Laparoscopic-assisted pancreaticoduodenectomy for periampullary cancer

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Abstract

Introduction: Laparoscopic pancreaticoduodenectomy is one of the most complicated major surgeries. The postoperative mortality and morbidity are still a burden of hepato-pancreato-biliary surgery. Aim of this study is to assess the short-term outcome of laparoscopic Whipple procedure for periampullary cancer.

Materials and methods: Case series report.

Results: From 1/2018 to 1/2019, we had performed laparoscopic Whipple procedure in 21 patients. The intracorporeal hepatico-jejunal anastomosis had been formed in all the cases. The pancreaticojejunal and gastro-jejunal anastomosis had been formed extracorporeally through small 5cm midline incision. The pancreatic duct had been drained with 8F drainage. The average operation time was 364 minutes. The average intraoperation blood loss was 175ml. Postoperative mean length of stay was 12.1 days. Pancreaticojejunal anastomosis accounted for 19,0%. Postoperative bleeding occurred in 2 patient (9%) whom were converted to open surgery for control bleeding. In our series, there was no postoperative mortality.

Conclusions: Laparoscopic-assisted pancreaticoduodenectomy is safe with low postoperative morbidity and mortality. This procedure is feasible for treatment of periampullary cancer.

Introduction

In 1935, Whipple and Pomp described the first pancreaticoduodenectomy case (Whipple procedure), Nonetheless, during this period the safeness and effectiveness were unsatisfactorily, the mortality was related very high (33%). Over 30 years after, the mortality and complication rates didn't improve significantly at 20% and 40% respectively.

Pancreaticoduodenectomy is still a major and complex procedure nowadays, for anatomy localized is sophisticated and the invasion, infiltration of cancerous cells into large vessels such as superior mesenteric artery, superior mesenteric vein, portal vein and so on. So, this is one of surgeries with very high complications from 20% to 30% and the high postoperative mortality rate from 5% to 7%.

In recent years, there have been many improvements applied in pancreaticoduodenectomy such as surgical techniques and equipment, anesthesia, postoperative care and so on, accordingly the mortality rates decreased distinctly (2,2%), nevertheless the complication rates was also as high as 30%. According

to Liao in 2006 [7], from the first case described in 1994 by Garner and Pomp, laparoscopic surgery has been applied to perform pancreaticoduodenectomy and demonstrated feasibly. Nowadays, many authors in the world reported the advantages in applying laparoscopic pancreaticoduodenectomy such as: reducing operation time, less blood loss, length of hospital stay [2], [3], [9].... compared with open pancreaticoduodenectomy. Therefore, we carry out this study to evaluate the result of laparoscopic-assisted pancreaticoduodenectomy at Binh Dan Hospital. This research is designed to assess the short-term outcome of laparoscopic Whipple procedure for periampullary cancer.

Materials and methods

Subjects:

The patient was diagnosed periampullary cancer, treated by laparoscopic pancreaticoduodenectomy from Jan 2018 to Dec 2019.

Selection criteria:

- The patient was diagnosed periampullary cancer at Binh Dan hospital from Jan 2018 to Dec 2019, indicated for laparoscopic pancreaticoduodenectomy and evaluated by preoperative diagnostic imaging.

Exclusive criteria:

- Laparoscopic pancreaticoduodenectomy failed and converted to open surgery during the operation.

Methods

Case series research with new technique.

Time: From Jan 2018 to Dec 2019 at Binh Dan Hospital.

Statistical analysis.

Patients are performed preoperative tests, CT/MRI, and biopsy through endoscopy or ultrasound endoscopy preoperative; assess size and the tumor invasion. We record clinical, subclinical characteristics, variables during surgery such as blood loss, operation time, complications during surgery, the number of cases were converted to open surgery, postoperative complications postoperative, length of hospital stay. All the database were collected in perioperative and postoperative follow up.

Operative technique

Position of patient: The patient is placed supine with two legs were spreading.

Position of port (Figure 1): Detail of procedure.

- Into lesser sac, transection of the right gastro-epiploic vessels (Figure 2), cut gastroduodenal artery, Pylorus-preserving gastrectomy (Figure 3).

- Extensive mobilization right colon and find superior mesenteric vein (Figure 4).

- Mobilization of the duodenum and head of pancreas past the inferior vena cava and aorta (Kocher maneuver – Figure 5).

- Dissected neck of pancreas from superior mesenteric vein, transect the pancreatic neck, lympho node dissection – 8, 9 group (Figure 6).

- Dissected uncinated process and head of pancreas from superior mesenteric vessels, lympho node dissection – 12, 13 group.

- Transect comon hepatic duct (Figure 7).

- Pancreas-bili-jejunale anastomosis type C, laparoscopic biliary enteric anastomosis, after that performing pancreaticojejunostomy and gastrojejunostomy through small incision at midline 5cm (Figure 8).



Figure 1. Position of port



Figure 2. Find right gastro-epiploic vessels



Figure 3. Pylorus-preserving gastrectomy



Figure 4. Find superior mesenteric vein

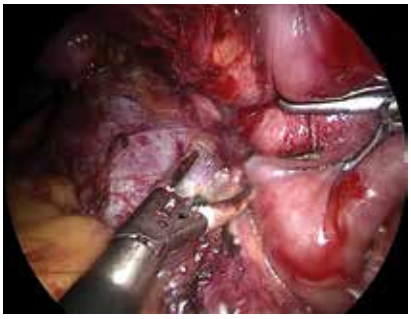


Figure 5. Kocher maneuver



Figure 6. Transection of the pancreatic neck



Figure 7. Transection of common hepatic duct



Figure 8. Billiary-enteric anastomosis



Figure 9. Incision

Ethics aspect

The study was approved by the Ethics Council in Binh Duong Hospital's Biomedical Research No. 27 / BVBD-QD dated January 7, 2020.

Results

- 21 cases (9 Male and 12 Female).
- The mean age was 50,3 years (range, 45 - 70).

Table 1: Position of lesions

Position of lesions	N	%
Vater	11	52.3
Distal common bile duct	03	14.3
Head of pancreas	07	33.3
Total	21	100

- Average operation time: 364 minutes (range 300 - 420 minutes).
- Amount of blood loss average 174ml (range 50 - 700ml).
- 01 cases needed to transfuse blood during operation.
- No cases were converted to open operation.
- Average time of hospital stay: 12 days (range 7 - 21 days).

Table 2: Post-operative complications

Post-operative complication	N	%
Delayed gastric emptying	2	9%
Postoperative pancreatic fistula	4	19%
Post-pancreatectomy hemorrhage	2	9%
Post-operative abdominal abscesses	1	4%
Post-operative enteric fistula	1	4%
Infection of incision	2	9%
Re-operation	3	9%
Death after surgery	1	4%

Discussions

Pancreaticoduodenectomy surgery is complicated and resulting the postoperative complication such as pancreatic fistula or leakage of pancreaticojejunal anastomosis is a common complication after pancreaticoduodenectomy surgery, and this complication determines the success and failure of the operation. The rate of this complication ranged from 6,6 to 47,8%. To avoid this in the first cases, we applied the technique of opening a small incision to perform pancreaticojejunostomy and gastrojejunostomy and most cases with an outlet drain connected by an 8 Fr tube and did pancreaticojejunal anastomosis with 2 layer. However, there are still 4 cases of pancreatic fistula. These can be treated by drug, not by reoperation is. Our pancreatic fistula rates is equivalent to the study of Jian-shu Chen [4] and Jun Suh Lee [11]. On a number of study of others authors, there is a delayed gastric emptying (DGE), and our study recorded 2 cases. We fed patients early (3^{th} day - postoperative) that had patients improves their health quickly on 5^{th} day postoperative. On two cases with DGE we used erythromycin, after using Metoclopramide no response. Patients improve after 3 - 4 days of treatment. The rates of DEG in our study is similar to many others study in the world [8], [11].

Table 3: Early results of others authors

	This study	Palanivelu [9]	Kendrick [6]	Dokmak [5]	Nguyen Đuc Thuan [1]
Average age	50	48	65	60	62
Operation time (minutes)	343	480	361	342	380
The amount of blood loss	174	592	260	368	150
Change to open operation	0	-	9%	6,5%	0
Pancreatic fistula	19%	29,9%	17,3%	47,8%	6,6
Length of hospital stay	12	14	9	25	7,8
Reoperation	3(14%)	-	-	4,3%	0

Reference to above table, in the beginning, we selected patient carefully with average age was 50 and without major comorbidity chronic diseases. We well prepared pre-operation for patients. In case the patient had jaundice and biliary obstruction with infective hazard, we would place a drainage into biliary duct through the skin, select patients cautiously, improve techniques to minimize complications.

Palanivelu [9] performed this approach on 75 patients with dissection rate 0%, surgery rate 357 minutes, significant loss of points (74ml), time of hospitalization: 8,2 days and death 1,33%.

Our result at first stage was not significantly different. However, the average hospital stay time was 4 days longer than results of other authors. The cases which have been done recently, the average hospital stay time has shortened to 8 - 10 days. We had a case with hospital stay time lasted 21 days because the patient had acute kidney failure at pre-operation due to hypovolemic. Patients had enteric fistula, nonetheless after 21 days of treatment, the patient came back to normal and were discharged from hospital.

The application of this technique is still quite difficult because it requires many surgical teams. Operation time is long but with the experiences also the support of technique and devices, our time for doing operation is shortened significantly. The first case, we operated in 420 minutes, but with the 10th case, we did in 330 minutes. And with recent cases, we did in only 300 minutes, not too longer than time for open surgery which is about 260 minutes. However, laparoscopic pancreaticoduodenectomy is still a big surgery and complicated, the complication rate is still high. This kind of surgery is a challenge for surgeons. Surgeons need to select patients carefully, use effective blood stop tools, and be careful when doing dissection nearly large blood vessel. Kendrick [6], one of the surgeons who do many this kind of surgery, also indicated the result of post-operation was good and our result was acceptable.

There were two cases, which needed to be re-operated due to hemorrhage on the second day of post operation. The first patient had signal of blood loss and abdominal drain and when doing re-operation, there was hemorrhage from mesenteric small intestine vessels. The second patient was very stable with no pancreatic fistula, no postoperative abdominal abscess. On the 12th postoperative day, the drains were removed and patient was discharged from hospital. After 5 hours of drain removal, the patient was suddenly shocked with serious hemorrhage, needed to be re-operated urgently. The hemorrhage was found from inferior pancreatoduodenal artery. This case, we judged that the drains were kept too long, resulting the necrosis surrounding tissues, including inferior pancreatoduodenal artery. Finally the patient died because of multiple organ dysfunction.

The third patient was with intra-abdominal hemorrhage, postoperative abdominal abscess and inserted Mono J to drain the intra-abdominal abscess, however not improved so we had to do re-operation, cleaning abdominal cavity. The patient was stable and discharged from hospital later. Through 21 cases, we recognize the factors that bring success of this surgery as below: [1] Selecting the patients carefully; [2] Standardizing the technique; [3] Using effective blood stop tools (ultrasonic blade, ligasure,...); [4] One more important thing is the smoothly teamwork among all the members.

Conclusions

Laparoscopic-assisted pancreaticoduodenectomy is safe with low postoperative morbidity and mortality, beside this procedure remains benefits of laparoscopic surgery. Improving techniques, adequate equipment, selecting patients to minimize complications. Being intermediate step to apply robotic pancreaticoduodenectomy. Carry out research with long-term, comparing the long-term results between laparoscopic and open pancreaticoduodenectomy to evaluate the oncological effectiveness of surgery.

References

1. Nguyen Đuc Thuan (2013), "Laparoscopic pancreaticoduodenectomy for periampullary cancer", Journal of Medecine of Ho Chi Minh city, No 17.
2. G. V. Aranha, J. M. Aaron, M. Shoup, và J. Pickleman (2006), "Current management of pancreatic fistula after pancreaticoduodenectomy", *Surgery*, No 140(4), 561-8; discussion 568-9.
3. K. P. Croome, M. B. Farnell, F. G. Que, K. M. Reid-Lombardo, M. J. Truty, D. M. Nagorney, và M. L. Kendrick (2014), "Total laparoscopic pancreaticoduodenectomy for pancreatic ductal adenocarcinoma: oncologic advantages over open approaches?", *Ann Surg*, No 260(4), 633-8; discussion 638-40.
4. J. S. Chen, G. Liu, T. R. Li, J. Y. Chen, Q. M. Xu, Y. Z. Guo, M. Li, và L. Yang (2019), "Pancreatic fistula after pancreaticoduodenectomy: Risk factors and preventive strategies", *J Cancer Res Ther*, No 15(4), 857-863.
5. S. Dokmak (2015), "Pancreaticoduodenectomy with Reconstruction of the Mesentericoportal Vein by the Parietal Peritoneum: 'Safi Dokmak Vascular Graft'", *Ann Surg Oncol*, No 22 Suppl 3, S343-4.
6. M. L. Kendrick và D. Cusati (2010), "Total laparoscopic pancreaticoduodenectomy: feasibility and outcome in an early experience", *Arch Surg*, No 145(1), 19-23.
7. C. H. Liao, Y. Y. Liu, S. Y. Wang, K. H. Liu, C. N. Yeh, và T. S. Yeh (2017), "The feasibility of laparoscopic

pancreaticoduodenectomy-a stepwise procedure and learning curve", *Langenbecks Arch Surg*, No 402(5), 853-861.

8. S. Mohammed, G. Van Buren Ii, A. McElhany, E. J. Silberfein, và W. E. Fisher (2017), "Delayed gastric emptying following pancreaticoduodenectomy: Incidence, risk factors, and healthcare utilization", *World J Gastrointest Surg*, No 9(3), 73-81.
9. C. Palanivelu, K. Jani, P. Senthilnathan, R. Parthasarathi, S. Rajapandian, và M. V. Madhankumar (2007), "Laparoscopic pancreaticoduodenectomy: technique and outcomes", *J Am Coll Surg*, No 205(2), 222-30.
10. A. O. Whipple, W. B. Parsons, và C. R. Mullins (1935), "TREATMENT OF CARCINOMA OF THE AMPULLA OF VATER", *Ann Surg*, No102(4), 763-79.
11. Jun Suh Lee, Hyun Han, Gun Na, Ho Choi, Tae Hong, Young You and Dong Kim (2013), "Laparoscopic Pancreaticoduodenectomy Assisted by Mini-Laparotomy", *Surgical laparoscopy, endoscopy & percutaneous techniques*, No 23, e98-e102.