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Palliative laparoscopic hepaticojejunostomy: a single-centre prospective series

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Objective – to assess the safety and efficacy of palliative laparoscopic hepaticojejunostomy in the management of distal bile duct obstruction.

Materials and methods. This single-centre prospective cohort study included 22 patients with inoperable tumour-related distal bile duct obstruction. Most participants were men (n = 17 (77.3 %)) with a mean age of 66.7 ± 9.6 years. Bile duct obstruction was caused by pancreatic head adenocarcinoma (n = 18), Vater's papilla adenocarcinoma (n = 2), cholangiocarcinoma (n = 1), and duodenal melanoma (n = 1). A total of 13 (59 %) patients had a history of percutaneous transhepatic cholangiostomy, and 3 (13.6 %) had unsuccessful endobiliary stenting attempts. All patients underwent palliative laparoscopic procedures, including Roux-en-Y hepaticojejunostomy (side-to-side or end-to-side) and entero-enteric anastomosis. The primary endpoint was biliodigestive anastomosis patency without reintervention until death or end of observation. Secondary endpoints included 30-day mortality, complications classified according to the Clavien–Dindo system, bile leakage defined by the International Study Group of Liver Surgery (ISGLS), length of hospitalization, time to resumption of enteral nutrition, and overall survival.

Results. The average duration of the operation was 354.5 ± 110.1 minutes with an average blood loss of 58.3 ± 43.1 ml. Complications occurred in 8 (37.5 %) patients, including bile leakage in 7 cases (ISGLS B – in 6, ISGLS C – in 1 with biliary peritonitis), and one Clavien–Dindo IIIb event (torsion of the small intestine around the entero-enteric anastomosis). No cases of wound infection or postoperative bleeding were recorded. The average length of hospitalization was 10.3 ± 5.3 days (range, 4–24 days). Most patients (n = 19 (86.3 %)) were mobilized on the 1st postoperative day, and oral nutrition was initiated on the 2nd day. During the follow-up period (median – 8.5 months, IQR 6.8–12.0), no recurrences of bile duct obstruction or need for repeated drainage were observed. Two episodes of acute cholangitis were managed conservatively. No deaths occurred within 30 days postoperatively.

Conclusions. Laparoscopic hepaticojejunostomy appears to be a feasible and effective palliative procedure for distal biliary obstruction in selected patients. This approach maintains anastomotic patency without the need for reintervention, is associated with low blood loss, and enables rapid resumption of enteral nutrition. The complication profile is primarily characterized by manageable bile leakage, with rare Clavien–Dindo grade IIIb adverse events. This method may be considered as an alternative to stenting when stenting is not possible or has failed, or in patients with a life expectancy > 6 months who are scheduled for chemotherapy.

Keywords
laparoscopic hepaticojejunostomy, palliative surgery, malignant bile duct obstruction, pancreatic head cancer, biliodigestive anastomosis, bile leakage, Clavien–Dindo classification, ISGLS, endobiliary stenting, internal biliary drainage.

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Pancreatic head cancer is among the most aggressive gastrointestinal malignancies and is frequently diagnosed at an inoperable stage due to local invasion or distant metastasis. In these cases, the primary objective is palliation of mechanical jaundice, which substantially reduces quality of life and causes such symptoms as pruritus, cholangitis, coagulopathy, and liver failure [1, 24].

Endoscopic stenting via endoscopic retrograde cholangiopancreatography (ERCP), endoscopic ultrasound-guided biliary drainage (EUS-BD), and percutaneous transhepatic biliary drainage (PTBD)

are the primary palliative approaches for managing biliary obstruction. These interventions rapidly reduce bilirubin levels and shorten hospitalization, but are limited by risks such as reobstruction, cholangitis, and the need for repeated procedures [3, 13, 20]. The European Society of Gastrointestinal Endoscopy (ESGE) and American Society for Gastrointestinal Endoscopy (ASGE) recommend that the choice between endoscopic and surgical drainage should be guided by the patient's expected survival and functional status [2, 6].

For patients with preserved general health and functional reserves, surgical biliodigestive anastomosis remains a viable alternative, offering longer-term internal biliary drainage and a lower rate of reintervention compared to stenting [15, 24]. Recent studies demonstrate that palliative surgical interventions can be effective even in resource-limited settings. For example, in the study by FL Mutombo et al. (2025) involving 53 patients with inoperable pancreatic cancer, the failure rate of palliative operations following biliodigestive bypass was 22.6 %, and most patients were able to resume oral nutrition [15].

Advancements in minimally invasive technologies have expanded the possibilities for palliative interventions. Laparoscopic hepaticojejunostomy (LHJ) provides physiological drainage with reduced trauma, decreased blood loss, and shorter hospital stays. Recent analyses by R. Wu et al. (2025) and M. Masood et al. (2025) indicate that laparoscopic techniques are associated with acceptable complication rates and sustained long-term patency of the anastomosis in cases with palliative indications [14, 24].

The selection of an optimal drainage strategy, whether endoscopic or surgical, remains a topic of debate. Consequently, evaluating the safety, efficacy, and durability of laparoscopic interventions for palliative management of inoperable pancreaticobiliary cancer with distal bile duct obstruction is of ongoing importance.

Objective – to assess the safety and efficacy of palliative laparoscopic hepaticojejunostomy in the management of distal bile duct obstruction.

Materials and methods

This single-centre prospective cohort study included 22 patients with inoperable tumour-related distal bile duct obstruction. Most participants were men (n = 17 (77.3 %)) with a mean age of 66.7 ± 9.6 years.

Inclusion criteria

- Patients presenting with malignant obstructive jaundice characterized by a distal biliary obstruction;
- Absence of carcinomatosis or significant ascites;
- Satisfactory overall health status permitting laparoscopic intervention;
- For patients with prior percutaneous cholangiostomy, the presence of asthenia resulting from bile loss and a sustained preference to avoid external drainage;
- Provision of written informed consent for surgical intervention.

Exclusion criteria:

- Presence of severe hypoalbuminemia or decompensated systemic conditions;
- Anatomical unsuitability, such as tumour masses or metastatic lymph nodes in the hepatoduodenal ligament region;
- Marked venous collateralization in the hepatoduodenal ligament secondary to tumour invasion of the portal vein.

Bile duct obstruction was caused by pancreatic head adenocarcinoma (n = 18), Vater's papilla adenocarcinoma (n = 2), cholangiocarcinoma (n = 1), and duodenal melanoma (n = 1).

A total of 13 (59 %) patients had a history of percutaneous transhepatic cholangiostomy, and 3 (13.6 %) had unsuccessful endobiliary stenting attempts.

All patients underwent palliative laparoscopic procedures, including Roux-en-Y hepaticojejunostomy (RYHJ) (side-to-side or end-to-side) and entero-enteric anastomosis (EEA).

The laparoscopic surgical technique involved the use of combined anesthesia, specifically endotracheal anesthesia in conjunction with epidural blockade. The patient was positioned supine with legs apart on the operating table. For procedures in the upper abdominal cavity, such as cholecystectomy and hepaticojejunostomy, the table was adjusted to the Fowler position. During interventions below the mesocolon, including excision of the Roux loop and creation of a jejuno-jejunal anastomosis, the table was placed in a moderate Trendelenburg position.

A total of six trocars were used (see figure): two 10-mm trocars for the camera positioned at the umbilicus and as an auxiliary port 5–6 cm cranial and 4–5 cm to the right of the umbilicus; one 12-mm trocar placed along the lateral edge of the left rectus abdominis muscle at the umbilical level; and one 5-mm trocar in the epigastrium, 1–2 cm to the left of the midline at the level of the round ligament of the liver, approximately 5–6 cm below the xiphoid process, designated for the needle holder. A 30° laparoscope was employed. The liver was elevated using a Nathanson retractor positioned in the right costoxiphoid angle.

The Roux-en-Y loop was created by transecting the small intestine 35–40 cm distal to the ligament of Treitz using a 45 mm stapler, followed by division of the mesentery to its root. In cases of a short mesentery, when additional length was required, the second or third jejunal artery was divided at the mesenteric root while preserving collateral blood flow. The Roux-en-Y loop was positioned retrocolically, to the right of the midcolonic vessels and duodenum, or, when technically necessary due to tumour size, through the lesser omentum.

In 18 of 22 cases, the hepaticojejunostomy was formed side-to-side with a diameter of 7–10 mm, without circular mobilization or transection of the common bile duct. A 15–20 mm segment of the anterior wall of the common bile duct was used. The anastomosis was completed using either knotted or continuous sutures with 5/0 or 4/0 monofilament absorbable material; in three patients, a V-lock suture (Opusmed, 15cm, 4/0 cutting, 17 mm, 1/2 circle round) was employed.

The jejuno-jejunal anastomosis was created in an isoperistaltic fashion using a 45 mm × 3.5 mm stapler. The mesenteric defect, including the Petersen space, was left unclosed.

When feasible, a biopsy was obtained from the liver (8 cases). If this was not possible, a laparoscopic trephine biopsy of the pancreatic head was performed (6 cases), although 3 of these were uninformative. Selection of the optimal access for the latter procedure required a detailed analysis of preoperative computed tomography data.

After completion of RYHJ, a stapled EEA was initiated. The enterotomy was closed with a double-row continuous suture, primarily using V-lock 3/0 suture material.

Percutaneous cholangiostomy, previously placed in 13 patients (59 %) for severe mechanical jaundice, was closed on postoperative day 3 and removed on days 4 or 5 following laparoscopic surgery.

A video of the procedure is available at: https://youtu.be/S0C93hF6t2A?si=pd-FfbkDdoYG6jj9

The study endpoints included a primary endpoint of anastomotic patency without reinterventions and secondary endpoints of 30-day mortality, complications classified according to the Clavien–Dindo system [4], bile leakage defined by the International Study Group of Liver Surgery (ISGLS) [22], length of hospital stay, time to resumption of enteral nutrition, and overall survival.

Statistical analysis was conducted using IBM SPSS Statistics (version 22.0). Quantitative variables were described using the arithmetic mean (M), standard deviation (SD), and range (minimum to maximum). For variables not normally distributed,

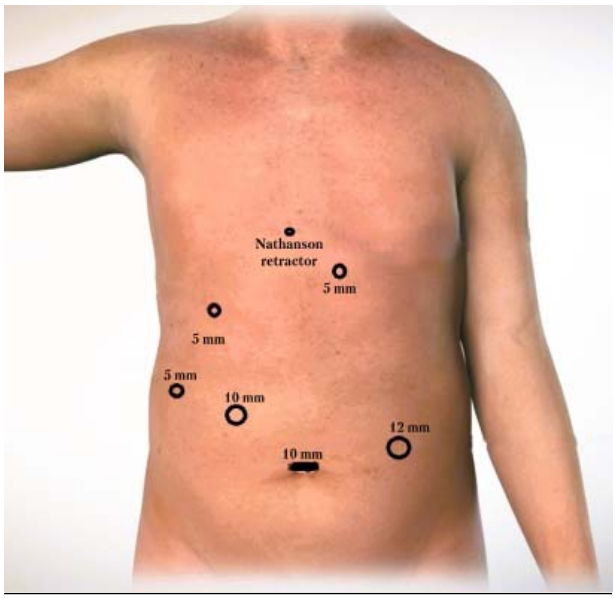

Figure. **Diagram of trocar placement**

data were presented as median (Me) and interquartile range (IQR, 25th–75th percentiles).

Normality of data distribution was assessed using the Shapiro–Wilk test. Comparisons of pre- and postoperative indicators were performed using the paired Student's t-test for normally distributed data or the Wilcoxon test for non-parametric data. Categorical variables were reported as absolute numbers and percentages.

A p-value of < 0.05 was considered statistically significant.

Results

Intraoperative indicators. All surgical procedures were performed laparoscopically, and no cases required conversion to open surgery. In 12 patients (54.5 %), the anastomosis was created using a continuous suture, while in 10 patients (45.5 %), a knotted suture was utilized. The mean operative time was 354.5 ± 110.1 minutes (range: 140 to 670 minutes), and the mean intraoperative blood loss was 58 ± 43 ml (range: 30–120 ml). In three cases of subcompensated duodenal stenosis, a Roux-en-Y gastroenterostomy was additionally performed anterior to the colon, without the formation of a Brownian fistula.

Following surgery, most patients (n = 19; 86.3 %) were transferred to the surgical ward and mobilized the day after surgery. Oral nutrition with liquid food was commenced 24 hours postoperatively. In three patients, oral nutrition was initiated one day later.

Postoperative bilirubin levels demonstrated a significant decrease. Prior to surgery, the mean total bilirubin concentration was 79.3 ± 71.1 μmol/l

(range: 10.0 to 260.0 μmol/l), which declined to 34.1 ± 35.3 μmol/l before hospital discharge (p = 0.011). Additionally, patients with prior percutaneous transhepatic cholangiostomy experienced a reduction in bilirubin levels from 54.8 ± 43.4 to 25.0 ± 13.4 μmol/l (p = 0.026), suggesting that HJ provides more favourable conditions for bile outflow compared to percutaneous transhepatic cholangiostomy. Overall, the mean total bilirubin level decreased by 46.1 % ± 5.1 % (range: 90.6 % to 0.0 %).

Postoperative complications were observed in 8 patients (37.5 %), including bile leakage in 7 patients (31.8 %) and torsion of the small intestine around the EEA in 1 patient (4.5 %).

Among patients with bile leakage, 6 cases were classified as ISGLS B and were managed with drainage or observation without further intervention. One case was classified as ISGLS C (Clavien–Dindo IIIb) and presented with biliary peritonitis due to partial HJ insufficiency, necessitating laparotomy and debridement without intervention at the anastomosis (Table). Following abdominal cavity debridement and placement of drains to the anastomosis, the patient's condition stabilized, enteral nutrition was resumed, and bile leakage through the drains gradually decreased over the subsequent 12 days.

The mean duration of bile leakage was 14.6 ± 1.7 days, ranging from 8 to 20 days.

A torsion of the small intestine involving the EEA (Clavien–Dindo IIIb) was managed surgically by untwisting the EEA during laparotomy.

No cases of wound infection or bleeding were observed. Patients with percutaneous transhepatic cholangiostomy underwent preoperative bile cultures with an antibioticogram. Standard antibiotic prophylaxis was administered (cefazolin 2 g or an alternative antibiotic based on sensitivity, 40 minutes before surgery and again 3 hours later), and antibiotics were discontinued postoperatively. Antibiotic therapy was required only in the case of peritonitis (one patient).

The mean duration of hospitalization was 10.4 ± 5.5 days, with a range of 4 to 22 days. In the absence of bile leakage, patients were discharged between days 4 and 9, with a mean of 7.1 ± 1.3 days, considering the complexity of home transfer. When bile leakage through drains was present, most patients in satisfactory condition were discharged home for observation, with an average duration of 16.0 ± 4.9 days. Drains were removed on an outpatient basis after cessation of bile leakage.

During the observation period (median 8.5 months [IQR 6.8–12.0]), no recurrence of bile duct obstruction or need for repeated drainage was observed. Two episodes of acute cholangitis were recorded (after 50 days, one associated with chemotherapy),

Table. **Patient characteristics, operative course and follow-up outcomes**

Parameter	Value
Number of patients	22
Male/female	17/5
Age, years (M ± SD; range)	66.8 ± 10.5 50–86
Main disease (nosological structure)	
Adenocarcinoma of the head of the pancreas	18
Adenocarcinoma of the Vater's papilla	2
Cholangiocarcinoma	1
Duodenal melanoma	1
Reasons for inoperability	
Distant metastases	15
Locally advanced forms with substantial vascular involvement or invasion	7
Prior decompression of the biliary tract (percutaneous cholangiostomy)	13 (59.1 %)
Interventions performed	
Laparoscopic hepaticojejunostomy	19
Hepaticojejunostomy + gastrojejunostomy	3
Liver biopsy (laparoscopic)	8
Percutaneous biopsy of the pancreatic head (of which uninformative)	6 (3)
Lymph node biopsy	1
Intraoperative indicators	
Duration of surgery, min (M ± SD; range)	354.5 ± 110.1 140–670
Blood loss volume, ml (M ± SD; range)	58 ± 43 30–120
Postoperative complications (overall)	8 (37.5 %)
Clavien–Dindo IIIb	3 (13.6 %)
Cholestasis, SGLS B/SGLS C	6/1
Bile leakage, days (M ± SD; range)	14.6 ± 1.7 8–20
Torsion of the jejuno-jejunal anastomosis	1 (laparotomy, repeat EEA)
Biliary peritonitis	1 (laparotomy, debridement, drainage)
Wound infection/intra-abdominal collections	0
Postoperative hospital stay, days (M ± SD; range)	10.3 ± 5.3 4–24
Recurrence of biliary obstruction or repeated percutaneous transhepatic cholangiostomy during follow-up (months [IQR])	Not reported (8.5 [6.8–12.0])
30-day mortality, %	0

both managed conservatively without intervention on the anastomosis. No deaths occurred within 30 days (see Table). Prolonged hospitalization and extended bile leakage were primarily observed in elderly patients, during the initial phase of technique development, and in one patient with liver failure due to prior chemotherapy and prolonged jaundice. These factors may be partially preventable.

Discussion

Hepaticojejunostomy is commonly used as an effective method for internal drainage of the biliary tract in cases of malignant obstruction of the distal common bile duct. This procedure is indicated following unsuccessful endoscopic retrograde cholangiopancreatography, biliary obturation, stent migration, intraoperative identification of an inoperable tumour, or after prior external drainage, with the primary aim of improving patient quality of life [5, 17, 18, 21].

In the past two decades, reports documenting the successful use of laparoscopic HJ in patients with inoperable distal biliary obstruction have increased [8, 10, 23]. This technique represents a minimally invasive alternative to open HJ or endoscopic stenting.

The findings indicate that laparoscopic hepaticojejunostomy is a safe and highly effective approach for palliative restoration of biliary outflow in patients with inoperable distal biliary obstruction of malignant origin. The lack of conversions, mortality, and recurrent obstruction aligns with contemporary studies that report a high success rate for laparoscopic HJ and a low incidence of severe complications [5, 10].

In this series, bile leakage (31.8 %) did not result in significant clinical manifestations and was primarily managed conservatively. These findings align with those of FL Mutombo et al. (2025), who reported an overall complication rate of 38 % and a mortality rate of 0 % in 37 patients undergoing laparoscopic or open palliative bypass [15].

Compared with endoscopic stenting, LHJ provides a longer period of patency and a reduced need for reinterventions [11, 17, 21]. Cohort studies report that jaundice recurrence after self-expanding metal stents (SEMS) occurs in approximately 17–37 % of patients within 3–6 months [16]. Plastic stents demonstrate a median patency of 3–6 months, which is associated with frequent reinterventions and recurrence of jaundice during this period [9]. In the present study, no recurrence of bile duct obstruction or requirement for re-drainage was observed during the follow-up period (median 8.5 months [IQR 6.8–12.0]). Furthermore, the laparoscopic approach reduces surgical trauma and lowers the incidence of infections and bleeding compared with open surgery [8, 17].

The present findings are consistent with those of M. Masood et al. (2025), who reported in their review that laparoscopic palliative interventions for inoperable pancreatic cancer are safe and associated with lower complication rates and shorter hospital stays compared with open surgery [14].

GEM Rizzo et al. (2023) emphasize that when selecting between endoscopic and surgical palliative methods, consideration should be given to life expectancy, patient condition, and resource availability. The authors note that surgical biliodigestive anastomoses offer prolonged drainage, whereas endoscopic approaches are preferable for patients with limited survival prognosis [19].

From a technical perspective, side-to-side anastomosis has several advantages over end-to-side, including shorter operating time, reduced risk of bleeding and injury to the hepatoduodenal ligament, and a lower likelihood of ischemic stricture. Concerns regarding the development of blind sac syndrome (Sump syndrome) in Roux-en-Y LHJ are not supported by recent evidence. Contemporary publications report only isolated cases occurring 10 to 20 years after open procedures, which lack clinical significance in patients with malignant pathology [7, 12].

LHJ offers the combined benefits of minimal invasiveness and physiological internal drainage. The present study confirms its feasibility as a preferred method for patients with inoperable pancreatic head cancer who have an expected life expectancy exceeding 3 to 6 months.

Several limitations of our study should be considered when interpreting the results. First, the single-centre prospective design and relatively small sample size (n = 22) reduce statistical power and limit the generalizability of our findings. Second, the absence of a control group, such as patients who underwent endoscopic or open palliative intervention, precludes direct comparison of the effectiveness of different methods. Third, the heterogeneity of the nosological composition (adenocarcinoma of the pancreatic head, adenocarcinoma of the Vater's papilla, cholangiocarcinoma, and duodenal melanoma) may influence outcomes, particularly survival and complication rates. Fourth, the median follow-up duration of 8.5 months is insufficient to assess long-term anastomotic patency and the occurrence of late complications, such as strictures or blind sac syndrome. Additionally, bile leakage and postoperative events were evaluated clinically, based on drain output, without routine use of control cholangiography or magnetic resonance cholangiopancreatography

(MRCP), which may have resulted in underestimation of minor leakage frequency.

To validate these findings, multicentre prospective studies with larger sample sizes, standardized patient selection criteria, and a unified protocol for assessing complications according to the Clavien–Dindo and ISGLS classifications are necessary. Future research should compare LHJ with endoscopic stenting and open palliative interventions in terms of quality of life, duration of anastomotic patency, reintervention rates, and overall survival. Additionally, the influence of technical variants of the anastomosis (side-by-side versus end-by-side) on the incidence of bile leakage and stricture formation warrants investigation. The combination of LHJ with laparoscopic gastroenterostomy should be examined separately, considering the potential for duodenal stenosis over time and evaluating the role of LHJ in comprehensive palliative treatment, including the early initiation of chemotherapy.

Expanding the sample size, standardizing the methodology, and extending the observation period will facilitate a more objective evaluation of the long-term efficacy and safety of LHJ.

Conclusions

Laparoscopic hepaticojejunostomy represents a safe and effective approach for internal biliary drainage in patients with inoperable pancreatic head cancer following unsuccessful endobiliary stenting or external drainage.

In this study, the procedure was completed without conversions or fatalities. The incidence of serious complications (Clavien–Dindo i IIIb) was 13.6 %.

The anastomosis maintained complete patency of the biliary tract throughout the observation period, with no recurrence.

Laparoscopic hepaticojejunostomy enables the collection of histological material during a single intervention, thereby facilitating subsequent oncological management.

In selected patients without carcinomatosis or ascites and with adequate functional reserves, laparoscopic hepaticojejunostomy may be considered as an alternative to endoscopic stenting.

Declaration of interests

The Authors declare no conflict of interest.

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Authors contributions

O. V. Ivanko: conception and design, drafting the article; V. V. Skyba: critical revision of the article; A. V. Homan: acquisition of data, analysis and interpretation of data.

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Паліативна лапароскопічна гепатикоєюностомія: одноцентрова проспективна серія

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Мета — оцінити безпечність та ефективність паліативної лапароскопічної гепатикоєюностомії при дистальному блокові жовчних проток.

Матеріали та методи. В одноцентрове проспективне когортне дослідження було залучено 22 хворих із неоперабельним дистальним блоком жовчних проток пухлинного генезу. Серед них переважали чоловіки (17 (77,3 %)). Середній вік — (66,7 ± 9,6) року. Причинами обструкції жовчних проток були аденокарцинома головки підшлункової залози (n = 18), фатерового сосочка (n = 2), холангіокарцинома (n = 1), меланома дванадцятипалої кишки (n = 1). В анамнезі черезшкірну черезпечінкову холангіостомію проведено 13 (59 %) хворим, невдалі спроби ендобіліарного стентування — 3 (13,6 %). Усім пацієнтам виконано паліативні операції з лапароскопічного доступу: гепатикоєюноанастомоз за типом бік-у-бік чи кінець у бік на Ру-петлі та ентеро-ентероанастомоз. Первинна кінцева точка — патентність (прохідність) біліодигестивного анастомозу без реінтервенцій до смерті/кінця спостереження, вторинні — 30-денна смертність, ускладнення за класифікацією Клав'єна — Діндо, жовчні витоки за ISGLS (Міжнародна дослідницька група з хірургії печінки), тривалість госпіталізації, термін відновлення ентерального харчування, загальна виживаність.

Результати. Середня тривалість операції — (354,5 ± 110,1) хв, об'єм крововтрати — (58,3 ± 43,1) мл. Ускладнення зареєстровано у 8 (37,5 %) пацієнтів: жовчні витоки — у 7 (ISGLS B — у 6, ISGLS C — в 1 із жовчним перитонітом, Клав'єна — Діндо IIIb — в 1 (перекрут тонкої кишки навколо ентеро-ентероанастомозу). Інфекції ран/кровотечі після операції не зафіксовано. Середня тривалість госпіталізації — (10,3 ± 5,3) доби (4—24 доби). Більшість пацієнтів (19 (86,3 %)) активізовані в 1-шу добу, пероральне харчування розпочато з 2-ї доби. За період спостереження (медіана — 8,5 міс (IQR 6,8—12,0) рецидивів обструкції жовчних проток або необхідності повторного дренування не спостерігали. Два епізоди гострого холангіту проліковано консервативно. Випадків смерті упродовж 30 днів не було.

Висновки. Лапароскопічна гепатикоєюностомія є здійсненною та ефективною паліативною операцією при дистальному блокові у відібраних пацієнтів: збережена прохідність анастомозу без реінтервенцій, низька крововтрата та швидке відновлення ентерального харчування. Профіль ускладнень зумовлений переважно керованими жовчними витоками, небажані події IIIb рівня трапляються рідко. Метод можна розглядати як альтернативу стентуванню у випадках його неможливості/невдачі або за очікуваної тривалості життя > 6 міс із плановою хіміотерапією.

Ключові слова: лапароскопічна гепатикоєюностомія, паліативна хірургія, злоякісна обструкція жовчних проток, рак головки підшлункової залози, біліодигестивний анастомоз, жовчні витоки, класифікація Клав'єна — Діндо, ISGLS, ендобіліарне стентування, внутрішнє дренування жовчних шляхів.

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