ORIGINAL ARTICLE

Endoscopic Versus Percutaneous Transhepatic Biliary Drainage in Management of different Types of Hilar Common Bile duct Stricture

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Abstract

Background: ***Many different benign and malignant disorders can result in biliary strictures at the liver hilum. Hematologic, hepatic, renal, and cardiac dysfunction are just a few of the organ systems that may be impacted by biliary blockage, which changes normal physiology.***

Aim and objectives: ***To evaluate the effectiveness of endoscopic vs percutaneous transhepatic biliary drainage (PTBD) in treating various types of hilar common bile duct stricture.***

Patients and methods: ***Fifty individuals with hilar obstructive jaundice were hospitalized between June 2022 and September 2024 at the Gastroenterology and Hepatology Unit of the Department of Internal Medicine at Al-Hussein University Hospital. Clinical evaluation, laboratory results, imaging results, invasive procedures (endoscopic retrograde cholangiopancreatography, or ERCP), percutaneous transhepatic drainage, or rendez-vous drainage, and a postoperative laboratory follow-up of five to seven days.***

Results: ***Bismuth Corlette types and ERCP outcome were highly statistically significantly correlated (P<0.001). Of patients who had a successful ERCP, 14 patients had type I Bismuth Corlette (48.3%), 10 patients had type II (34.5%), 3 patients had type III (10.1%), and 2 patients had type IV (6.9%).***

Conclusion: ***PTD is superior to ERCP in drainage of hilar biliary obstruction. ERCP effectively drains Bismuth type I and II strictures, and no significant difference between using one plastic stent and two plastic stents in these types of strictures, while PTD is more effective in drainage of more complex strictures in Bismuth type III and IV.***

Keywords: PTBD; Bile duct stricture; Endoscopy; Hilar

1. Introduction

Many different types of diseases, both benign and cancerous, can lead to biliary strictures near the liver hilum.[1]

Negligible hilar strictures can be caused by a variety of surgical procedures, such as cholecystectomy, liver transplantation or resection, or primary sclerosing cholangitis. On the other hand, malignant hilar strictures can be caused by cholangiocarcinoma, tumours that extend directly from the gallbladder or liver, or metastasis from other cancers.[2]

Both an internal and an exterior technique can be used to accomplish biliary drainage. A biliary stent and an endoscopic sphincterotomy can be used to accomplish internal biliary drainage, whereas a fluoroguided percutaneous transhepatic approach can be used to accomplish external biliary drainage, which can subsequently be internalised. While surgical bypass can also accomplish biliary drainage, the intrusive nature of the treatment makes it a less preferable method.[3]

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When dealing with severe cholangitis and other specific clinical circumstances, percutaneous transhepatic biliary drainage (PTBD) can literally save lives. There are a number of variables that affect the technical and clinical success of PTBD. These include the interventional radiologist's skill, the patient's condition, and the procedure itself. The level of peripheral biliary ductal dilatation is regarded as the most important component in the technical success of PTBD in routine interventional radiology (IR) treatment. Patients who are willing and able to follow breath-hold instructions are also more likely to have a positive technical outcome. Blood clots or bile leaks into the peritoneal space are more likely to occur when there is a lot of free fluid in the perihepatic space, which also makes it harder to reach the biliary system.. [4]

For patients with hilar stricture, particularly hilar cholangiocarcinoma, the optimal biliary drainage technique—whether endoscopic retrograde cholangioscopy (ERCP) or percutaneous drainage—remains unknown, despite decades of clinical research on the subject. Preoperatively (in patients eligible for curative treatment) or postoperatively (as a palliative measure), either one can be done. The clinical decision of which method to use is not simple. Only in cases when the anatomy has been altered can a simple choice be made.[5]

In order to better understand how to treat various forms of hilar common bile duct stricture, this study will compare endoscopic and percutaneous transhepatic biliary drainage.

2. Patients and methods

From June 2022 through September 2024, fifty consecutive patients hospitalized to the Gastroenterology and Hepatology Unit of El-Hussein University Hospital with hilar obstructive jaundice were included in this study. The study received green light from the medical school's ethics committee in Cairo, Egypt's Al-Azhar University.

Inclusion criteria:

Individuals with hilar CBD stricture, as well as those between the ages of 18 and 80.

Exclusion criteria:

Patients refuse to participate in the study. Patients contraindicated for anesthesia or had a bleeding tendency.

All patients were subjected to the following on admission:

Demographic data: including age, sex and residence. Clinical assessment: including medical history and clinical examination. Laboratory investigations: including blood count, liver functional tests, renal function tests, tumor markers and coagulation profile. Radiological investigations: including abdominal ultrasonography and magnetic resonance cholangiopancreatography (MRCP). Invasive procedures: Endoscopic retrograde cholangiopancreatography was done for all patients under general anesthesia. Patients whose ERCP attempts were unsuccessful had percutaneous transhepatic biliary drainage. Follow up with complete blood picture and liver profile 5-7 days after procedures.

Techniques of measuring laboratory investigations:

The laboratory tests were done using the commercially available kits.

Statistical Analysis:

Version 25 of the Statistics Package for the Social Sciences (SPSS) was used for data analysis. Qualitative data were presented using percentages and frequencies. The median with interquartile range (IQR) or mean±standard deviation (Mean±SD) was used to express continuous quantitative data.

A set of discrete numbers' mean (or average) is its central value, which is the sum of all the values divided by the total number of values. A measure of the dispersion of a set of values is the standard deviation (SD). The closer the values are to the set mean, the lower the SD, and the more dispersed the values are, the higher the SD. Finding the median involves sorting all of the data points in descending order and selecting the middle one (or, if there are two middle numbers, arithmetically summing them). The statistical dispersion, or the spread of the data, can be measured by the IQR, or inter-quartile range. Discrepancy between the data's 75th and 25th percentiles is how it is defined. Based on probability (P-value), a significance level of less than 0.05 was deemed significant, a level of less than 0.001 was deemed extremely significant, and a level of greater than 0.05 was deemed inconsequential.

The following tests were done:

To verify if the continuous data followed a normal or abnormal distribution, we ran the Kolmogorov-Smirnov and Shapiro-Wilk tests for normality. Mann Whitney When comparing two groups, the U test is used (for data that does not follow the normal distribution). Using the Wilcoxon Signed-Ranks Test (Z) to compare two sets of normally distributed data within the same group: paired data. Non-parametric categorical data were compared using the chi-square test.

Ethics and patient consent:

All patients had their written informed consent forms filled out before any treatments were done.

The protocols adhered to the standards set forth by the Al-Azhar University Ethical Committee.

3. Results

Table 1. Detailed description of patient demographics.

		ALL PATIENTS (N= 50)	
SEX	Males	37	74.0%
	Females	13	26.0%
AGE	Mean ± SD	59.9 ± 11.3	
	Min – max	27 – 80	

Among 50 patients with hilar common bile duct obstruction. They were 37 (74%) males and 13 (26%) females, the mean age 59.9 ± 11.3 years in all studied patients, (Table 1; Figure 1).

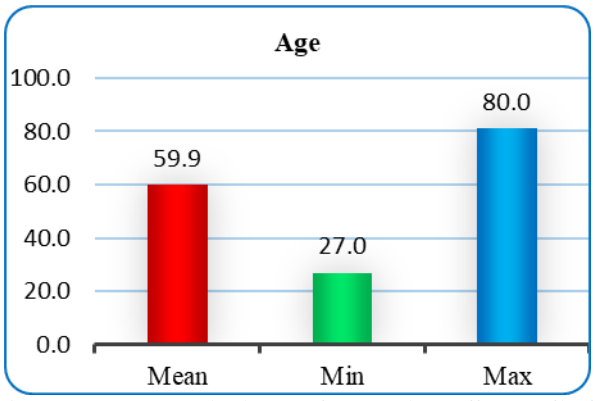

Figure 1. Description of age in all studied patients.

Table 2. Description of MRCP findings in all studied patients.

		ALL PATIENTS (N= 50)
DILATED CBD	0	0.0%
IHBRD	50	100.0%
HFL	12	24.0%
BISMUTH CORLETTE TYPE		
TYPE I	15	30.0%
TYPE II	10	20.0%
TYPE III	10	20.0%
TYPE IV	15	30.0%
SUBTYPES OF TYPE III (N= 10)		
TYPE III A	6	60.0%
TYPE III B	4	40.0%

IHBRD was present in all 50 patients (100%), HFL was present in 12 patients (24%) and no patients (0%) presented with dilated CBD in all studied patients. As regard types of Bismuth Corlette, it was type I in 15 patients (30%), type II in 10 patients (20%), type III in 10 patients (20%) and type IV in 15 patients (30%) in all studied patients. Type III of Bismuth Corlette was divided in to III a in 6 patients (60%) and III b in 4 patients (40%), (Table 2; Figure 2).

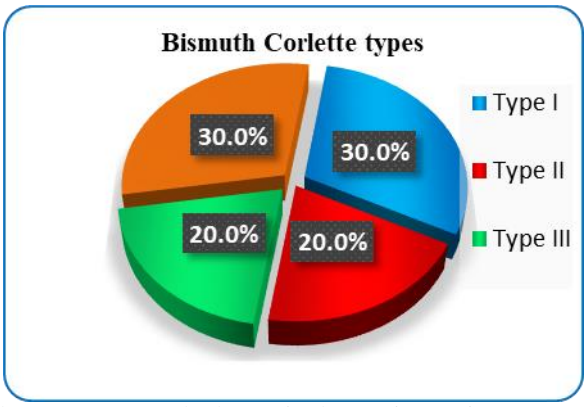

Figure 2. Description of Bismuth Corlette types in all studied patients.

Table 3. Description of ERCP data in all studied patients.

		ALL PATIENTS (N= 50)	
OUTCOME	Succeeded	29	58.0%
	Failed	21	42.0%
SUCCEEDED ENDOSCOPE (N= 29)			
NO. OF STENT	One stent	17	58.6%
	Two stents	12	41.4%
TYPE OF STEN	Plastic	26	89.7%
	Metallic	3	10.3%
PTD SUCCESS IN PATIENTS WITH FAILED ENDOSCOPE (N= 21)			
RT HEPATIC BILIARY SYSTEM		21	100.0%
LT HEPATIC BILIARY SYSTEM		19	90.5%
RENDEZ VOUS			
SUCCEEDED		5	10.0%

As regard type of stents used, it was plastic in 26 patients (89.7%) and metallic in 3 patients (10.3%) in patients with successful endoscopy. As regard PTD, R-system was successful in 21 patients (100%) and L-system was successful in 19 patients (90.5%) in patients with failed endoscopy. As regard Rendez Vous, it was successful in 5 patients (10%) in all studied patients, (Table 3).

Table 4. Comparison of laboratory data (before and after procedures) in all studied patients.

		PRE-PROCEDURES (N= 50)	POST-PROCEDURES (N= 50)	Z	P-VALUE
HB	Median (IQR)	11.7 (10.7 – 13.2)	11.5 (10.5 – 13.1)	-1.2	0.23 NS
PLTS	Median (IQR)	272 (211 – 375)	289 (219 – 367)	-1.46	0.14 NS
TLC	Median (IQR)	8 (6.7 – 10.9)	8 (7 – 10.1)	-1.66	0.098 NS
AST	Median (IQR)	373 (146 – 644)	129 (71 – 231)	-4.35	<0.001 HS
ALT	Median (IQR)	292 (121 – 454)	143 (71 – 222)	-4.15	<0.001 HS
T. BILIRUBIN	Median (IQR)	14.5 (10 – 18)	4 (2.5 – 7.6)	-5.6	<0.001 HS
D. BILIRUBIN	Median (IQR)	9.3 (6.9 – 13)	2.1 (1.6 – 5.9)	-4.6	<0.001 HS
ALP	Median (IQR)	766 (627 – 982)	290 (228 – 549)	-4.6	<0.001 HS
GGT	Median (IQR)	423 (246 – 539)	155 (96 – 363)	-3.8	<0.001 HS

High statistically significant (P<0.001) decreased D. Bilirubin after procedures (median= 2.1, IQR= 1.6 – 5.9) when compared with that before procedures (median= 9.3, IQR= 6.9 – 13) in

all studied patients. High statistically significant (P<0.001) decreased ALP after procedures (median= 290, IQR= 228 – 459) when compared with that before procedures (median= 766, IQR= 627 – 982) in all studied patients. High statistically significant (P<0.001) decreased GGT after procedures (median= 155, IQR= 96 – 363) when compared with that before procedures (median= 423, IQR= 246 – 539) in all studied patients, (Table 4).

Table 5. Correlation between outcome of ERCP (succeeded – failed (succeeded PTD)) and post procedure laboratory data in all studied patients.

		SUCCEEDEI ERCP (N= 29)	FAILED ERCP (SUCCESSFUL PTI (N= 21)	U	P-VALUE
HB	Median (IQR)	12 (10.9 – 13.	11 (10.2 – 12.8)	239	0.196 NS
PLTS	Median (IQR)	328 (231 – 40	261 (216 – 326)	218	0.089 NS
TLC	Median (IQR)	9 (7.1 – 11)	7.4 (6.6 – 9.4)	216	0.08 NS
AST	Median (IQR)	132 (74 – 523	127 (68 – 175)	247	0.258 NS
ALT	Median (IQR)	143 (73 – 336	142 (53 – 198)	242	0.219 NS
T. BILIRUBIN	Median (IQR)	5 (3.7 – 11)	2.5 (2.1 – 4)	91	<0.001 HS
D. BILIRUBIN	Median (IQR)	3 (2 – 8.2)	1.6 (1.4 – 2)	112	<0.001 HS
ALP	Median (IQR)	391 (193 – 91	281 (231 – 356)	233	0.16 NS
GGT	Median (IQR)	183 (104 – 62	118 (95 – 216)	202	0.043 S

U: Mann Whitney U tests. NS: P>0.05 is considered non-significant.

S: P<0.05 is considered significant.

No significant (P= 0.16) correlation between patients with succeeded and failed endoscopy as regard post-procedure ALP in all studied patients.

A statistically significant (P= 0.043) decreased GGT after procedures in patients with failed endoscopy (median= 118, IQR= 95 – 216) when compared with that in patients with successful endoscopy (median= 183, IQR= 104 – 626) in all studied patients, (Table 5).

Table 6. Correlation between ERCP outcome and Bismuth Corlette type.

		SUCCEEDEI (N= 29)		FAILED(PTD (N= 21)		X2	P-VALUE
BISMUTH CORLETTE TYPE	Type I	14	48.3%	1	4.8%	30.4	<0.001 HS
	Type II	10	34.5%	0	0.0%		
	Type III	3	10.3%	7	33.3%		
	Type IV	2	6.9%	13	61.9%		

X2: Chi-square test. HS: P<0.001 is considered highly significant.

High statistically significant correlation between ERCP outcome and Bismuth Corlette types, in patients with succeeded ERCP, Bismuth Corlette was of type I in 14 patients (48.3%), type II in 10 patients (34.5%), type III in 3 patients (10.3%) and type IV in 2 patients (6.9%). While in patients with failed ERCP, Bismuth Corlette was of type I in 1 patient (4.8%), type III in 7 patients (33.3%) and type IV in 13 patients (61.9%), (Table 6; Figure 3).

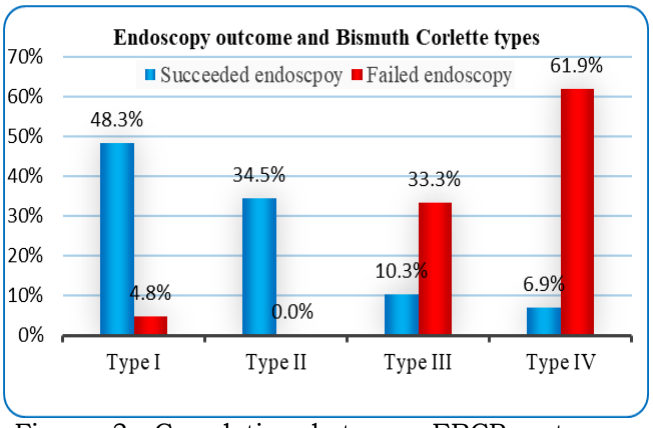

Figure 3. Correlation between ERCP outcome and Bismuth Corlette type

4. Discussion

The optimal approach to biliary drainage for patients with hilar strictures, particularly hilar cholangiocarcinoma, remains unknown after decades of clinical investigation. Preoperatively (in patients eligible for curative treatment) or postoperatively (as a palliative measure), either one can be done. The clinical decision of which method to use is not simple. Patients with changed anatomy are the only ones who can make a simple choice.[5]

The results of our study show that PTD is superior to ERCP for the draining of various hilar common bile duct obstructions, that's going with Moole et al.,[3] Regarding patients with advanced hilar malignancy, they noted that PTD appears to be better than endoscopic drainage.

Although Liu et al.,[6] said that there is no evidence to suggest that PTD is more effective than ERCP in terms of clinical feasibility or success rate for patients with obstructive jaundice caused by hilar cholangiocarcinoma.

The present study discovered a highly significant correlation (P-value <0.001) between the outcome of endoscopic retrograde coronary angioplasty (ERCP) and the types of Bismuth Corlette used. Specifically, 14 patients (48.3% of the total) had Bismuth Corlette of type I, 10 patients (34.5%) had Bismuth Corlette of type III, and 2 patients (6.9% of the total) had Bismuth Corlette of type IV. Hameed et al.,[7] have suggested that endoscopic drainage techniques could be more suited for Bismuth type I and II strictures. Also, Boškoski et al.,[8]; Mocan et al.,[9] recommended endoscopic retrograde cholecystitis drainage (ERCP) for Bismuth types I and II.

Evy Van Eecke,[10], suggests that progressive hilar stricture (Bismuth type III or IV) is typically diagnosed in most cases. In this group of patients, PTD is preferred because of the high treatment success rate it has shown, even at this late stage.

Going with these results Boškoski et al.,[8] was that Bismuth classes III and IV hilar strictures

may be drained via percutaneous transhepatic biliary drainage or a hybrid of the two.

Metallic biliary stents are more cost-effective than plastic stents, have a longer stent patency, and do not obstruct the side branches of IHDs or cystic ducts, despite their relatively large diameter.

For biliary drainage, plastic stents are the material of choice, irrespective of the severity of the stricture. Plastic stents have the advantages of being inexpensive, simple to insert, and interchangeable [11]

Hong et al.,[12] Consistent with these findings, our meta-analysis found no statistically significant difference between the use of one stent and the use of two stents for drainage, suggesting that unilateral and bilateral biliary drainage may be equally effective in hilar biliary blockage.

In conclusion, our findings highlight PTD as a superior method for draining complex hilar CBD strictures, while ERCP remains effective for simpler cases.

This study contributes to the growing body of evidence supporting tailored approaches based on structure type, advocating for a reassessment of management strategies in clinical practice.

Limitations: Our study limitations may be related to the following: first, the small number of studied patients, making it difficult to draw firm conclusions; second, the potential for selection bias. Additionally, the cross-sectional nature of the analysis may introduce confounding factors that are not accounted for.

4. Conclusion

PTD is superior to ERCP in the drainage of hilar biliary obstruction. ERCP effectively drains Bismuth type I and II strictures, and no significant difference between using one plastic stent and two plastic stents in these types of strictures, while PTD is more effective in the drainage of more complex strictures in Bismuth type III and IV.

Disclosure

The authors have no financial interest to declare in relation to the content of this article.

Authorship

All authors have a substantial contribution to the article

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Conflicts of interest

There are no conflicts of interest.

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