

Outcome and Complications of Percutaneous Transhepatic Biliary Drainage: Influence of Liver Entry Site

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ABSTRACT

Objective: To determine the outcome and complications of percutaneous transhepatic biliary drainage (PTBD) performed via right lobe and left lobe duct puncture.

Study Design: Cross-sectional study.

Place and Duration of Study: Department of Interventional Radiology, Dow Institute of Radiology, Dow University of Health Sciences from July 2020 to March 2021.

Methodology: Both adult male and female patients with obstructive jaundice having dilated intrahepatic biliary ducts on ultrasound were included. PTBD was performed under ultrasound guidance. Following intrahepatic biliary duct puncture, a guide wire was inserted followed by placement of 8 Fr or 10 Fr pigtail drainage catheter. Total bilirubin level was measured before and one day after the procedure. Cholangiogram was performed 48 hours after the procedure to check the drain placement and residual dilatation.

Results: 130 patients were included with mean age of 55.3 ± 12.3 years. Success rate was same in patients with right and left lobe puncture i.e. 96.9%. The frequency of complication in right lobe puncture was higher (37.5%). Mean procedure time was significantly higher in patients who developed complications (75.92 ± 19.20 minutes) as well as mean exposure time was also significantly higher in patients who developed complications (12.00 ± 6.87 minutes) as compared to patients who did not develop any complication (8.08 ± 3.43 minutes) ($p < 0.05$).

Conclusion: It was concluded that the success rate in right and left lobe puncture was equal and complication rate in right lobe puncture was observed to be high as compared to left lobe puncture.

Keywords: Biliary drainage, Complications, Effect, Liver

INTRODUCTION

Obstructive jaundice occurs as a result of obstruction in the biliary tree and may be due to benign causes such as benign strictures¹ or malignant causes such as cholangiocarcinoma, cancer of gallbladder, pancreatic head or ampulla of Vater.² Consequences of obstructive jaundice include pain, cholangitis and hemostasis impairment and therefore, biliary drainage is required for its management.^{2,3} Bypass via surgery, endoscopic retrograde cholangiopancreatography (ERCP), endoscopic ultrasound (EUS) guided biliary drainage, and percutaneous transhepatic biliary drainage (PTBD) are the biliary drainage methods available.^{4,5} Due to advancement in techniques, PTBD is still used as a common method for biliary drainage. Manipulations such as dilatation of stricture, placement of biliary stent and sphincterotomy can also be performed.¹ However, despite these advantages, cholangitis and complications and related to catheter can occur due to a long term drainage.^{2,3} Some major complications can also be encountered during the procedure such as sepsis, hemothorax, pneumothorax, hemorrhage or hemobilia.⁶ Hemorrhage is the most devastating complication that may occur due to injury to portal vein or hepatic artery as a result of their close approximation with intrahepatic biliary ducts and variation in biliary anatomy.⁷ The needle insertion route during PTBD usually depends on obstruction site through left or right lobe.² A thorough knowledge of hepatic vascular and biliary system is essential to select the appropriate puncture route for successful drainage with avoidance of complications. To

the best of our knowledge and after thorough literature search, limited literature was retrieved regarding success rate and complications of PTBD performed via different approaches (right lobe versus left lobe) as well as placement of drain in external system or internal-external drainage. Therefore, the aim of this study was to evaluate the outcomes and complications of PTBD performed via right lobe and left lobe approach.

MATERIALS AND METHODS

This prospective study was conducted at Interventional Radiology department of Dow Institute of Radiology, Dow University of Health Sciences, Karachi from July 2020 to March 2021. Patients presenting with obstructive jaundice having dilated intrahepatic biliary ducts on ultrasound and referred for PTBD were included. Patients with non-obstructive jaundice, moderate or severe ascites, perihepatic collection, dilated intrahepatic biliary ducts within the tumor or deranged PT or INR were excluded. PTBD was performed under ultrasound guidance. Injection Xylocaine was used for local anesthesia. Heart rate, blood pressure and oxygen saturation were measured before, during and after the procedure. An 18G needle was used for puncturing dilated intrahepatic biliary ducts taking care to avoid major vascular structures. Following puncture of intrahepatic biliary ducts, a guide wire was inserted followed by placement of 8 Fr or 10 Fr pigtail drainage catheter. The catheter was secured on the skin using silk sutures. Total bilirubin level was measured before and one day after the procedure. Moreover, the approach of performing PTBD

(right lobe or left lobe), placement of drain (external or internal-external), procedure time and radiation dose were recorded. Cholangiogram was performed 48 hours after the procedure to check the drain placement and residual dilatation. PTBD outcome was determined in the form of success and failure. Success was defined as placement of catheter in less time duration with minimum single puncture that results in decline in serum bilirubin and failure was defined as static total bilirubin or persistent increase in total bilirubin after catheter placement or failure to puncture via right or left side. All the demographic data including outcome and complication in terms as Hemobilia, hemorrhage, fever/infection, bile leak and Biloma were recorded via study proforma. SPSS version 22.0 was used for data entry and analysis.

RESULTS

Total 130 patients were subjected. Mean age of the patients was 55.3 ± 12.3 years. Mean procedure time was 66.15 ± 18.61 minutes and mean radiation exposure time was 9.23 ± 5.00 minutes. There were 57.7% males and 42.3% females. Left lobe puncture was higher (75.4%) as compared to right lobe puncture (24.6%). Most of the patients had external biliary drain placed (73.8%) whereas (26.2%) underwent internal and external biliary drain placed. As per causes of obstructive jaundice, malignant causes were higher (90.0%) as compared to benign causes (10.0%). Table.1.

Total 38 (29.2%) patients developed complications

after procedure with 10 patients developing more than one complication. Table 2. Majority of patients had successful outcome (96.9%) whereas in (3.1%) the outcome was not successful. Mean procedure time and mean radiation exposure time and was significantly higher in patients who developed complications. Although there was no significant effect of procedure time and radiation exposure time on outcome. Similarly, there was no significant effect of puncture site, drain placement location and etiology of obstructive jaundice on outcome and development of complications (p->0.05) as showed in table.3

Table 1: Etiology of obstructive jaundice n=130

Etiology	Frequency	%
Cholangiocarcinoma	44	33.8
Carcinoma of head of pancreas	34	26.2
Carcinoma of gallbladder	19	14.6
Ampullary carcinoma	14	10.8
Inflammatory common bile duct stricture	9	6.9
Hepatic metastasis	6	4.6
Iatrogenic common bile duct injury	4	3.1

Table 2: Post procedure complications n=130

Complications	Frequency	%
Bile leak	18	13.8
Cholangitis	12	09.2
Hemobilia	11	08.5
Hemorrhage	07	05.4

Table 3: Factors and their association with outcome and complications n=130

Variables		Outcome			P-value
		Successful	Unsuccessful	Total	
Puncture site	Left	95 (73.1%)	3 (2.3%)	98 (75.4%)	0.682**
	Right	31 (23.8%)	1 (0.8%)	32 (24.6%)	
Drain placement site	External	92 (70.8%)	4 (3.1%)	96 (73.8%)	0.292
	Internal external	34 (26.2%)	0 (0.0%)	34 (26.2%)	
Obstructive jaundice cause	Malignant	113 (86.9%)	4 (3.1%)	117 (90.0%)	0.653
	Benign	13 (10.0%)	0 (0.0%)	13 (10.0%)	
Variables		Complications			P-value
		Yes	No	Total	
Puncture site	Left	26 (20.0%)	72 (55.4%)	98 (75.4%)	0.236
	Right	12 (9.2%)	20 (15.4%)	32 (24.6%)	
Drain placement site	External	24 (18.5%)	72 (55.4%)	96 (73.8%)	0.075
	Internal external	14 (10.8%)	20 (15.4%)	34 (26.2%)	
Obstructive jaundice cause	Malignant	35 (26.9%)	82 (63.1%)	117 (90.0%)	0.238
	Benign	3 (2.3%)	10 (7.7%)	13 (10.0%)	

DISCUSSION

Obstruction of biliary system may result in impairment of quality of life in patients. This may result in cholangitis, pruritus or hepatic failure.⁸ Patients may improve after palliative relief in obstructive jaundice.⁹ Drainage of biliary system can be performed either by surgery, by endoscopic retrograde cholangiopancreatography (ERCP) or percutaneous transhepatic biliary drain (PTBD). PTBD is usually employed in the setting when ERCP has failed to resolve the obstruction/ jaundice. Moreover, PTBD is also helpful when the obstruction lies above the level of common hepatic ducts.¹⁰ The results of our study have shown a successful outcome in majority of our patients. Another study has reported almost comparable, but slightly lower success rate of ultrasound guided puncture for

PTBD.¹¹ The sample size of that study was slightly lower as compared to our study and this might be a possible reason for a very small difference in success rate.¹¹ In this study, the success rate by right and left lobe puncture was equal. However, this contrasts with the finding of a previous study which reported that success of PTBD was increased by left lobe puncture.⁷ Moreover, the study also reported a decrease in bilirubin associated with puncture of left lobe. A difference in study results could be attributed to difference in sample size. Our study was done on a smaller sample size as compared to previous study.⁷ Another previous study demonstrated no significant difference in results in terms of right or left lobe puncture.¹¹ Our study results have demonstrated that complication rate related to right lobe puncture was higher. Similar results related to complication

have been reported by a previous study.⁷ However, another recent study has shown no significant difference in complication rate with either right or left lobe puncture.¹¹ Our study results have demonstrated that although the success rate was high in internal-external drain placement as compared to external only drain placement, the difference was not significant. Another previous study has demonstrated no significant difference between groups treated by different drain position, whether endoscopic methods or percutaneous biliary drain.¹²

In our study complication rate was higher in internal-external drain placement. However, similar results have been shown by other studies.¹³ However, when taking cholangitis as a complication, the results contradict with those reported with literature.¹³⁻¹⁵ We found high frequency of cholangitis in patients with external drain placement compared to placement of internal-external drains. Whereas according to a previous study, the development of cholangitis was significantly more common in patients with internal drain placement as compared to external drain.¹⁴ Another study showed that endoscopic drainage has more complications than PTBD.¹⁶⁻¹⁹ Our study results showed a mean procedure time higher in successful as compared to unsuccessful procedures. Similarly, mean radiation exposure time was also higher in successful procedures. It could be postulated that internalizing the drain may result in an increased procedure time, however as reported earlier, the success rate is higher as compared to external drain.

In this study mean procedure time was higher in complicated patients. Similarly, mean radiation exposure time was also significantly higher in patients with complications. A possible reason could be due to the fact that biliary system manipulation for prolonged periods of time may pave way for infectious organisms. However, this fact requires further studies. Few limitations need consideration like its small sample size and single institution study and we did not incorporate the number of punctures required to successfully puncture the biliary duct and operator experience was also not taken into account. We believe that a difference in experience might result in difference in complication rate and successful outcomes. These limitations aside, this study is the first of its kind to report the outcome of PTBD from a developing country related to site of puncture as well as other variables such as catheter placement, radiation exposure and procedure time. Moreover, data collection was prospective in nature, which is one of the strength of our study. Further prospective studies are recommended on a larger sample size and incorporating variables such as number of punctures and operator experience so that further insights can be obtained.

CONCLUSION

It was observed that the success rate in right and left lobe puncture was equal. Complication rate in right lobe puncture was higher as compared to left lobe puncture. A significant higher mean procedure time and mean exposure time was observed in patients who developed complications.

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