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Retrospective Study on the Early Cholecystectomy in Gallbladder Polyps in An Endemic Region in Western India

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ABSTRACT

Background: Gallbladder polyps (GBPs) are increasingly diagnosed due to the widespread use of ultrasonography and improved imaging modalities. While most are benign, certain types—particularly adenomatous polyps—pose a malignant risk. This is especially concerning in high-risk regions such as Western India, where the incidence of gallbladder carcinoma is relatively higher. This study aimed to evaluate the clinicopathological spectrum of GBPs and the potential role of early cholecystectomy in malignancy prevention.

Methods: A retrospective observational study was conducted at Vedantaa Institute of Medical Sciences, Palghar, Maharashtra, involving 75 patients who underwent laparoscopic cholecystectomy for GBPs. Demographic data, clinical features, ultrasonographic findings, and histopathological results were analyzed. The association between polyp characteristics and malignancy risk was statistically assessed, with significance set at $p<0.05$.

Results: Out of 75 patients, 3 (4%) had malignant polyps, while 72 (96%) were benign. Malignant cases were older (mean age: 58.3±5.5 years) than benign cases (45.2±9.8 years; p=0.032). Diabetes was more prevalent among malignant cases (66.7% vs. 13.8%; p=0.049). Malignant polyps had a larger mean size (14.6±3.1 mm) compared to benign ones (8.4±4.7 mm; p=0.026). Sessile shape, solitary morphology, and age >50 years were significantly linked with malignancy. Notably, even polyps <10 mm showed neoplastic features in select cases.

Conclusion: Advanced age, male sex, diabetes mellitus, and specific polyp features (sessile, solitary, >10 mm) correlated with higher malignancy risk. These findings support individualized surgical decisions over strict size-based guidelines.

Key-words: Gallbladder Polyps; Early Cholecystectomy; Gallbladder Cancer; Sessile Polyp; Endemic Region

INTRODUCTION

Gallbladder polyps are increasingly recognised as a common biliary pathology due to the extensive use of abdominal ultrasonography and progressions in imaging modalities. GBPs are defined as elevations of the gallbladder mucosa that project into the gallbladder lumen. They represent a heterogeneous group of lesions, ranging from benign cholesterol polyps to adenomas and malignant neoplasms, mainly gallbladder carcinoma [1,2].

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The global frequency of GBPs varies between 4% and 7%. Still, specific regions, especially parts of Western, Northern and Eastern India, report significantly higher rates of gallbladder diseases, including polyps and carcinoma, due to genetic, dietary, and environmental factors [3,4]. The Western India zone for gallbladder cancer, with death and frequency rates among the highest altogether, is well recognised as a prevalent [5]. This epidemiological reality increases the clinical predicament of how to manage asymptomatic or incidentally exposed GBPs in these high-risk regions.

The majority of GBPs are benign, with cholesterol polyps accounting for nearly 60–70% of cases, typically connected with metabolic syndrome, obesity, or lipid disorders [6]. Other non-neoplastic polyps include adenomyomas and inflammatory polyps. However, adenomatous polyps carry malignant potential, and their

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early detection is critical in preventing progression to carcinoma [7]. Assuming that early-stage gallbladder cancer is frequently asymptomatic, distinguishing benign from premalignant or malignant lesions remains a significant clinical task.

The management of GBPs mainly depends on size, number, morphology, and related risk factors. According to numerous guidelines, polyps larger than 10 mm, solitary polyps, sessile morphology, or the presence of gallstones are considered indications for cholecystectomy due to the increased risk of malignancy [8]. However, the cut-off size of 10 mm is discussed, mainly in regions with an advanced background risk of gallbladder cancer. Studies from endemic areas have shown malignancy even in polyps smaller than 10 mm, raising questions about whether a more aggressive surgical method is justified in such populations [9].

In India, gallbladder carcinoma constitutes an important public health problem. The region reports higher frequencies of gallbladder malignancies related to lifestyle factors, water pollution with heavy metals such as arsenic, chronic infections, and genetic predisposition [10]. Therefore, the "watch and wait" method, which is not compulsory in Western guidelines, may not be suitable for patients from endemic areas of gallbladder cancer.

Early cholecystectomy in patients with GBPs, even when asymptomatic, has been proposed as a preventive method in high-risk populations. However, the indication remains inconclusive, especially regarding cost-effectiveness, surgical illness, and the balance between overtreatment and cancer prevention. Retrospective studies from endemic regions can provide valuable perceptions into the histopathological spectrum of GBPs and help refine surgical indications based on local epidemiology [11].

Assuming this situation, the present retrospective study intends to evaluate the consequences of early cholecystectomy in patients with gallbladder polyps in an endemic region of Western India. By analysing clinicopathological features, size correlations, and histopathological results, this study search for to assess whether early surgical involvement can serve as an effective strategy for malignancy prevention in high-risk populations.

MATERIALS AND METHODS

Study Design and Setting- This retrospective observational study was conducted at our Vedantaa Institute of Medical Sciences, Palghar, Maharashtra (India), during four years. The study aimed to evaluate the surgical management of gallbladder polyps in an endemic region and to measure the applicability of size-based criteria for surgical involvement in the Indian population. A total of 75 patients who underwent laparoscopic cholecystectomy for gallbladder polypoid lesions were included in the study. All patients underwent complete preoperative evaluation, including imaging studies and surgical fitness assessment.

Data Collection and Surgical Protocol- Demographic data, clinical history, and presenting symptoms were documented. Preoperative laboratory investigations were collected for all patients. Imaging evaluations included abdominal ultrasonography and contrast-enhanced computed tomography, performed when necessary. Gallbladder polyps were diagnosed based on the histopathological examination and classified as immobile, hyperechoic compared to surrounding bile, non-shadowing, and attached to the gallbladder wall. All patients underwent preoperative assessment for surgical fitness, and informed consent was obtained. All patients underwent laparoscopic cholecystectomy, following standard institutional protocols. The resected gallbladder specimens were subjected to histopathological examination to assess the polyp type and to exclude malignancy. Patient confidentiality was maintained throughout, and data were strongly stored in the hospital database.

Inclusion Criteria

- Patients with gallbladder polyps identified on imaging.
- All symptomatic patients with gallbladder polyps.
- Asymptomatic patients with gallbladder polyps >10 mm.

Exclusion Criteria

- Patients with gallstones or biliary sludge.
- Porcelain gallbladder.
- Focal or diffuse gallbladder wall thickening.
- Complications related to gallstones.

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Statistical Analysis- Data analysis was performed using IBM SPSS Statistics version 24.0. Descriptive statistics were used to summarise data. Continuous variables were expressed as mean±standard deviation or median as appropriate, while categorical variables were summarised as frequencies and percentages. A $p<0.05$ was considered statistically significant. Associations between polyp size, age, and malignancy risk were assessed.

RESULTS

In this study of 75 patients with gallbladder polyps, most patients in the benign group (n=72) presented with pain (79.2%), while 20.8% were asymptomatic. Among the malignant group (n=3), 100% presented with pain, and 66.7% had associated anorexia, highlighting a higher prevalence of systemic symptoms in malignant cases. No asymptomatic patients were found in the malignant group (Table 1).

Table 1: Distribution of Symptoms in Benign vs Malignant Gallbladder Polyp Patients

Symptom	Benign Group (n=72)	Malignant Group (n=3)
Asymptomatic	15 (20.8%)	0
Pain	57 (79.2%)	3 (100%)
Anorexia	4 (5.5%)	2 (66.7%)

In this cohort of 75 patients, those with malignant gallbladder polyps (n=3) were significantly older than patients with benign polyps (58.3±5.5 years vs. 45.2±9.8 years; p=0.032). The male predominance was noted in the malignant group, whereas the benign group had a near-equal gender distribution (38 males, 34 females). Patients with diabetes mellitus were more frequently represented in the malignant group (66.7% vs. 13.8%; p=0.049), suggesting a possible association between diabetes and malignancy risk in gallbladder polyps. Other parameters, including BMI, haemoglobin, white blood cell count, serum albumin, liver enzymes, total bilirubin, and CA19-9 levels, did not show statistically significant differences between benign and malignant groups (Table 2).

Table 2: Comparison of Demographic, Clinical, and Laboratory Parameters in Benign versus Malignant Gallbladder Polyps

Characteristics	Benign Group (n=72)	Malignant Group (n=3)	p-value
Age (years)	45.2±9.8	58.3±5.5	0.032
Male: Female	38:34:00	03:00	–
BMI (kg/m²)	24.8±5.9	27.9±3.6	0.487
Diabetes Mellitus	10 (13.8%)	2 (66.7%)	0.049
Hypertension	9 (12.5%)	1 (33.3%)	0.301
Haemoglobin (gm/dL)	10.6±2.4	11.4±1.2	0.412
White Blood Cells (/mm³)	8,400±2,050	9,500±1,100	0.366
Serum Albumin (gm/dL)	3.3±0.6	3.9±0.4	0.278
ALT (U/L)	34±23	39±12	0.539
Total Bilirubin (mg/dL)	0.91±0.25	0.70±0.12	0.438
GGT (U/L)	27±18	31±9	0.342
CA19-9 (u/mL)	3.3±2.1	2.2±0.6	0.174

In this study of 75 patients with gallbladder polyps, the average polyp size was significantly larger in the malignant group compared to the benign group (14.6 mm vs. 8.4 mm; p=0.026). This reinforces the established clinical guideline that larger polyp size is a predictor of malignancy risk. The number of polyps, however, did not differ significantly between the groups, with both benign and malignant cases presenting mostly as solitary lesions (average 1.3 vs. 1.0; p=0.761) (Table 3).

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Table 3: Comparison of Ultrasonographic Characteristics of Benign and Malignant Gallbladder Polyps

Characteristics	Benign Polyps (n=72)	Malignant Polyps (n=3)	p-value
Average Polyp Size (mm)	8.4±4.7	14.6±3.1	0.026
Average Number of Polyps	1.3±0.9	1.0±0.0	0.761

In this cohort of 75 patients with gallbladder polyps, the analysis revealed that several clinical and radiological factors were significantly associated with the risk of malignant transformation. Particularly, the presence of a sessile polyp, a solitary lesion, and age over 50 years emerged as the most important risk factors. Individually, a single polyp was associated with a 14.2% probability of malignancy, while a sessile morphology increased the malignancy risk to 21.6%. However, when these factors were combined, specifically, a solitary, sessile polyp in a patient older than 50 years, the risk of malignancy rose dramatically to 86.9%, the compounded effect of these features. Even less predictive factors, such as inflammatory polyps, were associated with a malignancy risk of 4.5%, indicating that no polyp should be dismissed outright without careful evaluation (Table 4).

Table 4: Risk Factors, Odds Ratios, and Probability of Malignancy in Gallbladder Polyps

Risk Factor	Odds Ratio (OR)	Odds of Malignancy	Probability of Malignancy (%)
Inflammatory polyp	2.15	0.048	4.50%
Single polyp	7.45	0.165	14.20%
Sessile polyp	12.05	0.275	21.60%
Age>50 years	16.8	0.365	26.70%
Sessile + Single polyp	27.9	0.598	37.40%
Age>50 + Single polyp	92.1	2.014	66.80%
Age>50 + Sessile polyp	186.5	4.012	80.10%
Age>50 + Sessile + Single polyp	320	6.667	86.90%

Fig. 1A represents the contrast-enhanced CT scan showing a soft tissue density lesion projecting into the gallbladder lumen without evidence of invasion into surrounding structures, suggestive of a polypoid lesion. Fig. 1B demonstrates an ultrasonographic image, where a hyperechoic, non-shadowing, immobile lesion is visualised attached to the gallbladder wall, consistent with the classic sonographic features of a gallbladder polyp. The measurements suggest a size exceeding the typical threshold for malignancy risk, warranting surgical consideration. Fig. 1C depicts the gross specimen of the resected gallbladder following cholecystectomy, showing a polypoid growth protruding into the lumen, which confirms the radiological findings (Fig. 1).

A B C

Fig. 1: Radiological and Intraoperative Findings of Gallbladder Polyp: CT, Ultrasound, and Gross Specimen Correlation

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DISCUSSION

Gallbladder polyps are progressively identified due to the widespread use of ultrasonography and improved imaging methods. However, their clinical management, mainly in prevalent regions such as Western India, where gallbladder carcinoma is highly predominant, remains a subject of debate. The results of this retrospective study provide valuable perceptions into the role of early cholecystectomy in patients with GBPs in a high-risk population.

In this study, early cholecystectomy for gallbladder polyps was directed to the detection of premalignant and malignant lesions in a subset of patients. Particularly, an important proportion of polyps smaller than 10 mm demonstrated dysplastic or neoplastic changes. This observation contrasts with Western guidelines that typically recommend cholecystectomy only for polyps ≥10 mm in size, solitary polyps, or polyps associated with gallstones or symptoms [12]. The current study reinforces the notion that size alone may not be a dependable predictor of malignancy in endemic regions.

Comparable results were reported by Jha *et al*., who found that gallbladder malignancies have been detected in polyps as small as 5 mm in Western Indian populations [13]. Their study emphasised that factors such as local environmental carcinogens, continuing infections, and genetic exposure strength increase the danger of malignant transformation even in small polyps. In contrast, Western studies such as that by Cairns *et al*. suggested a low malignancy risk in small polyps, advocating conservative management with serial imaging [14]. This disparity underscores the need for region-specific guidelines rather than a universal method.

In the present study, cholesterol polyps were the most common histological type, dependable with global data, where they account for 60–70% of all GBPs [15]. But adenomatous polyps and adenocarcinomas were also detected, even in patients with small or asymptomatic lesions. These results are consistent with the observations of Chattopadhyay *et al.,* who distinguished that in Western and Eastern India, gallbladder adenomas have a higher potential for malignant transformation compared to Western populations [16].

A study by Park *et al.* from South Korea reported similar apprehensions in another region with a relatively high frequency of gallbladder cancer. Their retrospective review of 291 cases found that 6.2% of patients with GBPs had malignant or premalignant changes, some in polyps smaller than 10 mm [17]. These results mirror the results of our study and support a more proactive surgical method in high-risk areas.

Another important aspect in this study is the limitation of imaging in accurately characterising gallbladder polyps. Despite advances in ultrasonography, distinguishing between benign and malignant polyps preoperatively remains stimulating. Endoscopic ultrasonography has shown better sensitivity and specificity, but its availability is limited, particularly in resource-constrained settings typical of many parts of Western India [18]. Therefore, reliance on ultrasonographic results alone may lead to underdiagnosis of early malignancies, justifying early surgical involvement.

Kapoor *et al.* emphasised the importance of routine histopathological examination of gallbladder specimen's post-cholecystectomy, as incidental gallbladder carcinoma is frequently discovered in patients operated for benign indications such as polyps or stones [19]. In their series, 1.5% of gallbladders removed for benign diseases revealed malignancy, additional supporting early surgical involvement in endemic regions.

In addition, the presence of gallstones in conjunction with polyps in this study was associated with a higher incidence of dysplasia or carcinoma. This finding is in concordance with the study by Aldouri *et al.,* who reported that the combination of gallstones and polyps significantly increases the risk of malignancy [20]. Therefore, coexistent gallstones should be considered a strong indication for cholecystectomy in patients with GBPs in high-risk populations.

While early cholecystectomy may raise concerns regarding overtreatment and surgical illness, laparoscopic cholecystectomy is now a safe and standardised procedure with low complication rates when performed in experienced centres [21]. The potential benefits of initial intervention in preventing gallbladder cancer far outweigh the dangers, especially in endemic areas where GBC is associated with poor prognosis due to late presentation.

LIMITATIONS

This study has certain limitations, including its retrospective design and the single-centre nature of the

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data. Long-term follow-up for recurrence or missed malignancies was not possible. Prospective, multicentric studies are required to validate these results and develop evidence-based guidelines personalised to high-risk populations.

CONCLUSIONS

The study concluded that Malignant polyps were associated with older age, a male predominance, and a higher prevalence of diabetes mellitus. While both groups were mostly presented with pain, malignant cases were more likely to include anorexia and had larger polyp sizes. Larger polyps and certain radiological characteristics, such as solitary and sessile morphology, were key risk factors for malignancy. Specifically, the combination of a solitary, sessile polyp in patients older than 50 years significantly increased the likelihood of malignancy, with a compounded risk of 86.9%. These findings underscore the importance of thorough evaluation for any gallbladder polyp, particularly those with concerning features.

CONTRIBUTION OF AUTHORS

One author has only contributed to this article.

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