as risk factors for malignancy[3-8]. The most commonly used imaging modality for diagnosis is ultrasonography (USG). However, USG is poor at differentiating benign and malignant polyps. Computed tomography (CT) and endoscopic ultrasonography (EUS) are also two of the additional diagnostic tools.

In this study, patients in our clinic with the diagnosis of gallbladder polyp who had surgery were examined; and indication for surgery, frequency of polyp types, malignancy rates of polyps and reliability of USG in identification and differentiation of polyps were investigated.

**MATERIALS AND METHODS**

***Patients***

Age, sex, clinical signs and symptoms, preoperative ultrasound and histopathological diagnoses of patients were analyzed retrospectively in patients admitted to our clinic with gallbladder polyp and underwent cholecystectomy between the years of 1996-2012. All of these patients were evaluated with USG prior to surgery in Radiology Department of Uludag University Faculty of Medicine (hyperechoic lesions that have no acoustic shadowing and does not move with position change) and diagnosis of gallbladder polyp was confirmed[8]. Detection of polyps larger than 10 mm, suspicious findings in USG (such as vascularization pattern, Figure 1), growth during follow-up, and personal request of the patient were indications for surgery.

Polyp size and number and presence of stones were evaluated in preoperative USG reports, and compatibility of these findings with histopathological data were analyzed.

According to histopathological diagnoses, cholesterol polyps/cholesterolosis, hyperplastic and adenomatous polyps were assembled under the title of “pseudopolyp”, adenoma and adenocarcinoma were assembled under the title of ‘real polyps’. In addition, patients were evaluated in individual groups according to the age of the patients (older or younger than 50 years old) and polyp size( bigger or smaller than 10 mm).

***Statistical analysis***

2 test was used, when appropriate, to calculate the statistical significance of the different demographic and clinical variables. *P* values of < 0.05 were deemed as significant.

**RESULTS**

***Demografic and clinical characteristics of patients with PLG***

Cholecystectomy was performed in 5832 patients between 1996-2012 and surgical indication of 138 patients (2.3%) was GPsıÜü5832 patients. Ninety-one of the patients were female and 47 of them were male and the median age was 55 (26-85). While polyps were detected in 99 of 138 patients (71.7%) undergoing surgery for GPs, gallbladder stones were detected instead of polyp in 39 of them. The false positive rate was determined to be 28% in ultrasound evaluation of polyps. It is remarkable that the size of polyps in all of these cases has been reported to be less than 10 mm.

While 66 patients (66.6%) did not have any symptoms at the time of presentation, 33 patients with polyp were symptomatic. Sixty-two of 66 asymptomatic patients elected surgical treatment due to possible risks in the future. Three of 4 asymptomatic patients had a cholecystectomy due to increase of polyp size to bigger than 10 mm in 6 mo and the other remaining patient had a cholecystectomy due to being a 65-years-old male patient. Polyps of these four patients were detected as cholesterol polyps and adenomatous polyps in pathological examination. Thirty-three sypmtomatic patients presented with complaints of right upper quadrant pain and dyspepsia; and had surgery upon detection of polyps in USG (Table 1). Gallstones were accompanied with polyps in 18 (54.5%) of these symptomatic patients. Only in 2 of malignant cases, a polypoid structure was accompanied by gallstone.

As presented in Table 1, 54.5% of patients were under the age of 50 and 90% of true polyps were seen in patients over 50-years-old. In addition, polyp incidence was 3.7% under 50 years of age, and the incidence rises to 44% over 50 years of age (*P <* 0.0001).

***Sonograhic characteristics of the patients***

While gallstones were detected only in 1 of 26 patients who have lesions of 10 mm diameter in preoperative USG; postoperative diagnoses was true gallbladder polyp in 21 (84.6%) of the remaining 25 patients. The other 4 patients were reported as pseudopolyp. Pre-operative USG diagnosed 96% of lesions over 10 mm accurately and 84% of them were found to be true polyps (adenoma/adenocarcinoma). Histopathological diagnoses were reported as polyps only in 74 of 112 patients who have lesion diameter of smaller than 10 mm. In other words, accuracy rate of USG for smaller polyps than 10 mm decreased to 66% and only one of these 74 cases was shown to be a true polyp(adenoma). There is a statistically significant difference in diagnosis of true polyps between polyps smaller than 10 mm or bigger (*P <* 0.0001).

***Histopatologic examinations of GP***

Mean polyp diameter of 99 patients (77 pseudopolyps, 22 true polyps), who were diagnosed with gallbladder polyp in histopathologic examination, was 8.8 mm (range 3-19 mm). The most commonly seen GP was cholesterol polyp (Figure 2). Twenty-one of 22 patient with true polyps were diagnosed with adenocarcinoma, and the other one was adenoma. The size of all malignant polyps was bigger than 10 mm and polyps were single. Eleven patients with malignancy were male and the median age was 61 (40-85). In our series, malignancy incidence of GPs was found 21.2% (21 of 99 cases). This value was 15.2% when 138 patients with preoperative diagnoses of polyps were taken into the consideration.

***Results of malignant patients***

Only cholecystectomy was performed in 16 of 21 patients with malignancy; and cholecystectomy with liver S-5 resection and lymph node dissection was performed in the remaining 5 patients. Any additional treatment other than cholecystectomy was not performed in 10 patients with T1 tumors limited to the mucosa and submucosa, and the other 7 patients did not accept additional treatment. A total of 8 patients received chemotherapy treatment after surgery. Ten of these patients were still alive and 11 of them died. Survival was 14.8 mo (range 4-38 mo).

**DISCUSSION**

Gallbladder polyps are common gallbladder lesions and should not be ignored due to its association with malignancy. The incidence has been reported in the literature between 0.3 and 12%[9,10]. In our clinical series of 5832 patients undergoing cholecystectomy, gallbladder polyps have been the indication for cholecystectomy in 2.3% (138 patients) of cases. When 39 of these patients were diagnosed with only cholelithiasis, the true incidence of GPs was 1.7%.

There are different concepts about the effect of demographic factors such as age and gender on the incidence of GPs. There are some studies reporting that GPs are more frequently seen in males[2,11-14] or females[9-15] and even some studies suggest that there is no effect of gender on GPs[14-21]. Approximately 2/3 of cases in our study are women and the true polyp ratio was 29.7% in men and 17.7% in women (Table 1). Ito *et al*[17] reported that the mean age was 59 in their 417 patients series. Although 53% of patients in our study were under the age of 50, 90% of true polyps were detected in patients over 50 years-old. As demonstrated in Table 1, the incidence of true polyps is 3.8% under the age of 50 years and rises to 44% over the age of 50 years (*P <* 0.05).

Ultrasonography is the most frequently used and most valuable diagnostic tool for preoperative evaluation of gallbladder pathologies[8]. One hundred thirty eight patients in our series were diagnosed with GP by means of USG. Considering that 39% of them were also diagnosed with cholelithiasis, accurate diagnosis rate of USG is 71.7%. Sensitivity of USG for GPs was reported to be between 32 and 90%[5,18]. While USG can usually detect polyps bigger than 5 mm, it becomes more accurate if polyp size is greater than 10 mm[19]. As a matter of fact, USG detected almost all polyps bigger than 10 mm accurately (25 of 26 cases) and these polyps were then reported as true polyps (adenoma/ adenocarcinoma). However accurate diagnostic rate of USG for lesions smaller than 10 mm was 66%. In addition, the size of GPs had been detected smaller than 10 mm in 39 patients who were thought to have GPs preoperatively but no polyps were detected in postoperative period. Postoperative pathologic diagnoses of these 39 patients were assessed as chronic cholecystitis and cholelithiasis. Cholesterolosis occurs as a result of accumulation of esterified cholesterol and triglyceride in macrophages of the lamina propria and they are often mixed with small polyps in USG[17]. Gallbladder stones attached to the wall of the gallbladder can easily be interpreted as a polyp in USG[18]. Presence of stones in the gallbladder reduces the success rate of USG to diagnose GPS, and accurate diagnosis rate of GPS by USG rises to 99% in the absence of any stones. On the other hand, GPs usually did not cause any symptoms in patients as in our series. Association of stones with GPs may cause symptoms and provides the patient to consult a doctor and diagnosis becomes easier. In our study, GPs were accompanied by gallstones only in 18.1% (18 patients) of patients. All patients accompanied by stones were symptomatic. However, there were no stones in 15 of 33 symptomatic patients and GPs cause symptoms in these patients. In our series of patients, being symptomatic did not have any impact on detection of true polyps (*P =* 0.71).

Another important factor associated with malignancy in GPs is diameter of polyps[6,20]. Kozuka *et al*[21] reported that critical limit for differentiation of benign and malignant was 12 mm and suggested cholecystectomy for gallbladder polyps larger than 12 mm. Kubata *et al* compared postoperative pathologic data of 72 patients with GPs and preoperative ultrasound. They reported 22% of neoplastic polyps of the gallbladder to be larger than 10 mm. They also reported that evaluation of the polyp shape may be beneficial but it is not far enough to distinguish cholesterol polyps from adenoma and cancer[22]. Sugiyama *et al*[23] have tried to make a distinction between benign and malignant polyps using preoperative USG and endoscopic USG They detected adenoma or cancer in 14% of polyps with diameter of 6-10 mm in preoperative USG. Zielinski *et al*[2] emphasized that there is a significant increase in the risk of neoplasia in polypoid lesions bigger than 6 mm and they suggest performing cholecystectomy in these patients. In our study, the majority of polyps (73 of 74 cases) smaller than 10 mm were pseudopolyps and the remaining polyps were adenomas. There were no malignant polyps encountered in this size. Eight-four percent of polyps bigger than 10 mm were true polyps (adenoma/adenocancer) and all of the these true polyps were found to be adenocarcinoma. This situation suggests that limit of 10 mm is very important (*P =* 0.0001). Similarly, no true polyps were detected in the setting of multiple polyps. It is also remarkable that 28% of single polyps were diagnosed with adenocarcinoma.

Literature suggests that patients over 50 years old, polyps greater than 10 mm, polyps with a broad base or long pedicle, polyps associated with cholecystitis or cholelithiasis, or irregular thickening of the gallbladder in the setting of biliary colic are indications for cholecystectomy[4,23,24]. In our study, 21 (21.2%) of 99 patients with GPs were diagnosed with malignancy, all of whom were older than 50 years with polyps greater than 10 mm and solitary. In addition, success rate of USG to diagnose GP bigger than 10 mm was more evident and an important point. Patients had surgery mostly because of theirs extreme sensitivity and anxiety. We found that surgery was not beneficial in patients with multiple polypoid lesions and polyps smaller than 10 mm. For this reason, surgical team should reassure and relax the patients and avoid unnecessary cholecystectomy operations.

In conclusion, being male and over 50 years-old having a solitary polyp and bigger than 10 mm benefitted most from cholecystectomy.

**COMMENTS**

***Background***

Gallbladder polyps (GP) are frequently detected incidentally. They are usually misdiagnosed as gallstones in sonographic examinations. There is not a consensus for treatment and follow-up of GP due to its particularly rare malignancy incidence. There are some risk factors associated with high risk of malignancy. Early diagnosis and surgical treatment of GP effects survival of gallbladder carcinomas.

***Research frontiers***

There are many studies investigating risk factors that are increasing malignancy incidence of GP. Age, gender, polyp size, polyp number, accompanying gallstones, inflammatory status of gallbladder are remarkablly defined risk factors.

***Innovations and breakthroughs***

All of the malignant polyps were solitary and sized over 10mm in our study. Also a malignant polyp was determined in 44% of the patients aged over 50. We failed to show an association between gender and malignancy for GP. Ultrasonography (US) was more sensitive for polyps sized over 10mm. US is more helpful in showing malignancy for cases with polyps sized over 10mm.

***Applications***

This study will facilitate surgeons decision making for treatment and follow-up of patients with GP.

***Terminology***

Cholesterol polyps/colestherolosis, hyperplastic and adenomateous polyps are defined as pseudopolyps while adenomas and adenocarcinomas are defined as true polyps histopathologically.

***Peer review***

This manuscript which was written on a subject of considerable controversy in general surgery has been generally well-designed.

**REFERENCES**

1 **Cha BH**, Hwang JH, Lee SH, Kim JE, Cho JY, Kim H, Kim SY. Pre-operative factors that can predict neoplastic polypoid lesions of the gallbladder. *World J Gastroenterol* 2011; **17**: 2216-2222 [PMID: 21633532 DOI: 10.3748/wjg.v17.i17.2216]

2 **Zielinski MD**, Atwell TD, Davis PW, Kendrick ML, Que FG. Comparison of surgically resected polypoid lesions of the gallbladder to their pre-operative ultrasound characteristics. *J Gastrointest Surg* 2009; **13**: 19-25 [PMID: 18972168 DOI: 10.1007/s11605-008-0725-2]

3 **Lee KF**, Wong J, Li JC, Lai PB. Polypoid lesions of the gallbladder. *Am J Surg* 2004; **188**: 186-190 [PMID: 15249249 DOI: 10.1016/j.amjsurg.2003.11.043]

4 **Terzi C**, Sökmen S, Seçkin S, Albayrak L, Uğurlu M. Polypoid lesions of the gallbladder: report of 100 cases with special reference to operative indications. *Surgery* 2000; **127**: 622-627 [PMID: 10840356 DOI: 10.1067/msy.2000.105870]

5 **Yang HL**, Sun YG, Wang Z. Polypoid lesions of the gallbladder: diagnosis and indications for surgery. *Br J Surg* 1992; **79**: 227-229 [PMID: 1555088 DOI: 10.1002/bjs.1800790312]

6 **Koga A**, Watanabe K, Fukuyama T, Takiguchi S, Nakayama F. Diagnosis and operative indications for polypoid lesions of the gallbladder. *Arch Surg* 1988; **123**: 26-29 [PMID: 3276295 DOI: 10.1001/archsurg.1988.01400250028003]

7 **Shinkai H**, Kimura W, Muto T. Surgical indications for small polypoid lesions of the gallbladder. *Am J Surg* 1998; **175**: 114-117 [PMID: 9515526 DOI: 10.1016/S0002-9610(97)00262-6]

8 **Yang HL**, Kong L, Hou LL, Shen HF, Wang Y, Gu XG, Qin JM, Yin PH, Li Q. Analysis of risk factors for polypoid lesions of gallbladder among health examinees. *World J Gastroenterol* 2012; **18**: 3015-3019 [PMID: 22736927 DOI: 10.3748/wjg.v18.i23.3015]

9 **Jørgensen T**, Jensen KH. Polyps in the gallbladder. A prevalence study. *Scand J Gastroenterol* 1990; **25**: 281-286 [PMID: 2320947]

10 **Lin WR**, Lin DY, Tai DI, Hsieh SY, Lin CY, Sheen IS, Chiu CT. Prevalence of and risk factors for gallbladder polyps detected by ultrasonography among healthy Chinese: analysis of 34 669 cases. *J Gastroenterol Hepatol* 2008; **23**: 965-969 [PMID: 17725602 DOI: 10.1111/j.1440-1746.2007.05071.x]

11 **Chen CY**, Lu CL, Chang FY, Lee SD. Risk factors for gallbladder polyps in the Chinese population. *Am J Gastroenterol* 1997; **92**: 2066-2068 [PMID: 9362194]

12 **Segawa K**, Arisawa T, Niwa Y, Suzuki T, Tsukamoto Y, Goto H, Hamajima E, Shimodaira M, Ohmiya N. Prevalence of gallbladder polyps among apparently healthy Japanese: ultrasonographic study. *Am J Gastroenterol* 1992; **87**: 630-633 [PMID: 1595653]

13 **Heyder N**, Günter E, Giedl J, Obenauf A, Hahn EG. [Polypoid lesions of the gallbladder]. *Dtsch Med Wochenschr* 1990; **115**: 243-247 [PMID: 2406119 DOI: 10.1055/s-2008-1064999]

14 **Collett JA**, Allan RB, Chisholm RJ, Wilson IR, Burt MJ, Chapman BA. Gallbladder polyps: prospective study. *J Ultrasound Med* 1998; **17**: 207-211 [PMID: 9544602]

15 **Farinon AM**, Pacella A, Cetta F, Sianesi M. "Adenomatous polyps of the gallbladder" adenomas of the gallbladder. *HPB Surg* 1991; **3**: 251-258 [PMID: 1859800 DOI: 10.1155/1991/59324]

16 **Moriguchi H**, Tazawa J, Hayashi Y, Takenawa H, Nakayama E, Marumo F, Sato C. Natural history of polypoid lesions in the gall bladder. *Gut* 1996; **39**: 860-862 [PMID: 9038670 DOI: 10.1136/gut.39.6.860]

17 **Ito H**, Hann LE, D'Angelica M, Allen P, Fong Y, Dematteo RP, Klimstra DS, Blumgart LH, Jarnagin WR. Polypoid lesions of the gallbladder: diagnosis and followup. *J Am Coll Surg* 2009; **208**: 570-575 [PMID: 19476792 DOI: 10.1016/j.jamcollsurg.2009.01.011]

18 **Berk RN**, van der Vegt JH, Lichtenstein JE. The hyperplastic cholecystoses: cholesterolosis and adenomyomatosis. *Radiology* 1983; **146**: 593-601 [PMID: 6402801]

19 **Mainprize KS**, Gould SW, Gilbert JM. Surgical management of polypoid lesions of the gallbladder. *Br J Surg* 2000; **87**: 414-417 [PMID: 10759734 DOI: 10.1046/j.1365-2168.2000.01363.x]

20 **Shoup M**, Fong Y. Surgical indications and extent of resection in gallbladder cancer. *Surg Oncol Clin N Am* 2002; **11**: 985-994 [PMID: 12607584 DOI: 10.1016/S1055-3207(02)00041-8]

21 **Kozuka S**, Tsubone N, Yasui A, Hachisuka K. Relation of adenoma to carcinoma in the gallbladder. *Cancer* 1982; **50**: 2226-2234 [PMID: 7127263]

22 **Kubota K**, Bandai Y, Noie T, Ishizaki Y, Teruya M, Makuuchi M. How should polypoid lesions of the gallbladder be treated in the era of laparoscopic cholecystectomy? *Surgery* 1995; **117**: 481-487 [PMID: 7740417 DOI: 10.1016/S0039-6060(05)80245-4]

23 **Sugiyama M**, Atomi Y, Kuroda A, Muto T, Wada N. Large cholesterol polyps of the gallbladder: diagnosis by means of US and endoscopic US. *Radiology* 1995; **196**: 493-497 [PMID: 7617866]

24 **Gouma DJ**. When are gallbladder polyps malignant? *HPB Surg* 2000; **11**: 428-430 [PMID: 10977124 DOI: 10.1155/2000/34201]

**P-Reviewers** Nikolaos G S, Sari YS, Vettoretto N **S-Editor** Wen LL  **L-Editor**  **E-Editor**

**Figure 1 Polyp with 6 mm size and feeding artery are clearly seen in Doppler Ultrasonography.**

**Figure 2 Distribution of pseudopolyp cases.**

**Table 1** **Characteristics of cases according to the criterias analysed in 99 patients diagnosed with Gallbladder polyps in histopathologic examination**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Characteristics**  **Pathology result** | | **Pseudopolyp (*n* = 77)** | **True Polyp (*n* = 22)** | | ***P* value1** |
| **Adenocarcinoma** | **Adenoma** |
| Sex | Woman | 51 | 10 | 1 | 0.33 |
| Man | 26 | 11 | 0 |
| Age (yr) | < 50 | 52 | 1 | 1 | < 0.0001 |
| ≥ 50 | 25 | 20 | 0 |
| Symptoms | Yes | 24 | 9 | 0 | 0.62 |
| No | 53 | 12 | 1 |
| Number | Multiple | 23 | 0 | 0 | 0.01 |
| Single | 54 | 21 | 1 |
| sıze | ≤ 10 mm | 73 | 0 | 1 | < 0.0001 |
| > 10 mm | 4 | 21 | 0 |

1In terms of true polyp incidence between data.