



Hepatobiliary Surgery

RETROSPECTIVE AND PROSPECTIVE STUDY OF SURGERIES OF THE HEPATO - PANCREATICO- BILIARY SYSTEM AND THEIR COMPLICATIONS

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ABSTRACT HPB surgery since its inception in the yesteryears has been associated with a high rate complications leading to increased morbidity and mortality.

In view of the risk of complications of HPB surgery it was thought to review 309 cases over a 7 year single unit data and study the procedure related morbidity and mortality following various surgical procedure. Benign CBD pathologies had 17.39% morbidity as compared to 46% morbidity in pancreatoco biliary resections for cancer. The mortality was also higher in the malignant group of 7.76% as compared with 2.7% as compared with benign pancreatic pathologies. Pancreatic fistula was the most common complication in the malignant group. Gain in experience and higher patient volume, coupled with a meticulous pre-operative work-up, sound surgical technique and dedicated post-operative management indicate that major pancreatoco- biliary resections can be safely performed.

KEYWORDS : Pancreatic fistula, delayed gastric emptying, biliary fistula, gastric outlet obstruction

INTRODUCTION

HPB surgery since its inception has been associated with a high rate complications leading to increased morbidity and mortality.

Majority of all HPB surgeries are technically demanding and truly test the skills of a surgeon dealing with these cases. With the refinement in surgical techniques and advent of newer modalities and advances in the life support systems, intensive care and a wide range of effective antibiotics the complications can be managed much better and the overall outcome has definitely improved. Many factors play an important role in postoperative mortality and morbidity.

However a highly skilled team of surgeons with a well equipped intensive care unit, interventional radiologists and therapeutic endoscopists are required for the successful management of these patients.

METHOD

The study was conducted after approval from the institutional review board. 309 patients operated for hepato-pancreato-biliary surgeries were included between May 2000 and Apr 2007. A detailed history regards onset-duration-progress of symptoms, jaundice, pain, lump was taken. All patients were subjected to investigations like USG, C.T SCAN, EUS, ERCP, MRCP as applicable and blood investigations were also done. A routine X-ray chest and a standing X-ray abdomen was done to rule out any other causes of abdominal cause and for anaesthesia fitness. Some patients were also subjected to invasive procedures like percutaneous transhepatic biliary drainage (PTBD). Surgeries would be classified as for benign & malignant diseases with stress on post-operative surgical & non-surgical complications if any were thoroughly investigated. Morbidity & mortality data were also accounted for and an audit was done for these complications. Post-operative death was defined as death within 30 days post-op or before discharge from the hospital. Pre-op variables include Age, sex, H/O cirrhosis, portal hypertension, viral hepatitis, jaundice, cardiac disease, diabetes mellitus, COPD and pre-op biliary instrumentation.

The patients were put on total parenteral nutrition or feeding jejunostomy and IV fluids supported by blood products when needed. Nutrition was not neglected but given prime importance. Medications in the form of broad spectrum antibiotics were used. Superior coverage was given in septic cases. All the biochemical blood investigations were repeated and the parameters of Hb and prothrombin time normalized. X-ray chest was taken and counts were checked to rule out respiratory infections. Routine cultures were done of urine and blood if the patients were febrile. The histopathology reports were traced and the histological diagnosis confirmed. If the patients developed any post op complications the necessary remedial action was taken and the patient monitored closely. The intra-abdominal status was evaluated by Ultrasonography or if needed a CT scan. The patient was kept

indoor till complete recovery. Re-exploration if the need be was done promptly for any life threatening complications.

OBSERVATION AND RESULTS
STUDY GROUPS

BENIGN	MALIGNANT
(I) Benign CBD Pathologies n(92)	(III) Pancreatoco-biliary resection for malignancy n(106)
(II) Benign pancreatic Pathologies n(74)	(IV) Palliative bypass procedures n(37)

Benign CBD Pathologies
n(92)

SURGERY	n
Cholecystectomy with choledochoduodenostomy	38
Roux-en-Y H-J for CBD Injuries	44
Excision of choledochal cyst	10

Morbidity 16 pts (17.39%)

Wound Infection 6 pts (6.52%) Bile Leak 5 pts (5.43%)

Mortality Nil

Wound infection was seen to be commoner in patients previously stented. Bile culture and wound swab grew the same organism. Antibiotic protocols were directed according to bile culture reports.

II): Benign Pancreatic Pathologies
n(74)

SURGERY	n
Puestow s/ Frey s Procedure	35
Cystoenterostomy	26
Distal pancreatectomy	7
Enucleation	4
Pancreatic Necrosectomy	2

Morbidity 14pts (18.92%)

Mortality 2pts (2.70%)

Complications

Wound complications 5pts (6.76%). Pulmonary complications 3pts (4.05%) (2 succumbed)

Peritonitis 3pts (4.05%) (Stomal ulcer perforation, Roux loop gangrene, Bile leak)

Haemorrhage 3pts (4.05%) (2 Pseudoaneurysms, 1 Anastomotic bleed)

Pancreatic Fistula 4pts (5.40%)

(III)
i) Resections for Pancreatico-biliary Malignancies
n(106)

SURGERY	n
Whipple s pancreatico-duodenectomy	103
- Ampullary	38
- Cholangiocarcinoma	33
- Ca Head	27
- Ca Duodenum	5
Distal Resections	3

Morbidity 49pts (46%)

Mortality 11pts (10.67%)

Procedure related 8pts (7.76%)*

3- Each due to MI/PE/Pneumonia

6- Due to leak

2- Due to hemorrhage

Complications

Pancreatic Fistula 32pts (30.18%)

Wound complications 26pts (24.53%)

Peritonitis 19pts (17.93%) (6 succumbed)

Pulmonary complications 13pts (12.26%) (2 succumbed)

Delayed Gastric Emptying 5pts (4.72%)

Biliary Fistula 4pts (3.78%)

Hemoperitoneum 2pts (1.89%) (succumbed)

Pancreatitis 2pts (1.89%)

Gastric Outlet Obstruction 1pt (0.94%) (needed revision surgery)

Hematemesis 3pts (2.83%)

Myocardial Infarction 1pt (1.89%) (succumbed)

Bile reflux Gastritis 7pts (6.60%)

Depression 1pt (0.94%)

Factors responsible for increased Morbidity and Mortality

1) Depleted nutritional status (1)

2) Cholangitis (2)

3) Pre-operative stenting (3,4)

4) Delayed presentation

5) Infrastructural Deficiencies

This morbidity and mortality can also be attributed to nutritionally depleted patients usually presenting late with most of them in cholangitis. Early referrals coupled with aggressive nutritional support, treating the sepsis and correcting the gross hepatic dysfunction (5).

ii)

Morbidity	No Complications	Complications
Sr Proteins	5.4 gm/dl	4.3 gm/dl
Sr Albumin	2.7 gm/dl	2.2 gm/dl

(p<0.001)

(IV): Palliative Bypass Procedures
n(37)

SURGERY	nn
Triple Bypass	32
Choledochoduodenostomy	5

Triple bypass was performed in a majority of cases in whom the tumour was not resectable. The 2 patients who succumbed had widespread peritoneal disease and ascites.

Morbidity 10pts (27.03%) **Mortality** 2pts (5.40%)

Palliative Bypass Procedures

Malignant cachexia is one of the common problems faced with patients undergoing palliative bypass procedures. Gross ascites- Patients usually have gross ascites with severe hypoproteinemia and severely deranged liver functions and coagulation profile. Non surgical management- This is opted for if the performance status is very poor and in cases of advanced malignancy. Other problems encountered in this group was that most of these patients were anemic and hypoproteinemic with very high bilirubin levels. Role of Therapeutic Endoscopist and Interventional Radiologist should be considered in the management of these cases.

GROUP	Morbidity(%)	Mortality(%)
Benign CBD Pathologies	17.39	0
Benign Pancreatic Pathologies	18.92	2.70
Pancreatico-Biliary Resections	46.00	7.76*
Palliative Bypass Procedures	27.30	5.40

DISCUSSION

In the present study, it was initiated to help to determine the causes of major morbidity and mortality after HPB surgery so that patient care can be altered in order to avoid similar complications in the future.

More than 50% patients required ICU admission for respiratory failure. Instituting a pulmonary rehabilitation programme might decrease this excessive rate of pulmonary complications. (6,7). Data showed that previously drained patients with tumors causing proximal or distal obstruction of the biliary tree who undergo surgical resection or bypass suffer increased intra-operative blood loss and increased post-op infection and the organism were same as those from bile culture.

Pre-op prothombin and albumin as well as a H/O viral hepatitis and cirrhosis with or without Portal hypertension, may be taken to indicate a need for increased alertness to the possibility of the need for critical care after HPB surgery. The significant morbidity and mortality of pancreatic resection raises questions by Surgical Oncologists of whether the small possibility of cure is justified by the price of possible death from surgery or its associated complications that leads to prolonged hospitalization.

Pancreatico-duodenectomy generally, is considered to be the standard operation for resection of carcinomas of the pancreas or the periampullary region. (8,9,10)

Complications rates are high in patients undergoing curative resections with complications of some type developing in more than 50% of patients. The most common complication is the pancreatico-jejunal fistula formation. As the literature has substantiated concerns about tumour seeding and multicentricity are not relevant because the 5 year survival rate in a patient who undergoes Whipple s surgery is the same as that of total pancreatectomy (11). Despite the fact that ligation causes more fistulas than pancreatico-jejunostomy, fistula formation after pancreatico-jejunostomy is more dangerous. Probably there is an activation of pancreatic enzymes caused by the enteric secretions (12). Activated pancreatic fluid is more corrosive compared to the fluid secreted by the isolated pancreatic remnant.

Exposure of the gastro-jejunostomy to alkaline secretions minimizes the risk of marginal ulceration caused by the sensitivity of the jejunal mucosa to gastric acid. In most of the international studies the leading cause of morbidity was early delayed gastric emptying. It is often marked by postoperative emesis and the need to get naso-gastric tube re-insertion. Early delayed gastric emptying although not life threatening can result in a marked prolongation of hospital stay. Its incidence was initially thought to be more after pylorus preservation, but it is now recognized to be equally frequent after classic pancreatico-duodenectomy.

The most common complication after pancreatico-duodenectomy is **fistula formation** from the anastomosis at the sites of gastrointestinal tract reconstruction. The pancreatico-jejunal anastomosis is technically difficult to perform and is the most frequent site of fistula formation (13). It is important that the pancreatico-jejunostomy to be a secure anastomosis because the leakage of pancreatic secretions from the anastomosis can have potentially fatal consequences. Large studies have shown that if pancreatic leakage occurs after pancreatico-duodenectomy, 20-40% of the patients die in the further post-operative course. Fortunately, in specialized surgical centres a serious anastomotic leakage is a rare event (<5%), but if it happens it frequently ends in catastrophe, with either long hospitalization or death.

A study has shown that the decisive factor for complications in the area of the anastomosis is i) soft tissue of the pancreatic remnant at the site of resection, ii) continued exocrine pancreatic secretion iii) prolonged duration of untreated jaundice, iv) deep jaundice, v) decrease creatinine clearance, vi) increased intra-operative blood loss and vii) shock during operation were statistically significant factors in pancreatico-jejunostomy leak.

The consistency of the pancreatic parenchyma seems to be a critical aspect for the security for the pancreatico-intestinal anastomosis and studies have shown a clear relationship between complications and secreting capacity of the remnant pancreas (14).

Various techniques of managing the pancreatic remnant have been studied like simple suture ligation of the pancreatic duct without enteric anastomosis combined with external tube drainage, has proven unsatisfactory with external fistulas occurring in 50-100% of patients. Other techniques are mucosa-to-pancreatico-jejunostomy with or without anastomosis stent. In a retrospective randomized review from UCLA, it is reported that pancreatic fistulae developed in 14% of the patients in whom mucosa-to-mucosa pancreatico-jejunostomy was performed and in 13% of patients reconstructed via invagination pancreatico-jejunostomy.

Studies have shown that in non dilated system placement of a stent is a better option. In another study end to side pancreatico-jejunostomy was compared with an end to end and the former was found to be better (15)

Various groups have favoured minor modifications of pancreatico-jejunostomy including external stenting of the duct, pancreatico-jejunostomy to an isolated Roux-en-Y jejunal limbs and use of fibrin glue to seal pancreatico-jejunostomy but the usefulness of none of them was proven(16)

Recent results with pancreatico-gastrostomy are favourable. Most commonly a pancreatic fistula is recognized between 3rd and 7th postoperative day. If the patient is clinically stable and without signs of intra-abdominal sepsis or bleeding, conservative management to include prohibition of oral intake and total parenteral nutrition.(17)

Approximately 80% of fistulae heal with conservative management. Somatostatin and its analogues inhibit pancreatic secretion and are advocated for the prevention and treatment of complications (18)

Opsit dressings were used very effectively so as to make it a controlled fistula for smaller leaks which spontaneously closed in majority of the cases. Upto 5% of the patients with pancreatic fistula develop significant intra-abdominal complications such as sepsis or bleeding that requires operative intervention. These patients are typically ill with sepsis, leucocytosis, an abnormal abdominal CT scan or evidence of sentinel bleeding via their drainage catheters. Under these circumstances it is recommended to do a completion pancreatectomy if a leak is confirmed. *By following this principle upto 50% of the patients can be salvaged.*

Wound infection was seen to be commoner in patients previously stented. Bile culture and wound swab grew the same organism. This suggests that the potential benefits of preoperative drainage of the biliary tree before surgical resection is questionable and needs to be evaluated further.

Antibiotic protocols were directed according to bile culture reports. All of these were treated conservatively and the use of opsit dressings were used.

Fluid collections demonstrated by abdominal CT scan are common following pancreatico-duodenectomy. In many cases, these have no significance and resolve spontaneously. Some with radiographically defined intra-abdominal fluid collection and septic clinical picture are associated with an increased mortality. The most common cause is a pancreatico-jejunostomy leak . these abscesses are mainly localized in the right subhepatic region or under the left diaphragm.

Percutaneous catheter drainage using radiographic guidance is the preferred method of drainage.

In patients with abscess related to hepatico-jejunostomy leaks, control of the bile leak may require placement of percutaneous transhepatic catheter, allowing external drainage and decompression of the biliary tree (19).

Patients with systemic toxicity from an intra-abdominal abscess who do not promptly improve after initiation of appropriate antibiotic therapy and percutaneous catheter drainage should be prepared for surgical re-exploration and open drainage. A pancreatic anastomotic leak if discovered, a strong thought must be given or completion pancreatectomy.

Delayed gastric emptying is defined as persistent secretion via the nasogastric tube of more than 500ml/day over more than 5 days after surgery, or recurrent vomiting in combination with swelling of the gastro-jejunostomy/ duodeno-jejunostomy and dilatation of the stomach in the contrast medium passage.

Pancreatico-duodenectomy may involve gastric atony after resection of duodenal pacemaker and the disruption of gastroduodenal neural connections, or ischaemic injury to the antropyloric muscle mechanism, gastric dysrhythmias secondary to intra-abdominal complications such as anastomotic leaks or abscesses and gastric atony in response to a reduction in circulating levels of motilin. (20)

The standard treatment of early delayed gastric emptying after pancreatico-duodenectomy is largely supportive, incorporating prolonged tube decompression combined with nutritional support by parenteral or enteral routes. Prokinetic agents such as erythromycin have been used.

The presence of mechanical obstruction at duodeno-jejunostomy or gastro-jejunostomy must be excluded by upper gastrointestinal series or endoscopy. In most cases, delayed gastric emptying resolves with these measures within 2- 4 weeks. It is important not to lose patience and to inform the patient that it is only a matter of time until the stomach adapts to the new situation.

Haemorrhage can occur early or late following pancreatico-duodenectomy. Haemorrhage within the first 24 hours of surgery is most often caused by a technical failure of haemostasis arising from a non-secured intra-abdominal vessel or from an anastomotic suture line. Early haemorrhage is best treated by appropriate resuscitation followed by prompt re-operation to secure haemostasis. In case of pancreatico-intestinal anastomosis leakage, the occurrence of post-operative haemorrhage is associated with a mortality rate of between 15 - 58%. (21,22)

Haemorrhage occurring on the 5th post-operative day may be from a gastrointestinal source such as marginal ulcer or may occur from drain site often arising in association with a pancreatic anastomotic leak.

If the first sign is bloody output of the nasogastric tube and/or malena, careful gastroscopy is the first diagnostic procedure which is performed. Suture line bleeding can often be recognized easily in this way. If endoscopic intervention fails and there is no stabilization by administering blood and fresh frozen plasma, re-operation is the therapy of choice.

A pseudoaneurysm is another cause for bleeds and which is best treated by the interventional radiologist. Stress ulcers are always feared but rarely seen following pancreatico-duodenectomy. They are prevented by perioperative use of proton pump inhibitors. Some studies have shown that high serum bilirubin levels are correlating with a higher frequency of bleeding complications after pancreatic surgery.

The best way to prevent post-operative haemorrhage is to perform a meticulous surgery with careful haemostasis.

The improved safety of hepatic resection is directly attributable to the techniques employed to decrease intra-operative blood loss and to preserve a well perfused and drained hepatic remnant.(23) The techniques utilised to decrease blood loss include division of vascular in-flow (portal vein and hepatic artery) structures and out-flow structures (hepatic vein) prior to the division of parenchyma as well as prompt attention to intra-operative bleeding. (24) Mortality of less than 5% for liver resections now represent the gold standard of care, but 0% mortality rates are achievable and this must be the long-term goal.

REQUISITES FOR BETTER OUTCOME

Higher patient volume.
Meticulous pre-operative work-up.
Sound surgical technique.
Dedicated post-op management.
Help from technology based services like therapeutic endoscopist, interventional radiologist.

CONCLUSION

The foregoing results demonstrate that complications are inevitable

but a proper patient selection alongwith sound surgical technique and technology based backup facilities like interventional radiology will definitely help to improve the outcome.

Aggressive post-operative management with early mobilization and decreasing the number of tubes significantly reduce the morbidity and leads to early restoration of daily activities.

Post-operative nutrition is not to be neglected and titrating the feeds with a margin to be flexible is needed.

Gain in experience and higher patient volume, coupled with a meticulous pre-operative work-up, sound surgical technique and dedicated post-operative management indicate that major pancreatico-biliary resections can be safely performed.

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