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Case Report

Nursing Management of Continuous Autologous Bile Perfusion in a Patient with Malignant Obstructive Jaundice: A Case Report

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Abstract

Background: Prolonged percutaneous transhepatic cholangial drainage (PTCD) in malignant obstructive jaundice (MOJ) causes fluid and electrolyte deficits. Continuous autologous bile perfusion (CABP) offers a physiological alternative, but standardized nursing protocols are lacking.
Objectives: To describe the preoperative nursing management of CABP in a patient with MOJ, with a focus on protocol implementation and monitoring of patient tolerance and safety.
Methods: This case report describes a 58-year-old female with MOJ receiving preoperative PTCD, enteral nutrition, and continuous autologous bile perfusion via a closed-loop system. Nursing responsibilities included: (1) daily bile quality and circuit patency monitoring; (2) aseptic technique during collection and reinfusion; (3) adverse event surveillance; and (4) documentation of nutritional, hepatic, and complication outcomes. Tolerance and safety were assessed at least twice per shift.
Results: After 12 days of combined nutritional support and CABP, total bilirubin fell from 258.9 to 83.5 μmol/L, albumin rose from 31.8 to 33.0 g/L, and weight stabilized at 48.5 kg. No perfusion-related adverse events occurred. The patient underwent radical resection and was discharged. At the July 2025 follow-up, she was independent and asymptomatic.
Conclusion: Structured CABP with multidisciplinary nursing may support nutritional and hepatic recovery in PTCD-treated MOJ patients. Larger cohort studies are needed.

Implications for Nursing and Midwifery Preventive Care

- Structured CABP protocols preserve nutritional status and metabolic stability in PTCD patients, improving preoperative readiness.
- Preventive nurse-led monitoring detects perfusion changes and intolerance early, enabling timely intervention and complication prevention.

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Introduction

Malignant obstructive jaundice (MOJ) results from direct tumor invasion or extrinsic compression of the biliary tract, leading to cholestasis, intrahepatic bile duct dilation, disruption of the intestinal barrier, and systemic metabolic derangements [1]. These pathophysiological changes significantly impair patients' nutritional status, quality of life, and surgical outcomes.

Nursing care plays a critical role in managing this patient population, as safe and effective continuous autologous bile perfusion (CABP) delivery depends heavily on skilled nursing practice**.** Percutaneous transhepatic cholangial drainage (PTCD) is an established intervention to relieve biliary obstruction and lower serum bilirubin levels [2-4]. However, prolonged external drainage can lead to substantial bile loss, water-sodium electrolyte imbalances, and disruption of the enterohepatic circulation, thereby exacerbating malnutrition [5, 6]. Bile perfusion, the process of collecting, filtering, and reinfusing autologous bile into the gastrointestinal tract, has been proposed to reduce nutrient loss, stimulate digestive hormone secretion, maintain gut integrity, and preserve physiological bilirubin cycling [7-9]. When combined with enteral nutrition, CABP may offer synergistic benefits by restoring the enterohepatic circulation of bile salts, thereby facilitating fat absorption and optimizing the utilization of enteral nutrients.

Despite its therapeutic rationale, a significant knowledge gap persists: no standardized protocols exist to guide CABP nursing. This gap is clinically concerning, as suboptimal nursing management directly increases complications such as infection, catheter obstruction, and gastrointestinal distress. Nursing responsibilities, bile quality monitoring, circuit patency maintenance, infection prevention, early intolerance detection, and patient education remain systematically undescribed.

Establishing explicit links between specific nursing interventions and the prevention of complications is therefore essential to enhance patient safety and clinical utility.

This case report describes the nursing management of a patient with MOJ who received CABP combined with enteral nutrition under the guidance of a multidisciplinary nutrition team. By detailing the structured nursing protocol, including preventive monitoring, catheter care, patient education, and complication surveillance, we aim to reduce complications and provide a preliminary nursing framework that can be tested and refined in future studies, thereby addressing the current gap in nursing evidence and supporting the safe integration of CABP into clinical practice.

Objectives

This study describes the preoperative nursing management of CABP in a patient with MOJ, focusing on protocol implementation, patient tolerance, and safety monitoring.

Case Description

A 58-year-old woman was admitted on April 23, 2025, with a 6-month history of intermittent upper abdominal pain. During the two months preceding admission, she developed progressive jaundice accompanied by dark urine and pruritus. She also reported an unintentional weight loss of 5 kg over 3 months, with her body weight decreasing from 53.0 kg to 48.0 kg.

Patient Information

The patient was a 58-year-old woman with no significant past medical history. Before the onset of her current symptoms, she had no known underlying diseases or relevant medical conditions.

Clinical Findings

On admission, physical examination revealed a body mass index (BMI) of 18.3 kg/m², a temperature of 38.1°C, jaundice of the skin and sclerae, and right upper quadrant tenderness. No hepatosplenomegaly or palpable masses were noted.

Diagnostic Assessment

Contrast-enhanced CT and magnetic resonance cholangiopancreatography (MRCP) demonstrated space-occupying lesions at the common hepatic duct

and the origins of the left and right hepatic ducts, with significant intrahepatic and extrahepatic bile duct dilation. Laboratory findings on admission: Hb 99.0 g/L, albumin 31.8 g/L, total bilirubin 258.9 μmol/L, direct bilirubin 53.8 μmol/L, ALT 156 U/L, ALP 412 U/L, and CRP 125.68 mg/L. Of note, the direct bilirubin level appeared relatively low relative to the total bilirubin for classic obstructive jaundice. This biochemical profile likely reflects a mixed pattern of hyperbilirubinemia, as concomitant hepatocellular injury was also present in this patient. We have rechecked the original laboratory data and confirmed the accuracy of the reported values. This mixed pattern was taken into account in our nursing assessment, with particular attention paid to monitoring for worsening obstruction and acute deterioration in liver function. Subsequent histopathological confirmation (percutaneous biopsy) diagnosed moderately differentiated hilar cholangiocarcinoma (Bismuth–Corlette type IIIa).

Therapeutic Intervention

Day 3: PTCD was performed under ultrasound guidance with placement of an 8.5 Fr external drainage catheter.

Day 5: A nasojejunal feeding tube was inserted for enteral nutrition.

Days 7–19: CABP was initiated and maintained for 12 days via a nasojejunal feeding tube.

Day 22: Radical laparoscopic resection of type IIIa hilar cholangiocarcinoma (extended left hepatectomy with caudate lobectomy and Roux-en-Y hepaticojejunostomy).

Day 28: Final pathology confirmed pT2N0M0 (Stage II) with negative resection margins (R0 resection).

Nursing management

Multidisciplinary nutrition team formation

A nutrition management team was established, comprising a chief surgeon, an attending physician, a dietitian, and two specialized nutrition nurses. The specialized nutrition nurses were responsible for nutritional risk screening, collaborating on nutrition plan formulation and adjustment, condition monitoring, health education, data collection, and discharge follow-up.

Nutritional risk assessment

The patient reported anorexia and had been consuming only a low-fat liquid diet (mainly rice soup and noodle soup) before hospitalization. Based on the Concise Dietary Self-Assessment Scale [10], the patient's daily oral intake was estimated to be approximately 300 kcal.

Nutritional screening tools

NRS-2002 [11]: score 4 (moderate nutritional risk)

PG-SGA [12]: score 16 (severe protein-energy malnutrition)

Nutritional intervention was initiated following multidisciplinary consultation.

Individualized nutritional support plan

Based on the patient's condition, dietary status, and metabolic characteristics, a two-stage nutritional support plan was developed [Table 1]. Daily energy requirements were estimated at a minimum of 1143 kcal based on basal energy expenditure (BEE) [13], in accordance with the China Nutrition Society guidelines.

Table 1. Two-Stage Nutritional Support Plan

Stage	Period	Regimen	Total calories
Stage 1	Pre-jejunal tube	1440 mL enteral nutrition (Intact®) + 30 g oral short-peptide powder + 600 mL rice water	1340 kcal/day
Stage 2	Post-jejunal tube	500 mL Liven® + 250 mL amino acids (parenteral) b + 500 mL Beeline® + 600 mL rice water + bile perfusion	1840 kcal/day

Note. Intact® is a polymeric intact-protein formula comprising casein, vegetable oils, maltodextrin, minerals, vitamins, and trace elements. Liven® is a structured triglyceride emulsion containing refined lecithin, anhydrous glycerol, and water for injection. Beeline® is a short-peptide formula composed of hydrolyzed whey protein, maltodextrin, vegetable oils, vitamins, minerals, and trace elements.

Table 2. Six Principles of Continuous Autologous Bile Perfusion

Principle	Implementation
Angle	Head of bed elevated 30–45° during infusion
Speed	Initiate at 20 mL/h; titrate by 10–20 mL/h every 2–4 h as tolerated to target 100–120 mL/h within 6–8 h
Temperature	Bile is warmed to 36–37°C using a constant-temperature heater.
Volume & duration	400–800 mL/day, collected every 4 h; continuous 24-h infusion for 12 days (Days 7–19)
Cleanliness & infection control	Infusion set changed every 24 h; bile discarded if not infused within 4 h of collection; bacterial culture and Gram stain performed every 2–3 days; strict aseptic technique during bag connection and disconnection
Concentration	Diluted 1:1 with warm sterile normal saline if viscous

Note. All principles were implemented by the bedside nurse and documented on the dedicated CABP nursing flow sheet.

Bile perfusion was initiated on Day 7 and continued for 12 days [Figure 1]. Daily energy requirements were estimated at a minimum of 1,143 kcal based on basal energy expenditure, in accordance with the China Nutrition Society guidelines.

Enteral nutrition was administered via a jejunal tube at a continuous rate of 60–80 mL/h.
b Parenteral nutrition (8.5% amino acid solution, 500 mL; 20% lipid emulsion, 250 mL) was infused via the PICC line overnight.

Weekly reassessments included albumin, hemoglobin, electrolytes, trace elements, liver and kidney function, and body weight to guide timely adjustments.

Enteral nutrition implementation

On day 2 of hospitalization, intravenous parenteral nutrition (8.5% amino acids 500 mL + 20% lipid emulsion 250 mL) was initiated, with supplementation of fat-soluble and water-soluble vitamins and minerals.

Following jejunal tube placement, the regimen was switched to enteral administration of 500 mL Beeline via the nasojejunal tube. A peripherally inserted central catheter (PICC) line was placed in the right arm for large-volume infusions. Infusion rates were maintained at a slow rate to prevent nausea, vomiting, and fever.

Continuous autologous bile perfusion protocol

On day 5, a nasojejunal feeding tube was placed via blind insertion. Before bile perfusion, 500 mL of 5% glucose saline was infused at 20 mL/h via a nutrition infusion pump, with the rate increased to 60 mL/h after 4 hours [14].

Bile quality confirmation

Microscopic examination, Gram staining, and cytology revealed no bacteria or tumor cells, meeting safety criteria for perfusion.

Perfusion procedure

A disposable sterile drainage bag and a nutrition infusion set were connected to a customized closed-loop perfusion device.

The "three labels" (gastric tube label, enteral nutrition label, green special treatment card) and "four dedicated items" (dedicated infusion stand, pump tube, enteral nutrition pump, infusion set) were used to prevent errors [Table 2].

Nursing responsibilities during CABP

(1) Asepsis and infection prevention: During each collection and reinfusion connection, the nurse followed sterile gloving, site disinfection, and sterile draping. Infusion sets were changed every 24 h; bile bags every 48 h. Bile not infused within 4 h of collection was discarded. Bacterial culture and Gram staining were performed every 2–3 days; perfusion was deferred if pathogens were detected. Temperature was monitored every 4 h.

(2) Gastrointestinal tolerance monitoring: The nurse assessed nausea, vomiting, abdominal distension, diarrhea, and pain hourly for the first 4 h, then every 2 h. Abdominal circumference was measured daily. If the patient was intolerant to 10–20 mL/h, and the

physician was notified. Patients were taught deep breathing and swallowing techniques. All assessments were documented on the dedicated flow sheet.

(3) Rate management and complication prevention: Perfusion was initiated at 20 mL/h and titrated by 10–20 mL/h every 2–4 h. as tolerated to a target of 100–120 mL/h within 6–8 h. The nurse monitored for rate-related complications (cramping, nausea, vomiting); if present, the rate was reduced. Persistent intolerance prompted pausing, then resuming at a lower rate. The head of the bed was elevated to 30–45° during infusion [15] to reduce reflux.

(4) Temperature and filtration: Bile were warmed to 36–37°C before reinfusion [16]. A 40–100 μm in-line filter was used if particulate/mucus was present and replaced every 24 h. Viscous bile was diluted 1:1 with warm saline. Tubing was rinsed with 20–30 mL warm water (36–37°C) before, after, and during infusion (three-step rinse).

(5) Patient education: The nurse explained the procedure, expected sensations, and warning signs (severe pain, fever, chills), and encouraged prompt reporting of discomfort.

No adverse events related to bile perfusion occurred.

Nutritional support and management of related complications

Nutritional support in the context of perioperative liver dysfunction

The patient presented with cholestatic hepatitis upon admission (ALT 156 U/L, AST 142 U/L, ALP 412 U/L). Hepatoprotective therapy included intravenous glutathione (1.8 g/day) and magnesium isoglycyrrhizinate (200 mg/day), plus oral ursodeoxycholic acid (250 mg t.i.d.).

To reduce hepatic stress, enteral nutrition (EN) and parenteral nutrition (PN) were coordinated as follows. PN (8.5% amino acids, 500 mL; 20% lipid emulsion, 250 mL) was initiated via PICC on Day 2 to supplement caloric intake, as the patient could not initially tolerate full EN rates. Concurrently, the enteral formula (Intact®) was administered enterally via the jejunal tube at a continuous rate of 60–80 mL/h. In addition, a structured lipid emulsion (SMOFlipid® 20%, 100 mL/day) was infused parenterally via the PICC line (not mixed with the enteral formula) to provide balanced lipid support. The combined EN and PN provided 1,340–1,840 kcal/day across two stages (Stage 1: PN ~50%, EN ~50%; Stage 2: PN ~15%, EN ~85%). PN was administered from Day 2 through Day 19, with gradual reductions in PN on Day 8 as EN tolerance improved. The overall daily carbohydrate-to-fat energy ratio (EN + PN combined) was maintained at approximately 1:1. This balanced substrate supply was chosen to minimize hepatic de novo lipogenesis and reduce cholestatic stress in a patient with pre-existing liver dysfunction while ensuring adequate energy delivery to meet metabolic demands (25–30 kcal/kg/day) and avoid overfeeding [16]. The patient was advised to take soft meals 5–6 times daily. Liver enzymes were monitored every 3–4 days and improved preoperatively.

Abdominal distension

The patient reported abdominal distension. Physical examination revealed tympanic percussion sounds, a firm abdominal texture, reduced mobility, and increased rigidity. The abdominal circumference had increased compared with pre-perfusion measurements. Interventions included administration of simethicone, elevation of the head of the bed (30-45°) [17], and maintenance of slow warming perfusion. Symptoms resolved before surgery.

Outcomes

After 12 days (CABP initiated on Day 7 and continued until Day 19) of continuous bile perfusion combined with enteral and parenteral nutrition, the patient's nutritional status and liver function showed clinical improvement [Table 3]. Body weight declined from 48.0 kg at admission to 47.0 kg on Day 4 (pre-intervention), then stabilized at 48.5 kg by Day 20 (pre-surgery). Serum albumin increased from 31.8 g/L to 33.0 g/L, and total bilirubin decreased from 258.9 μmol/L to 83.5 μmol/L. Notably, the bilirubin reduction occurred concurrently with PTCD, CABP, and nutritional support. It should therefore be interpreted as a temporal association rather than a direct causal effect of any single intervention. No electrolyte disturbances or perfusion-related adverse events were observed. The

patient underwent radical resection on Day 22 and was discharged on Day 36 without major complications. At follow-up in July 2025, she was independent in activities of daily living and reported no abdominal pain, bloating, nausea, or vomiting.

Table 3. Key Clinical Indicators Before and After Nutritional Intervention

Date	Body weight (kg)	Albumin (g/L)	Total bilirubin (μmol/L)	CRP (mg/L)	NRS-2002	PG-SGA
April 23 (admission)	48.0	31.8	258.9	125.68	4	16
April 27 (pre-intervention)	47.0	26.8	143.8	56.90	–	–
May 13 (pre-surgery)	48.5	33.0	83.5	5.67	2	8

Note. CRP = C-reactive protein; NRS-2002 = Nutritional Risk Screening 2002; PG-SGA = Patient-Generated Subjective Global Assessment.

Nutritional intervention comprised enteral nutrition, parenteral nutrition, and CABP (initiated on Day 7, continued for 12 days). Pre-intervention values were obtained on Day 4 (April 27) (one day after PTCD placement); pre-surgery values were obtained on Day 21 (May 13) before radical resection. NRS-2002 and PG-SGA were reassessed only at admission and pre-surgery per protocol. Body weight declined from 48.0 kg at admission to 47.0 kg pre-intervention, then stabilized at 48.5 kg pre-surgery, indicating an initial catabolic phase followed by nutritional repletion [Figure 1]. The device consists of a sterile bile collection bag connected to the PTCD catheter, followed by an optional filter, an enteral nutrition infusion pump (for flow rate control), a constant-temperature heater (36-37°C), and sterile infusion tubing connected to a nasojejunal feeding tube for bile reinfusion into the gastrointestinal tract [Figure 2]. This closed-loop system restores the enterohepatic circulation of bile salts and nutrients.

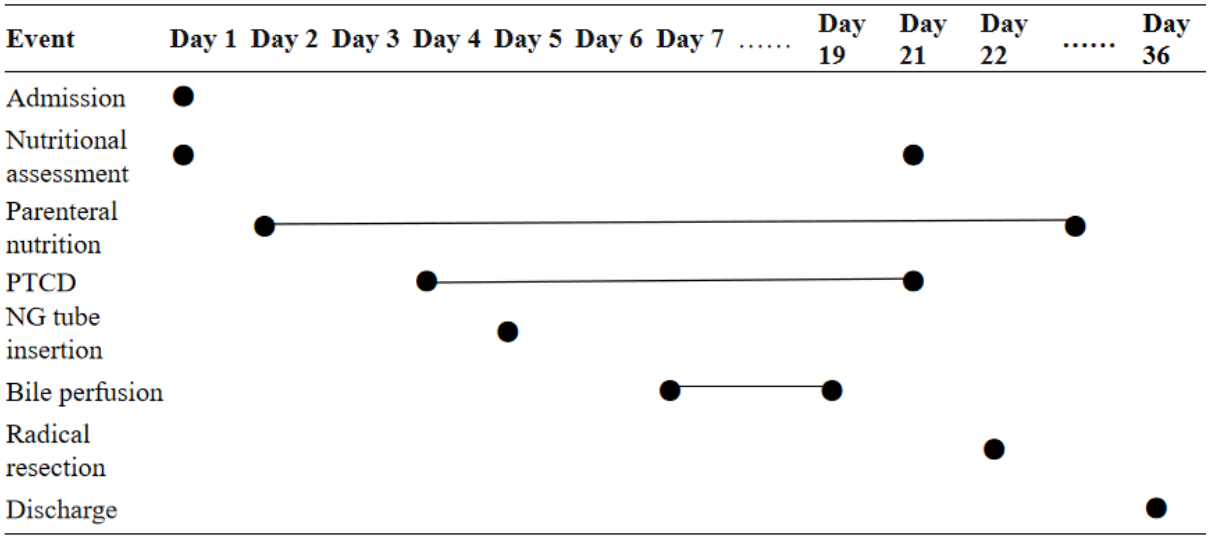


Figure 1. *Timeline of Nursing Interventions and Clinical Events*

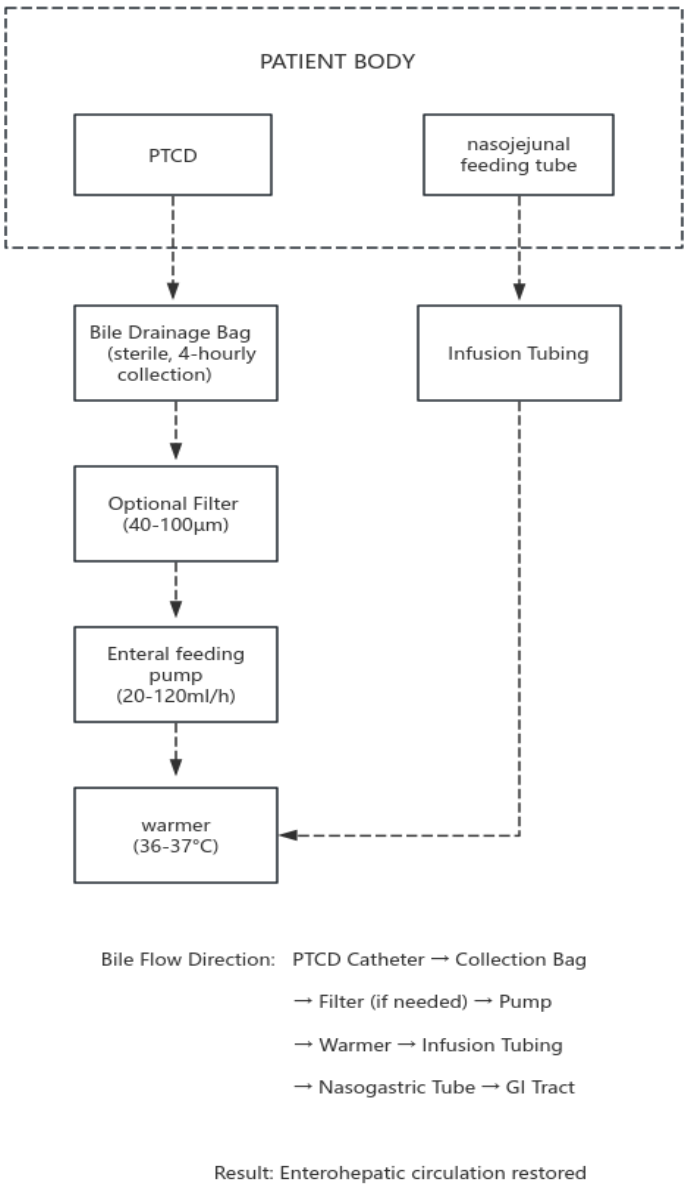


Figure 2. *Schematic Diagram of the Customized Closed-Loop Bile Perfusion Device*

Discussion

This case demonstrates that integrating continuous autologous bile perfusion within a structured nursing protocol and multidisciplinary nutritional management was associated with improved preoperative nutritional status and liver function in a patient with MOJ undergoing PTCD [18]. Given the concurrent implementation of multiple interventions, including PTCD, enteral nutrition, and CABP, the observed improvements should be attributed to the comprehensive multidisciplinary approach rather than to any single intervention.

Our findings align with those of Fu et al. [19], who showed that preoperative PTCD with bile reinfusion via a nasoduodenal tube significantly reduced serum bilirubin levels, improved overall resection rates, and reduced postoperative morbidity compared with conservative treatment alone. Although their study focused on surgical outcomes, its findings underscore the systemic benefits of preserving enterohepatic circulation. Consistently, bile perfusion reduces bile salt loss and preserves enterohepatic circulation, which are critical for

maintaining gut barrier function and preventing bacterial translocation [5, 6].

From a clinical and nursing perspective, this report highlights several key innovations and implications. The successful construction of a closed-loop, customized perfusion device using standard enteral nutrition infusion sets suggests a potentially affordable and accessible option for resource-limited settings. The "six principles" and "three-step, three-rinse" protocol provided clear, operational guidance for bedside nurses, offering a structured approach that may be adapted for local protocols.

The multidisciplinary nutrition team enabled timely adjustments based on weekly nutritional reassessments, demonstrating the value of collaborative care. These interventions are particularly relevant given that malnutrition affects 24–65% of surgical patients and is independently associated with increased postoperative mortality, complications, and length of stay [20, 21]. In MOJ patients undergoing PTCD, bile loss further compounds this nutritional decline. Our case suggests that proactive nutritional support, including bile perfusion, may be a valuable adjunct to standard care and warrants further investigation alongside surgical, pharmacological, and physical treatments.

Nursing-specific value: This report provides a detailed, replicable nursing protocol for continuous autologous bile perfusion, addressing a gap in the nursing literature. The structured approach to monitoring (temperature, rate, signs of intolerance) and prevention of complications (infection, abdominal distension) can guide other nurses in implementing this therapy safely.

Several limitations should be acknowledged. First, the single-case design limits generalizability. Second, because PTCD, enteral nutrition, and CABP were implemented concurrently, the independent contribution of CABP to the observed improvements cannot be determined. Third, long-term follow-up data beyond two months post-discharge are not available. Fourth, the customized device, though practical, has not been validated against commercial systems.

Future research, including prospective cohort studies or randomized controlled trials, is needed to compare bile perfusion against standard enteral nutrition and to establish standardized protocols regarding optimal temperature, rate, duration, and quality control measures.

Conclusion

In this patient with MOJ undergoing PTCD, continuous autologous bile perfusion delivered through a structured nursing protocol and a multidisciplinary nutrition team framework was associated with improved preoperative nutritional status and liver function. No significant adverse events were observed. This nursing strategy offers a practical approach that may be considered for broader clinical application, though further evaluation in larger studies is warranted.

Ethical Considerations

This case report was conducted in accordance with the Declaration of Helsinki. The study was approved by the Medical Ethics Committee of Tongji Hospital, Tongji Medical College, Huazhong University of Science and Technology (approval No. TJ-IRB20240812). Written informed consent was obtained from the patient for the publication of this case report and any accompanying images.

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Conflict of Interest

This study has no conflicts of interest.

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Authors' Contributions

Conceptualization: L. Li, X. Cao
Investigation (Data Collection & Intervention Implementation): L. Li, J. Luan, J. Fu
Writing – Original Draft: L. Li
Writing – Review & Editing: L. Li, J. Luan
Supervision: X. Cao

All authors read and approved of the final manuscript.

Artificial Intelligence Utilization

The authors confirm that they did not use artificial intelligence (AI)- assisted technology to assist with writing or editing the manuscript, and that no images were manipulated using AI.

Data Availability Statement

It will remain confidential to the first author.

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