

## THE VALUE OF MRCP AND ERCP IN MANAGEMENT OF SUSPECTED COMMON BILE DUCT STONES IN PATIENTS WITH GALLSTONE DISEASE.

By

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*MRCP and ERCP are able to detect CBD stones with high accuracy in patients with suspected stones. With increasing availability of MRI, MRCP is becoming the non-invasive extra-hepatic biliary diagnostic investigation of choice. ERCP, apart from being a diagnostic procedure, is also applied as a therapeutic tool. The aim of this study is to assess the value of MRCP and ERCP in management of suspected CBD stones in patients with gallstone disease undergoing elective cholecystectomy.*

*Out of 189 patients with gallstone disease - who underwent elective cholecystectomy - 85, who performed MRCP and/or ERCP were statistically analyzed in a retrospective study.*

*CBD stones were present in 29/85 patients (34%). 24/29 underwent ERCP with stone clearance followed by open cholecystectomy, 4/29 underwent CBD exploration with stone extraction and 1/29 underwent laparoscopic cholecystectomy followed by ERCP with stone extraction. MRCP proved to have a sensitivity of 12/13 (92%) and a specificity of 33/33 (100%) in demonstration of CBD stones. The positive predictive value of MRCP proved to be 12/12 (100%) and the negative predictive value was 33/34 (97%). MRCP detected stones in 12/13 patients with different combination of predictor variables (age >60 years, fever >37.6 °C, raised levels of serum amylase >95u/l, raised levels of alkaline phosphatase >670u/l and bile duct dilatation >8mm or stones on ultrasonography).*

*Fifty per cent (27/54) of patients who underwent ERCP were 'positive' and this percentage decreased to 41% (16/39) in patients who did not undergo MRCP before ERCP. Therapeutic ERCP was performed in 43/54 (80%) patients, in the form of: 22/43 stone extractions, 17/43 sphincterotomies, 2/43 naso-biliary drainage and 2/43 biliary stenting.*

*The use of MRCP prior to ERCP, results in maximum effectiveness of ERCP as a therapeutic tool while decreases the unnecessary diagnostic attempts in patients with normal findings. Limiting MRCP to gallstone disease patients with two or more variables is optimal as regards cost/benefit by reducing the number of unnecessary MRCPs and minimizing the risk of a missed stone. MRCP is recommended in these patients to confirm the diagnosis, prior to further management by ERCP or CBD exploration.*

*Keywords: MRCP, ERCP, Management of CBD stones, Gallstone disease.*

### INTRODUCTION

In most cases, stones in the common bile duct (CBD) are originally formed in the gallbladder<sup>(1)</sup>. It is estimated that about 20% of the population have gallstones<sup>(2)</sup> and about 15% of patients with gallstone disease have stones in the CBD<sup>(1)</sup>. CBD stones may be silent or may present by recurrent attacks of severe dull aching pain in the right hypochondrium and epigastrium<sup>(1)</sup>. Obstructive jaundice, acute pancreatitis and ascending cholangitis are among the complications of CBD stones with their major morbidity

and mortality<sup>(2)</sup>. Thus, detection and management of CBD stones are essentially required.

Several studies described useful non-invasive predictors and scoring systems for the prediction of CBD stones. Several variables were related to demonstrable CBD stones. They included, age, cholangitis with fever, raised levels of serum amylase and lipase. Jaundice with raised levels of serum bilirubin, alkaline phosphatase and gamma glutamyl transpeptidase and bile duct dilatation or stones

on ultrasonography were also included<sup>(3-7)</sup>

Magnetic resonance cholangiopancreatography (MRCP) and endoscopic retrograde cholangiopancreatography (ERCP) were able to detect CBD stones with high accuracy in patients with suspected stones<sup>(8)</sup>. With increasing availability of MRI, MRCP is becoming the non-invasive extra-hepatic biliary diagnostic investigation of choice<sup>(9)</sup>. ERCP, apart from being diagnostic, can also be applied as a therapeutic tool, but is associated with complications as bleeding in 2-9%, acute cholangitis in 1-3% and pancreatitis in 1-4% of cases<sup>(1)</sup> and thus should not be performed except in patients with suspected CBD stones<sup>(7)</sup>.

The aim of this study is to assess the value of MRCP and ERCP in management of suspected CBD stones in patients with gallstone disease undergoing elective cholecystectomy.

## PATIENTS AND METHODS

Out of one hundred and eighty nine patients with gallstone disease - who underwent elective cholecystectomy - eighty-five patients, who performed MRCP and/or ERCP were statistically analyzed in a retrospective study. They were subjected to full clinical history and examination, blood tests and preoperative imaging prior to surgery. Collected data included: age, sex, fever (>37.6 °C), biliary pain, TLC and shift to the left, serum bilirubin, alkaline phosphatase, SGOT, SGPT, GGT, serum amylase, lipase, presence of CBD stones or bile duct dilatation (>8mm) on ultrasonography.

MRCP was performed alone in 31 patients and followed by ERCP in 15 patients. ERCP was performed alone in 34 patients and followed by MRCP in 5 patients.

In order to analyze the value of MRCP and ERCP, the 46/85 patients who underwent MRCP alone or preceding ERCP were grouped (GroupA) and the 54/85 who underwent ERCP were grouped (GroupB). ERCP was performed in these patients with highly suspected CBD stones aiming for the complete CBD preoperative clearance.

MR imaging was performed with a 1.0-T MR imaging unit (Gyrosan ACS-NT; Philips Medical Systems, Best, the Netherlands). After localization images were obtained, transverse fat-suppressed turbo spin-echo T1- (repetition time msec/echo time msec, 500/18) and T2-weighted (1,800-2,000/100) images and transverse heavily T2-weighted turbo spin-echo images (6,000/350) were obtained with use of a body coil. MRCP was performed by using a half-Fourier single-shot turbo spin-echo sequence with a 20-cm circular surface coil to obtain a high signal-to-

noise ratio and high spatial resolution. The imaging parameters for MRCP were as follows: /400 (effective); echo train length, 128; field of view, 220 mm; section thickness, 4 mm; 18 sections; section overlap, 1 mm; matrix, 205 x 256; and one signal acquired. The imaging time was 18 seconds, which permitted a single breath hold. No oral contrast media were given.

ERCP was performed using an Olympus duodenoscope videosystem TJF-240. Pre-procedure medication was done by sedation midazolam up to 0.1mg/Kg body weight in a titrated dose. Propofol was used in few patients who could not tolerate conscious sedation. Intravenous hyoscine was given in bolus form when needed to relax the duodenal wall. A pulse oximeter was connected to the patient all through the procedure. The contrast material used was urografin (76%). Diagnostic ERCP was done when the opacified bile ducts were normal. Sphincterotomy was done prior to stone extraction using a basket. Large stones were crushed prior to fragment extraction. Sphincterotomy was performed when duct dilatation was present, even in the absence of opacified stones. When stone (s) could not be crushed, either stenting or naso-biliary drain was applied.

Exploration of the CBD was indicated when stones were palpable in the CBD during open cholecystectomy. It was performed by Kocherising the duodenum, the opened CBD was irrigated to flush out loose calculi. Impacted stones were extracted with Desjardin's forceps or Fogarty catheter. Transduodenal sphincteroplasty was not required. The CBD was closed over an external biliary T-tube drain, through which a cholangiogram was performed 10 days later. T-tubes were removed due to the absence of stones and the presence of free flow into the duodenum by T-tube cholangiography.

The term 'positive' was given to CBD stones visualized and extracted or attempted for extraction during exploration of the CBD and/or during ERCP, and was considered the 'gold standard' against which sensitivity, specificity and predictive values were calculated.

## RESULTS

The mean age of the 85 patients (25 males and 60 females) who underwent MRCP and ERCP was 55 years (range: 17-64 years).

The incidence of CBD stones was 29/85 (34%) [29/189 (15%) in the total patients with gallstone disease].

ERCP with stone clearance followed by open cholecystectomy (24/29), CBD exploration with stone extraction (4/29) and laparoscopic cholecystectomy followed by ERCP with stone extraction (1/29 due to

postoperative recurrent pain) were performed.

Table 1 and Chart 1 demonstrate the presence (positive) or absence (negative) of CBD stones as regards the patients and their groups and according to the procedures.

In the 46/85 patients Group A (who underwent MRCP alone or preceding ERCP), 13/46 (28%) were 'positive' and 33/46 (72%) were 'negative'. MRCP detected CBD stones in 12/13 (92%)(Fig1). MRCP proved to have a sensitivity of 12/13 (92%) and a specificity of 33/33 (100%) in demonstration of CBD stones. The positive predictive value of MRCP proved to be 12/12 (100%) and the negative predictive value was 33/34 (97%).

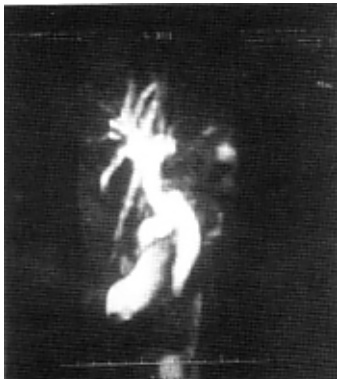
As regards CBD stones predictors; age >60 years, fever >37.6 °C, raised levels of serum amylase >95u/l (52u/l normal upper limit) and raised levels of alkaline phosphatase >670u/l (269u/l normal upper limit) were found to be statistically significant (P<0.05). Bile duct dilatation >8mm or stones on ultrasonography was highly significant (P<0.001), while other variables were not found significant. Combinations of the 5-variables correspond to different predicted probabilities. Their absence corresponds

to a 2% probability. The presence of one variable (other than sonar) corresponds to a 5% probability. Bile duct dilatation or stones on ultrasonography corresponds to a 15% probability that is equal to the combination of two variables without ultrasonography. The presence of all five corresponds to a 90% probability of CBD stones (multiple logistic regression).

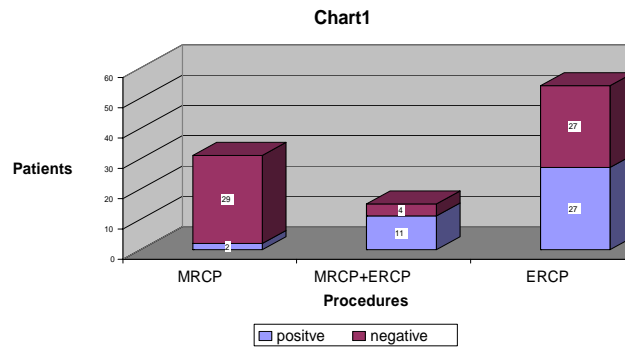
In the 54/85 patients Group B (who underwent ERCP), 27/54 (50%) were 'positive' and 27/54 (50%) were 'negative'. In patients who did not undergo MRCP before ERCP, demonstrable stones were observed in 16/39 patients (41%).

ERCP was indicated in: 18/54 patients with CBD stones detected by ultrasonography or MRCP, 14/54 patients with cholangitis, 9/54 patients with pancreatitis, 8/54 patients with cholangitis and pancreatitis and 5/54 with recurrent pain.

ERCP was performed as a diagnostic procedure only in 11/54 (20%) patients. It was performed with the aim of a therapeutic attempt in 43/54 (80%) patients, in the form of: 22/43 stone extractions, 17/43 sphincterotomies, 2/43 naso-biliary drainage and 2/43 biliary stenting.



*Fig.(1): A rounded signal void structure is seen at the region of the fundus of the gallbladder representing a stone. Another smaller signal void structure is seen at the lower common bile duct. The CBD is slightly dilated.*



*Chart (1)*

**Table(1) Procedures, Patients and Groups**

<i>Gro</i>	<i>ups</i>	<i>Procedures</i>	<i>Patients</i>	<i>'Positive'*</i>	<i>'Negative'*</i>
A		MRCP	31	2	29
46	B	MRCP+ERCP**	15	11	4
	54	ERCP alone or	34	16	23
		ERCP+MRCP**	5		
<i>To</i>	<i>tal</i>		85	29	56

\* Positive and Negative = No. of patients with stones and with no stones respectively. \*\* + = Followed by

## DISCUSSION

The following five variables proved to be of value in predicting CBD stones; age >60 years, fever >37.6 °C, raised levels of serum amylase >95u/l, raised levels of alkaline phosphatase >670u/l and bile duct dilatation >8mm or stones on ultrasonography.

MRCP detected stones in 12/13 patients with different combination of these variables. Since the incidence of CBD stones is small in patients with less than two variables, limiting MRCP to gallstone disease patients with two or more variables is optimal as regards cost/benefit by reducing the number of unnecessary MRCPs and minimizing the risk of a missed stone.

Gallstone disease patients with CBD stones are usually managed by ERCP with stone extraction before cholecystectomy. In this study 24/29 CBD stones patients underwent ERCP prior to cholecystectomy. ERCP is effective in managing CBD stones but it is not a procedure without morbidity or mortality especially when associated with sphincterotomy. Moreover, the success rate for stone clearance is 87-97%, the morbidity rate is 5-11% and the mortality rate is about 1%<sup>(10-14)</sup>. Many suspected patients undergo ERCP in the absence of CBD stones. In this study, only 50% (27/54) of patients who underwent ERCP were 'positive' and this percentage decreased to 41% (16/39) in patients who did not undergo MRCP before ERCP.

ERCP, apart from being an effective therapeutic tool, is also diagnostic. In this study only 20% (11/54) of ERCPs were diagnostic procedures. Diagnostic ERCP complications are about 2% and late sphincterotomy stenosis is about 10-33%<sup>(14)</sup>. The use of MRCP prior to ERCP, results in maximum effectiveness of ERCP as a therapeutic tool while decreases the unnecessary diagnostic attempts in patients with normal findings. In this study 11/15 (73%) patients who underwent MRCP followed by ERCP proved to be 'positive'. Thus it is recommended not to perform ERCP in patients with suspected CBD stones without previous MRCP, unless not available.

CBD stones clearance could be obtained by a single-

stage laparoscopic cholecystectomy with CBD exploration. This proved to be equally successful to the two-stage preoperative or postoperative ERCP with laparoscopic cholecystectomy<sup>(15)</sup>.

## CONCLUSION

Limiting MRCP to gallstone disease patients with two or more variables is optimal as regards cost/benefit by reducing the number of unnecessary MRCPs and minimizing the risk of a missed stone in the CBD. It is recommended to confirm the diagnosis, prior to further management by ERCP or CBD exploration.

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