

Clinical and Pathological Characteristics of Gallbladder Polyps: A Retrospective Cohort Study

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ABSTRACT

Objective: Gallbladder polyps (GPs) are increasingly detected with abdominal ultrasonography; although most are benign, differentiating benign from neoplastic lesions pre-operatively remains challenging. Current guidelines recommend cholecystectomy for polyps ≥ 10 mm, yet the true malignancy risk in smaller or symptomatic lesions is still debated.

Methods: We performed a single-centre retrospective cohort study of adults (≥ 18 years) who underwent elective cholecystectomy for radiologically confirmed gallbladder polyps. Demographic, clinical, radiological and histopathological data were extracted from electronic records. The primary outcome was histopathological evidence of neoplasia. Categorical variables are presented as n (%), continuous variables as mean \pm SD or median (IQR).

Results: Fifty-seven patients were included (33 women, 24 men; mean age 45.4 ± 14.8 years). Most (50/57, 87.7%) were symptomatic, commonly with right upper-quadrant pain or dyspepsia. Polyps were < 10 mm in 43 patients (75.4%) and ≥ 10 mm in 14 (24.6%). Histology revealed cholesterol or other benign polyps in 55 cases (96.5%). Neoplastic change was identified in two patients (3.5%): One benign intraluminal papillary neoplasia and one high-grade intraepithelial neoplasia; both lesions occurred in polyps ≥ 10 mm. No neoplasia was found in polyps < 10 mm. Sex, symptom status and polyp multiplicity were not associated with neoplastic transformation.

Conclusion: In this cohort, neoplastic transformation was confined to polyps ≥ 10 mm, reinforcing the 10-mm threshold for prophylactic cholecystectomy. Polyps < 10 mm—especially in asymptomatic patients—were uniformly benign, supporting conservative ultrasound surveillance. Larger, prospective studies are warranted to refine risk stratification for intermediate-sized lesions.

INTRODUCTION

Gallbladder polyps (GPs) are mucosal projections into the gallbladder lumen and are frequently detected incidentally during abdominal ultrasonography.^[1] They are broadly classified as benign or malignant. Benign polyps include cholesterol polyps, inflammatory polyps, and hyperplastic polyps, while adenomatous polyps have malignant potential. Cholesterol polyps, which are caused by the accumulation of cholesterol esters in macrophages, represent the most common type.^[2] Inflammatory and hyperplastic polyps are less common but are generally considered benign.^[3] Adenomatous polyps, although less prevalent, are of particular concern due to their potential for malignant transformation.^[4] Distinguishing between benign and malignant polyps remains a significant challenge in clinical practice, as imaging characteristics alone are often insufficient to determine malignancy.^[5]

Most gallbladder polyps are asymptomatic and are discovered incidentally during imaging studies performed for unrelated reasons.^[6] When symptomatic, patients may present with non-specific symptoms such as right upper quadrant pain, dyspepsia, nausea, or biliary colic.^[6] The clinical significance of gallbladder polyps stems from their potential to undergo neoplastic transformation. Size is considered the most important predictive factor for malignancy, with polyps larger than 10 mm having a higher likelihood of being malignant.^[7] However, other features such as rapid growth, patient age, sessile morphology, and the presence of gallstones have also been associated with increased malignant potential.^[8]

Current guidelines recommend cholecystectomy for gallbladder polyps larger than 10 mm or those demonstrating rapid growth, as these characteristics are strongly correlated with an increased risk of malignancy.^[9] However,

the management of smaller polyps remains controversial. Some studies suggest that polyps smaller than 6 mm rarely harbor malignancy and can be monitored with serial ultrasonography. For polyps between 6 mm and 10 mm, the decision to proceed with cholecystectomy is influenced by additional risk factors such as patient age, polyp morphology, and the presence of gallbladder wall thickening.^[10,11]

Despite the availability of guidelines, the management of gallbladder polyps remains highly individualized, with variability in clinical practice. The decision to perform cholecystectomy often depends on the surgeon's experience, patient preference, and institutional protocols. Understanding the clinical, radiological, and pathological characteristics of gallbladder polyps and their correlation with malignancy is essential for developing evidence-based management strategies and improving patient outcomes.^[12]

This study aims to retrospectively evaluate the clinical, radiological, and pathological characteristics of gallbladder polyps in a cohort of patients who underwent cholecystectomy. By analyzing factors associated with malignancy, we aim to provide insights into optimizing the management of gallbladder polyps and improving the accuracy of preoperative risk assessment.^[13]

MATERIALS AND METHODS

Study Design and Setting

This retrospective cohort investigation was carried out at a single tertiary hospital. Patient information covering the interval from January 2022 to December 2024 was abstracted from electronic health records and paper charts. The protocol adhered to the Declaration of Helsinki and received institutional review board approval (No: AEŞH-BADEK-2024-1204, Date, 25/12/2024); informed-consent requirements were waived because the study relied exclusively on previously documented data.

During the study period, a total of 5,354 cholecystectomies were performed, and among them, 57 (0.01%) underwent cholecystectomy for gallbladder polyps. This subgroup constituted the study population.

Patients with asymptomatic or small polyps (<10 mm) who did not meet surgical criteria were followed up with annual abdominal ultrasonography in the outpatient clinic. Given the high patient load, the extensive number of ultrasonographic examinations performed, and the routine practice of managing many gallbladder polyp cases conservatively under sonographic surveillance, it was not feasible to retrospectively ascertain the exact number of patients followed non-operatively.

The study population consisted of 57 patients who underwent cholecystectomy for gallbladder polyps. The inclusion and exclusion criteria were carefully defined to minimize selection bias and ensure the accuracy of data analysis (Fig. 1).

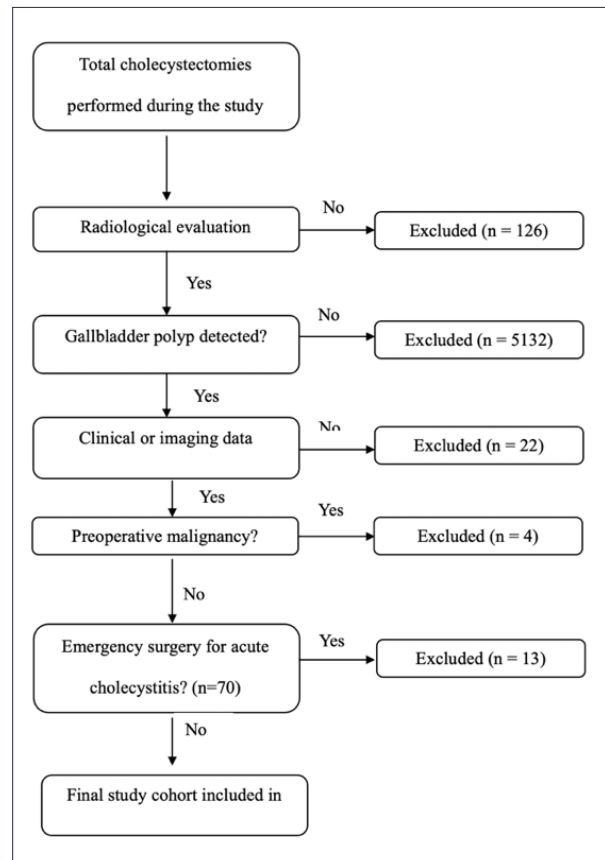


Figure 1. Algorithm of patient inclusion and exclusion.

Data Collection

Data were extracted from the hospital's electronic medical record system and patient charts. The collected data included detailed demographic, clinical, radiological, surgical, and histopathological variables:

- Demographic data: Age, sex, and comorbidities (e.g., diabetes, hypertension).
- Clinical data: Symptoms at presentation (e.g., pain, dyspepsia, nausea), symptomatic or asymptomatic status, duration of symptoms.
- Radiological data: Polyp size (maximum diameter), number of polyps, morphology (sessile or pedunculated), wall thickening, and the presence of gallstones or sludge.
- Surgical details: Type of surgery (laparoscopic or open), duration of surgery, intraoperative complications, and conversion to open surgery.
- Histopathological findings: Polyp type (cholesterol, adenomatous, inflammatory, hyperplastic), presence of dysplasia, malignancy, and coexisting gallbladder pathology (e.g., cholecystitis, cholesterosis).

The primary outcome measure was the presence of malignancy in the histopathological examination of gallbladder polyps. Secondary outcome measures included the correlation between polyp size and malignancy, association of

demographic and clinical factors with malignancy, and the rate of postoperative complications.

Data were summarised with descriptive statistics. Categorical variables are reported as counts and percentages, whereas continuous variables are expressed as mean \pm standard deviation for normally distributed data or median (interquartile range) when skewed. All analyses were conducted with SPSS, version 23 (IBM Corp., Armonk, NY, USA).

RESULTS

In this retrospective observational study, a total of 57 patients who underwent elective cholecystectomy due to gallbladder polyps between January 2022 and December 2024 were included in the final analysis. Of the included cases, 33 patients (57.9%) were female, while 24 patients (42.1%) were male, indicating a modest female predominance. The mean age of the entire study cohort was calculated as 45.4 years, with the youngest patient aged 18 and the oldest aged 77 years. When stratified by sex, female patients had a higher mean age of 50.4 years compared to 38.5 years among their male counterparts, suggesting a possible age-related trend in gallbladder polyp development or presentation.

The overwhelming majority of the cohort (n=50, 87.7%) presented with a variety of gastrointestinal symptoms that prompted further evaluation (Table 1). The most commonly reported symptoms were dyspepsia, right upper quadrant (RUQ) abdominal pain, and intermittent episodes of nausea, which are often non-specific but frequently associated with gallbladder pathology. Conversely, only seven patients (12.3%) were asymptomatic, and their polyps were discovered incidentally during abdominal

imaging performed for unrelated reasons such as general health screening or investigation of other abdominal complaints. Interestingly, all asymptomatic individuals had polyps measuring less than 10 mm in diameter.

In patients with symptomatic polyps <10 mm, additional upper gastrointestinal (GIS) causes of dyspepsia or pain (such as gastritis, reflux disease, or peptic ulcer) were assessed. Gastroscopy was performed in 18 patients (31.6%) and revealed no significant pathology that could account for the symptoms in any case.

Regarding polyp size, 43 patients (75.4%) had polyps smaller than 10 mm, while the remaining 14 patients (24.6%) presented with polyps that were equal to or greater than 10 mm. A size threshold of 10 mm is frequently considered clinically significant due to its established association with increased malignancy risk. Among those with polyps \geq 10 mm, symptoms such as RUQ pain and dyspeptic complaints were more prevalent, suggesting a potential correlation between polyp size and symptomatic manifestation. In terms of number, most patients (n=48, 84.2%) were found to have a solitary polyp upon pathological evaluation, whereas nine patients (15.8%) had multiple polyps. This finding reinforces the notion that solitary polyps are more common in the general population undergoing cholecystectomy for polyp-related indications.

Histopathological assessment of the resected gallbladders revealed that the vast majority of cases (n=55, 96.5%) were non-neoplastic in nature (Table 2). These lesions included cholesterol polyps, fibrous hyperplasia, and other benign alterations associated with chronic inflammation. Only two patients (3.5%) were found to have neoplastic changes. One of these cases was characterized by benign intraluminal papillary neoplasia, while the other exhibited high-grade intraepithelial neoplasia, a finding suggestive of

Table 1. Clinical characteristics and polyp size distribution

Parameter	Total (n=57)	Female (n=33)	Male (n=24)	Notes
Age (years)	45.4 (18–77)	50.4 (18-77)	38.5 (23-64)	Mean age with overall range
Clinical Presentation				
Symptomatic	50 (87.7%)	28	22	Predominantly dyspepsia, RUQ pain, and/or nausea
Asymptomatic	7 (12.3%)	5	2	All with polyps <10 mm
Polyp Size				
<10 mm	43 (75.4%)	22	21	Majority; frequently associated with benign findings
\geq 10 mm	14 (24.6%)	11	3	More often associated with prominent symptoms and neoplastic changes
Polyp Number				
Solitary	48 (84.2%)	27	21	
Multiple	9 (15.8%)	6	3	

Table 1 presents the demographic and clinical characteristics of 57 patients with gallbladder polyps, stratified by sex. The mean age was 45.4 years, with a slightly higher mean age observed in females (50.4 years) compared to males (38.5 years). Most patients (87.7%) were symptomatic, commonly presenting with dyspepsia, right upper quadrant pain, and nausea. Among the polyps, the majority (75.4%) were smaller than 10 mm, with these smaller polyps typically associated with benign findings. In contrast, larger polyps (\geq 10 mm) were more frequently linked to notable symptoms and potential neoplastic changes. Additionally, most polyps were solitary (84.2%), while 15.8% of patients had multiple polyps.

Table 2. Histopathological findings and gender distribution

Histopathological Category	Total (n=57)	Female (n=33)	Male (n=24)	Additional Details
No Neoplasia	55	32	23	In 53 cases, chronic cholecystitis was noted, with additional benign findings (cholesterol polyps, cholelithiasis, etc.)
Chronic cholecystitis	49	22	27	8 patients without chronic cholecystitis
Neoplastic Changes	2 (3.5%)	1	1	One case of benign intraluminal papillary neoplasia and one case of high-grade intraepithelial neoplasia; both in the ≥ 10 mm group
Other Benign Findings	5	3	2	
Adenomyomatosis	2	2	0	
Inflammatory polyp	1	0	1	
Hyperplastic polyp	2	1	1	

Table 2 summarizes the histopathological findings in 57 patients with gallbladder polyps, categorized by gender. The majority of cases (55/57) showed no neoplastic changes, with 53 of this exhibiting chronic cholecystitis accompanied by benign conditions such as cholesterol polyps or cholelithiasis. Chronic cholecystitis was present in 49 patients, with 8 patients not demonstrating this pathology. Neoplastic changes were identified in two cases (3.5%), consisting of one benign intraluminal papillary neoplasia and one high-grade intraepithelial neoplasia, both associated with polyps ≥ 10 mm. Other benign findings included adenomyomatosis (n=2), inflammatory polyps (n=1), and hyperplastic polyps (n=2), with slight gender variations in distribution.

Table 3. Comparison of clinical and demographic characteristics by gallbladder polyp size

Variable	Total (n=57)	<10 mm Polyp (n=43)	≥ 10 mm Polyp (n=14)
Age, years (mean \pm SD)	45.4 \pm 12.6	44.2 \pm 11.9	48.7 \pm 13.3
Female sex, n (%)	33 (57.9)	24 (55.8)	9 (64.3)
Symptomatic, n (%)	50 (87.7)	36 (83.7)	14 (100)
Common symptoms, n (%)			
Dyspepsia	31 (54.4)	22 (51.2)	9 (64.3)
RUQ pain	29 (50.9)	20 (46.5)	9 (64.3)
Polyp multiplicity, n (%)			
Single polyp	48 (84.2)	36 (83.7)	12 (85.7)
Multiple polyps	9 (15.8)	7 (16.3)	2 (14.3)

Table 3 compares the clinical and demographic characteristics of patients based on polyp size (<10 mm vs. ≥ 10 mm). The mean age was higher in patients with larger polyps (48.7 \pm 13.3 years) compared to those with smaller polyps (44.2 \pm 11.9 years). The prevalence of symptomatic cases was notably higher in the ≥ 10 mm group (100%) than in the <10 mm group (83.7%). Common symptoms such as dyspepsia and right upper quadrant (RUQ) pain were more frequent in patients with larger polyps. Polyp multiplicity was comparable between the groups, with single polyps being the predominant finding in both size categories.

pre-malignant transformation. Notably, both of these neoplastic lesions occurred in patients with polyps measuring ≥ 10 mm, further supporting the clinical importance of polyp size as a predictive factor for malignancy risk.

Chronic cholecystitis was observed in 49 patients, representing 85.9% of the entire cohort. This was often accompanied by cholesterol polyps or associated with cholelithiasis, suggesting a multifactorial inflammatory etiology. In contrast, eight patients did not show any histological evidence of chronic inflammation in their gallbladder specimens. Additional benign findings included adenomyomatosis in two patients, hyperplastic polyps in two patients, and

a single case of inflammatory polyp. These findings highlight the heterogeneity of gallbladder polyp pathology and the importance of thorough histopathological examination following cholecystectomy.

A comparative analysis between male and female patients revealed no statistically significant differences in terms of neoplastic transformation. Among the 33 female patients, one neoplastic lesion was detected, and similarly, one neoplastic lesion was found in the group of 24 male patients. This suggests that gender may not play a significant role in the likelihood of neoplastic progression of gallbladder polyps. Furthermore, both neoplastic cases involved

polyps ≥ 10 mm, consistent with previously reported literature indicating that polyp size, rather than gender, is a more critical factor in predicting neoplastic potential. It is also worth noting that polyps < 10 mm were almost universally associated with benign histopathological outcomes across both sexes.

When correlating clinical presentation with histopathological results, a clear pattern emerged. All asymptomatic patients had polyps smaller than 10 mm and exhibited benign histological features, most commonly cholesterol polyps or findings suggestive of incidental cholelithiasis. In contrast, symptomatic individuals, particularly those presenting with larger polyps (≥ 10 mm) were more likely to show pathological evidence of chronic cholecystitis and, in rare cases, neoplasia (Table 3). These findings underscore the diagnostic relevance of combining clinical symptomatology with imaging and size-based assessment to guide treatment decisions and risk stratification. The presence of symptoms in patients with large polyps should prompt clinicians to maintain a heightened index of suspicion for potential histopathological abnormalities.

DISCUSSION

The most prominent finding of this study is the extremely low rate of neoplastic transformation among patients who underwent cholecystectomy for gallbladder polyps. Only two cases (3.5%) demonstrated neoplastic changes, and both were associated with polyps ≥ 10 mm. This clear separation between small and large polyps reinforces the size-dependent risk pattern observed in several international series and supports the risk stratification thresholds adopted in contemporary guidelines. The complete absence of neoplasia among polyps < 10 mm in our cohort further indicates that conservative management is a safe and reasonable strategy for small lesions.

The second notable pattern in our data is the demographic distribution. Our cohort was younger than most Western populations described in recent reports and showed a female predominance. While our sample size limits firm conclusions, this trend suggests that regional or population-specific factors may influence GP epidemiology. The older age of female patients compared with males may also reflect more frequent imaging in women undergoing evaluation for biliary or gastrointestinal symptoms.

Histopathological analysis in our study showed that almost all polyps were benign, most commonly cholesterol polyps. Histopathologically, cholesterol polyps dominated our series, which is consistent with prior reports describing these lesions as comprising 60–90% of all GP.^[14,15] Moreover, the histopathological spectrum also included inflammatory and hyperplastic polyps, with adenomyomatosis and fibrous hyperplasia occasionally identified. This variety underscores the heterogeneity of gallbladder mucosal lesions and the limitations of preoperative imaging in accurately predicting polyp pathology.^[16]

The discrepancy between radiological findings and

histopathology once again highlights the limitations of ultrasonography. Although USG is useful in detecting polyps, it is not sufficiently reliable in distinguishing between benign and neoplastic lesions; therefore, size and growth rate should be more decisive in the decision-making process.

A critical clinical implication of our findings is the reaffirmation of the 10 mm size threshold as a significant predictor of neoplastic potential. Both patients with neoplastic lesions in our study had polyps ≥ 10 mm, in agreement with prior reports, who reported that malignant or pre-malignant changes are rarely observed in polyps smaller than this size.^[17,18] Our study also observed that all polyps < 10 mm were histologically benign, further supporting the safety of conservative management for small, asymptomatic polyps.

Our findings mirror the revised algorithm proposed in the 2023 ESGAR/EAES/ESGE guideline (prioritising cholecystectomy for polyps ≥ 10 mm or those showing rapid interval growth) and are further supported by the 2024 systematic review by Wang et al.,^[2] which reached identical conclusions on size- and growth-based risk stratification.^[19,20]

Interestingly, we observed no statistically significant association between sex and the presence of neoplastic lesions. Although previous studies have noted a slight male predominance in malignancy-associated polyps our findings suggest that gender may not be a reliable standalone risk factor.^[21] Instead, polyp size, patient age, and symptoms appear to be more relevant in risk stratification. It is worth noting, however, that female patients in our cohort were significantly older than males, which might reflect a greater prevalence of comorbid biliary conditions or incidental detection in older populations undergoing more frequent imaging.

Strengths and Limitations

The strengths of this study include a focused cohort with histologically confirmed diagnoses and comprehensive data on clinical, radiological, and pathological parameters. However, the study has several limitations. The principal limitations of this study are its small sample size, single-center design, and absence of long-term follow-up data. Additionally, the inability to retrieve complete data on non-operatively managed polyps limits broader epidemiological interpretation.

CONCLUSION

Our findings reinforce current guidelines that advocate for cholecystectomy in symptomatic patients and those with gallbladder polyps ≥ 10 mm due to the increased risk of neoplastic transformation. Polyps < 10 mm, particularly in asymptomatic individuals, were overwhelmingly benign, supporting a conservative follow-up approach in selected patients. While imaging and clinical features can aid in risk stratification, histopathological confirmation remains the gold standard for definitive diagnosis.

Future multicenter prospective studies with larger cohorts and long-term follow-up are needed to refine risk models and optimize management strategies for gallbladder polyps, particularly those in the 6–10 mm range. The development of novel biomarkers or advanced imaging modalities may also help bridge the current gap between radiological suspicion and pathological certainty.

Ethics Committee Approval

The study was approved by the Ankara Etlik City Hospital Ethical Committee (Date: 25.12.2024, Decision No: AEŞH-BADEK-2024-1204).

Informed Consent

Informed-consent requirements were waived because the study relied exclusively on previously documented data.

Peer-review

Externally peer-reviewed.

Authorship Contributions

Concept: M.S.S.; Design: S.D.; Supervision: S.B.; Materials: S.D., S.B.; Data collection &/or processing: S.D.; Analysis and/or interpretation: M.S.S., S.D.; Literature search: S.D., S.B.; Writing: M.S.S.; Critical review: S.D., S.B.

Conflict of Interest

None declared.

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Safra Kesesi Poliplerinin Klinik ve Patolojik Özellikleri: Retrospektif Kohort Çalışma

Amaç: Safra kesesi polipleri (SKP), abdominal ultrasonografi ile giderek daha sık saptanmaktadır. Çoğu benign olmakla birlikte, preoperatif dönemde benign ve neoplastik lezyonların ayırt edilmesi güçtür. Mevcut kılavuzlar ≥ 10 mm poliplerde kolesistektomi önermektedir, ancak daha küçük veya semptomatik poliplerde malignite riski tartışmalıdır.

Gereç ve Yöntem: Radyolojik olarak safra kesesi polibi saptanan ve elektif kolesistektomi uygulanan ≥ 18 yaş erişkin hastalar retrospektif olarak incelendi. Demografik, klinik, radyolojik ve histopatolojik veriler kaydedildi. Primer sonuç, histopatolojik olarak neoplazi varlığıydı. Kategorik veriler sayı (%) ile, sürekli değişkenler ortalama \pm SS veya medyan (IQR) ile sunuldu.

Bulgular: Toplam 57 hasta (33 kadın, 24 erkek; ort. yaş 45.4 ± 14.8 yıl) çalışmaya dahil edildi. Hastaların çoğu (%87.7) semptomatikti; en sık sağ üst kadranda ağrısı ve dispepsi izlendi. Kırk üç hastada (%75.4) polip < 10 mm, 14 hastada (%24.6) ≥ 10 mm idi. Histopatolojide 55 olguda (%96.5) kolesterol veya diğer benign polipler saptandı. İki hastada (%3.5) neoplastik değişiklik görüldü: Biri benign intraluminal papiller neoplazi, diğeri yüksek dereceli intraepitelyal neoplazi; her iki olgu da ≥ 10 mm poliplerdeydi. < 10 mm poliplerde neoplazi izlenmedi. Cinsiyet, semptom durumu ve polip çokluğu ile neoplastik dönüşüm arasında ilişki bulunmadı.

Sonuç: Bu kohortta neoplastik dönüşüm yalnızca ≥ 10 mm poliplerde görüldü ve profilaktik kolesistektomi için 10 mm eşik değerini destekledi. < 10 mm polipler özellikle asemptomatik hastalarda, tamamen benign bulundu ve ultrason ile konservatif izlem güvenilir görüldü. Orta boyutlu lezyonlar için risk sınıflamasını netleştirmek amacıyla daha geniş, prospektif çalışmalara ihtiyaç vardır.

Anahtar Sözcükler: Kolesistektomi; polipler; retrospektif çalışmalar; risk değerlendirmesi; safra kesesi neoplazileri.