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Original Research Article

Evaluation of Preoperative Clinical and Ultrasonogram and Per Operative Laparoscopic Findings in Gall Stone Disease: A Comparative Study

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Abstract

Background: One prevalent surgical issue that occurs all throughout the world is gallbladder disease. The common treatment for cholelithiasis and symptomatic gallbladder diseases prior to the development of laparoscopic cholecystectomy was open cholecystectomy. The purpose of this study is to determine the accuracy of clinical diagnosis following ultrasonographic assessment of gallstone and symptomatic gallbladder disease.

Methods: Patients with gallstones and symptomatic gallbladder disease who are admitted to surgery wards from emergency and outpatient departments are the subjects of this prospective study. From January 2023 to December 2023, 100 patients who were admitted to Heritage Institute of Medical Sciences in Varanasi, Uttar Pradesh, with a diagnosis of gallstone and symptomatic gallbladder diseases had laparoscopic cholecystectomy. Patients were selected according to their age, gender, or suitability for a laparoscopic cholecystectomy.

Results: The experiences of 100 patients who are admitted for laparoscopic cholecystectomy with a clinical and ultrasonographic diagnosis of gallstone and symptomatic gallbladder disease are represented in this study. Operation time was from 30-90 minutes with a mean time of 47.4 minutes**.** Typical clinical presentation was found in most of the cases. 15 (15%) patients presented with epigastric pain of which 12 (12%) patients were misdiagnosed and were treated for duodenal ulcer for years. 1 (1%) patient was diagnosed incidentally during ultrasonography for gynaecological complaints. All the patients in this study undergone ultrasonography of hepatobiliary system and pancreas. Out of 100 cases 93 (93%) cases were found to have stone in gallbladder sonologically, whereas 96 (96%) cases were found to have stone in the gallbladder peroperatively. Ultrasonography detected normal appearance gallbladder with stone in 73 (73%) cases but peroperatively found them in 76 (76%) cases. In 15 (15%) cases sonography revealed fibrosed and contracted gallbladder with stone, whereas 13 (13%) cases were found to have the findings per-operatively. Sonography commented 7 (7%) patients of thick gallbladder wall where per-operatively it was found in 11 (11%) patients. Distended gallbladder with stones was detected sonologically in 6 (6%) cases but peroperatively found them in 7 (7%) cases. In 1(1%) case sonography detected fibrosed and contracted gallbladder without stones but per-operatively such was found in 2 (2%) cases. Gallbladder polyp was found in 1 (1%) case both sonologically and peroperatively. No adhesions and stone in common bile duct were detected by sonologically.

Conclusion: It is possible to draw the conclusion that, in real-time laparoscopic cholecystectomy, a thorough clinical examination combined with ultrasonographic assessment of gallstones and symptomatic gallbladder disease is nearly accurate.

Keywords: Clinical presentation, Laparoscopic cholecystectomy, Detected sonologically, Gallbladder wall.

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Introduction

In Western countries, 10% to 15% of people have gallstones, also known as cholelithiasis, which is a prevalent medical condition that requires surgery.[1] Women are more likely to get gallstones. Obesity, diabetes mellitus, advanced age, estrogen, pregnancy, hemolytic illness, cirrhosis, which varies significantly by geography and ethnicity, and family history are additional risk factors. Only 10 to 20% of them develop symptoms within five to twenty years of diagnosis, making them primarily asymptomatic [1–3]. Acute cholecystitis, jaundice, cholangitis, and acute pancreatitis are among the major consequences that occur at a rate of 0.1% to 0.3% annually, while other mild complications occur at a rate of 2 to 2.6% annually.[4] Although gallbladder-related disease has a low death rate of 0.6%, the disease burden is nevertheless considerable.[5] Patients

may present with epigastric and right upper abdomen pain, nausea and vomiting or referred pain below the right shoulder area or between the shoulder blades, especially right after a fatty meal.[6] The presence of biliary colic with gallstone on an imaging study aids the diagnosis of chronic cholecystitis.[7] Cholecystectomy is the treatment of choice for all patients with symptomatic gallstones and acute cholecystitis and represents the widely accepted "gold standard", relatively easy, less expensive and safe surgery with mortality and morbidity of approximately 0.5% and 10% respectively.[8,9] Ultrasonography is the best imaging modality to diagnose gallstones and associated pathology of gallbladder. Pericholecystic fluid and thickened gallbladder walls are identified in acute cholecystitis; occasionally common bile duct stones and gallbladder sludge can also be seen with abdominal ultrasound. It is 84% sensitive, 99% specific and 96% accurate than oral cholecystography or computed tomography.[1,10] It is non-radiating, non-invasive, easily accessible and inexpensive.[11]

Materials and Methods

This prospective study was conducted at surgery department of Heritage Institute of Medical Sciences in Varanasi, Uttar Pradesh from January 2023 to December 2023. Total 100 patients admitted in surgery wards from emergency and outpatient department with the diagnosis of gallstone and symptomatic gallbladder disease. Quantitative sampling technique was used in the present study.

Samples were selected through inclusion and exclusion method from the patients who were admitted in surgery department of HIMS, diagnosed clinically and ultrasonographycally as gallstone and symptomatic gallbladder diseases.

Patients admitted in the hospitals through emergency and outpatient department, were diagnosed on the basis of clinical history, examination, laboratory data and ultrasonographic findings. In course of management laparoscopic cholecystectomy findings were recorded.

The study was conducted according to the protocol attached herewith. After collection of data according to data sheet, a detailed analysis of the various aspects of clinical findings, ultrasonographic evaluation and per-operative findings during laparoscopic cholecystectomy were made. All data analysis Windows SPSS version 22.0.

Results

All the patients underwent standard 4 ports laparoscopic cholecystectomy by experienced surgical teams. Operation time was from 30-90 minutes with a mean time of 47.4 minutes. The normal adult with an intact hepatic circulation and consuming an average diet secrets 250 to 1000 ml of bile per day, average 40 ml per hour from the hepatic cells. There is a diurnal variation, more being secreted in the daytime than at night. Secretion of bile is an active process, which is dependent upon hepatic blood flow and an oxygen supply available to the hepatic cell.

The main constituents of bile include electrolytes, bile, proteins, cholesterol, fats and bile pigments. Sodium, potassium, calcium and chloride have approximately the same concentration in bile as in plasma. There is a direct relation between the rate of secretion and the electrolytes concentration. As the former increases, there is an increase in bicarbonate and pH and a slight in chloride. The pH of liver bile which is usually range between 7.8 and 8.6 tending to the alkaline side varies with the diet. An increase in protein ingestion shifting the pH to the acid side. Liver bile becomes concentrated 5-10 times in gallbladder by absorption of water, sodium, chloride and bicarbonate [Table-1 and 2].

Table 1: Composition of hepatic duct bile (n=100)

Contents	Percentage
Water	97.0%
Bile salts	0.70%
Bile pigments	0.20%
Cholesterol	0.06%
Inorganic salt	0.70%
Fatty acids	0.15%
Lecithin	0.10%
Fat	0.10%

Table 2: Comparison between hepatic duct bile and gallbladder bile(n=100)

Contents	Hepatic duct bile	Gallbladder bile
Percentage of solid	2-4%	10-12%
Bile salts (mmol/L)	10-12	50-200
pH	7.8-8.6	7.0-7.4

Both female and male cases were studied randomly of which 71 were female and 29 male [Table 3].

Table 3: Distribution of patients by sex(n=100)

Sex	Number of patients	Percentage
Female	71	71.0%
Male	29	29.0%

A fat, fertile, flatulent, female of forty is the classical sufferer from symptomatic gallstone disease. In this series 1 patient was 19 years of age, 17 patients were between 21-30 years of age, 38 patients were 31-40 years of age, 24 patients were 41-50 years of age and 14 patients were in between 51-60 years of age, four patients was 61-70 years of age and 2 patients were above 70 years. Highest incidence was in the 3rd decade (38%) [Table 4].

Table 4: Distribution of patients by age(n=100)

Age in years	Number of patients	Percentage
<20	01(M-0,F-1)	01%
21-30	17(M-3,F-14)	17%
31-40	38(M-12,F-26)	38%
41-50	24(M-7,F-17)	24%
51-60	14(M-4,F-10)	14%
61-70	04(M-2,F-2)	04%
>70	02(M-1,F-1)	02%

Murphy's sign was positive in (11%) patient. 15% cases presented with pain in the epigastrium which was diagnosed primarily as chronic duodenal ulcer and was treated accordingly.

Many patients (57%) had history of fatty food intolerance. 1% patients had past history of jaundice that was not consistent with obstructive jaundice [Table 5]. In this study, 16 patients had diabetes mellitus, 13 patients had hypertension among which 5 patients had also diabetes and 3 patients had ischaemic heart disease among which one patient had also diabetes.

Only 2 patients had chronic obstructive pulmonary disease with no diabetes and hypertension. Patients with IHD were further evaluated by echocardiography [Table 6].

Table 5: Clinical presentation of patients (n=100)

Symptoms/signs	Number of patients	Percentage
Pain in the right hypochondrium	95	95%
Flatulence dyspepsia	68	68%
Nausea/Vomiting	27	27%
Fatty food intolerance	57	57%
Radiation of pain	26	26%
Pain in the epigastrium	15	15%
Past history of acute attack	13	13%
History of jaundice	01	01%
Murphy's sign positive	11	11%
Palpable gallbladder	02	02%
Fever	03	03%
Palpable liver	00	00

Table 6: Associated medical diseases (n=100)

Diseases	Number of patient	Percentage
Diabetes mellitus	16	16%
Hypertension	13	13%
COPD	02	02%
IHD	03	03%

COPD: Chronic obstructive airway disease, IHD: Ischemic heart disease

In this series no patients had previous history of upper abdominal surgery though past history of such operation is a relative contraindication of such surgery but technical skill which has now

developed in surgical community, eliminated this contraindication. Thirteen of them had lower abdominal surgery [Table 7], all were caesarean section and abdominal hysterectomy and no problem was encountered in doing laparoscopic cholecystectomy on those patients. All the patients in the present series underwent ultrasonography of the hepatobiliary system and pancreas.

Table 7: Past history of abdominal surgery (n=100)

Location of surgery	Number of patients	Percentage
Upper abdomen	00	00
Lower abdomen	13	13%

CBD: Common bile duct

In this study 73 (73%) cases were found to have normal appearance gallbladder with stones sonologically, but per-operatively such found in 76 (76%) cases. In 15 (15%) cases revealed fibrosed and contracted gallbladder with stones, whereas 13 (13%) cases were found to have the findings peroperatively indicating that ultrasonography had given two false positive results regarding fibrosed and contracted gallbladder which were really normal appearance gallbladder.[Table - 8]

Table 8: Ultrasonographic findings of patients (n=100)

Ultrasonographic findings	Number of patients	Percentage
Normal appearance gallbladder-with stones	73	73%
Fibrosed and contracted gallbladder-with stones	15	15%
Distended gallbladder with stones	06	06%
Fibrosed and contracted gallbladder- without stones	01	01%
Thick gallbladder wall	07	07%
Dense adhesions	02	02%
Gall bladder polyp	01	01%
Dilated CBD or CBD stone	00	00

In this study out of 100 cases 93 (93%) cases were found to have stones in gallbladder on ultrasonography, whereas 96 (96%) cases were found to have stones in gallbladder per-operatively indicating that ultrsonography had given three false negative results, correlates with the findings.

In this study 73 (73%) cases were found to have normal appearance gallbladder with stones sonologically, but per-operatively such found in 76 (76%) cases. In 15 (15%) cases revealed fibrosed and contracted gallbladder with stones, whereas 13 (13%) cases were found to have the findings peroperatively indicating that ultrasonography had given two false positive results regarding fibrosed and contracted gallbladder which were really normal appearance gallbladder, correlates with the findings.

Sonography commented 7 patients of thick gallbladder wall where per-operatively it was found in 11 patients. In 6 (6%) cases were found to have distended gallbladder with stones sonologically but per-operatively found in 7 (7%) cases indicating ultrasonography had given one false negative results about distended gallbladder [Table 9-10].

Table 9: Pre-operative laparoscopic findings of patients (n=100)

Ultrasonographic findings	Number of patients	Percentage
Normal appearance gallbladder-with stones	76	76%
Fibrosed and contracted gallbladder-with stones	13	13%
Distended gallbladder with stones	07	07%
Fibrosed and contracted gallbladder-without stones	02	02%
Thick gallbladder wall	11	11%
Dense adhesions	02	02%
Gallbladder polyp	01	01%
Short cystic duct	04	04%
Stone indilated bile duct	01	01%
Intrahepatic gallbladder	01	01%

Table 10: Comparison of ultrasonography and preoperative findings during laparoscopic cholecystectomy (n=100)

Findings	Ultrasonographic		Laparoscopic	
	No.	Percentage	No.	Percentage
Gallbladder containing stones	93	93%	96	96%
Normal appearance gallbladder with stones	73	73%	76	76%
Fibrosed and contracted gall-bladder with stones	15	15%	13	13%
Distended gallbladder with stones	06	06%	07	07%
Fibrosed and contracted gall-bladder without stones	01	01%	02	02%
Gallbladder polyp	01	01%	01	01%
Dense adhesions	00	00	03	03%
Thick gallbladder wall	07	07%	11	11%
Short cystic duct	00	00	04	04%
Stone indilated bile duct	00	00	01	01%
Intrahepatic gallbladder	00	00	01	01%

Fasting for six should ensure distension of gallbladder for visualization of the lumen. Scanning in two positions, supine and left lateral positions, ensures optimal visualization with a 3.5 or 5 MHz probe. Normal gallbladder contains anechoic bile and has a mural thickness of 3mm or less. High frequency scanning is able to define the layers of mucosa, muscularis and serosa. Contraction is demonstrable following fatty meal. The spiral valve of Heister appears echogenic with acoustic shadowing. The accuracy of ultrasound in detecting gallstone is over 98%; false negatives are usually due to observer error or technical limitations such as patient's obesity. Gallstones are characteristically echogenic casting posterior acoustic shadow. Consequent to their crystalline matrix often on the dependent portion of the gallbladder. They may change their position as the patient's position changes but this is an inconsistent feature [Figure 1 & 2].

Mean time required for laparoscopic cholecystectomy on this series was 47.4 min. which range from 30-90 min [Table-11).

Table 11: Operative time (in minutes) in laparoscopic cholecystectomy (n=100)

Number of cases	Range (min)	Mean (min)	Median (min)
100	30-90	47.4	50

In a study high diagnostic effectiveness of ultrasound examination in acute cholecystitis (95.5%) is demonstrated [Table 12].

Table 12: Incidence of calculous versus a calculous cholecystitis (n=100)

Nature of cholecystitis	Number of patient	Percentage
Calculous	95	95%
Acalculous	5	5%

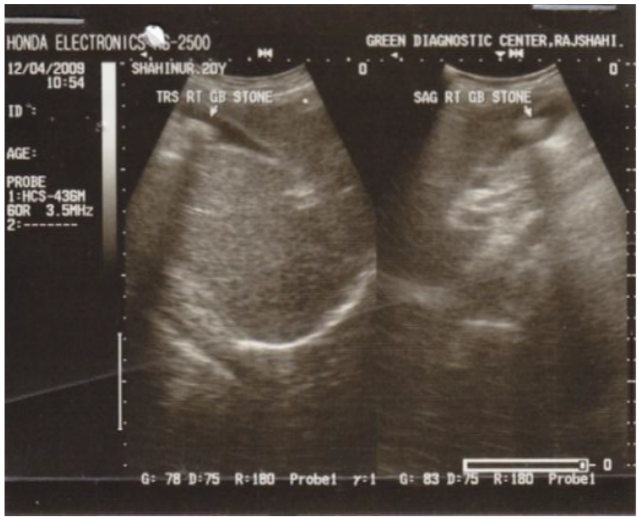

Figure 1: Ultrasonography showing Cholelithiasis

Figure 2: Ultrasonography showing soft tissue mass in G.B with dilated CBD

It is observed from the present series that improved result was obtained by laparoscopic chollecystectomy in respect of much reduced post-operative complications (table 13), early ambulation; most of the patients were ambulatory after 12 hours [Table 14], shorter hospital stay (1-5 days) mean 2.4 days, patients returned to their normal activity very fast (range 5- 12 days, mean 7 days), and almost invisible scar. Only 9 patients had some degree of postoperative problems or complications in the form of vomiting and right hypochondriac pain (5 patients), port site infection (2 patients), mild chest infection (2 patients).Vomiting was controlled by antiemetics, 2 patients had umbilical port infection which were healed by regular dressing and antibiotics.

Table 13: Post-operative problems and amp; complications (n=100)

Problems and complications	No. of patients	Percentage
Vomiting/right hypochondriac pain	05	05%
Port site infection (Obese patients)	02	02%
Decreased pulmonary function and mild chest infection	02	02%

Table 14: Ambulatory time after operation (n=100)

Range (hours)	Mean (hours)
10-24	12

Discussion

Ultrasonography has become the most important method of examination of gallbladder. In chronic calculus cholecystitis and in choledocholithiasis the ultrasound examination appeared to be accurate in 97% and 84.2% cases respectively [12]. With increasing technical sophistication and expertise, the diagnostic yields and accuracy of ultrasonography in the detection of gallbladder disease have recognized as the superior method of investigation.

So, ultrasonography is a useful screening test for patient undergoing laparoscopic cholecystectomy and it can help to predict technical difficulties. On the other hand, a relevant number of cases still exist wherein the concordance between the preoperative ultrasonography and surgical findings are unsatisfactory [13]. Both female and male cases were studied randomly of which 71 were female and 29 male. A fat, fertile, flatulent, female of forty is the classical sufferer from symptomatic gallstone disease. In this series 1 patient was 19 years of age, 17 patients were between 21-30 years of age, 38 patients were 31-40 years of age, 24 patients were 41-50 years of age and 14 patients were in between 51-60 years of age, four patients was 61-70 years of age and 2 patients were above 70 years. Highest incidence was in the 3rd decade (38%). The usual presentation was pain in the right hypochondriac region (95%) which correlates with the findings of Huber [14] (88%), flatulent dyspepsia (68%), characteristic radiation of pain to the back or right shoulder was experienced in (26%) cases. Murphy's sign was positive in (11%) patient. 15% cases presented with pain in the epigastrium which was diagnosed primarily as chronic duodenal ulcer and was treated accordingly. Many patients (57%) had history of fatty food intolerance. 1% patients had past history of jaundice that was not consistent with obstructive jaundice. In this study, 16 patients had diabetes mellitus, 13 patients had hypertension

among which 5 patients had also diabetes and 3 patients had ischaemic heart disease among which one patient had also diabetes. Only 2 patients had chronic obstructive pulmonary disease with no diabetes and hypertension. Patients with IHD were further evaluated by echocardiography. In this series no patients had previous history of upper abdominal surgery though past history of such operation is a relative contraindication of such surgery but technical skill which has now developed in surgical community, eliminated this contraindication. Thirteen of them had lower abdominal surgery, all were caesarean section and abdominal hysterectomy and no problem was encountered in doing laparoscopic cholecystectomy on those patients. All the patients in the present series underwent ultrasonography of the hepatobiliary system and pancreas. In this study out of 100 cases 93 (93%) cases were found to have stones in gallbladder on ultrasonography, whereas 96 (96%) cases were found to have stones in gallbladder per-operatively indicating that ultrsonography had given three false negative results, correlates with the findings of Tan [15]. In this study 73 (73%) cases were found to have normal appearance gallbladder with stones sonologically, but per-operatively such found in 76 (76%) cases. In 15 (15%) cases revealed fibrosed and contracted gallbladder with stones, whereas 13 (13%) cases were found to have the findings peroperatively indicating that ultrasonography had given two false positive results regarding fibrosed and contracted gallbladder which were really normal appearance gallbladder, correlates with the findings of Schmer[16]. Sonography commented 7 patients of thick gallbladder wall where per-operatively it was found in 11 patients. In 6 (6%) cases were found to have distended gallbladder with stones sonologically but per-operatively found in 7 (7%) cases indicating ultrasonography had given one false negative results about distended gallbladder. One (1%) case were found to have fibrosed and contracted gallbladder without stones sonologically, whereas 2 (2%) cases were found to have that findings peroperatively indicating that ultrasonography had given one false negative results about stones in the fibrosed and contracted gallbladder[17].

In this study gallbladder polyp was found in 1% case both in ultrasonography and per-operatively. No dense adhesions were found in sonologically but per-operatively dense difficult adhesions were found in 3 (3%) cases. One case of intrahepatic gallbladder, 4 cases of short cystic duct which were found per-operatively but not found sonologically. In one case stone found in dilated common bile duct per-operatively but not sonologically. Also this patient clinically showed no features of chodocholithiasis correlates with the findings of Gelfand[18].

Ultrasonography is the best diagnostic tool for detecting gallstones. Sonological results are accurate and false negative reports are rare if sonographers and radiologists are experienced. In the study by Chintapalli KN revealed that despite of improvement of sonological technology, detection of gallstones remains difficult in some cases (false negative rate was 1.2%). In a study by Sazhn-VP[12], high diagnostic effectiveness of ultrasound examination in acute cholecystitis (95.5%) is demonstrated. In chronic calculus cholecystitis and in choledocholithiasis the ultrasound examination appeared to be accurate in 97.0% and 84.2% of cases respectively. Ultrasonography of hepatobiliary system can be recommended as useful investigation for selecting the cases for laparoscopic cholecystectomy because good and expert ultrasound examination of gallbladder reliably predicts the degree of difficulty of procedure. In this respect the most important finding is a maximum gallbladder wall thickness more than 4 mm [19]. This finding is indicative of a contracted gallbladder, which is difficult to grasp (in the present series only 5% false negative by sonography). A large stone impacted in Hartmann's pouch creates problems in dissection of cystic duct and artery [20]. Good sonologist gives the information about gallbladder size, site, and number of stones, gallbladder wall thickness and condition of common bile duct. In the present study except few cases most of the operative findings were correlated with preoperative ultrasonographic findings, correlates with findings of Gelfand[17]. All patients were operated under general anesthesia adopting the more popular American approach with a standard 4-port technique.

Mean time required for laparoscopic cholecystectomy on this series was 47.4 min. which range from 30-90 min. longer time was required in the patient having dense adhesions. The times are nearer to the report by Bake-AA[21] (43 minutes) but lower than Watson DI[22] (90 minutes). This might be due to patient selection and evolution of surgical technique and experience with time. It is observed from the present series that improved result was obtained by laparoscopic chollecystectomy in respect of much reduced post-operative complications, early ambulation; most of the patients were ambulatory after 12 hours, shorter hospital stay (1-5 days) mean 2.4 days, patients returned to their normal activity very fast (range 5-12 days, mean 7 days), and almost invisible scar. Only 9 patients had some degree of postoperative problems or complications in the form of vomiting and right hypochondriac pain (5 patients), port site infection (2 patients), mild chest infection (2 patients).Vomiting was controlled by antiemetics, 2 patients had umbilical port infection which were healed by regular dressing and antibiotics.

Mild chest infection developed in only 2 patients who were recovered by chest physiotherapy and other measures. There was no other major postoperative complication. These are comparable with other studies [23-26]. To determine uncomplicated gallstone disease utrasonography has become the dominant method of investigation. This has occurred because ultrasonography is a convenient and safe initial investigation. It is also sensitive and specific accurate method for diagnosing gallstone disease.

Conclusion

It is possible to draw the conclusion that, in real-time laparoscopic cholecystectomy, a thorough clinical examination combined with ultrasonographic evaluation of gallstone and symptomatic gallbladder illness is nearly correct.

Ultrasonographic results and clinical evaluation outcomes are heavily impacted by expertise, training, experience, skill, and good judgment. Therefore, when choosing a patient for a laparoscopic cholecystectomy, a thorough clinical evaluation is essential, and ultrasonography might be suggested as the most helpful study.

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