

## Review of the Causes of Obstructive Jaundice and the Role of Endoscopic Retrograde Cholangiopancreatography (ERCP) in the Management

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### Abstract

- Background** Obstructive jaundice poses diagnostic and therapeutic challenges to practicing physician gastroenterologist and general surgeons.
- Objective** To highlight the etiological spectrum, treatment outcome of obstructive jaundice endoscopically by Endoscopic Retrograde Cholangiopancreatography (ERCP).
- Methods** It is a cross sectional case series study included 140 patients who presented with obstructive jaundice and dilated biliary system. They managed at Gastroenterology and Hepatology Center in Al-Imamein Al-kadhimein Medical City, Baghdad, Iraq from April 2012 to April 2014. All the patients were offered abdominal sonography (U/S), magnetic resonance cholangiopancreatography (MRCP) and upper endoscopy, as well as other laboratory work up, in order to prepare them for either palliative or curative treatment by the ERCP. Both success rate and complications were reported.
- Results** Common bile duct (CBD) stones were confirmed in 100 patients (71.4%) (56 female and 44 male) while pancreatic-biliary tumors found in 25 patient (17.8%) (15 male and 10 female) as pancreatic tumor in 11 patients, periampullary and ampullary tumor in 5 patients and cholangiocarcinoma in 4 patients while the rest due to metastasis. Benign causes as biliary fibrosis was seen in (10.8%). The success rate of ERCP treatment was 87.2%, but complications represented 6.4%. All of them were mild and reported within 24 hours.
- Conclusion** CBD stones are the predominant cause of benign cause of surgical obstructive jaundice, while the carcinoma of head of pancreas is the commonest concerning malignant causes. ERCP is very safe and effective procedure in the management.
- Keywords** CBD stone, Obstructive jaundice, ERCP, gallstone.

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**List of abbreviation:** CBD = Common bile duct, CDC = Choledochal cyst, CT = Computerized tomography, ERCP = Endoscopic retrograde cholangiopancreatography, EUS = Endoscopic ultrasonography, INR = International normalized ratio, MRCP = Magnetic resonance cholangiopancreatography, OGD = Esophagogastroduodenoscopy, PT = prothrombin time, PTT= Partial thromboplastin time, SEMS = Self-expandable metallic stent, SOD = Sphincter of Oddi dysfunction.

### Introduction

Obstructive jaundice is a condition in which, there is blockage of the flow of bile out of the liver with a consequence

of incomplete bile excretion from the body, which is may be due parenchymal diseases like in hepatitis (viral, immune or drug induced). This type of jaundice is termed cholestasis or medical jaundice, or due to surgical jaundice in which, there is dilation of biliary system. The imaging study will show dilatation of biliary canal either with internal filling defect or external compression to the extrahepatic biliary system. In United States, the incidence of biliary obstruction is approximately 5 cases

per 1000 people, and the majority of cases are attributable to cholelithiasis (gallstones) <sup>(1-3)</sup>. Other commonest causes of obstructive jaundice including: pancreatic-biliary tumor (pancreatic or cholangiocarcinoma and ampullary tumors) <sup>(4,5)</sup>, benign biliary stricture, sphincter of Oddi dysfunction, primary sclerosing cholangitis, or previous surgery of the liver and/or biliary system <sup>(6,7)</sup>. Other less common etiologies like congenital structural defects and cholidochal cyst of the bile duct or even Lymph node enlargement, as well as pancreatitis and Parasitic infection <sup>(1)</sup>.

Clinical features of obstructive jaundice are jaundice, dark-colored urine, steatorrhea, easy bruising and itching. These are usually seen more in patient with progressive painless obstructive jaundice due to biliary fibrosis or tumor, while biliary colicky abdominal pain (typically occurs in the right upper quadrant) is suggestive of gall stones. Unintentional weight loss is a red flag of malignancy. Cholangitis is expected whenever biliary obstruction is complicated by infection <sup>(8,9)</sup>.

Diagnosis of the obstructive jaundice depends on clinical features and laboratory finding e.g. increase in the bilirubin in addition to imaging studies (the corner stone in diagnosis) like abdominal U/S, abdominal MRI, MRCP. The latter is very sensitive in the diagnosis the dilation of biliary system and the site and cause of pancreatic-biliary obstruction <sup>(10)</sup>.

Treatment options for obstructive jaundice depend on the exact cause of the jaundice and on the severity of the disease.

Endoscopic retrograde cholangio-pancreatography (ERCP) is a sophisticated interventional procedure that combines upper gastrointestinal (GI) duodenoscope and X rays to treat problems of the bile and pancreatic ducts as well as used for diagnosis also. ERCP is used when it is suspected a person's bile or pancreatic ducts may be narrowed or blocked due to tumors, or stone stuck in the common bile ducts, pancreatitis due to impacted common bile duct (CBD) stone in ampulla, sphincter of Oddi dysfunction, scarring of the

ducts (fibrosis). Stent insertion in benign cases (plastic type) or in malignant pancreatic-biliary obstruction (SEMS) for inoperable patient <sup>(9-11)</sup>. ERCP complications may include pancreatitis, perforation and bleeding. It is recommended to check prothrombin time (PT), partial thromboplastin time (PTT) and platelet count before this procedure <sup>(2,6)</sup>. For inoperable cases, surgical treatment whether laparoscopic or laparotomy may be indicated <sup>(10,11)</sup>.

In order to highlight the role of ERCP in defining the etiological spectrum as well as the treatment outcome for obstructive jaundice, this study performed.

### **Methods**

Total patient were 140 (78 female, 62 male). They had been referred for GIT Department in Al-Imamein Kadhimein Medical City because of obstructive jaundice from April-2012 to April-2014.

Before any intervention, international normalized ratio (INR) must below 2 to avoid bleeding during ERCP. Whenever, it is above 2, correction can be achieved using vitamin k 10 mg daily for 3 days.

For all patients, hemoglobin should equal or above 12 g\dl and platelets count of at least 50,000/mm<sup>3</sup> or more.

Pre ERCP requisite included oxygen saturation above 90% and forced vital capacity more than 75% of predictive value in addition to ejection fraction by echocardiography study more than 50%.

Pentax video system EPK 1000, Pentax Duodenoscope ED with functional channel 4.2 mm was used in this study.

Fluoroscope machine model 9800 C-arm used for screening the biliary system.

The contrast used is (Omnipaque 240 mg/ml) equal to lohexol 518 mg + tromtamol 1.2 mg + sodium. Calcium editate 0.1 mg/ml

Boston scientific and Wilson's cock accessories (dream guide wire, Sphincterotome, balloon extractors, balloon dilators and stents) used in this setting.

The procedures performed while the patient is conscious under sedation using 5 mg of midazolam and 50 mg of pethidine intravenously, with continuous monitoring of by oximetry. Admission for all the patients post- ERCP procedure was considered up to 24 hours for follow up to manage and notice any possible complications.

After explanation and discussion the value and complication of ERCP for patients or their companions, the patients consent were taken. Chi squared test was run to determine the significance considering P value < 0.05.

### Results

Female patients were 78 and their ratio to male patients was 1.25:1, the age range was 25-80 yrs with a mean age of 52 yrs.

All patients had increased bilirubin level and most of patient presented with mild to moderate increase in the liver enzymes (Table 1).

The sensitivities of diagnosis to the cause of obstructive jaundice (by abdominal U/S, MRCP and ERCP) were 71.4%, 85.7% and 96.4% respectively (Table 2).

Benign obstructive jaundice (e.g. cholidocholithiasis, biliary fibrosis and Sphincter of Oddi dysfunction (SOD)) is more common than malignant causes (82.2% vs. 17.8% respectively). Diagnosis of CBD stone was found in 100 patient and represents 71.4%, which is mainly seen in female patients (56) with the mean age was 45 year (Table 2).

**Table 1. Characteristics of patients with obstructive jaundice**

| Female/male ratio | Total case No (%) | Biocheical parameters |           |           |          |         |
|-------------------|-------------------|-----------------------|-----------|-----------|----------|---------|
|                   |                   | TSB G/DL              | SGOT IU/L | SGPT IU/L | ALP IU/L | INR     |
| 55/45             | 100 (71.4)        | 1-2                   | 30-100    | 30-100    | 120-360  | 1.5-2   |
| 20/15             | 35 (25.0)         | 2.1-4                 | 101-300   | 101-300   | 361-600  | 2.1-2.5 |
| 3/2               | 5 (3.6)           | > 4                   | > 300     | > 300     | > 600    | > 3     |
| 78/62             | (140 ) 100%       |                       |           |           |          |         |

INR=international normalized ratio, TSB = Total serum bilirubin, ALP = Alkaline phosphatase, SGPT = Serum glutamic pyruvic aminotransferase, SGOT = Serum glutamic oxaloacetic transaminase, Reference values INR = 1-1.5, TSB = 1 mg/dl, ALP = 40-120 IU/L, SGPT = 20-30 IU/L, SGOT = 20-30 IU/L<sup>(1-3)</sup>

**Table 2. Imaging criteria for 140 patient with obstructive jaundice**

| Imaging   | Biliary dilation | Stone | Tumor | CDC | SOD and FIBROSIS | No DX | Sensitivity of DX |
|-----------|------------------|-------|-------|-----|------------------|-------|-------------------|
| U\S       | 140              | 85    | 15    | -   | -                | 40    | 71.4%             |
| MRI, MRCP | 140              | 98    | 20    | 2   | -                | 20    | 85.7%             |
| ERCP      | 140              | 98    | 22    | 2   | 13               | 5     | 96.4%             |

Biliary dilation= CBD diameter more than 8-10 mm, CDC = Choledochal cyst, SOD= sphincter of Oddi dysfunction

Other benign causes of obstructive jaundice apart from stones seen in 15 patient representing (10.6%) of all cases of the

obstructive jaundice, which include the followings: distal biliary fibrosis in 10 patient where some of those patients had history of

cholecystectomy but 2 patients had previous sphincterotomy. SOD was suspected in 3 patients according to criteria for diagnosis (age, female, recurrent jaundice) but it couldn't prove as there is no manometry study in our center. Sphincterotomy and follow up gave excellent result for above groups.

Diffuse choledochal cyst (type 1) diagnosed in 2 female patients who presented with features of obstructive jaundice and mass in the right upper quadrant. Their diagnosis confirmed by imaging study and ERCP.

Tumors were seen in 25 patient in this study (15 males and 10 females, M:F was 1.5:1),

which represent (17.9%). Their mean age was 62 year. Pancreatic tumor was seen in 11 patients, periampullary and ampullary tumor is second tumor in order seen in 5 patients and the least is cholangiocarcinoma in 4 patients only. Other 5 patients had obstructive jaundice due to metastasis from breast carcinoma, ovarian cancer or lymphoma due to external compression to biliary system. For those were inoperable, treatment by biliary SEMS deployment were performed (Table 3).

**Table 3. Causes of obstructive jaundice in 140 patients**

| Cause                      | Total cases<br>No (%) | Male<br>No (%) | Female<br>No (%) | Mean age |
|----------------------------|-----------------------|----------------|------------------|----------|
| <b>Benign</b>              | 115 (82.1)            | 47 (75.8)      | 68 (87.2)        | 48 yrs   |
| <b>Cholidocholithiasis</b> | 100 (71.4)            | 44 (71.0)      | 56 (71.7)        | 45 yrs   |
| <b>Fibrosis</b>            | 10 (7.1)              | 2 (3.2)        | 8 (10.3)         |          |
| <b>SOD</b>                 | 3 (2.1)               | 1 (1.6)        | 2 (2.6)          |          |
| <b>CDC</b>                 | 2 (1.4)               | 0 (0.0)        | 2 (2.6)          |          |
| <b>Malignant</b>           | 25 (17.9)             | 15 (24.2)      | 10 (12.8)        | 62 yrs   |
| <b>Ca pancreas</b>         | 11 (7.9)              | 7 (11.3)       | 4 (5.1)          | 66 yrs   |
| <b>Periampullary tumor</b> | 5 (3.6)               | 4 (6.5)        | 1 (1.3)          |          |
| <b>Cholangiocarcinoma</b>  | 4 (2.8)               | 3 (4.8)        | 1 (1.3)          |          |
| <b>Metastasis</b>          | 5 (3.6)               | 1 (1.6)        | 4 (5.1)          |          |
| <b>Total cases</b>         | 140                   | 62             | 78               | 52 yrs   |

Success of ERCP treatment reported in 122 patient (87.2%) while 18 patients (12.8%) patients failed to get response to ERCP. Fifteen of them have periampullary diverticulum with subsequent difficult biliary cannulation to extract CBD stone, two patients proved to have pancreatic tumor that obstruct the lower CBD while one patient with fibrosis and very small ampulla (Table 4) (Figure 1).

Complications were seen in 9 patient representing 6.4%, as one female patient developed perforation of ampulla during the use of precut knife for cannulation that necessitate treatment by laparotomy later on. Five patients developed mild to moderate pancreatitis that managed conservatively.

The other 3 patients developed minor to moderate bleeding during the procedure which treated conservatively by injection of adrenaline and normal saline (Table 4).

**Discussion**

In this study, all patient had an increase in the direct bilirubin level and most of patient had increased liver enzymes, which is in agreement with study by Siddique et al and others<sup>(12-15)</sup>.

ERCP was superior in the diagnosis of the cause of obstructive jaundice compared to other imaging tools in term of sensitivities as follows: (abdominal U/S, MRCP, and ERCP 71.4%, 85.7% and 96.4% respectively) in close to study by Verma et al who described sensitivities of

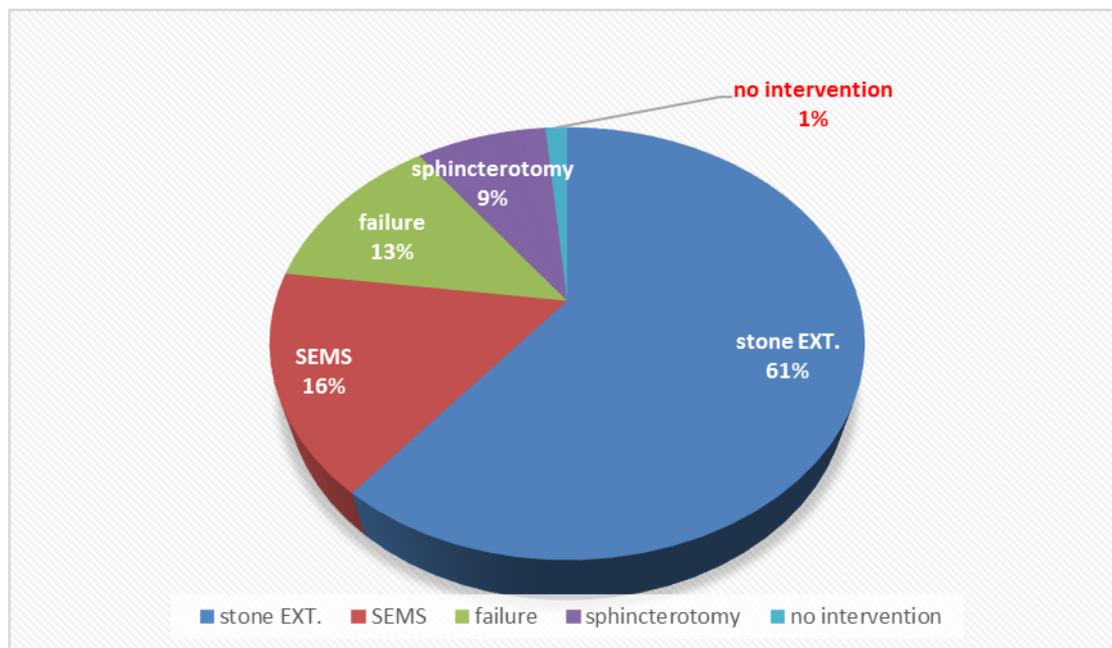
same modalities as 87.3%, 90% and 100% respectively <sup>(13)</sup>. The benign conditions were more frequent than malignant causes with mean age of presentation as 48 year. This is in agreement with Assi et al study done in Thi-

Qar governorate that found the benign conditions forming 93.4% of total causes the CBD stone was the most predominant (75.8%), which was more in young female under 55 year too <sup>(14)</sup>.

**Table 4. Outcome of ERCP procedure in treatment of 140 patient with obstructive jaundice**

| Disease spectrum | F/M          | ERCP success                 | ERCP procedure | Failure                     | Total      | Complications                                 |
|------------------|--------------|------------------------------|----------------|-----------------------------|------------|---|
| Stone            | 56/44        | 85                           | ERS+ S.EXT     | 15                          | 100        | 4 pancreatitis<br>2 bleeding<br>1 perforation |
| Tumor            | 10 /15       | 23                           | SEMS           | 2                           | 25         | -----   |
| Biliary fibrosis | 8/2          | 9                            | ERS            | 1                           | 10         | 1 pancreatitis                                |
| Type 1 CDC       | 2/0          | 2                            | no ERCP        | -----                       | 2          |   |
| SOD              | 2/1          | 3                            | ERS            |                             | 3          | 1 pancreatitis.                               |
| <b>Total</b>     | <b>78/62</b> | <b>122</b><br><b>(87.2%)</b> |                | <b>18</b><br><b>(12.8%)</b> | <b>140</b> | <b>9</b><br><b>(6.4%)</b>                     |

ERS = Endoscopic retrograde sphincterotomy, S.EXT= Stone extraction, SEMS = self-expandable metallic stent, CDC = Cholidochal cyst, SOD = Sphincter of Oddi



**Figure 1. Outcome ERCP procedure**

**Table 5. Comparative studies of type obstructive jaundice in different centers**

| Study                                      | Malignant | Benign |
|--|-----------|--------|
| Khanzada et al <sup>(11)</sup>             | 57%       | 43%    |
| Siddique et al (Pakistan) <sup>(12)</sup>  | 56.66%    | 43.33% |
| Verma et al (India) <sup>(13)</sup>        | 52.73%    | 47.27% |
| Assi et al (Thi-Qar, Iraq) <sup>(14)</sup> | 6.6%      | 93.4%  |
| Lobo et al (Croatia) <sup>(17)</sup>       | 27%       | 73%    |
| This study (Baghdad, Iraq)                 | 17.8%     | 82.2%  |

The CBD stone in this study was the commonest cause of benign obstructive jaundice (mean age 45 yrs and more in the female), but the second cause was the fibrosis. This is consistent with study of Prat et al <sup>(15)</sup>.

Another study was carried out in Croatia by Kujundzić et al, showed 83% due to benign causes with 54.1% secondary to CBD stone, which was higher among young female while malignant causes reported in 27% of condition. These result are close to this study <sup>(16)</sup>.

There is disagreement between this study and study published by Khanzada et al in Karachi <sup>(11)</sup> as well as Siddique et al study <sup>(12)</sup> who found that malignant obstructive jaundice was more common than benign causes <sup>(12)</sup>. The possible explanation for this difference may be due to high incidence of CA gall bladder.

This study shows cholangiocarcinoma as the least common tumor, which agreed with studies by Saddique et al, Khanzada et al and by Verma et al <sup>(11-13,16)</sup>.

In this study, the success rate of ERCP was 87.2% and failure was 12.8%, while success rate by of Prat et al, was 96% <sup>(15)</sup>. Stone extraction in this study done for 92% while by Prat et al was 100%. The difference is due more expert endoscopist, and general anesthesia and surgical backup that contribute in increasing the success rate <sup>(15)</sup>.

Failure of ERCP in this study (15 patients from 18 patients) was due to peri-ampullary diverticulum. This cause is the commonest cause in failure of ERCP as mentioned by Lob et al <sup>(17)</sup>. The complications was mild pancreatitis

(4 patients (2.8%)), moderate pancreatitis (2 patients (1.4%)), simple bleeding (2 patients (1.4%)), which is close to Prat et al <sup>(15)</sup>. In conclusion, benign causes of obstructive jaundice are more frequent than malignant causes.

The commonest cause of the benign obstructive jaundice in this study is the CBD stone, which is more in female patients. The next in frequency is biliary fibrosis. In malignant obstructive jaundice, the pancreaticobiliary malignancy and pancreatic tumor are the commonest type of tumor, which is more in middle and old age male patients.

ERCP was invaluable procedure in treatment of obstructive jaundice with very high success rate low cost and less traumatic to the patient.

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### Conflict of interest

The author declares no conflict of interest.

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None.

### References

1. Center SA. Diseases of the gallbladder and biliary tree. *Vet Clin North Am Small Anim Pract.* 2009; 39(3): 543-98.

2. Rossi RL, Traverso LW, Pimentel F. Malignant obstructive jaundice. Evaluation and management. *Surg Clin North Am.* 1996; 76(1): 63-70.
3. Nanashima A, Abo T, Sakamoto I, et al. Three-dimensional cholangiography applying C-arm computed tomography in bile duct carcinoma: A new radiological technique. *Hepatogastroenterology.* 2009; 56(91-92): 615-8.
4. Mutignani M, Iacopini F, Perri V, et al. Endoscopic gallbladder drainage for acute cholecystitis: technical and clinical results. *Endoscopy.* 2009; 41(6): 539-46.
5. Jaganmohan S, Lee JH. Self-expandable metal stents in malignant biliary obstruction. *Expert Rev Gastroenterol Hepatol.* 2012; 6(1): 105-14.
6. Gwon DI, Ko GY, Sung KB, et al. A novel double stent system for palliative treatment of malignant extrahepatic biliary obstructions: a pilot study. *AJR Am J Roentgenol.* 2011; 197(5): W942-7.
7. Adamek HE, Albert J, Weitz M. A prospective evaluation of magnetic resonance cholangiopancreatography in patients with suspected bile duct obstruction. *Gut.* 1998; 43(5): 680-3.
8. Bilhartz MH, Horton JD. Gallstone disease and its complications. In: Feldman M, (ed.) *Sleisenger and Fordtran's Gastrointestinal and liver disease.* 6<sup>th</sup> ed. Philadelphia: WB Saunders; 1998. p. 948-72.
9. Vlahcevic ZR, Heuman DM. Diseases of the gallbladder and bile ducts. In: Goldman G (ed.) *Cecil textbook of medicine.* 21<sup>st</sup> ed. Philadelphia: WB Saunders; 2000. p. 82
10. Ahmed A, Cheung RC, Keeffe EB. Management of gallstones and their complications. *Am Fam Physician.* 2000; 61(6):1673-80,
11. Khanzada TW, Samad A, Memon W, et al. The etiological spectrum of obstructive jaundice and treatment outcome. *J Postgraduate Med Inst.* 2008; 22: 2.
12. Siddique K, Ali Q, Mirza S, et al. Evaluation of the etiological spectrum of obstructive jaundice. *J Ayub Med Coll Abbottabad.* 2008; 20(4): 62-6.
13. Verma S, Sahai S, Gupta P, et al. Obstructive jaundice. etiological spectrum, clinical, biochemical and radiological evaluation. *Internet J Tropical Med.* 2010; 7(2): 25-32.
14. Assi AN, Hassan AJ, Ali KN. The etiological spectrum of obstructive jaundice & role of ERCP in Thi-Qar Governorate. *Iosr J Pharmacy.* 2013; 3(3): 26-30.
15. Prat F, Amouyal G, Amouyal P, et al. Prospective controlled study of endoscopic ultrasonography and endoscopic retrograde cholangiography in patients with suspected common-bileduct lithiasis. *Lancet.* 1996; 347: 75-9.
16. Kujundzić M, Petrovecki M, Romić Z, et al. Etiology and epidemiology of obstructive jaundice in Continental Croatia. *Gracanin AG1 Antropol.* 2013; 37(1): 131-3.
17. Lobo DN, Balfour TW, Iftikhar SY. Periapillary diverticula: consequence of failed ERCP. *Ann Royal Coll Surg Engl.* 1998; 80(5): 326-31.

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