

Endoscopic Retrograde Cholangio-Pancreatography: A Single Hospital Experience, Aden, Yemen

Fuad H. Bin-Gadeem

Abstract

Introduction: Since the last few years, 22 May Hospital-Aden has launched ERCP (endoscopic retrograde cholangio-pancreatography) services. ERCP is an endoscopic procedure used to diagnose and treat disease in the biliary tract and pancreatic duct. This study aimed to identify demographic characteristic of patients and indications for the procedure and underlying causes, to describe the techniques used during the procedure and the complications of ERCP, and to describe the received and referred cases from and to surgical department during the study period in this hospital.

Methods: This is a retrospective, descriptive study from the 1st October 2017 to 31st September 2019 in 22 May hospital. Available reports of ERCP during the study period were reviewed. Patients who underwent ERCP to remove stent from bile or pancreatic ducts were excluded from the study. Relevant data were extracted. Quantitative variables were expressed as mean and standard deviation whereas categorical variables were expressed as counts and percentages. For statistical entry and analysis, the Statistical Package for Social Sciences (SPSS) software version 17 was used.

Results: A total of 48 ERCP reports were evaluated. Composed of 26 females (54.2%) and 22 males (45.8%). The mean age of the patients was 50.2 with a standard deviation of 17.11 years. The most common indication for ERCP was obstructive jaundice (81.3%) and the most common underlying cause was choledocholithiasis (60.4%). All the ERCPs were done for therapeutic purpose. Common bile duct was successfully cannulated in 46 cases (95.8%). Post ERCP pancreatitis was developed in 2 patients (4.2%).

Conclusion: The findings of the study is comparable to that in many recent published papers in the world. The introduction of ERCP services into the hospital can be regarded as a foundation stone for a new era in the management of pancreatico-biliary disease.

Keywords: ERCP, Obstructive Jaundice, Choledocholithiasis, Laparoscopic Cholecystectomy, Sphincterotomy.

General Surgery Department, Faculty of Medicine and Health Sciences, University of Aden, Republic of Yemen.

Corresponding Author: Fuad H. Bin-Gadeem

Email: fuadbingadeem@hotmail.com

تصوير البنكرياس والأقنية الصفراوية بالتنظير الداخلي بالطريق الراجع: خبرة أحد المستشفيات في عدن، اليمن

فؤاد حسن بن قديم

ملخص الدراسة

المقدمة: منذ السنوات القليلة المنصرمة، بدأ مستشفى 22 مايو- عدن خدمة تصوير البنكرياس والأقنية الصفراوية بالتنظير الداخلي بالطريق الراجع. وهي عبارة عن إجراء بالمنظار يهدف إلى تشخيص وعلاج أمراض القناة الصفراوية وقناة البنكرياس. هدفت الدراسة إلى تحديد الخصائص الديموغرافية للمرضى ودواعي التنظير والأسباب الكامنة. وكذلك وصف التقنيات المستخدمة والمضاعفات ووصف الحالات المستقبلية والمحولة من وإلى قسم الجراحة خلال فترة الدراسة في المستشفى.

المنهجية: هذه دراسة إستيعادية ووصفية من أول أكتوبر 2017 إلى 31 سبتمبر 2019 في مستشفى 22 مايو. تمت مراجعة التقارير المتاحة للتصوير البنكرياس والأقنية الصفراوية بالتنظير الداخلي بالطريق الراجع واستقصاء الحالات التي أجريت لها إزالة دعامة الأقنية الصفراوية أو البنكرياسية كما تم استخلاص المعلومات وثيقة الصلة بموضوع الدراسة والتعبير إحصائياً عن المتغيرات الكمية بالمتوسط الحسابي والانحراف المعياري والمتغيرات النوعية بالعدد والنسبة. تم إدخال وتحليل البيانات باستخدام الحزمة الإحصائية للعلوم الاجتماعية (SPSS) إصدار 17.

النتائج: تم تقييم إجمالي 48 تقريراً لتصوير البنكرياس والأقنية الصفراوية بالتنظير الداخلي بالطريق الراجع لـ 26 انثى (54.2%) و22 ذكر (45.8%). كان متوسط العمر 50.2 مع انحراف معياري 17.11 سنة. كان الصفار الانسدادي من أكثر دواعي إجراء تصوير البنكرياس والأقنية الصفراوية بالتنظير الداخلي بالطريق الراجع (81.3%)، بينما كان تحصي الأقنية الصفراوية من أكثر الأسباب الكامنة (60.4%). كل إجراءات التصوير للبنكرياس والأقنية الصفراوية بالتنظير الداخلي بالطريق الراجع تمت لأغراض علاجية. تم إقناء الأقنية الصفراوية بنجاح لدى 46 حالة (95.8%). حدث التهاب البنكرياس بعد تصوير البنكرياس والأقنية الصفراوية بالتنظير الداخلي بالطريق الراجع لدى مريضين (4.2%).

الاستنتاج: كانت نتائج الدراسة مقارنة لعدد من الدراسات الطبية الحديثة. يمكن اعتبار إدخال خدمة تصوير البنكرياس والأقنية الصفراوية بالتنظير الداخلي بالطريق الراجع إلى المستشفى بمثابة حجر الأساس لحقبة جديد من العلاج لأمراض البنكرياس والأقنية الصفراوية. **الكلمات المفتاحية:** تصوير البنكرياس والأقنية الصفراوية بالتنظير الداخلي بالطريق الراجع، صفار انسدادى، تحصي الأقنية الصفراوية، استئصال المرارة بالمنظار، شق المصرة.

قسم الجراحة العامة، كلية الطب والعلوم الصحية، جامعة عدن، الجمهورية اليمنية.

Introduction

ERCP (Endoscopic retrograde cholangio-pancreatography) is an important technique of pancreaticobiliary disease and has continued to develop for more than 4 decades [1]. ERCP procedure can be defined as an endoscopic procedure with an intention to cannulate the common bile duct (CBD), the pancreatic duct or both [2]. It is a combined endoscopic and fluoroscopic procedure. An upper endoscope is led into a second part of the duodenum, duodenal papilla visualized and cannulated. Contrast material may be injected in the common bile duct or pancreatic duct, allowing for radiologic visualization of these ducts for diagnostic purpose. It is possible to pass other tools via the duodenal papilla into the biliary and pancreatic ducts and therapeutic interventions carried out, when indicated [3]. Removal of debris, stone removal, sphincterotomy, stent placement in symptomatic patients are few examples of therapeutic intervention carried out by ERCP [4].

ERCP once regarded as the gold standard imaging technique of the biliary and pancreatic ducts, its role as diagnostic tool has diminished with the advance of multiple non-invasive imaging test of the biliary and pancreatic systems including high resolution CT-scan, MRCP (magnetic resonance cholangio-pancreatography) and EUS (endoscopic ultrasound) [2,5,6]. One notable exception to this trend is the need for ERCP with tissue sampling in suspected malignant biliary obstruction [4]. The most frequent abnormality encountered in pancreaticobiliary tract is

obstruction, which is commonly caused by stones, tumors, or infection [7]. ERCP has been established as the method of choice for the treatment of choledocholithiasis. Its success rate is 85-90%. ERCP procedures, using ballooned double-lumen catheter, wired basket, and mechanical lithotripsy, found helpful especially in non-operated patients. Other cause of obstruction is tumor, with papillary cholangiocarcinoma being the most common, follow by pancreatic head tumors, whilst the incidence is increasing due to better sensitivity of diagnostic tools [8].

ERCP though complex and invasive, is one of the commonly performed endoscopic procedures [6]. It is really one of the most technically demanding procedure [9,10]. When ERCP is performed by an experienced person, the reported frequency of ERCP specific complications ranges from 5% to 40%. Acute pancreatitis is the most common and serious complication after ERCP [11], and carries a high morbidity and mortality [12]. Other post-ERCP specific complications include papillary bleeding, duodenal perforation and biliary septic complications [13].

Since 2nd January 2017, ERCP had been carried out in 22 May Hospital-Aden as a continuously available hospital service, although few ERCP procedures were carried out much earlier by visitor endoscopist to the hospital. Twenty-two May Hospital, Aden was the first governmental, public hospital in Aden, which had started ERCP service in Aden. It was found valuable to make a retrospective study of ERCP in this referral hospital, aiming to identify

demographic characteristic of patients (age and sex only) and indications for the procedure and underlying causes, to describe the techniques used during the procedure and the complications of ERCP, and to describe the received and referred cases from and to surgery.

Methods

This is a retrospective study of ERCP in 22 May hospital; a public referral surgical center in Aden, from 1st October 2017 to 30 September 2019. Available reports of ERCP during the study period were reviewed in this study. Patients who underwent ERCP to remove stent from bile or pancreatic ducts were excluded from the study. Relevant data were extracted. Quantitative data were expressed as mean and standard deviation whereas categorical data were expressed as counts and percentages. Tables and diagram were also used to summarize data and illustrate the description. The results of the study were compared to the literature. Statistical analysis was carried out using SPSS software version 17.

Instrumentation

After written consent, all the procedures were done under general anesthesia. The procedures were performed using Olympus Exera II video- duodenoscopy under fluoroscopic guide. They were carried out by three consultant gastroenterologist and one consultant surgeon.

Results

A total of 48 ERCP reports were analyzed, composed of 26 females (54.2%) and 22 males (45.8%). The

mean age of the patients was 50.2 years with a standard deviation (SD) of 17.11 and ranged from 12 to 90 years. Further details are illustrated in Table 1.

Table 1: Socio-Demographic Characteristic of the Study Population (n=48)

Characteristic	No.	%
Gender		
Female	26	54.2
Male	22	45.8
Age (years)		
<20	2	4.2
20- 29	6	12.5
30- 39	4	8.3
40-49	11	22.9
50-59	9	18.8
60- 69	10	20.8
≥ 70	6	12.5
Mean age + SD (years)	50.2 ± 17.11	
Range (years)	12- 90	

In Table 2; obstructed jaundice was the main ERCP indication (81.3%) followed by choledocholithiasis (stone in common bile duct) without obstructive jaundice (14.5%) and bile leak from operation site, namely, cholecystectomy (4.2%).

Table 2: Indications for ERCP and Underlying Causes (n=48)

ERCP Indications^ & causes*	No. (%)^	No. (%)*
Obstructive jaundice^	39 (81.3)	
CBD stones*		19 (39.6)
Biliary sludge (mud)*		4 (8.3)
Periampullary tumor*		3 (6.2)
Head of pancreas tumor*		3 (6.2)
CBD stones & SCD*		2 (4.2)
Benign papillary stenosis*		2 (4.2)
Stricture of bile duct*		2 (4.2)
Failed cannulation (undetermined)*		2 (4.2)
Mirizzi syndrome*		1 (2.1)
SOD*		1 (2.1)
CBDS without obstructive jaundice^	7 (14.5)	
CBDS*		5 (10.4)
CBDS & SCD *		2 (4.1)
Bile leak after cholecystectomy^	2 (4.2)	
Bile duct injury*		1 (2.1)
Stump leak + missed CBD stone*		1 (2.1)

CBDS: common bile duct stone; SOD: sphincter of oddi dysfunction; SCD sickle cell disease

As illustrated in Table 3, 89.6% of sphincterotomy was done during the procedure. Successful bile duct cannulation was done in 95.8%, whereas in 4.2% bile duct cannulation failed because of obstructed papilla and anatomical variation in position. Common bile duct was successfully cleared of stone in 24 cases and biliary sludge in 4 cases. In another 4 cases, stone extraction failed, because of large size stone. However, bile duct was successfully stented in these cases to relieve obstructive jaundice and patients were referred for surgical consultation. Stent was successfully deployed in position in 33 cases (68.8%), 31 (64.6%) into the bile duct and 2 (4.2%) into the pancreatic duct Table 3.

Table 3: Different Techniques Applied During ERCP (n=48)

Techniques applied during ERCP	No.	% *
CBD cannulation	46	95.8
Sphincterotomy	43	89.6
Bile duct stenting	31	64.6
CBDS [^] extraction	24	50.0
Biliary sludge extraction	4	8.3
Pancreatic duct stenting	2	4.2

* Percent calculated from total ERCP.

[^] CBDS: common bile duct stone

Regarding complications, Table 4 shows that 2 patients (4.2%) developed mild pancreatitis after procedure. Mild bleeding was visualized during procedure at sphincterotomy site in 5 cases (10.4%), controlled by local hemostasis, and did not associated with hemodynamic changes or drop in hemoglobin level or need for blood transfusion or prolonged hospital stay. One patient (2.1%) developed delayed bleeding after procedure and required 2 pints of

blood transfusion. This patient had concomitant liver cirrhosis. No reported duodenal perforation or other complications. Sixteen patients (33.3%) had synchronous cholelithiasis (gallbladder stone) and choledocholithiasis (common bile duct stone). After successful ERCP stone extraction from bile duct, patients were advised for laparoscopic cholecystectomy as soon as possible.

Table 4: Complications of ERCP (n=48)

Presence of complication	No.	%*
No complication	40	83.3
Mild bleeding	5	10.4
Mild pancreatitis	2	4.2
Significant bleeding	1	2.1

Diagram 1, illustrates the reciprocal referral of patients between the surgical department and endoscopy unit (ERCP). For example, sixteen patients (33.3%) were advised for laparoscopic cholecystectomy as soon as possible after successful endoscopic stone extraction from bile duct. They had synchronous cholelithiasis (gallbladder stone) and choledocholithiasis (common bile duct stone). Whereas 2 (4.2%) patients with bile leak after cholecystectomy were advised for ERCP.

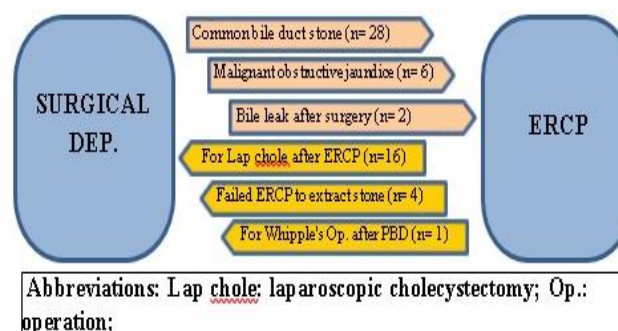


Diagram 1: Referral of cases between surgical department and ERCP

Discussion

The current audit provides insight to the ERCP carried out in a public referral hospital in Aden. To the best of my knowledge, this is the first such study in Aden.

In the current study, the highest percentage of patients were females (54.4%). This is similar to what was reported by Mitra *et al* (56%) [14], Shennak *et al* in Jordan (62%) [15] and others [16,17]. The mean age of the study population was 50.2 ± 17.1 years. This is in consistence with studies by, Borges *et al* in Brazil (54 ± 18.9) [18], Shennak in Jordan (49.5 ± 15.4) [15], and Gurung in Nepal (50.57 ± 17.8) [17].

The primary indication for ERCP was obstructive jaundice (81.3%). This figure is lower than what mentioned by Salim *et al* in Jakarta where clinically diagnosed obstructed jaundice reached 92% of the ERCP patients [19].

Cholelithiasis was the most common underlying disease in ERCP patients (60.4%). It presented with or without obstructive jaundice (43.8% and 14.5% respectively), and unfortunately it presented in one case (2.1%) as a bile leak from cystic duct stump after cholecystectomy associated with missed stone in common bile duct. Patients with sickle cell disease (like in this study) may present with obstructive jaundice due to cholelithiasis and the differentiation from the usual hemolytic jaundice is crucial.

Research from different parts of the world clearly indicated that cholelithiasis is the main

reason for ERCP [18,20,21]. For example, Jain *et al* in Karnatka, India, indicated that 76.43% of ERCP were carried out for choledocholithiasis, followed by cancer of head of pancreas (4.08%) and periampullary cancer (3.06) [20]. Likewise, Borges *et al* in Brazil, reported that the major reason for ERCP was choledocholithiasis in 57.8% and suspected choledocholithiasis in 16.6% of the cases [18]. Lee in South Korea identified bile duct stone and biliary sludge on endoscopy in 61.6% and 15.0% of patients respectively who had been diagnosed with acute pancreatitis [21].

In this audit, all the ERCP were done for therapeutic purpose. This is similar to the findings of Mitra *et al* in a non-tertiary referral district hospital in Northeast England [14] and Debnath *et al* in Mymensingh Medical College Hospital in Bangladesh [22]. Similarly, Borges *et al* reported that most of the ERCPs (97.6%) were therapeutic [18].

Successful biliary cannulation was achieved in around 96% of the patients. Similarly, successful biliary cannulation was achieved in most patients as mentioned in the study by Tumi *et al* in Libya [16], whereas Jain *et al* reported successful cannulation in desired duct in 90.2% of all ERCP [2]. ASGE (American Society for Gastrointestinal Endoscopy) quality indicator states that cannulation rates should be more than 90% [23]. In the present study, this quality indicator was fulfilled.

In the current study, sphincterotomy was done in 89.6% of the procedures. Perdigoto *et al* in Portugal reported that biliary sphincterotomy was

executed in 81.4% of the ERCP procedures. [24]. The high success rate of biliary cannulation was probably due to the use of sphincterotome, which differs from a standard biliary cannulation catheter due to the presence of an electrosurgical cutting wire at the distal end of the catheter. This cutting wire, which is intended to incise the papilla after cannulation, also assists in alignment of the catheter for achieving successful duct cannulation. As such, use of a sphincterotome rather than a standard catheter has been shown to improve initial biliary cannulation success rates [10].

Acute pancreatitis was developed after ERCP in 2 patients (4.2%). This is comparable to what was reported in some studies [23-26]. The reported incidence of post ERCP pancreatitis (PEP) is around 5% ranging from 3 to 14% [23,24]. PEP remains the most serious complication after ERCP [25]. Prophylactic pancreatic duct stenting was done in 2 patients. Naqvi *et al* in a tertiary care hospital in Pakistan, noted lower percentage of PEP with prophylactic pancreatic duct stenting [26].

Bleeding was visualized during ERCP procedure at sphincterotomy site in 5 cases (10.4%). In our opinion, these findings should not be regarded as complications of the procedure, because they were controlled during procedure and had no effect on vital parameters, did not require blood transfusion, nor prolonged hospital stay. However, one patient (2.1%) developed clinically manifested post ERCP hemorrhage, and this should be considered as post ERCP bleeding complication. This patient had

associated liver cirrhosis. As noted by Kim *et al*, liver cirrhosis is a significant risk factor related to post-ERCP bleeding [27].

The introduction of ERCP services into the hospital can be regarded as a foundation stone for a new era in the management of pancreatobiliary disease. For example, with the availability of these services, new algorithms for the management of synchronous cholelithiasis and choledocholithiasis have been preferentially selected by many of the local surgeons. This strategy composed of two stages, instead of the traditional one stage open surgical approach. In the current study, 16 cases (33.3%) had been diagnosed preoperatively by imaging technique as synchronous cholelithiasis and choledocholithiasis. They were referred from surgical outpatient department to have first the common bile duct cleared of stone by ERCP. After successful stone extraction, patients were advised to have laparoscopic cholecystectomy, as soon as possible. In the literature, no firm consensus exists on the best management plan for synchronous gallbladder stones and common bile duct stones and different valid management plans exist. However, this two-stage management strategy is the most commonly used treatment policy worldwide as it has been proved efficient and safe [28].

In this audit, 6 cases (12.5%) of malignant obstructive jaundice due to cancer of head of pancreas or periampullary carcinoma were successfully managed by endoscopic biliary drainage. In most of these cases (5 patients), biliary drainage was restricted for palliative intent

because of advanced tumor stage or comorbidities whereas, one patient after preoperative biliary drainage underwent Whipple's operation (a potentially curative surgery) [29].

Endoscopic biliary stenting is now accepted as the gold standard in case of nonresectable malignant obstructive jaundice. Although endoscopic stenting is associated with earlier recovery and shorter length of stay, recurrence of symptoms and reintervention are less frequent after palliative surgery [29]. In case of malignant obstructive jaundice caused by surgically resectable tumors, preoperative biliary decompression by means of endoscopic biliary stenting can improve patient physiological condition, nutritional status, coagulation function and immunity [30]. However, increased postoperative adverse events noticed by some researchers, like increased post-operative infection rate and anastomosis dehiscence [31,32]. Currently this issue is under active research.

In this study, 2 cases (4.2%) of bile leak were managed by ERCP. Traditionally, surgery has been the gold standard for the management of bile leak, but it is associated with significant morbidity and mortality. Recently, biliary endoscopic procedures including biliary stenting and/or endoscopic sphincterotomy (EST) have become the first choice for diagnosis and treatment of postoperative bile leakage as simple, noninvasive procedure, with low morbidity and mortality, short hospital stay, and cost effective, with demonstrated results comparable to those achieved with surgery [33]. Although ERCP has

become the preferred tool for the management of many conditions as mentioned above, it is still far from optimal. For example, in the current study, the success rate of common bile duct clearance of stone reached 85.7%. There were 4 patients with large impacted stone in the common bile duct, which needed surgical consultation and management. Obviously, local facilities also play an important role in the success rate of such procedure. Medicine is a continuously evolving science, likewise ERCP instrument, accessories and techniques are continuously developing on pressure of demand to improve success rate, even in the face of difficult situations.

Acknowledgement

I thank all staff of endoscopic unit, 22 May Hospital, and special thanks for Dr. Omar Banafea, Dr. Mohammed Nasr Haidara, Assist. Prof. Dr. Abdulwahed Aldoqm and Dr. Salah Al-Tawil.

References

1. Hu L, Xin L, Liao Z, Pan J, Qian W, Wang L, *et al.* ERCP development in the largest developing country: a national survey from China in 2013. *Gastrointestinal Endoscopy* 2016; 84 (4): 659-66.
2. Jain RP, Jain P, Ravichandra NS, Chaudary V, Kumar A. Procedural outcomes analysis of endoscopic retrograde cholangiopancreatography procedures at tertiary centre hospital in south india. *International J Research Review* 2019; 6(6): 37-41.

3. Freeman ML, Guda NM. ERCP cannulation: a review of reported techniques. *Gastrointestinal Endoscopy* 2005; 61(1): 112-25.
4. Tzimas DJ, Nagula S. Stones in the bile duct: endoscopic and percutaneous approaches. In: Jarnagin WR ed. *Blumgart's surgery of liver, biliary tract and pancreas*. 6th ed. Elsevier: 2017.p. 611-622.
5. Salerno R, Mezzina N, Ardizzone S. Endoscopic retrograde cholangiopancreatography, lights and shadows: Handle with care. *World J Gastrointest Endosc* 2019; 11(3): 219-30.
6. Wojda TR, Nuschke JD, Smith EA, Modi R, Schadt S, Strosberg D, *et al*. Endoscopic retrograde cholangiography: Complications, emergencies, and related topics. *International J Academic Medicine* 2018; 4(2): 124-41.
7. Abdullah AA, Abdullah M, Fauzi A, Syam A, Simadibrata M, Makmun D. The effectiveness of endoscopic retrograde cholangio-pancreatography in the management of patients with jaundice at CiptoMangunkusumo hospital, Jakarta. *Indonesian J Internal Medicine* 2012; 44(4): 298-303.
8. Parra V, Margarita Huertas MQ, Beltrán J, Ortiz D. Evaluation of the safety of ERCP in older patients in the experience of a university hospital in Bogota. *Rev Col Gastroenterol* 2015;30 (2): 155- 60.
9. Panda CR, Das HS, Behera SK, Nath P. Retrospective analysis of endoscopic retrograde cholangio-pancreatography (ERCP) procedures in a tertiary care centre in coastal Odisha. *Int J Res Med Sci* 2017;5(10):4281-4.
10. Wanis KN, Haimanot Sand Kanthan R. Endoscopic retrograde cholangio-pancreatography: a review of technique and clinical indications. *J Gastroint Dig Syst* 2014, 4(4): 1-6.
11. Zubair M, Hyder A, Zaidi AR. Frequency and contributing factors for acute pancreatitis after endoscopic retrograde cholangio-pancreatography in patients with obstructive jaundice. *Pak Armed Forces Med J* 2017; 67 (5): 783-7.
12. Habib M, Dar HA, Khan MA, Shah AH, Zargar SA, Singh B, *et al*. Clinical profile, complications, management, and outcome of post-endoscopic retrograde cholangio-pancreatography pancreatitis: anorth Indian study. *J Digestive Endoscopy* 2018; 9(4):155-8.
13. Iorgulescu A, Sandu I, Turcu F, Iordache N. Post-ERCP acute pancreatitis and its risk factors. *J Medicine Life* 2013; 6(1):109-13.
14. Mitra V, Mitchison H, Nylander D. Endoscopic retrograde cholangio-pancreatography services can be accessible and of a high standard in a district general hospital. *Frontline Gastroenterology* 2012; 3:152-6.
15. Shennak MM. Endoscopic retrograde cholangio-pancreatography (ercp) in the diagnosis of biliary and pancreatic ductdisease: a prospective study on 668 Jordanian patients. *Annals Saudi Medicine* 1994; 14(5): 409-14.
16. Tumi A, Magadmi M, Elfageih S, Rajab A, Azzabi M, Elzouki A. ERCP in a cohort of 759 cases: A 6-year experience of a single tertiary centre in Libya. *Arab J*

- Gastroenterology 2015; 16(1): 25-8.
17. Gurung RB, Purbey B, Koju R, Bedi TRS. Endoscopic retrograde cholangio-pancreatography at dhulikhel hospital: outcome analysis. Kathmandu Univ Med J 2014;45(1):55-9.
 18. Borges AC, Almeida PC, Furlani SMT, Cury MS, Pleskow DK. ERCP performance in a tertiary Brazilian center: Focus on new risk factors, complications and quality indicators. ABCD Arq Bras Cir Dig 2018;31(1): e1348.
 19. Salim S, Gunawan D, Ahmadi I, Simadibrata M, Fauzi A, Syam AF. The success rate of ERCP for identifying and stenting of obstructive jaundice in Dr. Cipto Mangunkusumo General National Hospital, Jakarta. Indonesian J Gastroenterology, Hepatology Digestive Endoscopy 2008; 9(1): 45-7.
 20. Jain PK, Vinay BN. Indications and complications of endoscopic retrograde cholangio-pancreatography procedures in a tertiary care centre. Int J Adv Med 2016;3(4):838-41.
 21. Lee HS, Chung MJ, Park JY, Bang S, Park SW, Song SY, *et al.* Urgent endoscopic retrograde cholangiopancreatography is not superior to early ERCP in acute biliary pancreatitis with biliary obstruction without cholangitis. PLoS ONE 2018; 13(2): e0190835. [cited 2018 Feb 5]. Available from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5798765/> accessed 12/12/2020.
 22. Debnath CR, Ahmed N, Debnath MR, Amin MR, Akther T, Tarafder AJ. Study on endoscopic retrograde cholangio-pancreatography. Mymensingh Med J 2019;28(2):317-21
 23. Adler DG, Lieb II JG, Cohen J, Pike IM, Park WG, Rizk MK, *et al.* Quality indicators for ERCP. Gastrointestinal Endoscopy 2015; 81(1): 54-66.
 24. Perdigoto DN, Gomes D, Almeida N, Mendes S, Alves AT, Camacho E, *et al.* Risk factors for post-endoscopic retrograde cholangio-pancreatography pancreatitis in the indomethacin era – A prospective study. GE Port J Gastroenterol 2019; 26:176-83.
 25. El Nakeeb A, El Hanafy E, Salah T, Atef E, Hamed H, Sultan AM, *et al.* Post-endoscopic retrograde cholangio-pancreatography pancreatitis: Risk factors and predictors of severity. World J Gastrointest Endosc 2016; 8(19): 709-15.
 26. Naqvi M, Khalid MS, Haider E, Saeed F, Shabbir K, Ali M, *et al.* Role of pancreatic stent placement in prevention of postendoscopic retrograde cholangio-pancreatography pancreatitis: experience at a tertiary care hospital in Pakistan. Pak Armed Forces Med J 2018; 68 (5): 1225-9.
 27. Kim JY, Lee HS, Chung MJ, Park JY, Park SW, Song SY, *et al.* Bleeding complication and clinical safety of endoscopic retrograde cholangio-pancreatography in patient with liver cirrhosis. Yonsei Med J 2019; 60(5):440-5.
 28. Freitas ML, Bell BL, Duffy AJ. Choledocholithiasis: Evolving standards for diagnosis and Management. World J Gastroenterol 2006; 12(20): 3162-7.

29. Perinel J, Adham M. Palliative therapy in pancreatic cancer—palliative surgery. *Transl Gastroenterol Hepatol* 2019; 4: 28. doi: 10.21037/tgh.2019.04.03.
30. Moole H, Bechtold M, Puli SR. Efficacy of preoperative biliary drainage in malignant obstructive jaundice: a meta-analysis and systematic review. *World J Surgical Oncology* 2016; 14:182. doi: 10.1186/s12957-016-0933-2.
31. Ng ZQ, Suthanathan AE, Rao S. Effect of preoperative biliary stenting on post-operative infectious complications in pancreaticoduodenectomy. *Ann Hepatobiliary Pancreat Surg* 2017; 21:212-6.
32. Bakens M, Rijssen B, Woerden V, Besselink M, Boerma D, Busch O, *et al.* Evaluation of preoperative biliary drainage in patients undergoing pancreatoduodenectomy for suspected pancreatic or periampullary cancer. *J Pancreas* 2018; 19(1):24-8.
33. Yun SU, Cheon YK, Shim CS, Lee TY, Yu HM, Chung HA, *et al.* The outcome of endoscopic management of bile leakage after hepatobiliary surgery. *Korean J Intern Med* 2017; 32: 79-84.