

Complete laparoscopic pancreaticoduodenectomy: our experience of the first case

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Abstract

Laparoscopic pancreaticoduodenectomy was described in 1994. It is considered the most challenging abdominal surgery. Although the procedure was found to be feasible in initial reports, the benefits were not considered favorable. In recent days, with the increasing experience of surgeons, acceptable outcomes are being observed and have been found to be technically beneficial and oncologically safe in selective cases in experienced hands. We performed the procedure in a 42-year-old gentleman with good operative and post-operative outcomes. The patient's follow-up for six post-operative months seems satisfactory. The operation took 840 minutes with minimal blood loss. The resected specimen was adequate and satisfactory from an oncological and technical point of view. The patient developed some inherent complications of the procedure in the post-operative period. He recovered well. Details of the case and technical aspects are being discussed.

Keywords: Pancreaticoduodenectomy; Laparoscopic Pancreaticoduodenectomy; Laparoscopic Whipple's Operation

Introduction

Pancreaticoduodenectomy or Whipple procedure is the complex surgical undertaking for various lesions of pancreatic, periampullary and distal common bile duct. Gagner and Pomp described the first laparoscopic approach to pancreaticoduodenectomy in 1994 with a conclusion that, although the procedure was technically feasible, the benefit might not be as apparent as for less complex laparoscopic procedures.¹ This procedure is considered the most challenging procedure for minimally invasive surgeons.² We, at our institute, successfully performed the complete laparoscopic pancreaticoduodenectomy and followed up the case for 6 months. The case and the technical details are reported here. Consent was taken from the patient for case report.

Case report

A 42-year-old gentleman, a known diabetic for 11 years, working at Dubai who had undergone laparoscopic

cholecystectomy 2 months back, developed icterus in the post-operative period for which he was thoroughly investigated and identified to have malignant ampullary growth. He then came back to Nepal for further treatment. At the time of examination, he was well built with a BMI of 24 kg/m², not icteric, mildly pale, but having itch marks all over the body and scars of previous laparoscopic cholecystectomy. His Hb was 9 gm/dl, Liver function test revealed slightly raised AST/ALT but markedly raised alkaline phosphatase (ALP). All other investigations were within normal limits. On upper gastrointestinal endoscopy, he had a large ulcerative growth at the ampulla. Endoscopic biopsy revealed adenocarcinoma. CT scan showed dilated common bile duct and intrahepatic biliary radicals with no features of ascites and distant metastasis. He underwent complete laparoscopic pancreaticoduodenectomy on 24th February 2019 at Kathmandu medical college by author and team. The operative duration was 840 minutes. Blood loss was approximately 100 ml. There were no remarkable

events during surgery. There was circumferential asymmetrical and irregular wall thickening noted involving the D1 and D2 segment of the duodenum. Mass was firm to hard in consistency extending up to ampulla resulting in dilated CBD. The pancreas was firm in consistency with the foci of fibrotic changes in the head and body. Post-operatively, the patient was kept in mechanical ventilation for 10 hours and extubated the next day morning.

He had a good recovery. He did not need a blood transfusion during or in the postoperative period. The nasogastric (NG) tube was removed on day 3. Gradual oral feeding was started. Drain amylase on day 3 and day 7 was normal. The drain was removed on the 9th post-op day. But on 10 post-op day onwards, there was bilious discharge from wound approximately 50ml per day. There was associated abdominal fullness and vomiting for which NG tube was re-inserted. Per day NG output was 700 to 1L. This was treated as delayed gastric emptying probably due to low output anastomotic leakage. Wound discharge gradually declined over 5 days but the features of delayed gastric emptying continued. UGI endoscopy was done on the 17th post-operative day revealed no remarkable findings. NG tube was removed as he started tolerating a liquid diet. CT scan was done on the 21st postoperative day for continuing upper GI discomfort. This revealed superior mesenteric vein thrombosis for which anticoagulation therapy started. With symptomatic improvement, he was discharged on the 26th post-operative day.

Histopathologic diagnosis was intestinal-type periampullary duodenal adenocarcinoma of size 1.8cm with lymphovascular invasion and without perineural invasion. All resected margins were free of tumor. Twenty-seven lymph-nodes were harvested out of which 7 were positive. (pT2N2, 8th edition AJCC)

On a recent follow up after 6 months, He has completed chemotherapy. He is in good health and he does not have any evidence of residual tumor and features of recurrence in a recent CT scan.

Technical details

The patient was kept in the lithotomy position. For the initial phase of surgery, the operating surgeon was on the left side and camera surgeon in between the legs. Later, the position of the surgeon was changed according to the site of surgery. During whole surgery, the operating surgeon's position was changed in three places: Left side, in between the legs and on the right side. Port positions are shown in Figure 1.

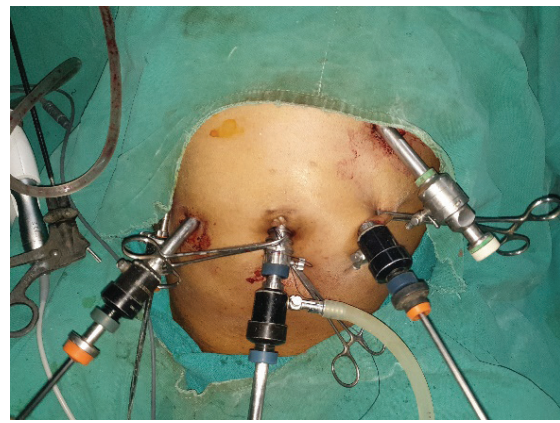


Figure 1: Port positions

First, adhesiolysis was done and hepatic flexure of the colon was mobilized.

Then, the mesocolon was mobilized and the right gastroepiploic pedicle clipped and divided. After this, extensive duodenal Kocherization was done.

The next step was the mobilization of the pancreatic neck from the superior mesenteric vein and portal vein (tunneling). It was successfully done without any unexpected consequences. The pancreatic neck was tied with umbilical tape so that it can be used for lifting purpose.

Then, the dissection was started in the supra-pancreatic portion for the mobilization of the common hepatic artery. All the lymph nodes overlying the common hepatic artery and porta were dissected out. The right gastric artery and Gastroduodenal artery were dissected clipped and divided. The stump of the gastroduodenal artery was secured with polypropylene 5-0 suture.

Greater omentum and the antrum of the stomach were mobilized. The antrum of the stomach divided with an endo stapling device.

Then the pancreatic neck was divided with ultrasonic shears. The pancreatic duct was identified which was approx. 5mm in size. Duodenojejunal flexure was mobilized deep so that it could be retracted to the right side. Proximal jejunum was divided with endo stapler and proximal jejunal mesentery was dissected with harmonic shears. The third part of duodenum along with proximal jejunum could be retracted to the right side.

Dissection of the pancreatic uncinata process was started then and continued along with the right border of the superior mesenteric artery. The inferior pancreaticoduodenal artery and the twigs from the first jejunal veins were clipped and dealt with harmonic scalpel. The common bile duct was divided at the end and the specimen was separated.

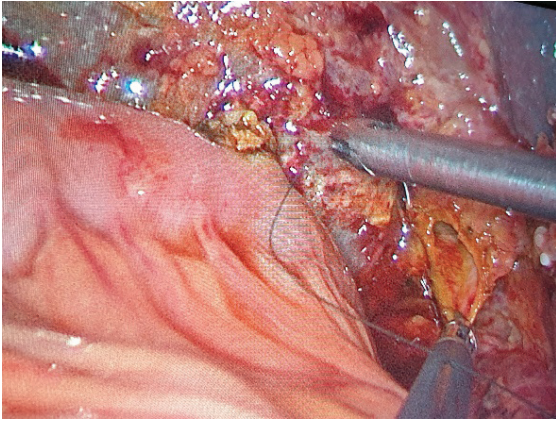


Figure 2: Hepaticojejunostomy

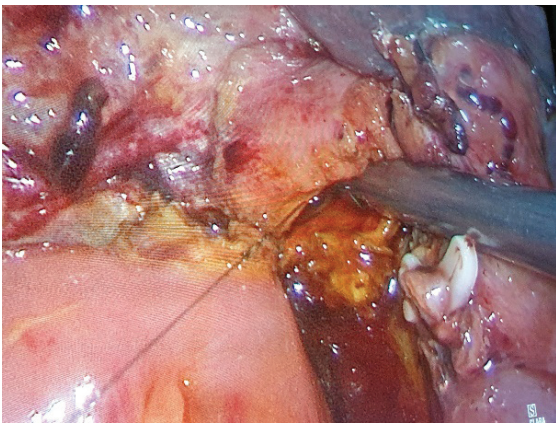


Figure 3: Hepaticojejunostomy

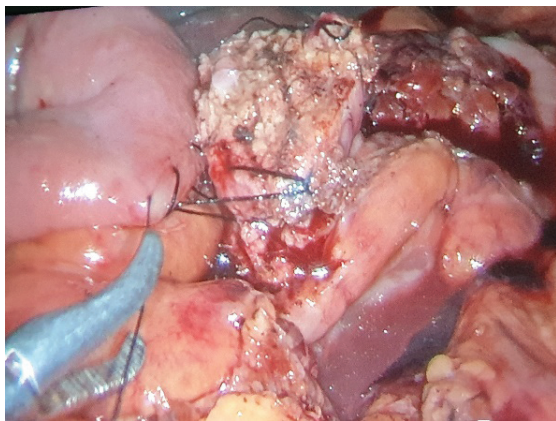


Figure 4: Outer layer sutures of pancreaticojejunostomy

Our first reconstruction was hepaticojejunostomy (Figures 2 and 3). It was done with a 5-0 monofilament absorbable suture. For this purpose, the monitor setup was changed to the left side and the surgeon operated from the right side. As the common hepatic duct was friable, this procedure was found to be the most difficult one. Then,

pancreaticojejunostomy was performed in two layers duct to mucosa anastomosis with an indwelling stent in situ with the surgeon staying on the left side and monitor on the right side. Three zero(3-0) silk was used for the outer layer (figure 4) and 5-0 absorbable monofilament for the inner duct to mucosa anastomosis (Figure 5). Lastly, the gastrojejunostomy was performed by an endo stapler (Figure 6) and sutured by 3-0 polyglactin.

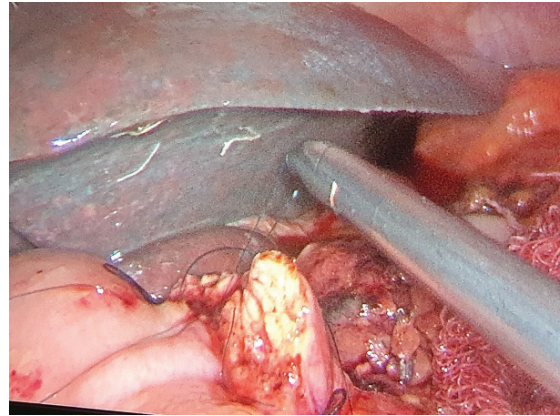


Figure 5: Inner layer sutures of pancreaticojejunostomy

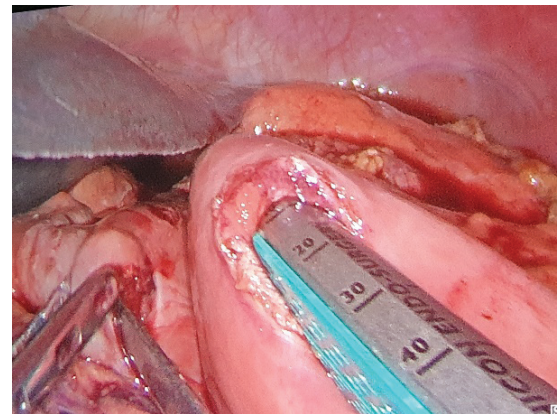


Figure 6: Gastrojejunostomy being performed with endostapler



Figure 7: Post operative picture

In the end, after performing laparoscopic-assisted feeding jejunostomy, a small incision was given along the right subcostal region for specimen retrieval. The same incision was used to evaluate the posterior hepaticojejunostomy site to put some reinforcement sutures as there was bile leak from the suture site. (Figure 7)

Discussion

Pancreaticoduodenectomy or Whipple's procedure is a standard surgical procedure for ampullary carcinoma.³ This is one of the most difficult abdominal operations.⁴ After the first laparoscopic cholecystectomy in 1989, the minimally invasive approach is considered the alternative approach to conventional open surgery in many abdominal surgeries.⁵ Gagner and Pomp reported the first Laparoscopic Whipple procedure in 1994.² However, its early outcomes were unfavorable and the conversion rates and morbidity were relatively high.⁶ Concerns regarding the use of laparoscopic pancreaticoduodenectomy have increased as a result of the long operative time, requirement for advanced laparoscopic skills, and lack of perceived benefits over open approaches.⁷ In comparison to open procedures, a recent meta-analysis of cohort studies has shown that minimally invasive pancreaticoduodenectomy is associated with decreased intraoperative blood loss, less delayed gastric emptying and decreased length of hospital stay whereas, on the other side there is increased operative time and there are concerns of safety of the procedure.⁸

Open Whipple procedure has been performed in our country for long. Our team had been performing complex gastrointestinal surgeries and our involvement in the development and introduction of laparoscopic procedures in complex gastrointestinal surgeries boosted the confidence to plan for the performance of this very complicated surgery. The team had earlier experience of doing advanced laparoscopic Gastrointestinal procedures like laparoscopic common bile duct exploration, laparoscopic liver, splenic and distal pancreatic surgeries, laparoscopic colorectal surgeries and long experience of operating and managing complex open Whipple's procedures. To date, there had not been any published report of successful complete laparoscopic pancreaticoduodenectomy from the country.

Our operation took a long time in comparison to other studies.⁹ There were some particular reasons for longer duration; it was being performed for the first time by the team, we have a single operating system which had to be repositioned according to the site of operation, patient had thin walled, fragile and mildly dilated hepatic duct

along with lots of post-operative adhesions of recent cholecystectomy and we performed duct-to-mucosa technique for pancreaticojejunostomy. At the completion of the surgery, while observing all the operative sites, we found biliary leakage from the posterior wall of hepaticojejunostomy. The soft hepatic duct had cut-through along with a suture site which we found very difficult to approach laparoscopically. We decided to retrieve the resected specimen through the right subcostal incision so that we could check the bile leak site and take some reinforcement sutures which we did through the same incision. In this patient, we constructed laparoscopic-assisted feeding jejunostomy which we rarely perform in open procedures. Blood loss was minimal throughout the procedure, the patient did not require a blood transfusion during and in the postoperative period. A good number of lymph nodes were harvested.

Although there are controversies about the safety and feasibility of the laparoscopic pancreaticoduodenectomy¹⁰, the surgeon's experience in recent years with advanced laparoscopy has increased, so, there is evidence demonstrating the safety and feasibility of total laparoscopic pancreaticoduodenectomy.^{11,12} The analysis of intraoperative and postoperative outcomes of the three Randomized Controlled Trials (PLOT¹³, PADULAP¹⁴, and LEOPARD-2¹⁵) shows statistically significant differences of two variables: Laparoscopic pancreatoduodenectomy is associated with longer operative time and decreased blood loss. One of the main concerns in minimally invasive hepatopancreatobiliary surgery is a compromise of oncological outcomes whereas high-quality studies on this topic are not available and whether Laparoscopic pancreatoduodenectomy can guarantee the same oncological radicality of open pancreatoduodenectomy is yet to be demonstrated.¹⁶ In this single experience also, we observed a very long operative time in comparison to our previous open procedures. The operative blood loss was remarkably low. Regarding oncological outcome, it was satisfactory as all margins were negative and a good number of lymph nodes were harvested i.e. 27 relatively more than in our open procedures. Patients outcome after six months of follow up is satisfactory too.

Laparoscopic pancreatoduodenectomy is one of the most advanced laparoscopic procedures. Although initial experiences were not satisfactory, with the increasing experience the procedure has shown advantages in some issues and results at par in others when compared with open procedures.

Conclusion

Laparoscopic pancreatoduodenectomy is feasible in our hands and successful achievement in completing the procedure with good patient outcomes in our first experience hopefully adds another milestone in the development of advanced laparoscopic procedures for the coming generation of the country.

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