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ORIGINAL ARTICLE

COMPLICATIONS AFTER PERCUTANEOUS BILIARY DRAINAGE PLACEMENT: A PERSONAL EXPERIENCE AND A LITERATURE REVIEW

Y. Asenov

Department of Surgery, University Hospital Queen Giovanna-ISUL, Medical University – Sofia, Bulgaria

Abstract. Background: *Percutaneous transhepatic biliary drainage (PTBD) is an essential procedure for managing biliary obstructions, particularly in cases where endoscopic retrograde cholangiopancreatography (ERCP) is unsuccessful or contraindicated. While PTBD is effective, it is associated with a range of complications, necessitating continuous evaluation of its safety and efficacy.* ***Objective:*** *This study aims to provide a comprehensive analysis of the complications and outcomes associated with PTBD during a single specialist's learning curve. Additionally, a thorough review of the literature on PTBD complications will be conducted, and best practices for preventing and managing complications will be explored, focusing on improving clinical outcomes.* ***Materials and methods:*** *A retrospective analysis of 45 patients who underwent PTBD between 2022 and 2024 was conducted. All procedures were performed under combined ultrasound and fluoroscopy guidance. Data on procedural success, complications, and in-hospital mortality were collected. Complications were classified as minor or major based on clinical significance. The analysis focused on the types of early complications and mortality occurring during the patient's hospital stay directly related to the procedure.* ***Results:*** *Technical success was achieved in 43 patients (95.5%). Complications were observed in 18 patients (41.9%), with 8 cases (18.6%) classified as major. The most common complication was hemobilia (30.2%), followed by cholangitis, which occurred in 5 patients (11.6%) during their hospital stay. Minor complications were managed conservatively, while major complications required invasive interventions such as embolization for severe hemobilia and percutaneous drainage for abscesses and bilomas. Two patients (4.6%) died during hospitalization due to underlying conditions unrelated to the procedure.* ***Discussion:*** *The findings align with existing literature, emphasizing PTBD's effectiveness despite a high overall complication rate. Preventive strategies, including adequate pre-procedural preparation and precise catheter placement, are crucial for minimizing risks. This study underscores the importance of early recognition and prompt management of complications, particularly cholangitis and bleeding.* ***Conclusion:*** *PTBD is a safe and effective intervention for biliary obstructions when performed with meticulous technique and appropriate patient selection. Despite its inherent risks, most complications can be effectively managed, reinforcing PTBD's role in complex biliary cases. Further studies are needed to optimize strategies for reducing complications and improving clinical outcomes.*

Key words: *percutaneous transhepatic biliary drainage, PTBD, biliary obstruction, biliary complications, biliary drainage management*

Corresponding author: *Yavor Asenov, Department of Surgery, University Hospital Queen Giovanna-ISUL, Medical University – Sofia, Bulgaria, email: yavorasenov@gmail.com*

ORCID: *0000-0002-4005-5570*

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INTRODUCTION

Percutaneous transhepatic biliary drainage (PTBD) is a vital interventional procedure used to manage biliary obstruction, particularly in cases where endoscopic retrograde cholangiopancreatography (ERCP) is unsuccessful or contraindicated. Introduced several decades ago, PTBD has become an essential tool in the armamentarium of interventional radiologists and surgeons, offering a minimally invasive alternative for biliary decompression. The procedure is particularly critical for patients with malignant obstructions or complex anatomical alterations, where alternative drainage methods are ineffective or unavailable [1, 3].

The increasing prevalence of hepatobiliary malignancies and the complexity of surgical and endoscopic interventions have further underscored the importance of PTBD. While the procedure effectively alleviates biliary obstruction and improves quality of life, it is not without risks. Complications such as cholangitis, bleeding, bile leakage, and organ injury can occur, with reported rates ranging from 5% to over 61%, depending on patient factors and procedural expertise [2-9]. The outcome variability highlights the need to evaluate PTBD techniques and their associated risks continuously [4, 7].

This study aims to provide a comprehensive analysis of the complications and outcomes associated with PTBD during a single specialist's learning curve. Additionally, a thorough review of the literature on PTBD complications will be conducted, and best practices for preventing and managing complications will be explored, focusing on improving clinical outcomes.

MATERIALS AND METHODS

A retrospective study was conducted on patients who underwent percutaneous transhepatic biliary drainage (PTBD) between 2022 and 2024. All procedures were performed by a single specialist during their learning curve. No other specialist at the medical institution performed such procedures during this period.

The analysis focused on the types of early complications and mortality that occurred during the patients' hospital stay and were directly related to the procedure. Complications were classified as minor or major based on their severity and the need for additional interventions. Post-procedural mortality during hospitalization was also examined.

RESULTS

Over the two-year study period, PTBD was attempted in 45 patients, with successful catheter placement achieved in 43 cases, resulting in a success rate of 95.5%. Among the 43 patients included in the analysis, there were 25 men and 18 women, yielding a male-to-female ratio of 1.4:1. The mean age was 70.9 years, with the youngest patient being a 47-year-old and the oldest an 89-year-old.

A notable aspect of the procedures was using vascular access equipment typically employed in interventional cardiology and vascular surgery, owing to the specialist's expertise in endovascular techniques. Only two patients were treated using the Neff Percutaneous Access Set. In five cases, an 18-gauge trocar needle was used to directly introduce a stiff 0.035-inch guidewire, while in the remaining 36 cases, a vascular access sheath was utilized.

The procedural strategy primarily involved a two-stage approach to overcome the obstruction. Initially, an external biliary drain was placed, followed by an attempt to pass through the obstruction after two days, which succeeded in 19 cases. In cases where internal-external drainage placement failed, a subsequent attempt was performed after 2–3 weeks, successfully achieving drainage in an additional nine cases. Overall, internal-external drainage was successfully achieved in 28 cases (65%). Nearly all PTBDs were performed under combined ultrasound and fluoroscopic guidance. The procedure was conducted exclusively under fluoroscopic guidance for three patients approached via the right side.

All 43 patients had undergone unsuccessful endoscopic management before PTBD. The majority (42) presented with malignant biliary obstructions, while one patient suffered from severe cholangitis caused by a migrated plastic stent and chronic indurative pancreatitis. PTBD was performed as a prelude to definitive radical surgery in 9 cases. Additionally, rendezvous procedures with endoscopic stent placement were completed in 6 cases, while percutaneous stenting was performed in 1 case.

Post-procedural mortality was observed in 2 patients. One patient succumbed to severe cholangitis complicated by sepsis and multiorgan failure, while the other developed hepatorenal syndrome despite successful drain placement.

Hemobilia was observed in 13 cases (30.2%). Initial management involved monitoring and, if necessary, closing the drain while verifying its position. In 2 cases, the drain was repositioned due to dislodgment. One of these cases developed a subcapsular hematoma with a small amount of free fluid (hemoperitoneum), which resolved spontaneously without additional intervention. In 6 patients, bleeding stopped entirely within 24 hours without requiring further mea-

sures. Four patients required blood transfusions, and in one case (2%) with arterial bleeding, embolization was necessary. Following embolization, the patient recovered without further complaints.

Cholangitis occurred in 5 patients (11.6%) during their hospital stay. All of these patients had undergone a previously failed ERCP attempt, and bile samples collected during the initial PTBD placement tested positive in 4 cases. One patient developed cholangitis at a later stage due to catheter occlusion. Among these, one patient succumbed to septic shock and multiorgan failure. Three patients required additional biliary drainage procedures, while the remaining cases were successfully managed with antibiotic therapy.

Pancreatitis occurred in 3 patients (6.9%), all of whom underwent a rendezvous technique involving cannulation and contrasting of the pancreatic duct. This highlights the potential risk of pancreatic irritation during complex biliary drainage procedures. Two cases responded quickly to conservative treatment. However, one patient developed necrotizing pancreatitis, necessitating subsequent percutaneous drainage of peripancreatic collections. Although this patient responded favorably to treatment, this required prolonged hospitalization lasting 29 days.

One patient developed a **post-procedural abscess** in the right hepatic lobe. The abscess occurred after an unsuccessful right-sided drainage attempt, biliary drain placement on the left side, and a rendezvous procedure. The abscess was successfully managed with percutaneous drainage. Another patient required drainage of a large localized biloma in segments 6 and 7 of the liver, which developed after multiple unsuccessful attempts at right-sided drainage. Biloma drainage was achieved by positioning two percutaneous, ultrasound-guided (12Fr) catheters and a successful PTBD on the left side.

Despite securing the drains with multiple sutures to the skin, partial drain dislodgment occurred in two cases early in the study period. These drains were 6 Fr in size, which may have contributed to the issue. The dislodgment was promptly identified, and the drains were successfully repositioned without the need for additional drainage procedures.

In this series, no perforations of hollow abdominal organs or pleural complications were observed. None of the complications required surgical intervention, underscoring the efficacy of minimally invasive management strategies.

The data showed complications in 18 out of 43 patients (41.9%). Some patients experienced more than one complication. When complications were classified as **minor** (resolved without additional interventions) or **major** (requiring invasive treatment), it was found that only 8 cases (18.6%) involved major complications. The mortality rate was 4.6% (2 patients), and in both cases, the deaths were unrelated to the procedure but instead resulted from the underlying disease (Table 1).

DISCUSSION

Percutaneous transhepatic biliary drainage (PTBD) is an essential interventional procedure for managing biliary obstructions, particularly in patients with advanced malignancies or failed endoscopic approaches. Despite its utility, PTBD is associated with a range of complications that require careful management to optimize patient outcomes. This study highlights the success and complications observed during the learning curve of a single operator, providing a foundation for discussing the broader implications and management strategies for PTBD-related complications.

Hemobilia: a significant bleeding risk

Hemobilia was the most common complication, occurring in 30.2% of cases in this series. This is consistent with rates reported in the literature, which range from 2% to 26%, depending on patient comor-

Table 1. Major Complications requiring reintervention and mortality

Complication	Number of Cases (n)	Percentage (%)	Management
Bleeding	3	7%	2 cases managed with drain repositioning; 1 case required embolization
Biloma	1	2.3%	PTBD, abdominal drain placement, and biloma drainage
Hepatic abscess	1	2.3%	Percutaneous abscess drainage and adequate biliary drainage
Cholangitis	3	7%	Additional biliary drains were placed due to insufficient initial drainage.
Total Major Complications	8	18.6%	
Mortality	2	4.6%	Resulted from underlying conditions: sepsis with multiorgan failure and hepatorenal syndrome

bidities and procedural factors [8, 16]. Hemobilia can result from vascular injury during the procedure, with severity ranging from minor oozing to life-threatening arterial bleeding.

In this study, six patients experienced self-limited bleeding that resolved within 24 hours without intervention, while four required blood transfusions. One case involved significant arterial bleeding requiring embolization, which successfully controlled the hemorrhage. Embolization has been well-documented as an effective treatment for hemobilia, mainly when the source of bleeding is a hepatic artery branch [15, 20].

To minimize bleeding risks, pre-procedural correction of coagulopathies is crucial. The use of fine-gauge needles and ultrasound guidance during puncture can reduce the likelihood of vascular injury. Additionally, ensuring the catheter is positioned correctly and avoiding unnecessary manipulation during the procedure are vital preventive measures [17].

Cholangitis

Cholangitis was observed in 5 patients (11.6%) during their hospital stay. The high incidence of cholangitis aligns with findings from Molina et al., who reported that biliary infection remains a common complication following PTBD [3]. Cholangitis typically arises from incomplete drainage or bacterial colonization of the biliary system. Prolonged catheter indwelling times and suboptimal catheter placement have been identified as significant risk factors [10-21]. Unsuccessful ERCP attempts are a well-documented independent risk factor for the development of cholangitis. This underscores the importance of timely and effective biliary drainage following failed endoscopic procedures to minimize the risk of infection and associated complications.

Management of cholangitis primarily involves antibiotic therapy targeting gram-negative and anaerobic bacteria commonly associated with biliary infections. Ensuring adequate drainage during the procedure and maintaining catheter patency through regular flushing and monitoring are critical components of effective management [22-27].

Preventive strategies include using larger-diameter catheters to reduce the risk of obstruction and initiating prophylactic antibiotics before the procedure, as suggested by Clark et al. These measures can significantly reduce the incidence and severity of cholangitis [27].

Pancreatitis: a rare but severe complication

Pancreatitis occurred in 6.9% of patients in this study, with two cases responding to conservative treatment and one developing necrotizing pancreatitis requiring percutaneous drainage. While pancreatitis is a less common complication of PTBD, its occurrence underscores the potential risks of manipulating the biliary system.

The literature identifies mechanical trauma, retrograde bile flow, and secondary infections as potential causes of pancreatitis following PTBD [24]. Management strategies include fasting, intravenous hydration, and broad-spectrum antibiotics to prevent secondary infections. For cases involving necrotizing pancreatitis, image-guided percutaneous drainage of collections is the preferred approach, as demonstrated in this series [18].

Hepatic abscess and biloma formation

Hepatic abscesses and bilomas are less frequent complications but can lead to significant morbidity. One patient in this series developed a hepatic abscess following unsuccessful right-sided drainage and subsequent left-sided biliary drainage. Another patient required drainage of a large biloma caused by repeated unsuccessful attempts at right-sided drainage.

Hepatic abscesses often result from inadequate initial drainage or secondary infection of bile leaks. Early detection using imaging modalities such as ultrasound or computed tomography (CT) is crucial for effective management. Both abscesses and bilomas are typically managed with percutaneous drainage under imaging guidance, as was successfully performed in this study [28-37].

Catheter-Related Complications

Catheter dislodgment was observed in two cases despite secure fixation with sutures. This highlights the importance of regular monitoring and patient education regarding catheter care. In both cases, the dislodged catheters were repositioned without requiring new PTBD placement. Catheter occlusion, a common issue reported in the literature, was observed in only one case in this series. This low incidence is likely attributable to the routine use of flushing protocols and the short duration of the study, which focused on complications occurring during the patients' hospital stay [31, 32].

To prevent catheter-related complications, secure fixation techniques and regular flushing protocols are recommended. Additionally, ensuring that patients and caregivers are educated on catheter maintenance can reduce the risk of dislodgment and infection [35].

Mortality and overall outcomes

The overall mortality rate in this study was 4.6%, with both deaths attributed to the patient's underlying conditions rather than the procedure itself. This finding is

consistent with other studies reporting PTBD-related mortality rates between 3% and 5% [6, 25]. The absence of procedure-related deaths underscores the safety of PTBD when performed with meticulous technique and appropriate patient selection.

While the overall complication rate in this study was high (41.9%), most complications were minor and resolved without the need for invasive interventions. Only 8 cases required additional procedures, highlighting the importance of early recognition and management to prevent escalation [11, 29].

Comparison with the literature

This study's findings align with existing literature on PTBD complications. For example, Giurazza et al. reported similar rates of technical success, emphasizing the importance of operator expertise and imaging guidance in minimizing risks [4]. The two-stage approach employed in this series, involving initial external drainage followed by an attempt at internal drainage, has been validated as an effective strategy in patients with challenging anatomy or severe obstructions [8].

Implications for Practice

This study highlights several key considerations for clinical practice:

1. Pre-procedural planning: thorough imaging and correction of coagulopathies are essential for minimizing risks.
2. Technique optimization: using ultrasound and fluoroscopy guidance and appropriate equipment is crucial for ensuring procedural success.
3. Post-procedural monitoring: early detection and management of complications, coupled with patient education, can significantly improve outcomes.

LIMITATIONS

The single-operator nature of this study, while providing a controlled environment for evaluation, limits the applicability of the findings. The retrospective design may also introduce bias, and a more extensive multicenter study would provide more robust data.

CONCLUSION

Percutaneous transhepatic biliary drainage (PTBD) is a reliable and effective intervention for biliary obstructions, especially when endoscopic options are not viable. This study demonstrates a high technical success rate (95.5%) and manageable complications, with no procedure-related mortality.

Despite inherent risks, PTBD remains safe and effective with proper planning. Future research should aim to reduce complications and optimize outcomes further, enhancing its role in complex biliary cases.

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