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Short Run of the Hybrid Whipple–Smooth Sailing or Rough Waters?

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ABSTRACT

Background: Open pancreaticoduodenectomy, the gold standard for periampullary cancer is associated with significant morbidity. As minimally invasive surgery gains its ground in oncology, conflicting evidence regarding the technically challenging minimally invasive Whipple continues to challenge surgeons across the world.

Methods: A total of 10 patients with periampullary cancer underwent hybrid Whipple (Robotic/laparoscopic resection and Open Reconstruction) procedure at Kidwai Memorial Institute of Oncology between January 2023-September 2024 and demographic, staging, performance scores, and intraoperative and postoperative outcomes were recorded and analyzed.

Results: Mean operative time was 337 minutes and mean intraoperative blood loss was 625 ml. The rate of conversion was 2/10 (1 emergent, 1 non-emergent). The mean lymph nodal harvest was 7.3 lymph nodes and the range was 4-12 lymph nodes. 50 % of patients developed grade A postoperative pancreatic fistula and all were managed conservatively. The extent of resection was R0 in all patients. Median length of hospital stay was 20 days.

Conclusion: In our experience, hybrid Whipple surgery is a safe and feasible option for carefully selected patients with periampullary carcinoma. We completed resection in 80% of cases with comparable blood loss. Open reconstruction preserved tactile feedback, aiding high-quality anastomoses. Final histopathology confirmed margin negativity and adequate lymph node yield, supporting oncological safety. Despite a steep learning curve, hybrid Whipple offers advantages like magnification, reduced length of hospital stay, and less blood loss, without increasing major complications. Our experience at a tertiary care academic center affirms its potential as a valuable surgical approach.

Key-words: Laparoscopic whipple, Hybrid whipple, Pancreaticoduodenectomy, Robotic whipple

INTRODUCTION

The pancreaticoduodenectomy (PD) or Whipple procedure remains the cornerstone for the treatment of periampullary malignancies. Traditional open approaches are associated with significant morbidity while fully laparoscopic procedures are technically demanding. Despite refinements in surgical techniques and postoperative care PD remains associated with substantial morbidity and a prolonged recovery period with reported complication rates up to 50% even in high-volume centres [1]. Minimally invasive approaches to PD, including laparoscopic and robotic-assisted techniques, have been explored to mitigate the morbidity associated with open PD [2]. However, full laparoscopic PD is technically demanding and not widely adopted due to its steep learning curve and complexity, particularly regarding vascular control and reconstruction [3]. The hybrid technique typically involving laparoscopic mobilisation and lymphadenectomy followed by open reconstruction, aims to strike a balance between reduced surgical trauma and reliability of hand-sewn anastomosis [4,5].

This study aims to evaluate short-term clinical outcomes of the hybrid-laparoscopic/robotic-assisted Whipple procedure in a single institutional series.

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MATERIALS AND METHODS

Place and duration of study- The study included patients who underwent laparoscopic/robotic whipple for periampullary cancer in the Department of Surgical Oncology, Kidwai Memorial Institute of Oncology, Bangalore from January 2023 to September 2024.

Inclusion criteria

- Operable periampullary cancer
- Age: 18-80 years
- ASA II-III
- Patients willing to participate in the study

Exclusion criteria

- Distant metastasis
- Vascular invasion
- Patients not willing to participate in the study

Methodology- Between January 2023-September 2024, with prior informed consent, 100 patients underwent the Whipple procedure out of which 10 patients with periampullary cancer underwent hybrid pancreatico duodenectomy (Robotic/ laparoscopic resection and Open Reconstruction) procedure at Kidwai Memorial Institute of Oncology. The patients planned for laparoscopic/robotic Whipple procedure were considered. Patients were carefully selected after a multidisciplinary tumour board meeting and demographic, staging, performance scores, and intraoperative and postoperative outcomes were recorded.

Surgical procedure- The position of the patient was supine leg split position with the monitor at the patient's left shoulder, the surgeon standing between the legs of the patient and the camera assistant standing to the left of the surgeon, scrub nurse to the surgeon's right side as shown in Fig. 1 and 5 port technique used with port positions as shown in Fig 2. Standard anaesthesia protocol followed.

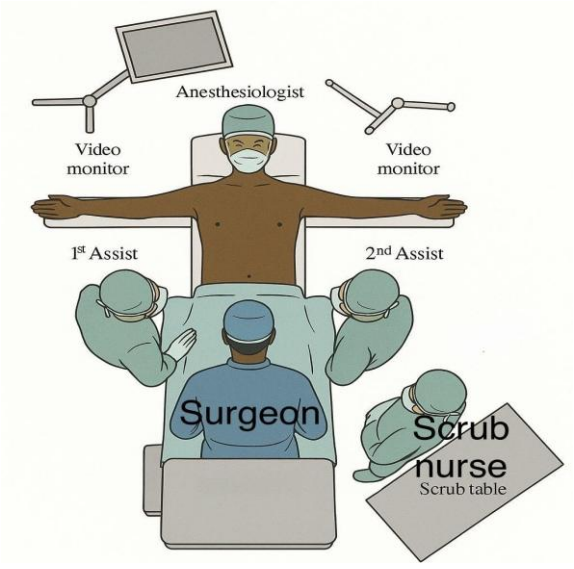

Fig. 1: Patient position

Fig. 2: Port position

Salient steps

Phase I

1. Diagnostic laparoscopy was performed to rule out peritoneal, liver metastasis ascites and liver retracted with no 1 silk suture passed across the falciform ligament.
2. Lesser sac entry and hepatoduodenal ligament dissection followed by common hepatic artery dissection and station 8a lymph node retrieval.
3. The right gastroepiploic artery and gastroduodenal artery were dissected as shown in Fig. 3 and ligated using Hemolock /Ligaclip.
4. Ligation of the gastrocolic trunk of Henle branches
5. Portal dissection and lymphadenectomy
6. Kocherisation and hepatic flexure takedown
7. Tunnelling, superior mesenteric vein and uncinate dissection were done with a harmonic scalpel from the inferior border of the pancreas as shown in Fig. 4.

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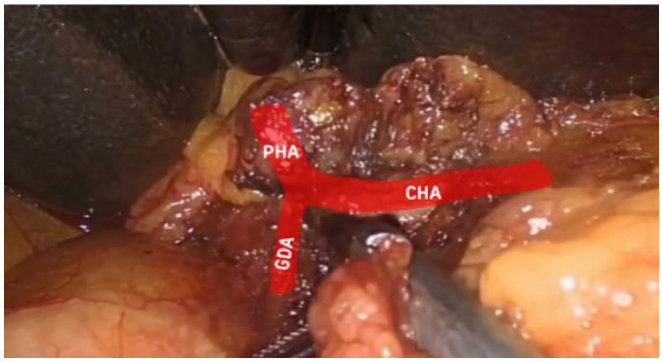

Fig. 3: Gastroduodenal artery dissection

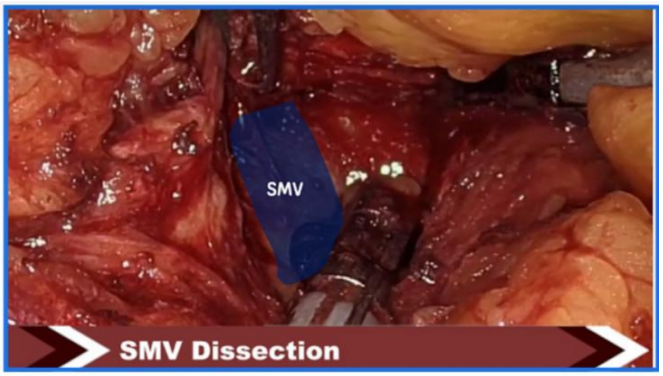

Fig. 4: SMV dissection

8. D1 transaction: Duodenum/ stomach transected with endo GI staples and ligation of right gastric artery done with lilac lip.
9. Proximal jejunal devascularization and transaction: The ligament of Treitz was identified, the mesentery of the proximal jejunum de-vascularized with a harmonic scalpel and the jejunum 15 cm distal to the ligament of Treitz transected with endo GI staple
10. Cholecystectomy and common hepatic duct transection with scissors.
11. Pancreatic transaction: Pancreas transacted with a harmonic scalpel after identifying the pancreatic duct.

Phase 2- Specimen Extraction and Reconstruction

1. A 10 cm laparotomy incision is then made in the upper abdomen and the specimen is extracted.
2. Reconstruction
3. Pancreatojejunostomy was done via a modified Heidelberg technique with PDS 3-0 and 4-0 sutures.
4. Hepaticojejunostomy done single layer hand sewn continuous PDS 4-0 sutures.
5. Gastrojejunostomy done in stapled/ handsewn 2 layered technique with PDS 3-0 sutures with Naso jejunal tube passed across the anastomosis and Ryles tube placed in the stomach for drainage.

Peritoneal lavage was given and haemostasis ensured. Intraperitoneal drains placed via port sites were placed posterior to hepaticojejunostomy, pancreatico jejunostomy and in the pelvis (Fig. 5).

Fig. 5: Post-operative picture

Standard post-operative care was followed. Patients were classified into R0, R1 and R2 based on histopathological reports (Fig. 6).

Fig. 6: Specimen laparoscopic pancreaticoduodenectomy

Patient age, sex, tumor subtypes, no lymph nodes, rate of pancreaticojejunostomy/ hepaticojejunostomy leak, rates of postoperative pancreatic fistula, and length of hospital stay were studied to confirm the feasibility of hybrid Whipple.

Statistical Analysis- Statically analysis performed using IBM SPSS statistics for Windows, version 25. The data was statistically analysed using descriptive statistics including mean and percentage.

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RESULTS

During the study period, 9 patients underwent laparoscopic Whipple's and one patient underwent robotic Whipple's procedure. All data was collected with standard proforma and analyzed. The main indication was periampullary cancer. Median operative time was 337 minutes and intraoperative blood loss was 625 ml. The rate of conversion was 2/10 (1 emergent, 1 non emergent). The mean lymph nodal harvest was and the range was 7.3 lymph nodes and the range was 4-12 lymph nodes. 50 % of patients developed grade A postoperative pancreatic fistula and all were managed conservatively. The extent of resection was R0 in all patients.

Table 1: Patient Profile

Parameter	n or mean	% or range
Gender - Men	7	80%
Gender - Female	3	20%
Age (years)	53	44–66
Age (>50 years)	6	60%
Age (<50 years)	4	40%
ASA		
II	7	70%
III	3	30%
Comorbidities	7	70%
NACT/RT	0	0
Bilirubin	7.3	3–12
Pre OP Stenting	0	0%
Tumor Marker: CA19-9	188	97–320

Table 2: Intra operative details

Operative details	n or mean	% or range
Operative time (minutes)	337	300–360
Conversion to open surgery before pancreatic transection	2	20%
Estimated blood loss (ml)	625	500–800
Intraoperative transfusion	5	50%

Table 3: Patient-wise intraoperative details

	duration of surgery (mins)	Blood loss	Intraop transfusion	extent of laparoscopic/ robotic surgery	Time and type of conversion	length of hospital stay	post op complication
Patient 1	360	600 ML	no	tunneling	emergent conversion bleeding SMV dissection	20 days	Pj leak + hj leak +

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Patient 2	320	500 ML	no	complete	-	19 days	No leak
Patient 3	300	600 ML	no	complete	-	20 days	pj leak + hj leak +
Patient 4	300	500 ML	no	complete	-	18 days	no leak
Patient 5	360	650 ML	yes	complete	-	26 days	Pj leak + secondary hemorrhage + hj leak +
Patient 6	350	800 ML	yes	tunneling	non emergent conversion bleeding	21 days	No
Patient 7	330	700 ML	yes	complete	-	20 days	Pj leak +
Patient 8	360	650 ML	yes	compete	-	19 days	Pj leak +
Patient 9	340	600 ML	no	complete	-	20 days	-
Patient10	350	650 ML	yes	complete	-	18 days	-

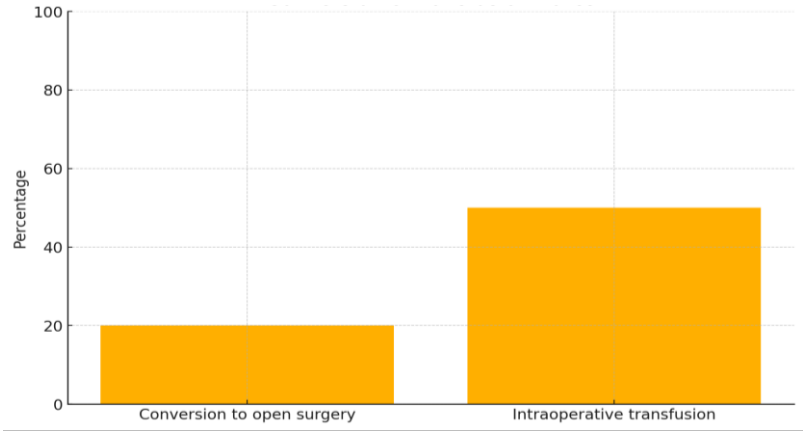

Fig. 7: Bar chart depicting conversion rates and intraoperative transfusion

Table 4: Major postoperative complications

Complication	Number of Cases	Percentage or range
Major postoperative complication	3	3%
Pancreatic fistula	5	50%
- Grade A	5	14.3%
- Grade B	0	0%
- Grade C	0	0%
Post pancreatectomy haemorrhage	1	10%
Delayed gastric emptying	4	40%
Bile leak	3	30%
Pulmonary embolism	0	0
Reoperation	0	0
Length of hospital stay (days)	14	9–23
90-days readmission	0	0
90-days mortality	0	0

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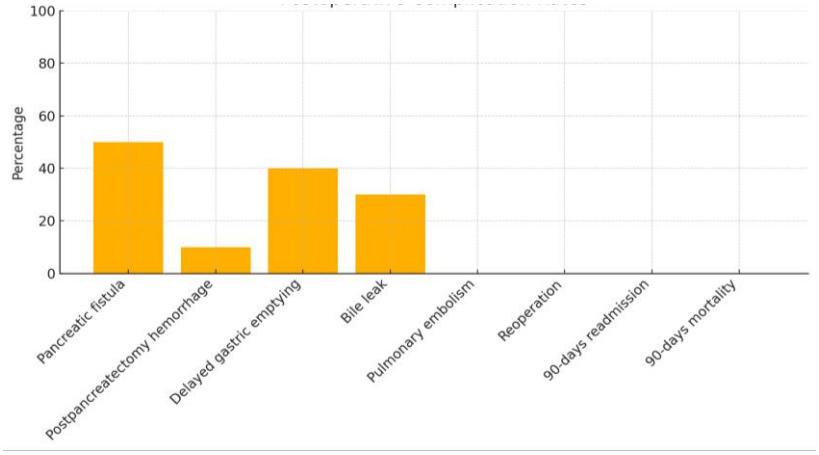

Fig. 8: Bar chart depicting major postoperative complications

Table 5: Tumor characteristics

	mean or number	% or range
T stage	T2	T1–T3
Tumor size	3.57	2.5–4.7
Vascular invasion	0	0
Neoadjuvant therapy	0	0
R0 rate	10	10
Lymph node yield	7.2	2–12

DISCUSSION

Since the first successful pancreaticoduodenectomy done by Walter Kausch in 1912 and Allan Whipple in 1934, the Whipple surgery has evolved. The first laparoscopic Whipple procedure described by Gagner was done for a patient with chronic pancreatitis and uses a 5-6 port technique with intracorporeal anastomosis [6]. Table 6 summarizes the short-term outcomes of minimally invasive pancreaticoduodenectomy in several similar studies.

The study demonstrates that the operative duration and conversion rates are like the meta-analysis done by Vladimirov *et al.* [8], Hilst *et al.* (LEOPARD 2) [9], Palanivelu *et al.* [7]. In comparison with the PLOT trial [7] which fared better in blood loss (250. Vs 625 ml), length of hospital stays (7 days vs 14 days), lymph node yield (18.9 vs 7.2), R0 resection rates (94 % vs 100%) and grade B/ C post-operative fistula rates (15.6 % vs 0 %) were better in our study.

On comparing with the meta-analysis on hybrid Whipple's done by Vladimirov *et al.* [8], the operative time (397 vs 337 minutes), length of hospital stays (16 vs 14 days) and conversion rates (23% vs 20%) are similar in both studies while blood loss (494 vs 625 ml) is higher in our study. The incidence of postoperative pancreatic fistula B/C was 13% in this meta-analysis as compared to nil in our study. LEOPARD 2 [9] trial had similar operative duration (300 vs 337 minutes), conversion rates (20% vs 20 %), and length of hospital stay (12 vs 14 days) but had better lymph node yield (8-15 vs 4-12) and less blood loss (410 ml vs 625 ml).

To elucidate the role of Laparoscopic pancreatico-duodenectomy in pancreatic distal adenocarcinoma specifically, a prospective multicentre randomised parallel control non-inferiority trial was conducted on 200 pancreatic adenocarcinoma patients across 10 centres in China by Wang *et al.* [10]. In comparison to the Wang *et al.* study, our study had a similar operative duration (330 vs 337 minutes) and length of hospital stay (14 days in both studies). The conversion rates (2 % vs 20 %) and blood loss (625 vs 145 ml) were minimal in wang et al study. The margin positivity rates (3% vs 0%) and grade B/C POPF rates (8 vs 0 %) remained higher in their study [10].

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The BRESCIA guidelines published in 2024 describe invasive laparoscopic and robotic pancreatic surgery defining the terminology, indications, patient selection, assessment tools (including morbidity, mortality, postoperative pancreatic fistula), conversion rate and type, patient-reported outcomes, implementation and training and role of artificial intelligence in future MIPS [11]. It defined that there are no contraindications for laparoscopic and robotic pancreatic surgery in terms of age, obesity, previous abdominal surgery and size of the tumor and that anastomotic technique remains the surgeon's preference.

Our initial experience with the hybrid Whipple procedure indicates that this approach is both safe and feasible in a selected patient cohort. The observed short-term outcomes like operative duration, length of hospital stay, and conversion rates are consistent with most contemporary studies while the R0 resection rates (100%) are higher and POPF grade B/C are nil in our study [7-12]. Grade A POPF was seen in 50% of patients in this study and all patients were managed conservatively.

evidence-based and consensus guidelines on minimally The laparoscopic dissection phase offers enhanced visualization and reduced bowel handling, potentially decreasing the incidence of postoperative ileus [13,14]. Performing the open reconstruction phase openly preserves tactile feedback, facilitating precise anastomoses and possibly reducing anastomotic complications [15].

In our experience, we selected periampullary carcinomas deemed operable based on imaging studies, ensuring appropriate patient selection [16,17]. Utilizing a team approach and advanced energy devices, we completed the resection phase in 80% of cases. Initially, operative times were longer but improved with experience, reflecting the learning curve associated with hybrid procedures [18]. Blood loss was comparable to that of conventional open surgery, likely due to the effective hemostasis achieved with advanced energy devices [19,20]. Final histopathological reports confirmed margin negativity and adequate lymph node retrieval, supporting the oncological safety of the hybrid Whipple approach in selected patients [21].

Table 6: Summary of similar studies

Name of study	Study type	sample size MIS subgroup	blood loss mean	operative duration	length of hospital .	lymph node yield	R0 rates	Post op fistula	conversion rate
Palanivelu *et al.* [7]	prospective RCT comparing laparoscopic PD vs open PD	32	250	359	7	18.9 (mean)	94%	5 grace B/C	3%
Vladimiro *et al.* [8]	Metanalysis comparing Hybrid PD vs open PD	28	494.6	397.2	16.68	-	-	13	23%
Van-Hilst *et al.* [9]	open vs lap PD	50	410	300	12	8-15	82%	28%	20%
Wang *et al.* [10]	open vs lap PD	100	145	330	14	12-21	97%	8%	2%
Our study	lap PD	10	625	337	14	4-12	100 %	0% grade B/C	20%

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CONCLUSIONS

The hybrid Whipple, despite having a steep learning curve, in trained hands offers several advantages including magnification, reduced length of hospital stays, and reduced blood loss without an increased risk of major postoperative complications. Our experience in a tertiary care academic centre with limited cases shows that the hybrid Whipple surgery is a safe and feasible option for patients with periampullary carcinoma.

LIMITATION

The limited sample size is the main drawback of this study.

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CONTRIBUTION OF AUTHORS

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Data collection- Dr Aparna S Mallya
Data analysis and interpretation- Dr Aparna S Mallya
Literature search- Dr Aparna S Mallya, Dr O Ramya Krishna
Writing article- Dr Aparna S Mallya
Critical review- Dr Arun H.N
Article editing- Dr Aparna S Mallya, Dr O Ramya Krishna
Final approval- Dr Arun H.N, Dr Prakash B.V

REFERENCES

[1] Winter JM, Cameron JL, Campbell KA, Arnold MA, Chang DC, et al. 1423 pancreaticoduodenectomies for pancreatic cancer: a single-institution experience. J Gastrointest Surg., 2006; 10(9): 1199–210.

[2] Zhang J, Wu WM, You L, Zhao YP. Laparoscopic versus open pancreaticoduodenectomy for pancreatic ductal adenocarcinoma: a systematic review and meta-analysis. Cancer Commun., 2020; 40(5): 301–14.

[3] Kendrick ML, Sclabas GM. Major venous resection during total laparoscopic pancreaticoduodenectomy. HPB (Oxford), 2011; 13(7): 454–58.

[4] Dokmak S, Ftériche FS, Aussilhou B, Bensafta Y, Lévy P, et al. Hybrid laparoscopic pancreatico duo denectomy: an intermediate step toward totally laparoscopic pancreaticoduodenectomy. Surg., 2014; 155(1): 77–84.

[5] Dindo D, Demartines N, Clavien PA. Classification of surgical complications. Ann Surg., 2004; 240(2): 205–13.

[6] Gagner M, Pomp A. Laparoscopic pylorus preserving pancreatoduodenectomy. Surg Endosc., 1994; 8(5): 408–10.

[7] Palanivelu C, Senthilnathan P, Sabnis SC, Babu NS, Gurumurthy SS, et al. Randomized clinical trial of laparoscopic versus open pancreatoduodenectomy for periampullary tumours. Br J Surg., 2017; 104(11): 1443–50.

[8] Vladimirov M, Bausch D, Stein HJ, Keck T, Wellner U. Hybrid laparoscopic versus open pancreato duodenectomy: a meta-analysis. World J Surg., 2022; 46(4): 901–15.

[9] Van-Hilst J, de Rooij T, Bosscha K, Brinkman DJ, van Dieren S, et al. Laparoscopic versus open pancreato duodenectomy for pancreatic or periampullary tumours (LEOPARD-2): a multicentre, patient-blinded, randomised controlled phase 2/3 trial. Lancet Gastroenterol Hepatol., 2019; 4(3): 199–207.

[10] Wang M, Pan S, Qin T, Li H, Huang X, Gong Y, et al. Short-term outcomes following laparoscopic vs open pancreaticoduodenectomy in patients with pancreatic ductal adenocarcinoma: a randomized clinical trial. JAMA Surg., 2023; 158(12): 1245–53.

[11] Abu Hilal M, van Ramshorst TME, Boggi U, Dokmak S, Edwin B, et al. The Brescia Internationally Validated European Guidelines on Minimally Invasive Pancreatic Surgery (EGUMIPS). Ann Surg., 2024; 279(1): 45–57.

[12] Poves I, Burdío F, Morató O, Iglesias M, Radosevic A, et al. Comparison of perioperative outcomes between laparoscopic and open approach for pancreatoduodenectomy: the PADULAP randomized controlled trial. Ann Surg., 2018; 268(5): 731–39.

[13] Khandelwal KC, Merchant NH, Udani RJ, Sharma OP, et al. CT staging of pancreatic and periampullary carcinoma. Indian J Cancer, 1992; 29(2): 66–70.

[14] Alessandrino F, Ivanovic AM, Yee EU, Radulovic D, Souza D, et al. MDCT and MRI of the ampulla of Vater. Part I: technique optimization, normal

doi: 10.21276/SSR-IIJLS.2025.11.2.43

anatomy, and epithelial neoplasms. Abdom Imaging, 2015; 40(8): 3274–91.

[15]Dindo D, Demartines N, Clavien PA. Classification of surgical complications: a new proposal with evaluation in a cohort of 6336 patients and results of a survey. Ann Surg., 2004; 240(2): 205–13. doi: 10.1097/01.sla.0000133083.54934.ae.

[16]Kumar A, Aggarwal R, Srivastava DN, et al. Imaging preoperatively for pancreatic adenocarcinoma. World J Radiol., 2015; 7(7): 152–58.

[17]Alessandrino F, Ivanovic AM, Yee EU, Radulovic D, Souza D, et al. Optimal Imaging Modalities for the Diagnosis and Staging of Periampullary Masses. Abdom Imaging, 2016; 41(5): 1000–12.

[18]Zhou Y, Zhang Q, Li Y, et al. Learning curve of laparoscopic pancreaticoduodenectomy: a single-center experience. World J Gastroenterol., 2014; 20(36): 12954–60.

[19]Park JS, Yoon DS, Kim KS, et al. Clinical validation of the International Study Group of Pancreatic Fistula (ISGPF) definition of postoperative pancreatic fistula after pancreaticoduodenectomy. World J Surg., 2008; 32(1): 111–16.

[20]Kang CM, Kim DH, Lee WJ. Laparoscopic pancreaticoduodenectomy: a review of current status. J Hepatobiliary Pancreat Sci., 2012; 19(1): 21–26.

[21]Kumar A, Aggarwal R, Srivastava DN, et al. Imaging preoperatively for pancreatic adenocarcinoma. World J Radiol., 2015; 7(7): 152–58.