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Comparative study of endoscopic retrograde Cholangio-pancreatography findings versus magnetic resonance Cholangio-pancreatography in detection of lesions of the biliary tree in patients with common bile duct dilatation

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Abstract:

Introduction: There are different modalities that aid in diagnosing common bile duct (CBD) pathologies, such as endoscopic-retrograde cholangiopancreatography (ERCP), intraoperative cholangiography, computerized tomography (CT) cholangiography, and/or magnetic resonance cholangiopancreatography (MRCP).

Aim of the study: To compare ERCP findings versus MRCP in diagnosing the cause of CBD dilatation.

Subjects and Methods: The study was a prospective descriptive comparative study that included fifty patients submitted to ERCP at Fayoum University Hospital from February 2020 to September 2021.

Results: The causes of biliary obstruction by ERCP are: 20 cases (40%) due to stones, 18 cases (36%) due to stricture, 7 cases (14%) due to both stricture and stones within the CBD, 1 case (2%) mass, 1 case (2%) slipped suture after cholecystectomy, 1 case (2%) is due to CBD tear after cholecystectomy, 1 case (2%) stricture and mud and 1 case (2%) stricture and pus. The sensitivity of MRCP in the detection of stones, strictures, and masses is 85.19%, 62.96%, and 100%, respectively, while the specificity is 95.65%, 100%, and 100%, respectively.

Conclusion: MRCP is a highly specific and sensitive modality for identifying various CBD pathologies, with the exception of biliary strictures, where its sensitivity is low (62.96%).

Key words: ERCP; MRCP; Biliary pathologies; CBD strictures.

1. Introduction

Patients with biliary obstruction and infection can be identified using clinical data such as history, physical examination, and laboratory investigations. Noninvasive imaging techniques such as ultrasound (US), CT, MRI, and nuclear medicine hepatobiliary scintigraphy (Hydroxy-iminodiacetic acid, HIDA) are also required to confirm the existence, location, and severity of the disease process [1].

Because of colonic gaseous distension and surrounding structures, the trans-abdominal US may not always image the distal CBD, making it difficult to determine the cause or degree of obstruction. Due to these restrictions, it has been documented that variable sensitivity exists when determining the degree of obstruction (from 27 to 95%) and the cause (from 23 to 88%) of extrahepatic biliary obstruction, as well as whether the obstruction is benign or malignant [2].

MRCP is a safe radiological technique that does not require the use of contrast material and allows for noninvasive visualization of the pancreato-biliary tree [3].

The standard method for treating different CBD-related pathologies is ERCP [4].

2. Subjects and Methods

2.1. Subjects

It included fifty patients submitted to ERCP in Fayoum University Hospital from February 2020 to September 2021.

Inclusion criteria

- Significant CBD dilatation > 7 mm by ultrasound.

Exclusion criteria

- Marked Ascites.
- Patients who suffer from cluster phobia.
- Patients with cardiac pacemakers, insulin pumps and cochlear Implant, in addition to other general contraindications of MRI.
- Severe cardiac or pulmonary diseases
- Refusal of the procedure or absent consent.
- Severe coagulopathy or bleeding tendency (INR > 1.5; platelet count <50,000/µl).
- Patients with previous hepatobiliary surgery, liver injury, or destructive biliary disease.

2.2. Methods

All patients were subjected to the following:

- History-taking and thorough clinical examination.
- Laboratory investigations: CBC, creatinine, FBS, INR, Alt, Ast, Total, direct bilirubin level, GGT, and alkaline phosphatase level.
- Chest X-ray and ECG.
- Anesthesiologist consultation for fitness.
- MRCP study.
- ERCP under general anesthesia and intubation.

MRCP equipment

We employed a Toshiba Titan 1.5 T MR scanner with a circular surface coil for improved resolution. Subsequently, spectral pre-saturation inversion recovery (SPIR) fat suppression was used to reduce the background intensity. Additionally, we employed a breathing monitoring device to ascertain the exact moment to initiate a single-shot scan.

Technique

Prior to MRCP, patients were instructed to fast for a minimum of six hours in order to enhance gastric emptying and GB filling, decrease intestinal motility, and increase appropriate vision by reducing unnecessary fluid signals from the gut. Survey balance sequences in the sagittal, coronal, and axial planes were acquired.

Prior to the examination, axial T1W (T1 weighted), T2W (T2 weighted), and T2 SPAIR (Spectral attenuated inversion recovery) images of the abdomen were obtained, along with coronal T2W images with slice thicknesses of 6-7 mm. The biliary system was appropriately localized, and the MRCP slabs were planned using axial T2W as a guide. We used two techniques in the scan: I-respiratory-triggered, three-dimensional (3D) MRCP with maximum intensity projection (MIP reconstruction). II-Breath Hold, Two-Dimensional (2D), and Single-Shot MRCP. The data was interpreted by an expert radiologist.

ERCP technique

- Fluoroscopy: Genoray Oscar Classic was used for screening and taking plain films.
- Duodenoscopy: We used an Olympus 240 and a Pentax ED-3490TK video duodenoscopy.

The procedure was performed while patients were fasting for 6 hours under general anesthesia. ERCP was then performed by two experienced endoscopists while patients were in the prone position.

Results for MRCP and ERCP obtained from both techniques were compared.

2.3. Statistical analysis:

Data was gathered, coded, translated into English to make data manipulation easier, and double-entered into Microsoft Access. SPSS software version 18 running on Windows 7 was used for data analysis. • Basic descriptive analysis using percentages and numbers for qualitative data; arithmetic means for measuring central tendency; standard deviations for quantifying parametric data; and inferential statistical tests.

For quantitative parametric data: Paired t-test in comparing two dependent quantitative data. For qualitative data, use the chi square test to compare two of more than two qualitative groups. bivariate correlation test to test association between variables. The level of $P \leq 0.05$ was considered the cut-off value for significance.

3. Results

This study was a prospective descriptive comparative study that included fifty patients submitted to ERCP in Fayoum University Hospital from February 2020 to September 2021. This study included fifty patients (22 males and 28 females) with mean age of 49.5 ±15.3 years (range 21–80 years). Abdominal ultrasound of the studied group, as shown in **Table 1**, revealed that the mean CBD diameter is 11.1± 3.39mm (range 7mm–20mm) and patients had chronic calculary cholecystitis in 21 cases (42%), 14 patients (28%) had normal GB, 10 patients (20%) had a past history of cholecystectomy, 2 patients (4%) had chronic non-calculary cholecystitis, 2 patients (4%) had GB mud, and 1 patient (2%) had GB mass.

Table 1: Biliary assessment by abdominal ultrasound of study participants (N=50).

Variable [a]			
CBD diameter by Ultrasound (mm) [a]		11.10± 3.39	
GB	Normal	14 (28%)	28.0%
	Mass	1 (2%)	2.0%
	Mud	2 (4%)	4.0%
	Surgically removed	10 (20%)	20.0%
	Stones	21 (42%)	42.0%
	Non calculary cholecystitis	2 (4%)	4.0%

Different findings by MRCP and ERCP are shown in **Tables 2 and 3**.

Table 2: MRCP findings (N=50).

Variable		**Count**	**%**
MRCP pathology	Mud	1	2.0%
	Mass	1	2.0%
	Slipped suture	1	2.0%
	Stone	23	46.0%
	Stricture	16	32.0%
	Stricture and stone	1	2.0%
	Tear	1	2.0%
	No cause	6	12.0%

Table 3: ERCP finding.

Variable		Count	%
MRCP pathology	Stone	20	40.0%
	Stricture	18	36.0%
	Stricture and stone	7	14.0%
	Mass	1	2.0%
	Stricture and mud	1	2.0%
	Stricture and pus	1	2.0%
	Slipped suture	1	2.0%
	Tear	1	2.0%

There is a statistically significant difference between ERCP and MRCP in the detection of CBD pathologies, as shown in **Table 4.**

Table 4: ERCP pathology versus MRCP pathology in the studied group (N=50).

		ERCP		MRCP		
		Count	%	Count	%	***P-value***
pathology	Stone	20	40.0%	23	46.0%	0.012*
	Stricture	18	36.0%	16	32.0%	
	Stricture and stone	7	14.0%	1	2%	
	Mass	1	2.0%	1	2.0%	
	Stricture and mud	1	2.0%	0	0.0%	
	Stricture and pus	1	2.0%	0	0%	
	Slipped suture	1	2.0%	1	2.0%	
	Tear	1	2.0%	1	2.0%	
	Mud	0	0%	1	2.0%	
	No cause	0	0%	6	12.0%	

**Significant.*

The sensitivity of MRCP in detection of stones in the CBD is 85.19%, specificity is 95.65% and accuracy is 90%. The sensitivity of MRCP in detection of CBD strictures is 62.96%, specificity is 100%, accuracy is 80%, positive predictive value is 100% and negative predictive value is 69.7%. The sensitivity of MRCP in detection of CBD masses is 100%, specificity is 100% and accuracy is 100%.

4. Discussion

We found that the causes of obstruction by ERCP are: 20 cases (40%) due to stones, 18 cases (36%) due to stricture, 7 cases (14%) due to both stricture and stones within the CBD, 1 case (2%) mass, 1 case (2%) slipped suture after cholecystectomy, 1 case (2%) CBD tear after cholecystectomy, 1 case (2%) stricture and mud, and 1 case (2%) stricture and pus.

The differences between ERCP and MRCP are in 20 cases (40%) in the detection of causes of obstruction; in 6 of them (12%), MRCP failed to diagnose the cause of obstruction. This difference is due to the low sensitivity of MRCP in the detection of CBD strictures.

Hurter et al. (in 52 patients) reported sensitivity and specificity for bile duct calculi of 87% and 80%, respectively, and sensitivity, specificity, positive predictive values, and negative predictive values for biliary strictures of 33.3%, 96.6%, 80%, and 77.8%, respectively. These results agreed with ours [5].

Additionally, Polistina et al. discovered that in 263 patients, the MRCP has 77.4% sensitivity, 100% specificity, and an 80.5% accuracy rate for detecting biliary calculi [6].

In 146 patients, Taylor and his colleagues discovered that the sensitivity, specificity, and accuracy of MRCP in identifying biliary calculi were 98%, 89%, and 94% [7].

Our findings were in line with those of Parashari et al., who discovered that the MRCP had an 88% diagnostic accuracy rate when determining the cause of obstruction when compared to the final diagnosis. The sensitivity of MRCP in diagnosing CBD strictures was 100%, with a specificity of 88.23% and an accuracy of 94.87%, whereas the sensitivity of MRCP in identifying CBD stones was 91.66%, with a specificity of 90.46% and an accuracy of 88.75% [8].

According to the results of another study, a 3.0 Tesla MRI machine can detect benign strictures with 91.7% sensitivity, 96.1% specificity, and 94.7% diagnostic accuracy using MRCP [9].

The differences in sensitivity are due to advances in the machine and expert technicians.

Conclusion

For the detection of stones and masses in the CBD, MRCP is sensitive and specific;

however, for the detection of strictures, it is lowly sensitive but highly specific. We recommend further improvement in the MRI scan for better detection and characterization of biliary strictures.

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Conflicts of Interest: All authors declare they have no conflicts of interest.

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