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Choledocholithiasis pattern in patients with MRCP evaluation

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Abstract

Cholelithiasis is a common patient condition that necessitates general surgery. As a result of the rapid advancement of medical technology, the diagnosis and treatment of this condition have constantly become more advanced. Nevertheless, the biliary system is exceedingly complicated, and there is still no universally accepted method for diagnosing cholelithiasis among medical professionals. In patients with acute cholecystitis, there is a possibility of developing stones in the common bile duct (CBD), and there is a growing trend among surgeons to detect choledocholithiasis prior to surgical procedures. The magnetic resonance cholangiopancreatography (MRCP) technique has the ability to properly detect choledocholithiasis in patients who are experiencing acute cholecystitis. The purpose of this study was to determine the number of patients who were suffering from choledocholithiasis and to examine the samples employing the use of MRCP.

Nine out of the total 374 individuals were diagnosed with choledocholithiasis. When it comes to the diagnosis of choledocholithiasis, magnetic resonance cholangiopancreatography is a dependable method of evaluation. It lowers the risk of overlooking choledocholithiasis and reduces the likelihood of making an incorrect diagnosis of retained choledocholithiasis using conventional biochemical predictors from occurring. For the purpose of determining whether or not choledocholithiasis is present, it has been determined that neither a single predictor nor a combination of indicators can be considered reliable.

INTRODUCTION

The disease that is associated with gallstones can have significant morbidity and mortality associated with it all over the world. In the Western world, the number of people suffering from diseases that are associated with gallstones is growing. The presentation, diagnosis, and associated problems of gallstone disease are dramatically variable depending on the anatomical location of the gallstones. Because of this, there are several different clinical symptoms of gallstone disease. Radiology plays a crucial role in the diagnosis, therapy, and follow-up of gallstone-related diseases. Imaging plays a broad role in gallstone-related pathology, with radiology playing an essential function in all three situations [1]. Increases in obesity rates are leading to an increase in the number of people in Western populations who have gallstones. In the United States of America, gallstones affect 8.6% of Caucasian males and 16.6% of women. Gallstones can cause a wide range of symptoms, from non-life-threatening conditions like biliary colic to life-threatening acute infections like pancreatitis. Gallstones can also cause pancreatitis. A patient who has already experienced a symptomatic manifestation of gallstones has a chance of experiencing another manifestation of gallstones during the course of their lifetime that is roughly three percent annual [2]. Gallstones affect 6% of the world's population; the prevalence is greater in women and South American countries [3].

More people are being identified with gallstones because more people are learning about them and more imaging tests are being used. However, 22.6% to 80% of people with gallstones don't have any symptoms at the time they are diagnosed. Even though these people don't have any symptoms, they are still at a lifelong risk of getting symptoms and problems like acute cholangitis and acute biliary pancreatitis. Therefore, early preventive cholecystectomy might be helpful for some patients, but it is currently the norm to only suggest cholecystectomy after signs or problems have occurred [4 ,5].

Magnetic resonance cholangiopancreatography (MRCP) is a highly effective imaging technology that does not involve any invasive procedures, allowing for the visualisation of intricate biliary anatomy. Similar to the high-resolution cross-sectional, two-dimensional, and three-dimensional projection images produced by these types of imaging modalities, ERCP and intraoperative cholangiograms are also available. In the following paragraphs, we will talk about the various types of gall bladder disease and the occurrence of gall stones in patients who were asymptomatic. In addition to this, we shall emphasise the clinical significance of these anatomical variances [6, 7] .

Table 1 depicts some risk factors associated with gall stones.

Risk factors for gallstone formation	**Comment**
Age	The incidence rises with age, but symptoms peak in middle age.
Gender	Females predominate 2:1.
Race	More common in Western, Caucasian, Hispanic, and Native Americans.
Family history	First-degree relatives with gallstones double risk.
Obesity	Increased cholesterol stone risk.
Rapid weight loss	Low calorie intake and increased cholesterol mobilisation cause bile stasis.
Haemolysis	Sickle cell disease and thalassemia are linked to an increased risk.
Raised serum lipids	Increased cholesterol stone risk.
Raised serum bilirubin	Increased pigmented stone risk.
Gallbladder stasis	Flow stagnation lets stones form.
Diabetes mellitus	Insulin resistance raises blood cholesterol.

Table 1: Risk factors leading to development of gall stone

MATERIALS AND METHODS

The participants in this quantitative cross-sectional study were patients sent to the Radiology and Imaging Department at Santosh Medical College & Hospital Ghaziabad for MRCP exams for a variety of clinical reasons.

Inclusion criteria:

1. Patients having MRCP Abdomen performed as part of their studies
   2. The study comprised patients whose ages ranged from eighteen to seventy-plus. Patients not eligible for magnetic resonance imaging (MRI).

The whole MRCP of gall bladder was performed to identify the pattern in the gallstones from different samples and to study other relevant things. The choledocholithiasis group was only included if the MRCP was good enough to clearly show the insertion of the CD and the presence of a gallstone in the common bile duct. Included in this category were cases without choledocholithiasis, which included 161 cases with normal MRCP findings, 10 cases with non-biliary pancreatitis, 2 cases with malignant biliary strictures, 5 cases with periampullary masses, 3 cases with biliary injuries, and 2 cases with pancreatic division. The Inadequate MRCP that did not permit a comprehensive evaluation of CD insertion was the sole criterion for exclusion from both groups [72 (19%) of 379 patients examined]. The institution's ethics board gave us approval. The following patient data were entered into a database: age, gender, cholecystectomy history (including the procedure's duration), presence of cystic duct modifications, and type of alterations.

RESULTS

The parameters of MRCP

Given in table 2 are the parameters of MRCP protocol withdrawn for our previous study (Singh *et al.,* 2023) [8] .

Table 2. Protocol parameters for MRCP. Shot Fast Spin Echo sequences; Fast Recovery Fast Spin Echo acquisitions

	THICKNESS	GAP	TIME REQUIRED
THICK SLAB 2D SSFSE	50 mm	n/a	1-2 sec for slice/2 min
THIN-SECTION 2D	3 mm	0-1 mm	20-25 sec
SSFSE			
RESPIRATORY-TRIGGERED 3D FRFSE	2-3 mm	1 mm	2-3 min
BREATH-HOLD 3D FRFSE	3 mm	0-1 mm	24-27 sec

Evaluation of gall stones from the examined sample

In all, 374 specimens were a part of this investigation (table 3). Every individual who participated in the research had one gallbladder, and it was located in the extrahepatic fossa on the inferior surface of the right lobe of the liver. No specimen showed signs of gallbladder mesentery. The most common bladder anomalies were Hartman's pouch form and neck, which

were observed in 9 patients (2.4%) each. Every single subject had a normal fundus and body. Nine individuals (2.4%) had gallstones. The common bile duct was 7 cm long in half of the people surveyed. The individuals' hair length varied from 6.5 cm in 25.1% to 9 cm in 2.4%. The gallbladder width varied between 3 and 4 cm, with the majority of individuals (40.1%) having a width of 3.2 cm. Fig. 1 depicts the MRCP discovered choledocholithiasis and cholelithiasis, along with a dilated central nervous system (CNS) and a prominent pancreatic duct, with no signs of pancreatitis. Whereas, fig. 2 shows the MRCP of dilated CBD.

Table 3 shows that 56.1% of the individuals had their bladder fundus below the inferior border of the liver, 21.1% had it above the inferior border, and 14.5% had it at or above the inferior border.

Table 3:The study population's gall blabber's gross anatomical features (N=374).

Anatomical feature	**Details**	**Number**	**%**
Number	**Single**	374	100
Position	**Inferior surface of the right lobe of the liver**	374	100
Situation	**Extrahepatic in fossa for gallbladder in right lobe of liver**	374	100
Mesentery of gallbladder	**Absent**	374	100
Shape	**Pear-shaped**	365	97.6
	Hartman's pouch	09	2.4
Fundu	**Normal**	374	100
Body	**Normal**	374	100
Neck	**Normal**	365	97.6
	Hartman's pouch	09	2.4
Interior of gallbladder	**Normal**	365	97.6
	Gallstones	09	2.4
Length of gallbladder	**6.5**	94	25.1
	7	187	50
	7.5	25	6.7
	8	25	6.7
	8.5	22	5.9
	9	21	5.6
Width	**3**	100	26.7
	3.2	150	40.1
	3.5	79	21.1
	4	45	12.1
	Below the inferior border	210	56.1

The fundus's location relative to the liver's inferior border	**Above the inferior border**	110	29.4
	At the level of inferior border	54	14.5

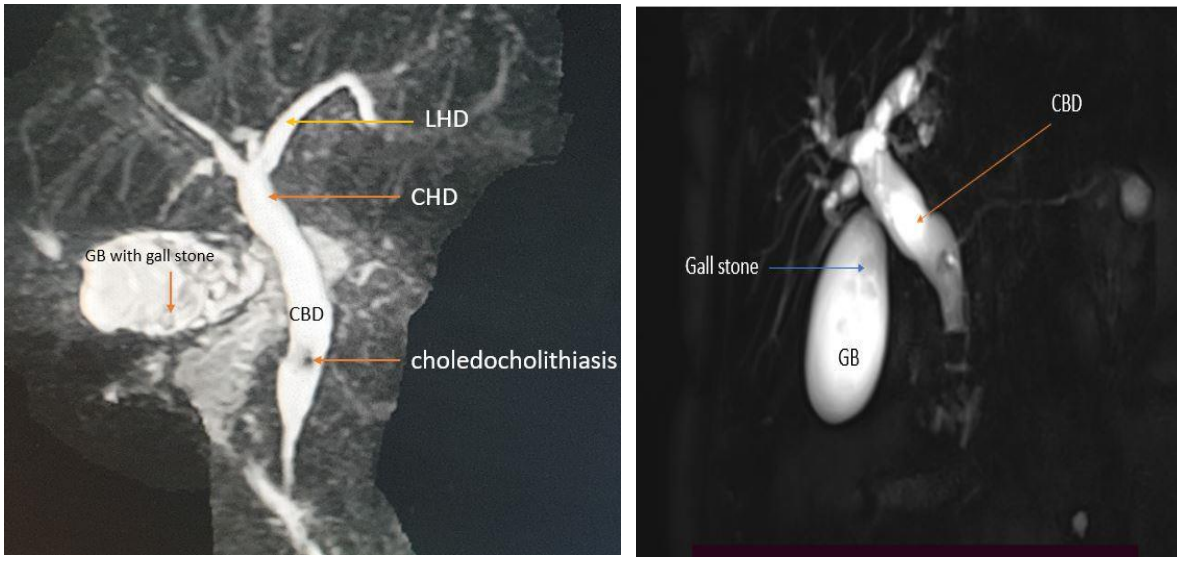

Fig 1: A dilated CBD and a prominent pancreatic duct are visible on magnetic resonance cholangiopancreatography, which also shows choledocholithiasis and cholelithiasis but no signs of pancreatitis.

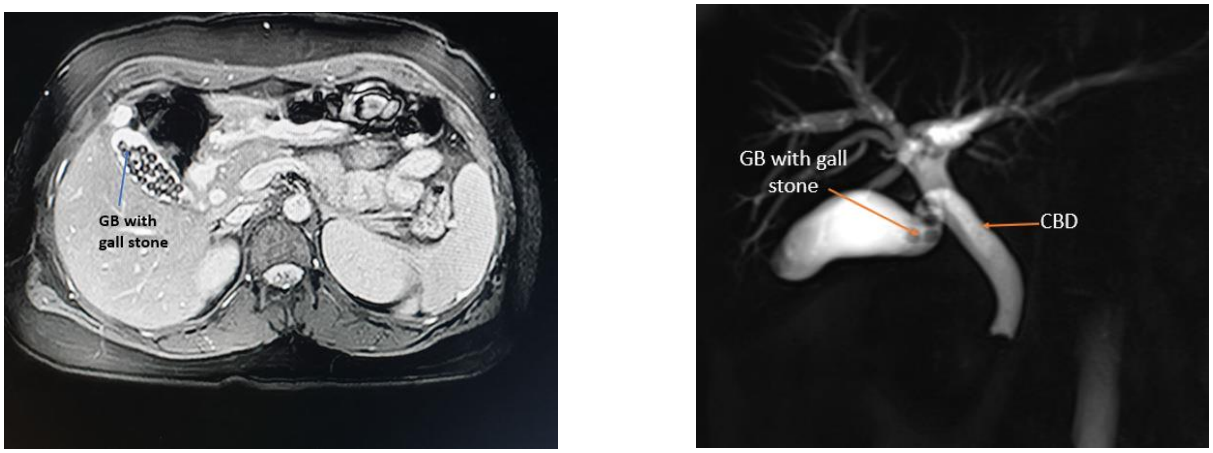

Fig 2: - Magnetic resonance cholangiopancreatography showing cholelithiasis with a dilated CBD.

DISCUSSION

The gallbladder and the biliary system are the two organs that are responsible for the formation of gallstones, which are solid, spherical particles that are formed of a mixture of cholesterol and bilirubin. The number and size of gallstones can vary from patient to patient, with some individuals developing several little gallstones while others experience the formation of a single or a few massive stones [9].

A number of researchers are of the opinion that the formation of gallstones is connected to anatomical variations in the cystic duct (CD). Gallstone development is influenced by the angle that exists between the common duct (CD) and the common bile duct (CBD) junction, which is referred to as the sistocholedochal angle (SCA). As the SCA grows, the frequency of gallstone production also increases [10]. The number of gallstones, the angle that exists between the long

axis of the gallbladder and the CD, and the diameter of the CD all have a significant relationship with the occurrence of biliary events that are associated with gallstones [11]. For the treatment of gallbladder stones that cause symptoms, laparoscopic cholecystectomy (LC) is now considered the procedure of choice[12]. Magnetic resonance cholangiopancreatography (MRCP) is a trustworthy technology that can also be used to examine the biliary tree. It has a diagnostic accuracy of about one hundred percent when it comes to demonstrating CBD stones. Previous research has evaluated the function that MRCP plays in selecting patients who have CBD stones for preoperative endoscopic sphincterotomy [13].

In the present study, the 9 patients identified to have the structural occurrence of gall stones out of the 379 studied population. The patients were asymptomatic and presented for other various clinical reasons. They were hence tested through MRCP for various evaluation. There is no need to use X-rays or contrast media with MRCP because it is a non-invasive imaging technique. The high expense and lack of therapeutic interventions offered by MRCP are its primary downsides. Unfortunately, the study did not evaluate the cost-effectiveness for patients. However, it did prove that preoperative MRCP is the only non-invasive way to screen patients for choledocholithiasis. The MRCP can provide the surgeon with the ability to determine the current condition of the patient's biliary ducts, as well as the possibility of the existence of severe inflammation, which is considered to be one of the most significant causes of bile duct injury [14, 15].

CONCLUSION

Considering that the anatomic variations of the gall stones that were discovered in the samples that were analysed were somewhat less than those that were reported in the literature, it was necessary to do additional research. On the other hand, it seems reasonable to assist in the MRCP mapping of the gall bladder prior to interventions in order to prevent issues that may arise as a result of surgical, endoscopic, or percutaneous treatments. MRCP, both in two dimensions and in three dimensions, is a dependable approach in order to evaluate the inherent anatomical variations and normal intrahepatic biliary anatomy prior to surgery. However, the addition of contrast-enhanced MRCP will greatly increase diagnostic accuracy and bring it closer to the gold standard IOC.

However, pre-operative MRCP performed prior to laparoscopic cholecystectomy is dramatically reducing the frequency of post-operative problems. This is due to the fact that it reduces the occurrence of residual stones and may also assist in reducing the risk of CBD injuries by identifying congenital malformations. However, the usage of it on a regular basis may be controversial and requires additional research in the future.

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Author contributions: This must include a statement of the different responsibilities that specify the contribution of every author. For research articles with several authors, a short paragraph specifying their contributions must be provided. The following statements should be used "Conceptualization, MKS, YY and AS; methodology, MKS, YY and AS; software, MKS; validation, YY, AS and S; formal analysis, MKS, YY, AS and S; investigation, MKS; resources, YY and AS; data curation, MKS; writing—original draft preparation, MKS; writing—review and editing, MKS, YY, AS and S; visualization, MKS; supervision, MKS, YY, AS and S.

All authors have read and agreed to the published version of the manuscript." Authorship must be limited to those who have contributed substantially to the work reported.

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