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Taming A Surgeon's Worst Nightmare – A Case Series Emphasizing Early Detection of Complications Following Whipple's Resection and Their Successful Management

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ABSTRACT

Pancreaticoduodenectomy (Whipple's resection) is by far one of the most complicated procedures in surgery with tedious dissection, multiple anastomoses and a stormy postoperative course. The post operative management of these cases may be extremely challenging due to the varied nature of complications involved. Here we present a case series of 5 patients with a varied spectrum of postoperative complications. 3 patients had vascular complications, 1 had pancreatic leak and 1 had efferent loop syndrome. The various methods used to deal with such complications are described.

Keywords: Whipple's resection, Pancreaticoduodenectomy, Postoperative complications, Vascular complications, Efferent loop syndrome

INTRODUCTION

Pancreaticoduodenectomy (Whipple's resection) is by far one of the most complicated procedures surgeries has to offer. A complete resection of the duodenum along with the pancreatic head requires meticulous and tedious dissection and hemostasis. Vascular reconstructions are also needed depending on the infiltration. All this coupled with three anastomoses, two of which are to maintain the continuous flow of the most irritant bodily fluids (the pancreatic juice and the bile) add to the risks involved in this operation. Decades of refinement of sur-

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gical skill has resulted in a significant decrease in the postoperative mortality but the morbidity rates still remain high - around 30-50%.[1] Complications like postoperative pancreatic fistula, delayed gastric emptying, bleeding remain common despite advancements in surgery. Prehabilitation, meticulous surgery and sound postoperative care, all come together synergistically for a successful recovery.

While prehabilitation and surgical procedure is directly under the surgeon's control, the postoperative recovery becomes the limiting agent in a successful treatment. So here in this case series we have enumerated the most tenacious challenges that were faced in the post operative management of Whipple's resection and means used to successfully tackle them.

We describe a series of 5 cases of Whipple's resection at our centre between 2020 and 2024 with a challenging postoperative course. Our centre has an average case volume of 25-30 cases a year which would qualify it as a high-volume centre.[2] The cases enlisted here deal with early detection and successful management of Pseudoaneurysm, Postoperative pancreatic fistula (POPF) and Efferent loop syndrome.

Case Series Analysis

1.Case A

A 61-year-old female who was evaluated for obstructive jaundice and was diagnosed to have periampullary carcinoma. She underwent Whipple's resection for the same. She had elevated drain amylase on post operative day (POD) 3 which subsequently decreased and normalized by POD 9. However, she developed hemorrhagic drain of around 60 ml volume on POD 11 and a diagnostic CECT abdomen with CT angiogram was ordered. She had no abdominal distention, tachycardia or fall in hemoglobin value. The CT revealed a pseudoaneurysm in the distal part of the splenic artery (Fig.1) She underwent glue embolization of the pseudoaneurysm on the same day. The subsequent postoperative course was uneventful and she was discharged by POD 22.

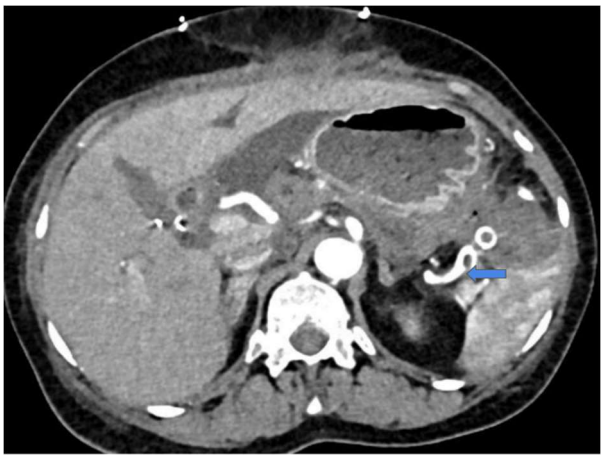

Figure 1: CECT scan showing a pseudoaneurysm in the splenic artery (blue arrow)

2.Case B

A 46-year-old female who was evaluated for obstructive jaundice was diagnosed to have a periampullary carcinoma. She underwent whipple's resection for the same and had an uneventful procedure. On POD 3 drain amylase was done and was found to be raised. Imaging showed no collection. On POD 13 the patient had a syncopal attack and had a fall. Following this she progressively developed abdominal distention. She had a drop in hemoglobin from 10.3 to 7.9 and received packed red cell transfusions for the same. The abdominal drains had been removed by then and she was being considered for discharge when the incident occurred. CECT (with CT angiogram) taken showed a pseudoaneurysm in the splenic artery with hemoperitoneum. She was subsequently taken up for emergency embolisation of the vessel (Fig. 2 a and b). Post procedure the course in her hospital was uneventful and she was discharged by POD 28.

Figure 2 (a) and (b): Angiogram image Pre and Post coiling of the splenic artery (blue arrow)

3. Case C

A 63-year-old female was evaluated for obstructive jaundice, loss of weight, loss of appetite and was diagnosed with carcinoma of head of pancreas. She underwent

Whipple's resection for the same. She had an elevated drain amylase value on POD 3 and the subsequent values showed a decreasing trend. On POD 12 she had around 50 ml of hemorrhagic drain. Her vital signs were stable and she had no abdominal distention or fall in hemoglobin value. CECT (with CT Angiogram) taken showed a pseudoaneurysm in the proximal splenic artery (Fig. 3). She was taken up for embolisation on the same day and the procedure was uneventful. She had an uneventful course in the hospital thereafter and she was discharged on POD 20.

Figure 3: CECT scan showing pseudoaneurysm in proximal splenic artery (Blue arrow)

4. Case D

Case D had an elevated postoperative drain amylase value (on POD 3 and POD 5) and developed fever on POD 7 with features of abdominal pain. A CECT taken revealed a collection near the pancreaticojejunostomy site. The collection was subsequently aspirated under USG guidance. The aspirate was a milky white collection around 200ml (Fig. 4). The aspirate culture grew E Coli and the patient was given antibiotics according to the sensitivity report. An abdominal sonography done after 30 days confirmed the absence of any residual/reformed collection. The rest of the postoperative course was uneventful.

5. Case E

Case E had an uneventful course until POD 9 when the patient started having abdominal distention and erythema around wound site. On POD 10 the patient developed multiple episodes of bilious vomiting. Bilious discharge was also noted from the wound site. A CECT scan was done which showed a dilated stomach, a dilated afferent loop and a peripancreatic collection (Fig. 5). No definite point of leak could be demonstrated. The patient was put on continuous nasogastric (NG) tube aspiration. Upper GI scopy done on POD 12 revealed plenty of bile in stomach and solid residue and inspissated secretions obstructing the efferent loop. The secretions were suctioned out and a thorough lavage was given. The NG tube aspirate decreased over the next 3 days and the patient was restarted on an oral diet. There was no bilious discharge noted from the wound following the upper GI scopy. The rest of the postoperative period was uneventful.

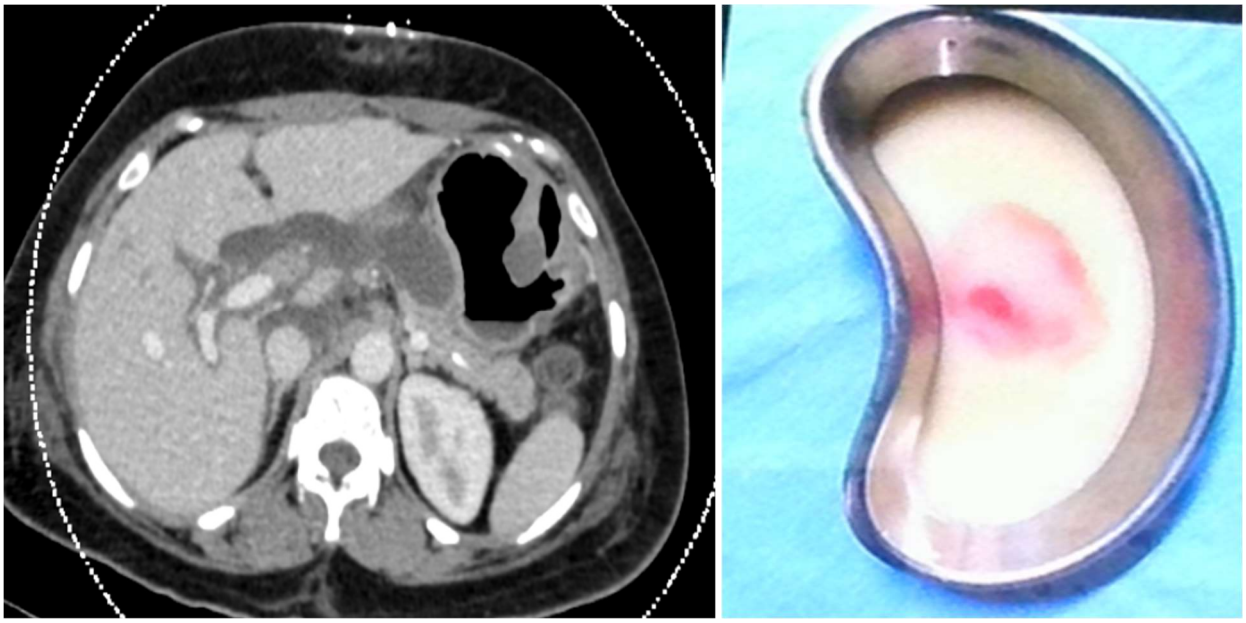

Figure 4: Pancreatic bed collection and Aspirated milky white fluid from the pancreatic bed

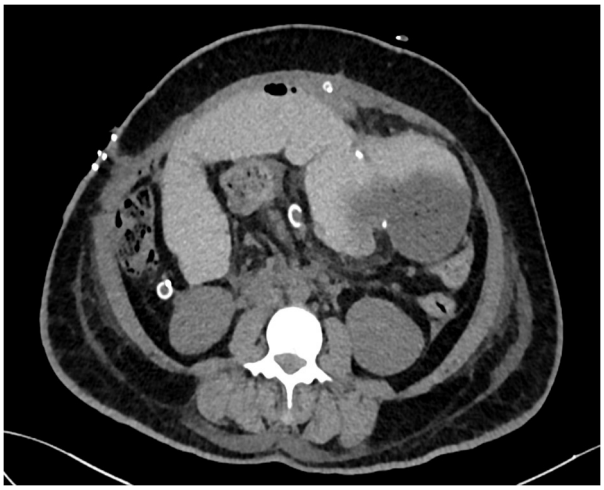

Figure 5: A dilated stomach and dilated afferent loop seen post pancreaticoduodenectomy

DISCUSSION

As already mentioned, the cases enlisted dealt with early detection and successful management of Biochemical leak/POPF and Pseudoaneurysm (Case A, B, C); Infected peripancreatic collection (Case D); and Efferent loop syndrome (Case E)

The incidence of POPF, a frequent adverse effect following pancreatic jejunostomy, is still high, ranging from 13 to 41%.[3] The occurrence of a POPF can lead to the development of secondary complications, including infections, postoperative sepsis, multiorgan dysfunction, and post pancreatectomy hemorrhage. Postoperative pancreatic fistula rates are still high despite a number of advancements on the surgical front.

POPFs are categorized into three risk classifications by the International Study Group of Pancreatic Surgery (ISGPS).[4] While Grade B POPF necessitates a modification in postoperative treatment or continuous drainage for more than three weeks post-surgery, potentially increasing the incidence of infection, Grade A POPF is deemed mild and of no clinical consequence (now known as "Biochemical Leak"). Grade C POPF, which is the most severe type can lead to acute hemorrhage and abdominal sepsis, increasing both morbidity and mortality.

4 out of the 5 patients in our series had at least a biochemical leak demonstrated. In mild pancreatic leakage, conservative management yields excellent outcomes.[5] Grade C POPF remains a challenge for pancreatic surgeons and extensive surgeries including pancreatectomy and splenectomy may need to be carried out which in itself may predispose the patient to diabetes, immunosuppression and therefore higher morbidity and mortality.[6] Our policy of retaining patients till the end of the second week paid rich dividends as most of the patients had their complicating event in the second week postsurgery.

Table 1: Summary of all the five cases

Patient	Case A	Case B	Case C	Case D	Case E
Age/ Sex	61/F	46/F	63/F	37/F	43/F
Diagnosis	Periampullary Ca	Periampullary Ca	Carcinoma head of Pancreas	Periampullary Ca	Carcinoma head of pancreas
Preoperative stenting	Yes	Yes	Yes	Yes	Yes
Preoperative neoadjuvant therapy?	No	No	No	No	No
Pancreatic leak?	Biochemical leak	Biochemical leak	Biochemical leak	Clinical leak	No leak
Presenting Symptom	Hemorrhagic drain - 60ml	Abdominal distention	Hemorrhagic drain - 50ml	Abdominal pain	Abdominal distention, Bilious vomiting, Bilious wound discharge
POD	Day 11	Day 13	Day 12	Day 7	Day 9
Vital Signs	Normal	Tachycardia	Normal	Fever Tachycardia	Tachycardia
CT finding	Pseudoaneurysm-Splenic artery	Pseudoaneurysm-Splenic artery, Hemoperitoneum	Pseudoaneurysm-Splenic artery	Peripancreatic collection	Gastric and afferent loop dilation with small peripancreatic collection
Procedure done	Angio Embolisation of splenic artery	Angio Embolisation of splenic artery	Angio Embolisation of splenic artery	USG guided aspiration - 200 ml milky white fluid	OGD scopy - lavage
Day of discharge	Day 22	Day 28	Day 20	Day 16	Day 19

Because of the corrosive nature of the pancreatic contents, which can cause arterial rupture and bleeding, postoperative pancreatic fistula (POPF) is the most significant risk factor for postoperative hemorrhage among all complications after Pancreaticoduedenectomy. [7] Hence the surgeon should always have a high suspicion when there is a high colored drain and a POPF. What we wish to emphasize is that even biochemical leak should be followed up with caution. Biochemical leak, if continuous for a long time can complicate a pseudoaneurysm.

Pseudoaneurysms are not uncommon following upper abdomen surgeries considering the proximity of several major vessels to the organs being dissected. Close dissection with surgical devices is thought to damage the adventitia which may result in pseudoaneurysms.[8] Pseudoaneurysm is caused by dissection close to the adventitia during tumor excision or lymphadenectomy, which weakens the arterial wall. The true incidence of pseudoaneurysm is difficult to know as many pseudoaneurysm may be asymptomatic and may go unnoticed. Our series consisted of 3 patients who had pseudoaneurysms in the splenic vessel. The other common vessels that may be involved include the Common hepatic artery and the remnant of the gastroduodenal artery.

Early angiography to determine the location of bleeding is key to diagnosis and the timing of presentation also plays a key role in the outcome of the patient. In addition, it can save time and prevent the complications associated with an emergency laparotomy to locate the source of bleeding without angiography. Emergency laparotomy may be required for delayed massive hemorrhage when the bleeding focus cannot be located by standard investigation and therapeutic angiography cannot stop the bleeding.[9]

Efferent loop obstruction was the other interesting post operative complication reported in our series. It is a rare syndrome where the patient suffers high intestinal obstruction. The limb draining from the stomach when obstructed results in increased back pressure leading to complications related to the upstream anastomosis as well. Efferent loop syndrome (ELS) following pancreaticoduodenectomy is uncommon and is usually the result of recurrence of malignancy and hence presents late in the course.[10] The obstruction may have led to a buildup of pressure in the hepaticojejunal anastomosis which may have resulted in a leak of bilious content which subsequently discharged through the laparotomy wound. There have been case reports of foreign body Giant Cell reactions leading to an inflammatory phlegmon which resulted in ELS. Such inflammatory reactions, mechanical obstruction and technical defects leading to kinks in the efferent loop are the usual common causes for ELS early in the postoperative courses.[11]

The peripancreatic collections occurring due to a leak are notorious to get infected and the consequences can be devastating. This, again, requires sharp clinical acumen to detect early and nip it in the bud.

CONCLUSION

Our case series serves to present the myriads of complications that may occur following this major surgery. There are several important learning points to be noted from this series. Long standing abdominal distension can be the first presenting symptom of an underlying complication.

When an intra-abdominal pseudoaneurysm is suspected, diagnostic angiography should be performed immediately to enable early diagnosis and embolization therapy for rupture of pseudoaneurysms. Early detection and immediate embolization might bring about a favorable outcome in patients with pseudoaneurysms after surgical and interventional treatments.[3]

Upper GI scopy in the hands of an expert can also save the patient from another laparotomy. The management of such complications require multidisciplinary support including state of the art intensive care facilities.

Ethical Clearance: Ethical Clearance is not mandatory for retrospective studies as per the authors' institution policy.

Human/Animal Rights: All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2008(5).

Informed Consent: Informed consent was obtained from all patients to be included in the study

Author Contribution: KR and AK: Contributed in Data Collection, Manuscript writing; **MKR:** Contribution in Data Collection; **CK, MM, MW:** Contributes in Manuscript writing.

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