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Assessment of Congenital Anomalies Encountered During Laparoscopic Cholecystectomy

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Author`s Contribution

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ABSTRACT

Objective: To determine the congenital anomalies encountered during laparoscopic cholecystectomy.

Methodology: The study was conducted in the Department of Surgery from February 2021 to July 2021 following ethical approval, included patients scheduled for cholecystectomy due to gallstone disease. Both male and female participants aged 18 to 60 years who consented to participate were encompassed. Laparoscopic techniques under general anesthesia were employed, and anomalies observed during surgery were meticulously documented using a predefined proforma. Subsequently, all collected data were entered and subjected to analysis using SPSS version 26.

Results: A total of 143 patients were included in the analysis. The average age of the patients was 41.34 years, and the average duration of hospital stay was 6.28 days. The overall incidence of congenital anomalies among patients who underwent laparoscopic cholecystectomy was 18.88%. The most common anomaly observed was cystic artery anomalies, affecting 8.39% of patients, followed by cystic duct anomalies (3.49%), right hepatic duct anomaly (2.79%), gall bladder anomalies (2.9%), and the least common being the presence of a common hepatic artery (1.39%).

Conclusion: In summary, the study revealed an overall incidence of anatomical variations during laparoscopic cholecystectomy of 18.88%, with cystic artery anomalies emerging as the most common variation. It is essential to consider these anomalies during the procedure to mitigate potential complications.

Keywords: Laparoscopic cholecystectomy, anatomical variations/anomalies,

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Introduction

Gallstone disease is a major health problem worldwide particularly in the adult population.[1] The prevalence of gallstones in the United States is around 10% to 15 % amongst white males and in Europe is around 18.5%.[2] Although the data from within the country is scanty, but the breakthrough of the admission data from Karachi shows that it is the 3rd commonest cause of admission accounting for 16% and 14%.[3,4] Cholecystectomy is procedure of choice for symptomatic gallstones. The traditional open cholecystectomy performed for the first time in 1882 by Carl August Langerbach[5] has been replaced by Laparoscopic Cholecystectomy (LC) which has revolutionized the treatment of gall bladder disease and is now the gold standard for the treatment of gallstones and the commonest operation performed laparoscopically worldwide.[6] Congenital anomalies of extra hepatic biliary tree have long been recognized but are rare and may be of clinical importance because they may provide surgeons with an unusual surprise during laparoscopic cholecystectomy.[7] These anomalies include aberrant or accessory biliary ducts, aberrant cystic duct, bile duct cysts, alteration of biliary tract associated with situs

inversus and anomalous junction of bile duct to pancreatic duct along with vascular anomalies.[8] Variations in the anatomy of gallbladder, bile ducts and the arteries that supply them and liver are important to the surgeon because failure to recognize them may lead to inadvertent ductal ligation, biliary leaks, and strictures after laparoscopic cholecystectomy.[9] In a study conducted by Comitalo JB and colleagues[10] have shown success rate of laparoscopic cholecystectomy was 98% while the complication rate ranger from 0.5% to 6%,[11,12] in patients without congenital anomalies. Data regarding success rate and post-operative outcome in patients having congenital anomalies is still lacking worldwide. Only one previously conducted 11 years old study in Pakistan have shown post-operative complication rate of 20% in patients having congenital anomalies observed during laparoscopic cholecystectomy.[13] Familiarity of these variants is important prior to laparoscopic cholecystectomy, however, preoperative diagnosis by routine investigations is difficult[8] and is only seen in exceptional cases and they often turn out to be unexpected findings during laparoscopic surgery. However, a wide spectrum of biliary tree malformations along with pancreatic anomalies can be recognized by radiologic evaluation. Recent advances in MRI, MRCP and Multi Detector (MD) or Helical CT scan have improved image quality greatly and have contributed to increased recognition of these entities,[14] but unfortunately these investigations are not routinely advised due to cost and non-availability issues particularly in areas where most of the patients came to government hospital for their treatment hence these congenital anomalies incidentally identified during the laparoscopic surgery by the surgeons. That is why this study aims to determine the frequency of congenital anomalies encountered during laparoscopic cholecystectomy and correlation with surgical outcome.

Methodology

This cross-sectional study was conducted in the Department of General Surgery, Unit-II, Liaquat University Hospital Jamshoro/Hyderabad from February 2021 to July 2021. A non-probability sampling technique. For this study, Sample size was calculated by using Raosoft software; $n = t^2 \times p\ (1-p) \times m^2$, Where n = sample size, t = confidence interval (95%), p = probability of event happening (20.3%) (13), m = margin of error (5%). Calculated Sample size is 143 based on the above formula.

The inclusion criteria for this study were all the patients planned for cholecystectomy due to gallstone disease, both males and females, age more than 18 years and less than 60 years (in which laparoscopy can easily be performed), and those who consent to participate. The exclusion criteria for this study were patients with acute cholecystitis, empyema gallbladder, patients with HBsAg, anti-HCV, or HIV positive, presence of growth or underlying tumor, patients with American Society of Anesthesiologist (ASA) class III/IV, and those who do not consent to participate. All the patients who were planned for laparoscopic cholecystectomy and meeting inclusion & exclusion criteria were enrolled in our study. Ethical approval from the hospital's ethics committee was taken before commencement of the study. Informed & written consent were also taken from all patients or accompanied attendants after explaining the purpose of study, laparoscopic procedure and associated complications.

Diagnosis of cholelithiasis was made based on the patient's history and physical examination. The diagnosis then confirmed by ultrasound abdomen. All baseline investigations (blood CBC+ESR, Urea, Creatinine, Electrolytes, Liver function tests, HBsAg anti-HCV, and HIV) were sent as per protocol before surgery. All the surgeries were performed through laparoscopic technique under general anesthesia by the surgical. Anomaly during surgery was recorded in a pre-designed proforma. All data were entered and analyzed through Statistical Package for the Social Sciences (SPSS) version 26. Mean and standard deviation were used for continuous data like age and duration of hospitalization while frequency and percentage were calculated for categorical variables like gender, education status, area of residence, marital status, anomalies observed during operation, and complications observed post-operatively.

Results

The mean age of patients undergoing cholecystectomy was 41.34 years with a standard deviation of 9.74 years. The majority of patients (78.32%) were aged over 40 years. There were more male patients compared to females, accounting for 70.62% versus 29.37%, respectively. Most of our study subjects resided in rural areas rather than urban areas, with proportions of 62.23% and 37.76%, respectively. The mean duration of hospitalization was 6.28 days, ranging from a minimum of 3 days to a maximum of 11 days. The overall incidence of congenital anomalies was 18.88% (n = 27) in patients underwent laparoscopic cholecystectomy. Figure 1.

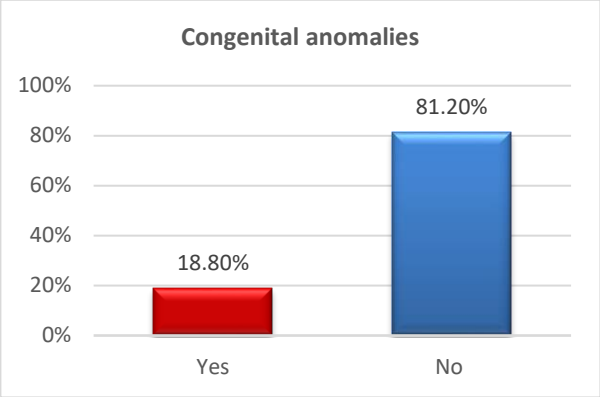

Figure 1. Distribution of patients according to the presence of congenital anomalies during Laparoscopic cholecystectomy. (n = 143)

According to the overall distribution of patients based on the types of congenital anomalies. The most common anomaly observed was cystic artery anomalies (8.39%), followed by cystic duct anomalies (3.49%), right hepatic duct anomaly (2.79%), gall bladder anomalies (2.9%, n = 4), with the least common being the presence of the common hepatic artery (1.39%). Figure 2

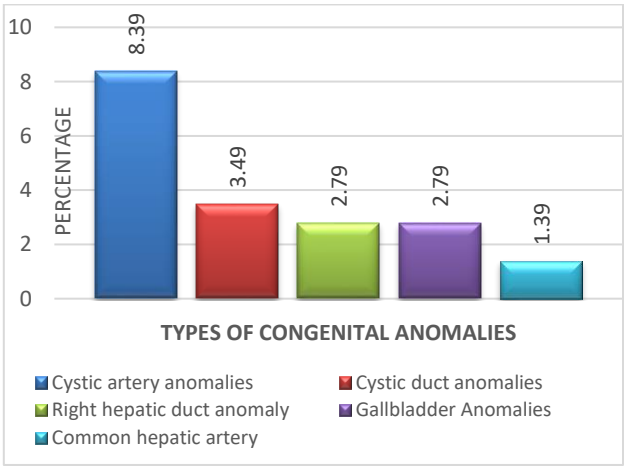

Table I provides a detailed description of congenital anomalies found during laparoscopic cholecystectomy. Among patients with cystic artery anomaly, the most common anomaly was the presence of the artery anterior to the cystic duct (14.81%). Short cystic duct (14.81%) was the most commonly encountered anomaly in patients with cystic duct anomalies. Moynihan's hump anomaly was found in 14.81% of patients with right hepatic duct anomaly. Buried gall bladder was most frequently observed in patients with gall bladder anomalies (7.4%). Long and tortuous cases were found in 7.4% of patients with common hepatic artery anomaly. Table I

Table I: Detailed description of congenital anomalies found during laparoscopic cholecystectomy (n = 27)

Congenital Anomalies	N	%
Cystic Artery Anomalies - (n = 12)		
Artery arising above calot's	2	7.4
Artery anterior to cystic duct	4	14.81
Artery posterior to cystic duct	1	3.7
Artery right to cystic duct	1	3.7
Double cystic artery	1	3.7
Aberrant cystic artery	2	7.4
Short cystic artery	1	3.7
Cystic Duct Anomalies - (n = 05)		
Short cystic duct	4	14.81
Long cystic duct	1	3.7
Accessory cholecysto hepatic duct	0	0
Right Hepatic Duct Anomaly - (n = 04)		
Moynihan's hump anomaly	4	14.81
Gall bladder Anomalies - (n = 04)		
Buried gall bladder	2	7.4
Floating gall bladder	1	3.7
Phrygian cap gall bladder	0	0
Parallel to common bile duct	1	3.7
Common Hepatic Artery Anomalies - (n = 02)		
Long and tortuous cases	2	7.4

Discussion

Open cholecystectomy has traditionally been the procedure of choice for the past many decades in patient with planned for cholecystectomy. Nowadays, laparoscopic cholecystectomy has taken its place for multiple beneficial reasons including, less chances of post-operative complications, decreased duration of hospitalization, and no large post-operative scar but both procedures do not have morbidity and mortality benefits. The majority of our study participants with congenital variations belonged to the middle age group, a trend consistent with findings from previous studies conducted in London,[15] Greece,[16] and Czechia.[17] This observation aligns with the common occurrence of cholelithiasis diagnosis among middle-aged individuals. Additionally, our study predominantly comprised females, a pattern supported by Farooq et al[18]., who reported that females constituted 84.5% of the participants, while males accounted for 15.5% and they found average age of the participants was 38.98+7.68 years, ranging from 27 to 65 years. This is because the prevalence of cholelithiasis.[19,20]

Congenital anomalies/variations of abdominal organs are not so common and present among 1.6% - 47.2% of all patients operated for open or laparoscopic cholecystectomy. Sometimes these variations may become clinically significant and cause the person to seek medical attention.[21] In our study the overall incidence of congenital anomalies was 18.88% in patients underwent laparoscopic cholecystectomy. The most common was cystic artery

anomalies (8.39%) followed by cystic duct anomalies (3.49%) right hepatic duct anomaly (2.79%), gall bladder anomalies (2.9%), and least common was presence of common hepatic artery (1.39%). Consistently Gupta R et al[22] reported that the most common variations were found in cystic arteries, accounting for 16.8% of cases. Anomalies in the CD were detected in 11.4% of cases, while anomalies in the gall bladder were the least frequent, occurring in only 5.4% of cases. In a previously published study by Talpur KAH et al[13] and his colleagues also observed most common congenital anomaly was presence of cystic artery (10.67%), which is almost similar as observed in our study. Another international study from Bangladesh has observed slightly higher prevalence of variation during cholecystectomy (15.2%) but their most common variation was also cystic artery (8%).[23] Although Singh H et al[24] reported that the different anatomical configurations of the cystic artery were noted during laparoscopy. Upon examining 600 cholecystectomies, they found that most patients (85.67%) had the cystic artery situated within the confines of the triangle of Calot.

Outside the triangle of Calot, the artery was observed in 13.33% of patients, while only 1% exhibited the compound type.[24] However the reason behind the common anatomical variation of cystic artery is not clearly understood and these variations most of the times remain undiagnosed because these do not cause any specific complain. Presence of anatomical variations or congenital anomalies during cholecystectomy should be considered as these findings may affect the outcome of such patients by complicating the surgical procedure, increase risk of post-operative complication, and/or increase duration of hospitalization. Particularly, arterial variations should be recognized during cholecystectomy to prevent from unnecessary bleeding caused by iatrogenic injuries.

Conclusion

Our study concludes that anatomical variations during laparoscopic cholecystectomy are not common but of clinical significance. Our study showed an overall incidence of anatomical variation of 18.88%, with the most common anatomical variation being the presence of cystic artery anomalies. Consideration of these anomalies is crucial during laparoscopic cholecystectomy to prevent unwanted complications.

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