e-ISSN: 0976-822X, p-ISSN:2961-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2026; 18(6); 2552-2557

Original Research Article

Minimally Invasive Palliative Biliary Drainage for Distal Malignant Obstructive Jaundice: Effects on Patient Quality of Life

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Received: 27-04-2026 / Revised: 26-05-2026 / Accepted: 28-06-2026
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Conflict of interest: Nil

Abstract:

Background: Malignant biliary obstruction (MBO) is a common complication of advanced hepatopancreatobiliary malignancies that markedly impairs quality of life (QoL). This study compared the QoL outcomes of four minimally invasive biliary decompression techniques in patients with malignant distal biliary obstruction.

Methods: A total of 196 patients underwent percutaneous transhepatic biliary drainage (PTBD), internal-external transpapillary biliary drainage (IETBD), internal-external biliary-jejunal drainage (IEBJD), or endoscopic retrograde biliary stenting (ERBS). Quality of life was assessed using the MOS SF-36 questionnaire before intervention and 2 months after the procedure. Physical Component Summary (PCS) and Mental Component Summary (MCS) scores were compared among the four groups.

Results: Baseline demographic characteristics and QoL scores were comparable across all groups. Two months after intervention, significant improvements were observed in both PCS and MCS scores ($p < 0.001$). The IEBJD group demonstrated the highest post-intervention PCS (48.1 ± 5.2) and MCS (42.5 ± 4.4) scores, followed by PTBD and IETBD, whereas ERBS showed the least improvement.

Conclusion: All minimally invasive biliary decompression techniques improved short-term quality of life. However, IEBJD provided the greatest improvement in both physical and mental health, suggesting superior palliative outcomes in patients with malignant distal biliary obstruction.

Keywords: Malignant biliary obstruction; biliary decompression; quality of life; MOS SF-36; palliative care.
DOI: 10.25258/ijcpr.18.6.397

Introduction

Quality of life (QoL) has become an essential outcome measure for evaluating treatment success, particularly in palliative settings where cure is not the goal. Malignant biliary obstruction (MBO) exemplifies this challenge: 70–80% of patients present with disease too advanced for resection, leaving palliative bile duct (BD) decompression as the only viable intervention [1]. Decompression can be achieved through antegrade techniques (percutaneous transhepatic biliary drainage, internal-external transpapillary drainage, internal-external biliary-jejunal drainage) or retrograde endoscopic biliary stenting, and the choice between these approaches remains a subject of ongoing debate [2,3].

Because none of these techniques is curative, QoL is frequently proposed as a key criterion for selecting among them. Existing evidence links successful bile duct decompression to meaningful QoL gains-improved bilirubin clearance has been associated with better social, emotional, and functional outcomes, and with expanded eligibility for systemic chemotherapy [4]. However, comparative data on how different decompression routes and stent types affect QoL specifically remain sparse and inconsistent [5]. Earlier studies suggested a QoL advantage for antegrade over retrograde stenting and for metal over plastic stents [6, 7], but more recent randomized evidence - including trials comparing EUS-guided drainage with conventional ERCP - has found these techniques largely equivalent on QoL and safety outcomes, even as differences in stent patency persist [8]. This inconsistency, combined with the limited number of studies directly comparing decompression techniques on QoL rather than technical outcomes alone, leaves an important gap in the evidence base.

The aim of the present study is therefore to evaluate the effect of minimally invasive palliative bile duct decompression techniques on quality of life in patients with distal malignant mechanical jaundice.

Study Design and Population: This prospective study enrolled 196 patients who underwent minimally invasive palliative bile duct (BD)

decompression for distal malignant biliary obstruction (MBO) at the Department of Surgical Gastroenterology (Department of Surgery), in a tertiary care referral centre in India, over a one-year period. Written informed consent was obtained from all participants prior to enrolment.

Inclusion criteria: Mechanical jaundice, age >18 years, either gender, and disease deemed unresectable on staging workup.

Exclusion criteria: Biliary obstruction without jaundice, age <18 years, high anesthetic risk (ASA grade IV), diffuse metastatic liver involvement, ascites, hemorrhagic diathesis, active pulmonary or urinary tract infection, coagulopathy (INR >1.5), prior Billroth-II or Roux-en-Y gastric resection, refusal to complete the questionnaire, or death during the follow-up period.

Quality of Life Assessment: Quality of life (QoL) was assessed using the validated Medical Outcomes Study Short Form-36 (MOS SF-36) questionnaire [9], administered in the patient's preferred language (English/Hindi/regional-language validated version, where applicable) before intervention and again 2 months after the procedure. The questionnaire evaluates eight health domains, namely physical functioning (PF), role-physical (RP), bodily pain (BP), general health (GH), vitality (VT), social functioning (SF), role-emotional (RE), and mental health (MH). These domains were summarized into the Physical Component Summary (PCS) (PF, RP, BP, and GH) and the Mental Component Summary (MCS) (VT, SF, RE, and MH), which were used to assess changes in patient-reported quality of life following biliary decompression.

Diagnostic Workup: The diagnosis and localization of malignant biliary obstruction were established using transabdominal ultrasonography as the initial imaging modality, followed by contrast-enhanced multidetector computed tomography (CECT). Magnetic resonance cholangiopancreatography (MRCP) was performed when the level or cause of obstruction remained uncertain. Duodenoscopy was carried out in all patients to evaluate the ampulla of Vater and exclude periampullary lesions. Ultrasound guidance and C-arm fluoroscopy were used during all minimally invasive biliary interventions according to institutional protocols.

Decompression Techniques: Patients underwent one of four minimally invasive biliary decompression procedures according to the level of obstruction, anatomical considerations, patient fitness, and institutional expertise: percutaneous transhepatic biliary drainage (PTBD), internal-external transpapillary biliary drainage (IETBD), internal-external biliary-jejunal drainage (IEBJD), or endoscopic retrograde biliary stenting (ERBS) using self-expanding metal stents (SEMS). The IEBJD technique, as previously described by the authors, utilizes a dual-fenestrated drainage catheter with proximal openings within the biliary tree and distal openings in the proximal small bowel to facilitate internal bile drainage while minimizing enterobiliary reflux and reducing the risk of cholangitis [2].

Outcome Measures: Baseline demographic and clinicopathological characteristics were recorded for all patients. The primary outcome was the assessment of quality of life using the PCS and MCS scores of the SF-36 questionnaire at baseline and 2 months after intervention. Technical success was defined as successful placement of the drainage catheter or stent with radiological or endoscopic confirmation of adequate biliary drainage. Clinical success was defined as a ≥50% reduction in total serum bilirubin within 10 days following the procedure [5].

Statistical Analysis: Data were analyzed using IBM SPSS Statistics version 22.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean ± standard deviation (SD), while categorical variables were presented as frequencies and percentages. The normality of continuous variables was assessed using the Shapiro-Wilk test. Baseline continuous variables among the four treatment groups were compared using one-way analysis of variance (ANOVA), whereas categorical variables were compared using the Chi-square test or Fisher's exact test, as appropriate. Changes in PCS and MCS scores from baseline to 2 months within each treatment group were analyzed using the paired t-test, while post-intervention scores among the four groups were compared using one-way ANOVA. A two-tailed p-value < 0.05 was considered statistically significant.

Results

Among the 196 patients, the mean age was 64.9 ± 11.1 years, and males constituted 56.1% of the cohort. The average duration of jaundice before intervention was 15.3 ± 3.8 days, while the mean serum bilirubin level was 197.6 ± 47.3 µmol/L. More than 94% of patients presented with advanced-stage malignancy, and pancreatic carcinoma was the predominant underlying diagnosis (65.8%). Baseline demographic and disease characteristics were comparable across the four intervention groups (Table 1).

Table 1: Baseline demographic and clinical characteristics of the study population (N = 196)

Characteristic	IEBJD (n = 56)	ERBS (n = 48)	IETBD (n = 42)	PTBD (n = 50)	Total (N = 196)
Age (years), Mean ± SD	65.8 ± 10.9	63.4 ± 11.2	64.1 ± 10.6	66.0 ± 11.5	64.9 ± 11.1
Male, n (%)	31 (55.4)	27 (56.3)	24 (57.1)	28 (56.0)	110 (56.1)
Duration of jaundice (days), Mean ± SD	14.8 ± 3.7	15.6 ± 4.0	15.9 ± 3.8	15.2 ± 3.6	15.3 ± 3.8
Serum bilirubin (µmol/L), Mean ± SD	212.4 ± 46.8	205.6 ± 49.3	183.7 ± 44.5	186.5 ± 45.7	197.6 ± 47.3
Advanced disease (Stage III/IV), n (%)	54 (96.4)	45 (93.8)	39 (92.9)	47 (94.0)	185 (94.4)
Pancreatic carcinoma, n (%)	38 (67.9)	33 (68.8)	23 (54.8)	35 (70.0)	129 (65.8)

Baseline quality of life was markedly impaired in all treatment groups. Mean PCS scores ranged from 36.8 to 39.2, whereas MCS scores ranged from 28.5 to 29.7, indicating poor physical and mental well-being before biliary decompression. Physical functioning and general health scores were similarly reduced, with no statistically significant differences between groups ($p > 0.05$) (Table 2).

Table 2: Baseline quality-of-life scores before intervention

Variable	IEBJD (n = 56)	ERBS (n = 48)	IETBD (n = 42)	PTBD (n = 50)	p-value
Physical Component Summary (PCS)	39.2 ± 5.8	37.5 ± 5.3	36.8 ± 5.1	37.0 ± 5.5	0.39
Mental Component Summary (MCS)	29.4 ± 4.0	29.1 ± 3.7	28.5 ± 3.9	29.7 ± 4.1	0.47
Physical Functioning (PF)	52.3 ± 14.8	46.7 ± 13.5	47.9 ± 14.1	45.9 ± 13.7	0.18
General Health (GH)	33.8 ± 6.4	33.1 ± 6.1	31.6 ± 6.2	31.2 ± 5.8	0.29

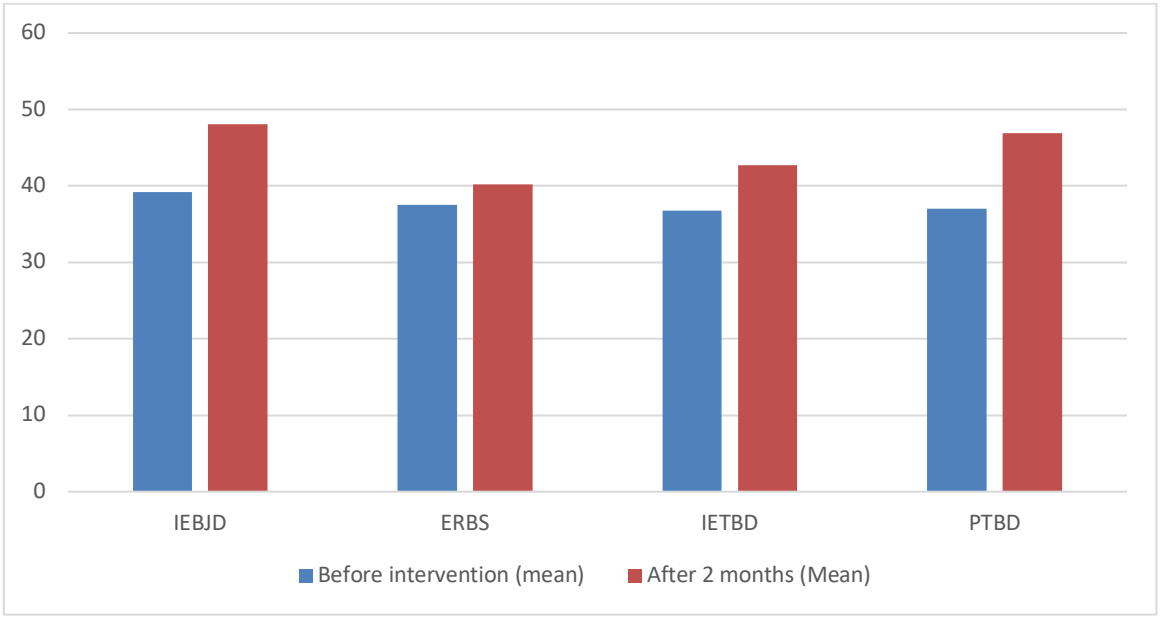

Figure 1: Physical Component Summary (PCS) Scores Before and After Intervention.

Two months after minimally invasive biliary decompression, significant improvements were observed in both the physical and mental components of quality of life across all treatment groups. The IEBJD group achieved the highest mean Physical Component Summary (PCS) score (48.1 ± 5.2), followed closely by the PTBD group (46.9 ± 5.3), while the ERBS group showed the lowest post-intervention PCS score (40.2 ± 5.0) ($p < 0.001$). Similarly, the Mental Component Summary (MCS) score was highest in the IEBJD group (42.5 ± 4.4), followed by the IETBD (40.8 ± 4.2) and PTBD (39.1 ± 4.3) groups, whereas the ERBS group demonstrated the lowest improvement (35.1 ± 4.1) ($p < 0.001$) (Table 3).

Table 3: Quality-of-life scores two months after intervention

Variable	IEBJD	ERBS	IETBD	PTBD	p-value
PCS	48.1 ± 5.2	40.2 ± 5.0	42.7 ± 5.4	46.9 ± 5.3	<0.001
MCS	42.5 ± 4.4	35.1 ± 4.1	40.8 ± 4.2	39.1 ± 4.3	<0.001

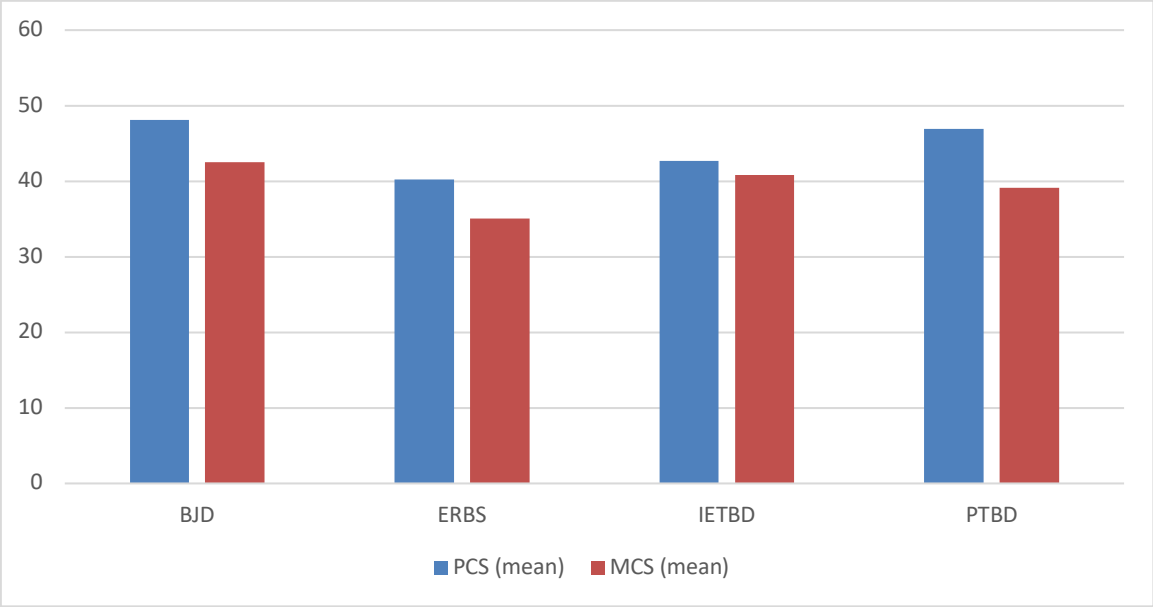

Figure 2: Quality-of-life scores two months after intervention.

Discussion

Improving quality of life is a major objective in the palliative management of patients with malignant biliary obstruction, as curative treatment is not feasible for many individuals at presentation. Although several minimally invasive biliary decompression techniques are available, their comparative influence on patient-reported quality of life has not been extensively investigated. Most published studies have evaluated these procedures using different QoL instruments and relatively short follow-up periods because of the limited survival associated with advanced malignancy [10-12]. In the present study, quality of life was assessed using the SF-36 questionnaire before intervention and two months after treatment in a cohort of 196 patients, allowing comparison of the physical and mental health outcomes associated with four commonly employed biliary decompression techniques.

The four procedures differ not only in their technical approach but also in their potential impact on postoperative recovery and daily functioning. External drainage through PTBD effectively relieves biliary obstruction but requires patients to live with an external drainage catheter, which may interfere with routine activities and overall comfort while also resulting in continuous bile loss [13]. Conversely, ERBS restores internal bile flow without an external device but may be associated with complications such as duodenobiliary reflux, recurrent cholangitis, stent occlusion, pancreatitis, and procedure-related bleeding due to manipulation of the papilla [1,14,15]. IETBD shares some of these limitations because communication between the biliary system and the duodenum may predispose patients to reflux-associated infection [16, 17]. In contrast, IEBJD is designed to preserve internal bile drainage while limiting enteric reflux, thereby potentially reducing biliary contamination and improving postoperative recovery.

Our findings demonstrated that all four interventions resulted in measurable improvements in quality of life after two months, indicating that successful biliary decompression contributes to better patient well-being regardless of the technique employed. However, the magnitude of improvement differed among the treatment groups. Patients treated with IEBJD achieved the highest post-procedure PCS and MCS scores, suggesting greater recovery in both physical and psychological health, whereas ERBS showed comparatively smaller gains. These observations are broadly consistent with previous reports indicating that techniques capable of maintaining physiological bile drainage while reducing reflux-related complications may produce more favorable patient-reported outcomes than conventional endoscopic stenting [18-20]. Collectively, these findings suggest that, beyond achieving effective biliary drainage, the choice of decompression technique may have an important influence on short-term quality of life in patients with malignant distal biliary obstruction.

Conclusion

Minimally invasive biliary decompression significantly improved the quality of life of patients with malignant distal biliary obstruction over a two-month follow-up period. Although all four techniques demonstrated clinical benefit, internal-external biliary-jejunal drainage (IEBJD) was associated with the greatest improvement in both physical and mental health components of the SF-36 questionnaire, followed by PTBD and IETBD, while ERBS showed comparatively smaller gains. These findings suggest that the choice of biliary decompression technique influences short-term patient-reported outcomes and that procedures designed to preserve physiological bile drainage while minimizing reflux-related complications may offer superior quality-of-life benefits. Further prospective, multicenter studies with longer follow-up are warranted to validate these findings and establish the optimal palliative decompression strategy for patients with malignant biliary obstruction.

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