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ORIGINAL ARTICLE

Role of Percutaneous Transhepatic Biliary Drainage in Management of Obstructive Jaundice

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Abstract

Background: ***The established image-guided procedure known as percutaneous transhepatic biliary drainage (PTBD) drains the obstructed bile duct system.***

Aim: ***Evaluation of the efficacy and incidence of complications in PTBD-treated cases with obstructive jaundice.***

Patients and methods: ***This prospective research was performed on thirty cases with distal malignant bile duct obstruction or hilum stricture confirmed by imaging studies or with surgically unrespectable neoplasm. Cases were referred to our radiology department through the general surgery and gastroenterology departments and the neighboring hospitals.***

Results: ***Complications occurred in six patients (20%) during and immediately after post-procedure (till 24 h). Immediately after the operation: Hemobilia was observed in 5 cases, and dislocation was observed in one patient 30 days following the procedure; adverse events and complications occurred in 23.33% (n = 7), documented in the patient's medical record. Of these seven patients, 2 (6.66%) had drain dislocation, 4 (13.33%) reported dysfunction of the drain in the form of peri catheter leak, and 1 (3.33%) developed cholangitis. Mortality in post-procedure was 10% (n = 3). In the third week after the treatment, one death was reported. In addition, two patients died within 4 weeks of biliary drainage. The deaths were caused by severe bad general conditions and cancer cachexia.***

Conclusion: ***Percutaneous transhepatic biliary drainage is a significant alternative to endoscopic drainage, an efficacious technique for decompression of the biliary tract. Mechanical jaundice reduces, and typical serum markers of cholestasis are reduced through percutaneous drainage of the biliary ducts.***

Keywords: PTBD, Obstructive Jaundice, Cholestasis

1. Introduction

The obstructed bile duct system is successfully evacuated via PTBD, a well-established image-guided procedure. The procedure may be conducted with the assistance of fluoroscopic guidance or a combination of ultrasound and fluoroscopic methods. Decompression of intrahepatic and extrahepatic biliary ducts in the presence of biliary stent insertion, benign or malignant obstruction, cholangitis, or decreased serum bilirubin prior to chemotherapy initiation are the principal indications for percutaneous transhepatic biliary drainage.[1]

Obstructive jaundice is predominantly caused by two types of neoplasms: pancreatic carcinoma and cholangiocarcinoma. Hepatocellular carcinoma, gallbladder carcinoma, metastases to the liver, and advanced carcinoma of the stomach or duodenum are further reasons.[2]

Regarding drainage catheter positioning and right-sided versus left-sided approaches for biliary puncture determined by ultrasound, the optimal method remains debatable. The right lobe contains the majority of the hepatic parenchyma, and many interventional radiologists are more receptive to the proper technique. As a result, the right approach is frequently chosen. Conversely, the left-side approach possesses particular benefits, as it frequently enables more favorable reasons for catheterization and may enable more advantageous angles in comparison to the intercostal right placement. [4]

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Actually, pain at the site of penetration that is attributed to irritation of the periosteum or nerve is more commonly correlated with proper access, especially when the catheter is inadvertently positioned below a rib and consequently causes irritation to the intercostal nerve. Although analgesics or paravertebral nerve blocks can often alleviate this pain, persistent discomfort may necessitate the insertion of a new percutaneous access site or the substitution of the percutaneous biliary drainage catheter with indwelling biliary stents.[3]

Jaundice symptoms can be alleviated; plasma bilirubin levels can be restored to normal through drainage, resulting in an enhanced quality of life and optimizing the patient's clinical condition to enable palliative radiotherapy, chemotherapy, or resection. A significant number of early or late complications, in addition to the requirement for biliary delivery to the gastrointestinal tract, are disadvantages of this technique. Hemorrhage, cholangitis, haemobilia, perforation of the biliary duct, peritonitis, edema, sepsis, infection, and the spread of neoplastic cells throughout the biliary duct are complications.[4]

The objective of this study was to evaluate the efficacy and incidence of complications in PTBD-treated cases with obstructive jaundice.

2. Patients and methods

This prospective study was conducted on 30 patients who were referred to our radiology department through the general surgery and gastroenterology departments and the neighboring hospitals.

Ethical approval:

The ethical committee of our hospital gave approval for this prospective investigation. We provide cases with detailed data relating to the treatment, advantages, and possible risks associated with the various approaches utilized in conducting the PTBD. Prior to participation, all patients were required to provide written informed consent.

Inclusion criteria: Inclusion criteria for this study included imaging studies that confirmed a distal malignant bile duct obstruction or hilum stricture, cases who had surgically unrespectable neoplasms, those who had failed endoscopic treatment, or those with conditions that don't satisfy requirements for ERCP. Dilatation of the right and left biliary trees resulting from distal obstruction is essential for the surgery to be feasible, despite access, and at the ultrasound assessment of the biliary tract, No age or gender restrictions were imposed on the inclusion of cases.

Exclusion criteria: Exclusion criteria for the study included cases who declined to participate, those with substantial coagulation abnormalities, individuals who had massive ascites, and individuals with respiratory function anomalies. According to the "SIR Consensus Guidelines," biliary interventions demand INR, PTT, and platelet count monitoring, similar to other procedures associated with elevated bleeding risk. Principal contraindications include an INR greater than 1.5; platelet counts below 50,000/µl, and an aPTT greater than 1.5 unless these parameter adjustments (transfusion) are possible.[5]

Interventional procedure technique

Procedure equipment:

For percutaneous transhepatic biliary drainage, the following instruments were utilized: Introducer system (Boston Scientific), 0.035-inch stiff guidewire (Amplatz Super Stiff Wire, Boston Scientific) or hydrophilic guidewire (Terumo Corporation), 8F internal–external/external multiple side hole biliary drainage catheter (Flexima, Boston Scientific), & PHILIPS-ALLURA-FD20-CATH-LABchiba needle (22G, fifteen centimeters long). Angiographical catheters and water-soluble iodinated contrast medium were employed in the majority of challenging patients as well.

Procedure technique

All surgeries were executed under the guidance of ultrasound and fluoroscopic technology, utilizing a digital subtraction angiography apparatus. Following local anesthesia, two percent lidocaine was applied to the puncture site. The biliary ductal puncture was performed under US guidance using a predetermined random approach as "left" (subxiphoid) or "right" (below the tenth rib in mid-axillary line with ten degrees forward and cranial angulation of the needle tip) as indicated by the predetermined approach. In order to examine the biliary tree, percutaneous transhepatic cholangiography was initiated once a needle was inserted into the bile duct and bile outflow began. Following the advancement of a 0.018-inch guidewire to a secure position, the needle was extracted, and the Seldinger technique was utilized to insert a coaxial dilatation catheter. An angiographic catheter and a 0.035-inch hydrophilic guidewire were utilized to examine the malignant stricture. As the guidewire passed through the papilla and into the duodenum, the introducer sheath was extracted. Following this, the PTBD internal-external catheter (8F) was positioned and fixed to the skin. A catheter for external drainage was inserted if the guidewire failed to penetrate the duodenum. The technical achievement was the successful insertion of an incision through the malignant stricture. A successful treatment was considered to have been obtained when the total bilirubin level decreased

by a minimum of thirty percent by the seventh day following drainage. Every complication was assessed and effectively managed.[6]

Post-procedural care

With the continuance of antibiotics, patient was admitted for a day in order to monitor for possible serious adverse reactions, particularly sepsis & hemophilia. Monitoring of liver function including bilirubin, GGTP, ALT, & AST".

Tube Care: Cases were instructed to frequently examine the external tube for kinks, particularly in cases where the dressing is moist, and bile is leaking. Documenting the amount and color of the bile each time the cases empty the drainage bag. Emptying the bag daily at the same time or when it reaches two-thirds full is recommended by passing the drainage bag through the opening located at the bag's bottom. The patient was instructed not to disconnect the tube from the bag. Maintaining the bile bag beneath the site of insertion to facilitate draining. Prior to discharge, every case was issued a prescription for cleanse syringes. Once daily, flush the tube with five to ten millilitres of sterile saline. Continue to empty the drain every two to three days if the drain tube is capped.

Bathing & Activity

Patients may shower twenty-four hours following the placement of the catheter. Removing the dressing prior to taking a shower & applying it once the shower is complete. Never take a shower in a bathtub. As tolerated, patients may resume normal activities as they maintain a secure tube & avoid from tugging on it. After each bathing & at least every two days, the dressing should be replaced.

Follow-up: To maintain patency and reduce the risk of infection, external biliary tubes are typically replaced every two to three months.

Tube Problems: Cases need to clean the catheter site more frequently and replace the dressing if the skin surrounding it becomes inflamed and red. Apply an antibiotic ointment to the affected area of the skin while replacing the bandage. If the symptoms persist for a duration of two days, please see us again. We were instructed that cases be returned to us. Should they manifest any of the subsequent symptoms: pain in the upper right abdomen, nausea and vomiting, fever and shivers, jaundice (characterized by yellow eyes and skin), or tube leakage at the site of insertion?

3. Results

Levels of serum bilirubin were measured at baseline & throughout the follow-up period. A complete bilirubin elevation was detected in all cases. Bilirubin levels decreased in 83.33 percent of the approaches ($p < 0.05$). Prior to the PTBD procedure, the average total bilirubin level was 20.03 mg per deciliter, ranging from twenty-five to ten mg per deciliter. Following percutaneous drainage, the mean decrease in bilirubin level was 5.3 milligram per deciliter, with a standard deviation of 20-1 milligram per deciliter. It was determined that the average concentration of gamma-glutamyl transpeptidase (GGTP) was 510.8 IU/l, ranging from 123 to 987 IU/l. A reduction in GGTP concentration was detected in 84.62 percent of the cases, with an average level of 128.6 IU/l (with a range of 40–277 IU/l) ($p < 0.05$). After biliary drainage, an 86.89 percent reduction in alkaline phosphatase was observed. Prior to therapy, the average concentration of ALP was 405.13 IU/l; percutaneous biliary drainage decreased that value to 136.56 IU/l ($p < 0.05$). Following percutaneous biliary drainage, the average level of AST decreased from 125.23 IU/l prior to therapy to 48.63 IU/l ($p < 0.05$). (Table 1)

Table 1. Bilirubin, GGTP, ALP & AST level before and after procedure

	AVERAGE MG/DL	MINIMUM MG/DL	MAXIMUM MG/DL	STD
BILIRUBIN BEFORE	20.03	10	25	4.68
BILIRUBIN AFTER	5.3	1	20	5.72
GGTP BEFORE	510.8	123	987	248.01
GGTP AFTER	128.6	40	277	58.95
ALP BEFORE	405.13	124	812	175.74
ALP AFTER	136.57	77	220	41.45
AST BEFORE	125.23	66	187	40.07
AST AFTER	48.63	10	80	25.07

Thirty cases comprised the study group, which underwent thirty-three Percutaneous Trans-Hepatic Biliary Drainage procedures. Technical success was obtained in one hundred percent of the procedures (hepatic ducts were cannulated at the conclusion of the procedure). Repetition of procedures was necessary in three cases (ten percent). (Figure 1)

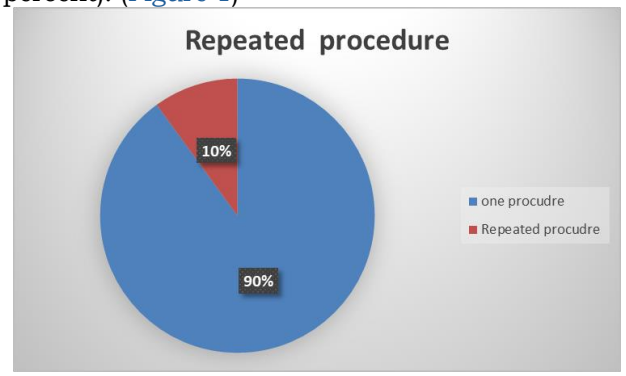

Figure1.Pie chart demonstrate percentage of repeated procedures.

Complications occurred in six patients (20%) during and immediately post procedure (till 24 h).

Five cases suffered haemobilia immediately

following the procedure; a drain was utilized to remove the bleeding substance. One case suffered a instant dislocation of the drain throughout the surgery. (Figure 2)

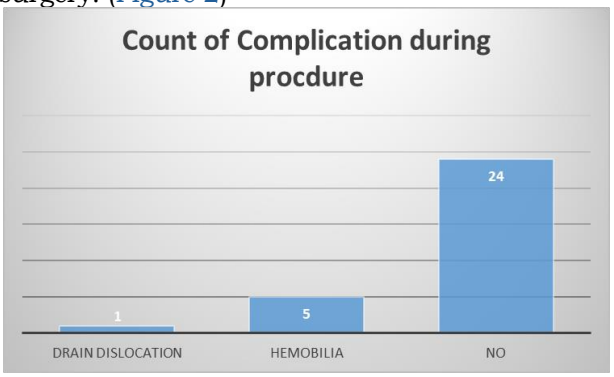

Figure 2. Chart of complication rate during procedure.

Complications and adverse events occurred in 23.33 percent of cases (n = 7), as recorded in the medical record of the case thirty days subsequent to the surgery. Of these 7 patients, 2 (6.66%) had drain dislocation, 4 (13.33%) reported dysfunction of the drain in form of peri catheter leak and 1 (3.33%) develop cholangitis. (Figure 3)

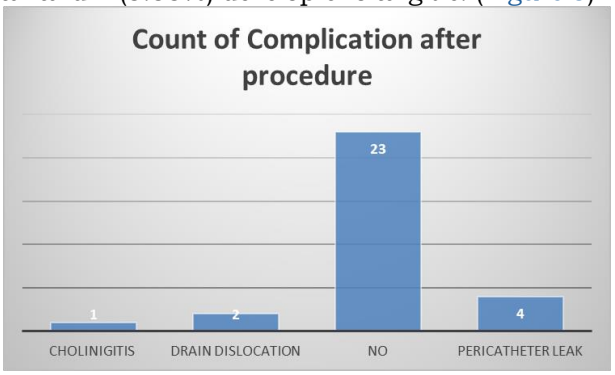

Figure 3. Chart of complication rate after procedure.

Mortality in post-procedure was 10% (n = 3). In the third week after the treatment, one death was reported. In addition, two patients died within 4 weeks of biliary drainage. Both cancer cachexia & severe general deterioration contributed to the deaths. (Figure 4)

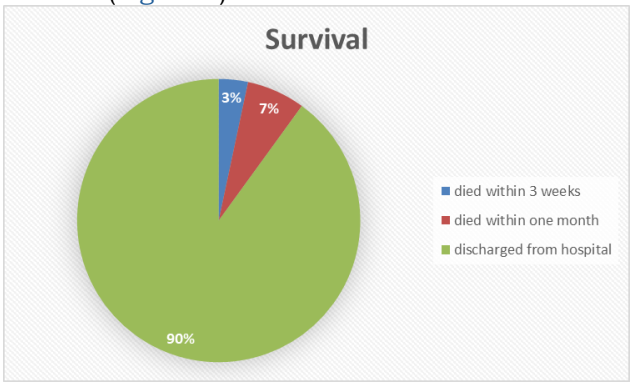

Figure 4. Pie chart of survival rate.

4. Discussion

Percutaneous transhepatic biliary drainage is an image-guided procedure utilized to treat bile duct obstruction when the case is ineligible to undergo an operation, preoperative preparation is necessary, or endoscopic methods are ineffective or not practical. It is regarded as a bridging or therapeutic procedure that improves the quality of life without altering the prognosis of the underlying illness.[7]

Decompression of intrahepatic and extrahepatic biliary ducts via PTBD is a highly efficacious approach utilized in cases affected with malignant or benign biliary obstruction caused by carcinoma of the biliary tract, pancreatic head cancer, or cancers affecting adjacent organs such as the stomach gallbladder, lymph nodes, or metastasis.[8]

Clinical success in all main series exceeds seventy-five percent, technical success of PTBD is one hundred percent, and complication rates are minimal. At the level of the X or XI intercostal space on the right side of the middle axillary line, a biliary tree perforation may be performed using radioscopy and/or ultrasound guidance. Alternatively, it may be conducted via the subxiphoid access route on the left side, assisted by ultrasound.[9]

The selection of an access point is a highly contentious clinical and decisional problem. General indications suggest that the site of obstruction and biliary tree dilation should inform the selection of the access point. The correct method has historically been favored over different options due to its conservative and low-risk nature regarding radiation exposure to the performer's hand. Furthermore, the drainage system includes more of the hepatic segments, which may prove to be critical for cases involving cholangitis or malignant obstruction. However, the utilization of the incorrect approach may result in increased case discomfort as a consequence of persistent irritation of the intercostal nerves, potential hazards such as crossing the parietal pleura, unfavorable angles for catheter insertion into the common bile duct, and a greater risk of inadvertent drainage catheter slippage due to respiratory motions.[8,9]

Although the left approach does result in increased radiation exposure to the performer's hand, it offers numerous benefits, such as facilitating catheterization at favorable angles, enabling more convenient drainage bag care, requiring fewer doses of X-ray exposure during the procedure, presenting a lower incidence of pleural complications, & providing better overall comfort for the case .[10] A greater risk of haemobilia has been correlated by some authors to the left (subxiphoid) approach.[11,12]

When comparing right-sided & left-sided biliary

operations in terms of procedural information & complications rate, no significant distinctions were observed in the present investigation.

Houghton et al.[13] documented a mean of three liver punctures for right lobe accessibility and two for left lobe accessibility in a sample of 150 cases. Although the incidence of significant bleeding-related complications increased for right lobe access (0.66 percent), it was still the lowest among all approaches. Conversely, two separate groups of authors suggested that left lobe access surgeries carried an increased chance of arterial blood loss.[12,13]

This is consistent with anatomical knowledge: arterial and portal branches run ventrally to the biliary tree in the left lobe, and the PTBD track may intercepted it.[14]

Adequacy criteria established by the American College of Radiology. For MBTO involving CBD or hilar level blocks,[15] recommend an internal-external catheter as "usually appropriate" and a permanent biliary metallic conduit as "may be appropriate." Additional researchers have observed higher rates of survival with stents, even in cases of hilar obstruction. For example, the median survival time in the research conducted by Shim et al. was 212 days.[16]

Following effective PTBD, the level of total bilirubin decreased. Prior to the operation, the mean value in the present investigation was 20.03 mg per deciliter; however, it decreased to 5.3 mg per deciliter following the procedure. Additionally, AST, ALP, and GGTP concentrations decreased following PTBD.

Similar to findings from other research studies, peri-catheter leak drain dislocation constituted the most prevalent post-procedure complications in our case.[17] Several published studies confirmed the infrequent occurrence of post-procedure haemobilia among patients.[18,19] Nevertheless, due to the anatomical characteristics of portal triads, proper technique is required to execute the procedure and avert significant hemorrhaging. In addition, cases with nondilated bile ducts should not undergo PTBD due to the elevated risk of complications. Once PTBD is performed on a patient with dilated bile ducts, the success rate is considerably higher.[20]

In spite of the use of prophylactic antibiotics, sepsis may develop shortly after drainage or within a few hours of the surgery.[21] We have not documented any cases of sepsis during the follow-up duration of our research.

Regrettably, an assessment of the overall survival rate among our patients was not possible. According to our data, ten percent of patients passed away, and ninety percent were discharged.

The predominant cause of mortality was the progression of the tumor. The median survival period following PTBD, as reported by Teixeira et al., was 2.9 months.[22] Values reported in numerous investigations involving cases with malignant biliary obstruction are identical.[19,23]

4. Conclusion

Biliary tract decompression via PTBD is an essential alternative to endoscopic drainage due to its efficacy. The typical serum indicators of cholestasis are reduced & mechanical jaundice is alleviated through percutaneous drainage of the biliary ducts.

Disclosure

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All authors have a substantial contribution to the article

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There are no conflicts of interest.

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