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Traumatic Bile Duct Injury with Complete Duodenal and Pancreatic Neck Transection Following Blunt Abdominal Trauma in a Child: A Case Report of Staged Surgical Management

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Case Report

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Abstract

Background

Combined pancreatoduodenal injury following blunt abdominal trauma is rare in children, and concomitant extrahepatic bile duct injury is rarer still. Bile duct injury is easily missed on initial imaging and at laparotomy, and typically declares itself only through delayed clinical signs.

Case presentation

A 21-month-old male child (9.2 kg) sustained blunt abdominal trauma in a road traffic accident, presenting in compensated shock. Contrast-enhanced computed tomography demonstrated multi-organ solid organ injury and pneumoperitoneum. Emergency laparotomy revealed complete transection of the first part of the duodenum and of the pancreatic neck, with an unrecognised hematoma overlying the retro-pancreatic bile duct. Primary duodenal repair, distal pancreatectomy with splenic vein preservation, and feeding jejunostomy were performed. The missed bile duct injury declared itself postoperatively through bile-stained drain output, pale stools, and later progressive jaundice, ultimately requiring cholecystojejunostomy with Roux-en-Y reconstruction six weeks later, as safe dissection of the porta hepatis had not been achieved.

Conclusions

A traumatic bile duct injury can be safely bridged to delayed reconstruction when bile drains freely through a wide-bore drain without intra-abdominal collection or sepsis, and when enteral bile refeeding is available. Staged management, individualised to the evolving clinical picture, allowed a favourable outcome in this severely injured child.

Background

Combined pancreatoduodenal injuries following blunt abdominal trauma are uncommon in children. The pancreas is vulnerable to compression against the vertebral column during high-energy trauma, most frequently resulting in transection at the pancreatic neck, the thinnest portion of the gland [1, 2]. Duodenal injuries account for approximately 3–5% of pediatric abdominal trauma and are frequently associated with pancreatic injury due to their close anatomical relationship [3]. Traumatic injury to the extrahepatic bile duct is considerably rarer, and — because it is not reliably visualised on initial cross-sectional imaging or apparent at emergency laparotomy amid more conspicuous injuries — it is easily missed at the index operation, declaring itself only later through bile leakage, pale stools, or progressive jaundice [7, 8]. We report a child with complete duodenal and pancreatic neck transection in whom a concomitant bile duct injury was missed at the initial laparotomy, and describe the staged, clinically-guided approach that allowed safe delayed biliary reconstruction.

Case presentation

Presentation and investigations

A 21-month-old male child, weighing 9.2 kg, presented following blunt abdominal trauma sustained in a road traffic accident. On arrival, the child was in compensated shock. Initial laboratory investigations revealed hemoglobin 8 g/dL, lactate 6 mmol/L, and serum amylase 88 U/L. Primary survey and resuscitation were performed according to pediatric trauma protocols, and blood transfusion was administered. Focused Assessment with Sonography in Trauma (FAST) demonstrated intra-abdominal free fluid.

Following stabilisation, contrast-enhanced computed tomography (CECT) of the chest, abdomen, and pelvis demonstrated bilateral lung contusions, a Grade II liver laceration, a Grade III splenic laceration, bilateral Grade III renal lacerations, a pancreatic body injury, and gross pneumoperitoneum. In view of the pneumoperitoneum and suspected hollow viscus injury, emergency laparotomy was performed.

Operative findings

Midline laparotomy revealed a splenic hematoma; a liver laceration involving the caudate lobe; retroperitoneal hematoma involving both kidneys; complete transection of the first part of the duodenum, approximately 3 cm proximal to the ampulla; complete transection of the pancreatic neck, exposing the superior mesenteric vein; and a hematoma involving the retro-pancreatic bile duct. No active intra-peritoneal bleeding was identified, and — as is characteristic of this injury — the retro-pancreatic bile duct itself could not be confidently assessed through the surrounding hematoma at this stage; the bile duct injury was therefore not recognised at this first operation.

Operative management

Primary repair of the duodenal transection was performed, on the basis of viable tissue margins, a short segment of injury, and early surgical intervention with minimal peritoneal contamination; more extensive diversion procedures (such as pyloric exclusion or duodenojejunostomy) were considered unnecessary given these favourable local conditions and were reserved as a fallback had the repair appeared tenuous.

A distal pancreatectomy was performed with preservation of the splenic vein, given that main ductal disruption at the pancreatic neck is not amenable to reconstruction in this setting; the proximal pancreatic duct and cut surface were ligated using Prolene sutures. The splenic parenchymal injury (Grade III laceration) was managed non-operatively, without splenectomy or splenorrhaphy, as there was no active splenic bleeding at laparotomy and the child remained hemodynamically stable following resuscitation — consistent with accepted non-operative management of hemodynamically stable pediatric splenic trauma.

A feeding jejunostomy was created to facilitate early enteral nutrition. Two large-bore abdominal drains — wide-calibre intercostal (IC) tube drains — were placed, one in the sub-hepatic region and one in the lesser sac; the wide calibre of these drains later proved important in allowing free egress of bile once the missed bile duct injury declared itself. The abdomen was closed, and the patient was transferred to the intensive care unit (ICU).

The child required postoperative ventilatory support only during the immediate postoperative period, with no prolonged ventilator requirement. Broad-spectrum intravenous antibiotics (piperacillin–tazobactam and metronidazole) were administered for 10 days according to institutional antimicrobial protocols. The duration of ICU stay following the first surgery was 8 days.

Postoperative course: declaration of the missed bile duct injury

On postoperative day 2, the child developed pale stools together with significant bile output through the lesser sac drain — the first clinical evidence of the bile duct injury that had not been apparent at the index operation. Early jejunal feeding was initiated, and bile re-feeding through the jejunostomy was commenced, which supported nutrition while the biliary fistula was managed expectantly.

An upper gastrointestinal contrast study performed on postoperative day 5 confirmed integrity of the duodenal repair. The subhepatic drain was removed, and oral feeding was gradually introduced.

The key factors that permitted safe delay of biliary reconstruction, rather than early re-exploration, were that bile was not collecting intraperitoneally and was draining freely through the wide-calibre lesser sac drain, and that there was no clinical or biochemical evidence of sepsis. The lesser sac drain dislodged spontaneously on postoperative day 15, after which the child developed progressive jaundice, with peak total bilirubin reaching 128 μmol/L. Ultrasound examination demonstrated no intra-abdominal bile collection but a dilated proximal common bile duct. Magnetic resonance cholangiography (MRC) demonstrated complete cutoff of the common bile duct at the retroduodenal level, confirming traumatic bile duct injury and, in retrospect, explaining the earlier bile leak and pale stools as its first manifestations.

Diminishing bile drainage in the presence of persistent jaundice was interpreted as an indicator that a biliary stricture was maturing at the site of injury — a process that, in this child, ultimately resulted in spontaneous cessation of the bile leak with no intra-abdominal collection and therefore no sepsis. This evolving picture allowed the extrahepatic biliary tree to dilate progressively, which was anticipated to facilitate subsequent biliary reconstruction. Endoscopic and percutaneous interventions were considered but deemed technically unfeasible following multidisciplinary discussion.

Timing of definitive reconstruction

Delaying biliary reconstruction under these circumstances offers several advantages: it allows time for the biliary tree to dilate, for local hematoma and oedema to resolve, and for tissues to mature and become less vascular, thereby facilitating safer dissection. However, waiting too long risks compromising liver health and compounds the systemic effects of obstructive jaundice, so optimal timing requires balancing these competing considerations. Had bile drainage or clinical status deteriorated, external biliary drainage would have been the necessary next step; this was avoided here, allowing enteral bile refeeding to continue uninterrupted.

Second surgery: definitive biliary reconstruction

Definitive biliary reconstruction was performed at 6 weeks post-injury. Dense adhesions were encountered around the porta hepatis, making safe identification and dissection of the common bile duct technically difficult. Choledochojejunostomy would have been the ideal reconstruction, but technical feasibility and safety took priority over anatomical purity; choledochoduodenostomy was not an option given the preceding duodenal injury and repair. Cholecystojejunostomy was therefore performed as an alternative to choledochojejunostomy, necessitated by the altered anatomy and adhesions between the duodenum and the porta hepatis. A Roux-en-Y jejunojejunostomy was created following mobilisation of the previously constructed jejunostomy limb.

Postoperatively, intravenous cefuroxime was administered for 5 days. The duration of ICU stay following the second surgery was 2 days.

Outcome

Enteral feeding was initiated on postoperative day 5 following the second procedure, and the child was discharged on postoperative day 7. The total hospital stay was 2 months. No significant postoperative infections occurred. No pancreatic fistula developed, as drain amylase was not elevated and follow-up ultrasonography demonstrated no intra-abdominal collections. The child attended the first outpatient review one week after discharge, with resolution of obstructive jaundice and tolerance of normal oral feeding.

Discussion and conclusions

Complete duodenal transection represents a severe injury requiring prompt surgical management; primary repair is recommended when tissue viability is preserved and contamination is limited, as early intervention reduces morbidity and improves outcomes [4]. In our patient, the short segment of injury, viable margins, and early operative intervention favoured primary repair over a diversion procedure, and this choice was validated by the confirmed integrity of the repair on contrast study.

Pancreatic neck transection typically implies disruption of the main pancreatic duct. Distal pancreatectomy remains the preferred surgical approach in cases of complete transection when ductal

reconstruction is not feasible [5], and preservation of splenic vessels during distal pancreatectomy has been associated with improved postoperative recovery and reduced risk of splenic complications [6]. The concurrent Grade III splenic laceration was managed non-operatively rather than by splenectomy or splenorrhaphy, in keeping with the low threshold for non-operative management of splenic trauma in hemodynamically stable children; this also preserved splenic immunological function without added operative risk.

The central lesson of this case, however, concerns the extrahepatic bile duct injury, which was not appreciated at the initial laparotomy despite direct inspection of the area — the retro-pancreatic hematoma obscured, rather than announced, the underlying ductal injury. Traumatic injury to the extrahepatic bile duct following blunt abdominal trauma is rare, accounting for a small proportion of pediatric biliary injuries [7], and delayed presentation of biliary obstruction is well described, resulting from progressive ischemia, fibrosis, or compression by surrounding hematoma [8]. In this case, the injury declared itself early in the postoperative course through bile-stained drain output and pale stools, rather than through a dramatic bile leak — a presentation that should heighten suspicion for occult bile duct injury whenever a retro-pancreatic or porta hepatis hematoma is encountered at trauma laparotomy, even when the duct cannot be directly visualised.

What allowed safe deferral of definitive repair, rather than early re-exploration, was free bile drainage through a wide-calibre drain with no intra-abdominal collection and no sepsis, supported by early bile refeeding through the existing jejunostomy to maintain enteral nutrition and enterohepatic circulation. Delayed biliary reconstruction is recommended to allow resolution of inflammation and facilitate safer dissection [9], but this must be individualised against the risk that prolonged obstruction compromises liver health, guided by drain output, sepsis markers, and bilirubin trend rather than a fixed interval. External biliary drainage remains an important fallback should this balance tip toward further delay.

Dense adhesions around the porta hepatis may limit safe identification of the common bile duct at the time of definitive surgery. Under such circumstances, cholecystojejunostomy provides a reliable alternative method of biliary drainage and has demonstrated acceptable long-term outcomes in selected pediatric patients [10]. Choledochojejunostomy remains the preferred reconstruction where the duct can be safely dissected, and choledochoduodenostomy was not available to us given the prior duodenal injury; the choice of cholecystojejunostomy with Roux-en-Y reconstruction in this case was therefore dictated primarily by technical feasibility and safety rather than by anatomical ideal.

The absence of pancreatic fistula in this case likely reflects secure ligation of the pancreatic duct and effective drainage of the pancreatic bed. Early initiation of enteral nutrition via jejunostomy also contributed to improved nutritional recovery and healing [11]. This case highlights the importance of staged surgical management in complex pancreatoduodenal trauma, and specifically the value of a clinically-guided, individualised approach to a bile duct injury missed at index laparotomy: vigilance for delayed signs, judicious use of wide-bore drainage and enteral bile refeeding, and careful timing of reconstruction around the interplay of ductal dilatation, tissue maturation, and the risk of prolonged

obstruction. Early operative intervention, vigilant postoperative monitoring, and individualised reconstruction strategies were key factors contributing to the favourable outcome observed in this infant.

In conclusion, combined duodenal and pancreatic neck transection with a missed bile duct injury following blunt abdominal trauma is exceedingly rare in children. Because such bile duct injuries are easily missed on initial imaging and at laparotomy, awareness of their subtle, delayed presentation — bile-stained drain output, pale stools, and progressive jaundice — is essential. When bile drains freely through a wide-bore drain without intra-abdominal collection or sepsis, and enteral bile refeeding is feasible, staged management with carefully timed delayed biliary reconstruction is safe and allows the biliary tree to dilate and tissues to mature, facilitating a technically safer repair. This case demonstrates that successful recovery is possible even after severe multi-organ trauma when injury patterns are recognised promptly, timing is individualised, and multidisciplinary management is employed.

Abbreviations

● CECT
Contrast-enhanced computed tomography
● FAST
Focused Assessment with Sonography in Trauma
● IC
Intercostal (tube drain)
● ICU
Intensive care unit
● MRC
Magnetic resonance cholangiography
● SMV
Superior mesenteric vein

Declarations

Ethics approval and consent to participate

Not applicable. This is a single de-identified case report, which is exempt from formal ethics committee review at our institution.

Consent for publication

Written informed consent was obtained from the patient's parent/legal guardian for publication of this case report and accompanying clinical images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Availability of data and materials

The datasets used and/or analysed during the current case report are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

VHJS: surgical management, data collection, manuscript drafting. RJ: data collection, manuscript review. MS: surgical management, critical revision and supervision. All authors read and approved the final manuscript.

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Figures

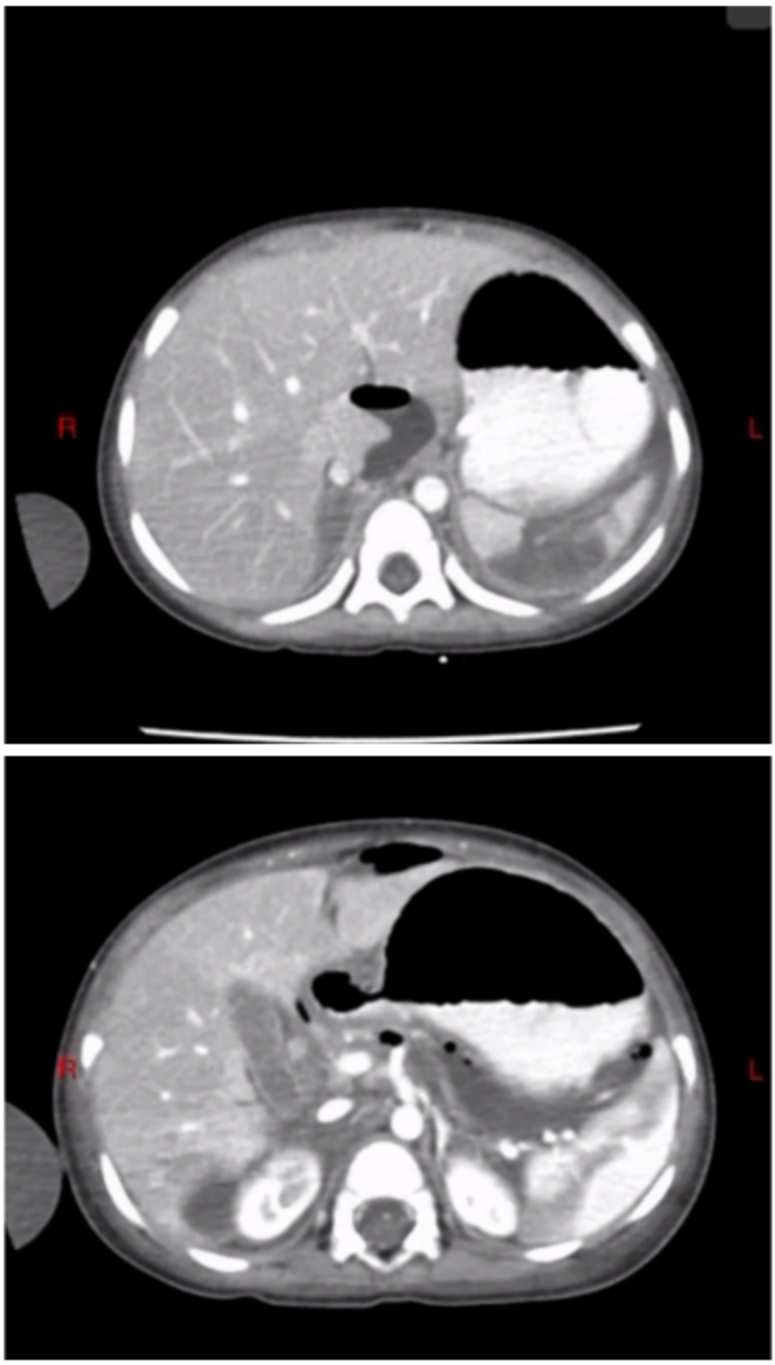


Figure 1

Contrast-enhanced CT (axial) demonstrating (A) grade II liver and grade III splenic lacerations, and (B) gross pneumoperitoneum with bilateral grade III renal lacerations.

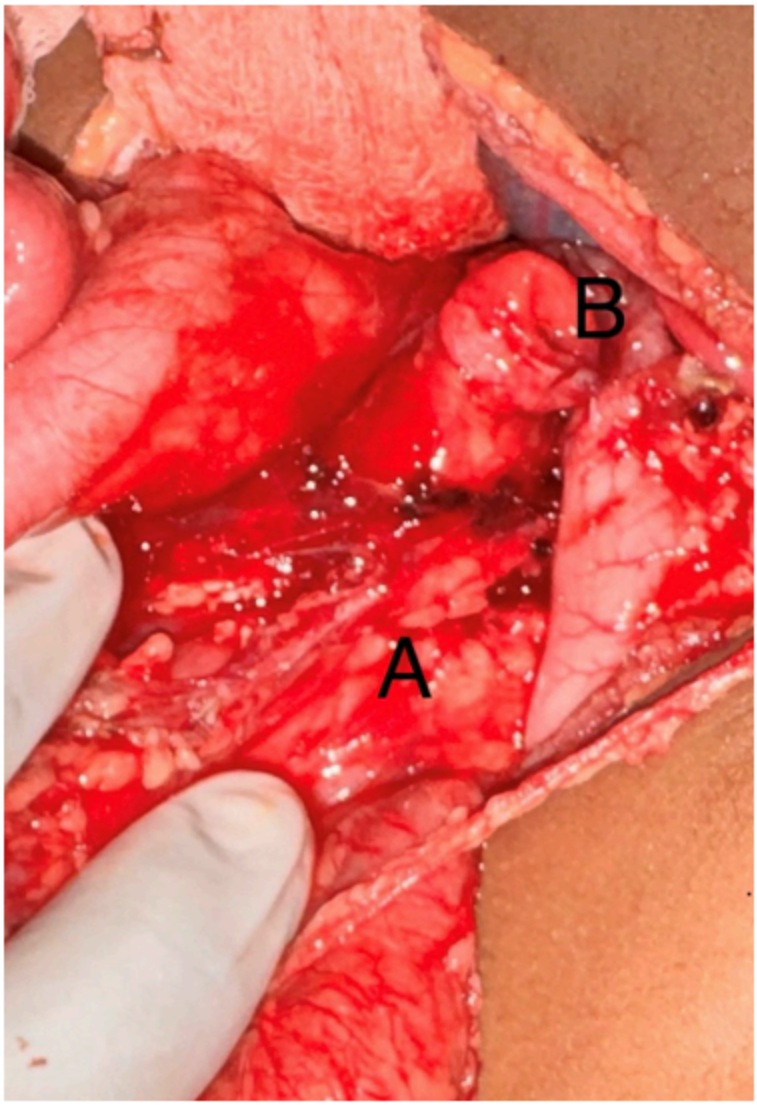


Figure 2

Intraoperative photograph demonstrating complete transection of the first part of the duodenum (A), approximately 3 cm proximal to the ampulla, with adjacent pancreatic neck transection (B).

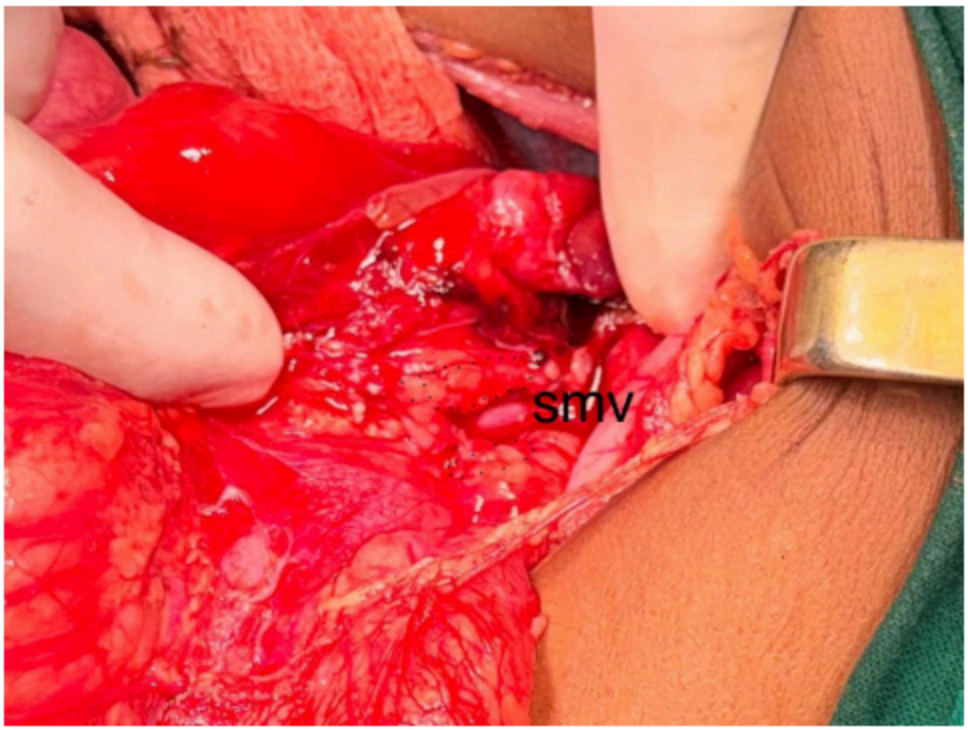


Figure 3

Intraoperative photograph demonstrating complete transection of the pancreatic neck, with exposure of the underlying superior mesenteric vein (SMV).

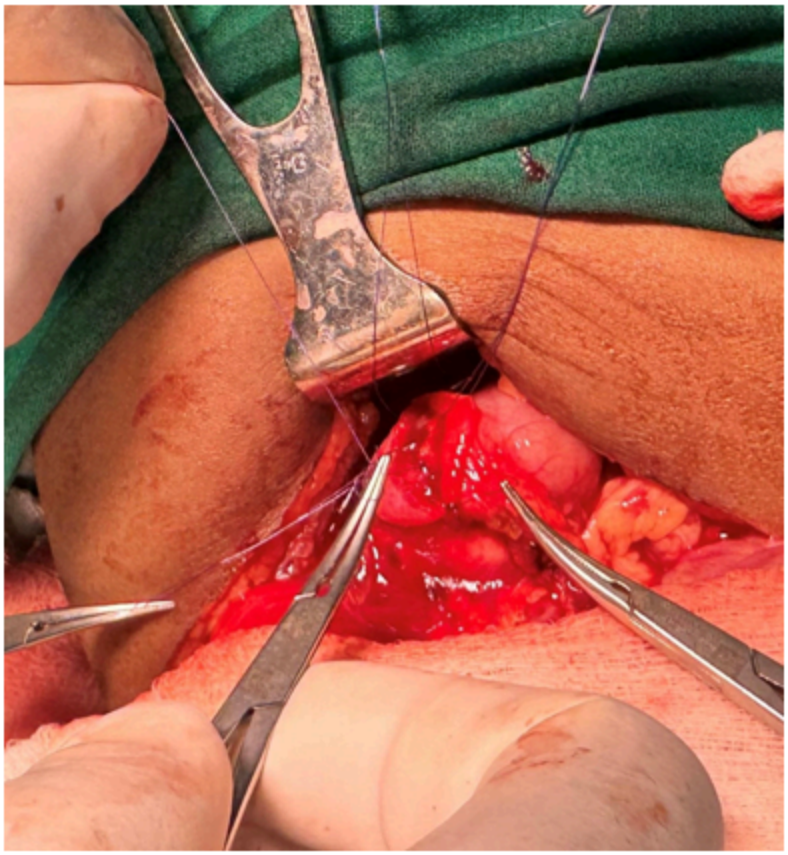


Figure 4

Intraoperative view following mobilisation demonstrating the extent of pancreatic parenchymal disruption at the neck region.

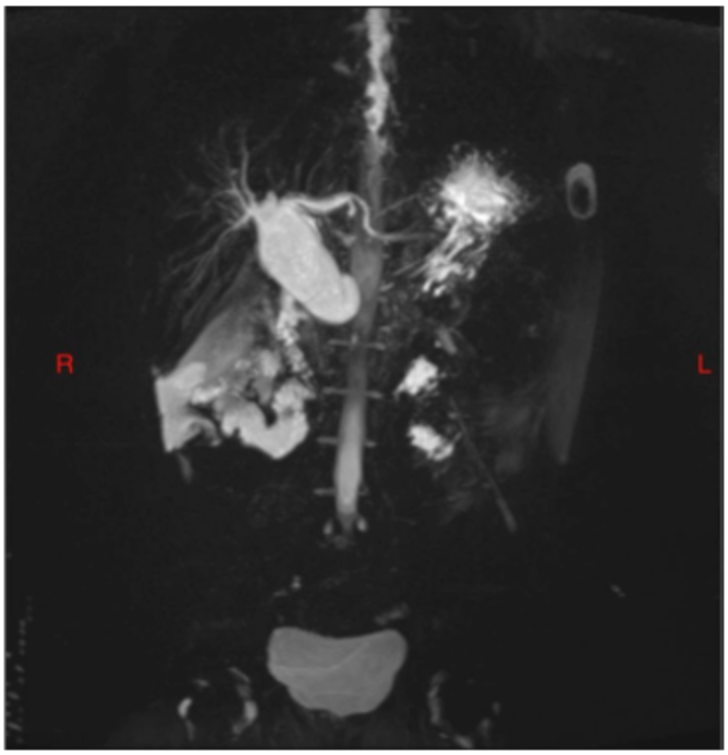


Figure 5

Magnetic resonance cholangiography (MRC) demonstrating a dilated proximal common bile duct with complete cutoff at the retroduodenal level, consistent with traumatic biliary injury.