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Laparoscopic Radical Antegrade Modular Pancreatosplenectomy: Safety, Feasibility and Early Outcome

Mushtaq Chalkoo[1*], Suhaib Bashir[2], Naeem Ahmad[3], Zubair[4], Abhinandan[5], Arul[6], Sajad Nazir[7] and Bisma lateef[8]
[1]Postgraduate Department of Minimal Access and General Surgery, Government Medical College, Srinagar, Jammu and Kashmir, India

Author Designation: [1]Professor

*Corresponding author: Mushtaq Chalkoo (e-mail: mushtaq_chalkoo@rediffmail.com).

Abstract **Background:** Radical Antegrade Modular Pancreatosplenectomy (RAMPS) was developed to improve oncological clearance during distal pancreatectomy by providing systematic lymphadenectomy and facilitating appropriate posterior retroperitoneal margin dissection. With advances in minimally invasive surgery, laparoscopic RAMPS (Lap-RAMPS) has emerged as a technically demanding approach that combines the principles of RAMPS with the potential perioperative advantages of laparoscopy. This study evaluated the feasibility, safety, perioperative characteristics, and short-term outcomes of laparoscopic RAMPS in patients with malignant tumours of the pancreatic body and tail. **Methods:** A prospective observational study was conducted in the Department of Minimal Access and General Surgery, Government Medical College, Srinagar, over an 18 month period from August 2024 to February 2026. Thirty consecutive adult patients with resectable malignant tumours of the pancreatic body and tail underwent planned RAMPS. Demographic characteristics, clinical presentation, operative approach, conversion, intraoperative complications, postoperative morbidity, pancreatic fistula, pathological findings, and short-term functional outcomes were assessed. All procedures were performed using the anterior RAMPS approach. Postoperative clinical assessment was performed at 1 and 3 weeks after discharge. **Results:** The study included 30 patients with a mean age of 57.0±7.2 years (range, 34-67 years). Eighteen patients (60%) were male and 12 (40%) were female, giving a male-to-female ratio of 1.5:1. Abdominal pain was the commonest presenting symptom (73.3%), followed by weight loss (53.3%) and anorexia (40.0%). Laparoscopic RAMPS was successfully completed in 27 patients (90%), while three patients (10%) required conversion to open surgery because of intraoperative technical difficulty and bleeding, including splenic artery-related vascular injury. Four intraoperative complications occurred (13.3%). No intraoperative blood transfusion or intraoperative mortality was recorded. Histopathological examination revealed pancreatic adenocarcinoma in 25 patients, pancreatic neuroendocrine tumour in four, and squamous cell carcinoma in one. R0 resection was achieved in all 30 patients. Postoperatively, six patients (20%) developed complications. Two patients developed postoperative pancreatic fistula, classified as Grade B according to the International Study Group of Pancreatic Surgery criteria, and were managed conservatively. Delayed gastric emptying occurred in six patients. Splenic vein thrombosis occurred in one patient. Endocrine and/or exocrine pancreatic insufficiency was documented in eight patients, while new-onset diabetes mellitus was identified in 16 patients during follow-up assessment. There was no major postoperative morbidity, reoperation, or 30-day mortality. **Conclusion:** Laparoscopic RAMPS was technically feasible in 90% of patients in this single-centre prospective series and was associated with acceptable short-term morbidity and no perioperative mortality. The findings support the feasibility of laparoscopic RAMPS in appropriately selected patients when performed by an experienced surgical team. Larger multicentre studies with longer oncological follow-up are required to determine its long-term survival and recurrence outcomes.

Key Words Radical Antegrade Modular Pancreatosplenectomy, RAMPS, Laparoscopic Surgery, Distal Pancreatectomy, Pancreatic Cancer, Pancreatic Adenocarcinoma, Postoperative Pancreatic Fistula

INTRODUCTION

Pancreatic ductal adenocarcinoma (PDAC) is an aggressive malignancy with a five-year survival rate below 10%. Tumours of the pancreatic body and tail account for 25-30% of cases and are typically diagnosed at advanced stages due to an absence of early symptoms like jaundice. Surgical resection remains the only potentially curative treatment; however, achieving oncological clearance (R0 resection) in left-sided pancreatic lesions is notoriously challenging due to early invasion into retroperitoneal tissues and major vasculature [1].

Conventional distal pancreatectomy with splenectomy (CDP) employs a retrograde (left-to-right) approach. This technique often delays assessment of tumour involvement with critical vessels-such as the celiac axis and Superior Mesenteric Artery (SMA)-and frequently yields inadequate posterior resection margins and sub-optimal lymph node clearance [2-4].

To address these limitations, Strasberg *et al.* introduced Radical Antegrade Modular Pancreatosplenectomy (RAMPS) [5]. Designed to maximize R0 margins and lymph node retrieval, RAMPS features:

Medial-to-lateral, antegrade dissection with early pancreatic neck division and prompt vascular control. Early establishment of posterior resection planes to promptly assess resectability [6]. Two anatomical variants: Anterior RAMPS (dissection anterior to Gerota's fascia and the left adrenal gland) and Posterior RAMPS (en bloc resection of the left adrenal gland and deeper tissues for suspected posterior invasion) [7].

With advancements in minimally invasive surgery, Laparoscopic RAMPS (Lap-RAMPS) has emerged to combine the oncological rigor of open RAMPS with the benefits of laparoscopy, such as reduced blood loss, less pain and faster recovery. While meta-analyses show that Lap-RAMPS delivers comparable R0 resection rates and equal or superior lymph node yields to conventional approaches, it remains a technically demanding procedure with a steep learning curve. Despite growing international acceptance, prospective observational data on Lap-RAMPS-particularly from the Indian subcontinent-remain scarce. Variations in demographic presentation, surgical expertise and resource availability necessitate regional institutional evaluation. Therefore, this study aims to evaluate the safety, feasibility, perioperative parameters and short-term outcomes of Lap-RAMPS for pancreatic body and tail tumors in a tertiary care teaching hospital [8].

Aims and Objectives

Aim: To study the safety and feasibility of laparoscopic Radical Antegrade Modular Pancreatosplenectomy (Lap-RAMPS) in our institutional setup.

Objectives

Primary Objectives:

- To assess intraoperative complications
- To evaluate operative time
- To determine the length of postoperative hospital stay

Secondary Objectives:

- To assess lymph node yield
- To evaluate the incidence of postoperative pancreatic fistula
- To assess the incidence of bile leak
- To evaluate short-term outcomes up to six months
- To assess the occurrence of Overwhelming Post-Splenectomy Infection (OPSI) in patients undergoing splenectomy
- To evaluate pancreatic endocrine and exocrine insufficiency

METHODS

A prospective observational study was conducted in the Department of Minimal Access and General Surgery, Government Medical College, Srinagar, over an 18-month period (August 2024 to February 2026). A total of 30 adult patients presenting with resectable benign or malignant tumours of the pancreatic body and tail were enrolled. Intraoperative parameters (conversion rates, complications, blood loss) and short-term postoperative outcomes (morbidity, mortality, length of hospital stay and R0 resection status) were evaluated. Follow-up clinical evaluations were performed at 1 week and 3 weeks post-discharge.

Inclusion Criteria:

- Patients falling in age group 18-80 years
- Tumours of body and tail of pancreas
- Benign and malignant resectable tumour of pancreas

Exclusion Criteria:

- Tumours involving head of pancreas
- Tumours which have metastasized
- Age of patients below 18 years and above 80 years
- Patient undergoing open surgery

Pathology and Oncological Metrics

Final histopathology revealed malignant lesions in 70% (n = 21) of cases (predominantly pancreatic ductal adenocarcinoma) and benign/borderline lesions in 30% (n = 9). A 100% R0 resection rate was achieved across all malignant cases.

Postoperative Outcomes

Uneventful recovery was observed in 80% (n = 24) of patients. Minor postoperative complications occurred in 20% (n = 6) and were managed conservatively. There were no major complications, redo surgeries or 30 day postoperative deaths (0% mortality). All patients remained clinically stable without short-term disease recurrence during the follow-up period.

RESULTS

Demographics and Clinical Presentation

The mean patient age was 57.0 pm 7.2 years (range: 34-67), with a male-to-female ratio of 1.5:1 (60% males, 40% females). Abdominal pain was the primary complaint (73.3%), followed by weight loss (53.3%) and anorexia (40.0%).

Operative Outcomes

Laparoscopic RAMPS was successfully completed in 90% (n = 27) of patients. Conversion to open surgery was required in 10% (n = 3) due to technical difficulties and intraoperative bleeding. Overall intraoperative complications occurred in

Table 1: Age and Gender Distribution Among Study Participants

Category	Mean Age (years)	SD (years)	Minimum Age (years)	Maximum Age (years)	Count (n)	Percentage (%)
Male	57.0	7.2	34	67	18	60
Female	57.0	7.2	34	67	12	40
Overall	57.0	7.2	34	67	30	100

Male: Female ratio = 1.5:1

Table 2: Age Group Distribution of Study Participants

Age Group (Years)	Number of Participants (n)	Percentage
≤ 40	1	3.3
41-50	3	10.0
51-60	18	60.0
> 60	8	26.7
Total	30	100.0

Table 3: Clinical Presentation of Patients

Presenting Symptom	Number	Percentage
Abdominal pain	22	73.3
Weight loss	16	53.3
Anorexia	12	40.0
Dyspepsia	9	30.0

Table 4: Nature of Lesion vs. Postoperative Morbidity/Operative Approach vs. Intraoperative Complications

Operative Approach	Intraoperative Complications	No Complications	Total
Laparoscopic RAMPS	2	25	27
Converted to open	2	1	3
Total	4	26	30

Statistical Test: Fisher's Exact Test, p-value: p = 0.031

Table 5: Preoperative Diagnostic Modalities Utilized

Investigations	Number	Percentage
Ultrasonography (USG) abdomen	30	100.0
Contrast-enhanced CT (CECT) abdomen	30	100.0
Upper GI endoscopy (UGIE)	18	60.0
MRCP	12	40.0
Endoscopic ultrasound (EUS)	9	30.0

13.3% (n = 4) of cases, with a significantly higher complication rate observed in patients requiring conversion (p = 0.031). No intraoperative blood transfusions were required and no intraoperative mortality occurred.

The mean age of the study population was 57.0±7.2 years, with an age range of 34-67 years. Males constituted 60% (n = 18) of the participants, while females accounted for 40% (n = 12), resulting in a male-to-female ratio of 1.5:1 (Table 1).

As shown in Table 1, males constituted 60% of the study population, while females accounted for 40%, indicating a male predominance in this institutional cohort.

Most patients (60.0%, n = 18) belonged to the 51-60 year age group, followed by those aged >60 years (26.7%, n = 8). Patients aged 41-50 years and ≤40 years accounted for 10.0% (n = 3) and 3.3% (n = 1), respectively (Table 2).

Multiple symptoms were present in several patients at the time of presentation.

Abdominal pain was the most common presenting symptom, reported in 73.3% (n = 22) of patients, followed by weight loss in 53.3% (n = 16) and anorexia in 40.0% (n = 12). Dyspepsia was reported in 30.0% (n = 9) of patients, with some patients presenting with multiple symptoms (Table 3).

Laparoscopic RAMPS was successfully completed in 90.0% (n = 27) of patients, while 10.0% (n = 3) required conversion to open surgery. Intraoperative complications occurred in 4 patients (13.3%), including 2 cases among patients who completed laparoscopic RAMPS and 2 among those converted to open surgery; Fisher's exact test showed a significant association between operative approach and intraoperative complications (p = 0.031) (Table 4).

All patients (100%) underwent ultrasonography and contrast-enhanced CT (CECT) abdomen as part of preoperative evaluation. Upper GI endoscopy was performed in 60% (n = 18) patients. MRCP and endoscopic ultrasound (EUS) were utilized in 40% (n = 12) and 30% (n = 9) patients, respectively, depending on clinical indications.

Abdominal ultrasonography and contrast-enhanced CT were performed in all patients (100%). Upper gastrointestinal endoscopy was used in 60.0% (n = 18), while MRCP and EUS were performed in 40.0% (n = 12) and 30.0% (n = 9) of patients, respectively, according to clinical indications (Table 5).

Preoperative Contrast-Enhanced Computed Tomography (CECT) demonstrated a well-defined lesion involving the pancreatic body/tail region, as indicated by the arrow (Figure 1). The imaging findings supported

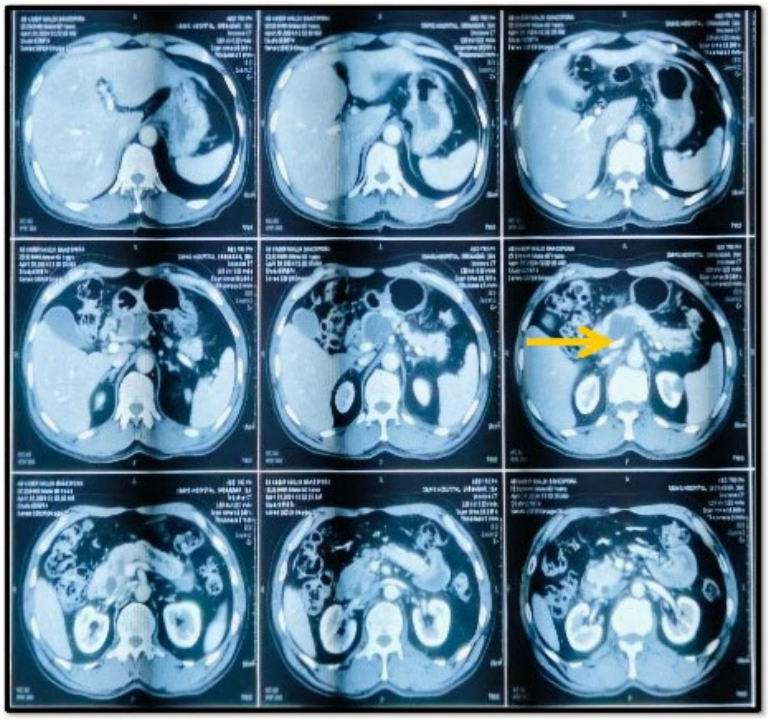

Figure 1: Axial section of CECT abdomen/pelvis showing a well-defined cystic lesion in the pancreatic body/tail region, with the lesion indicated by the arrow

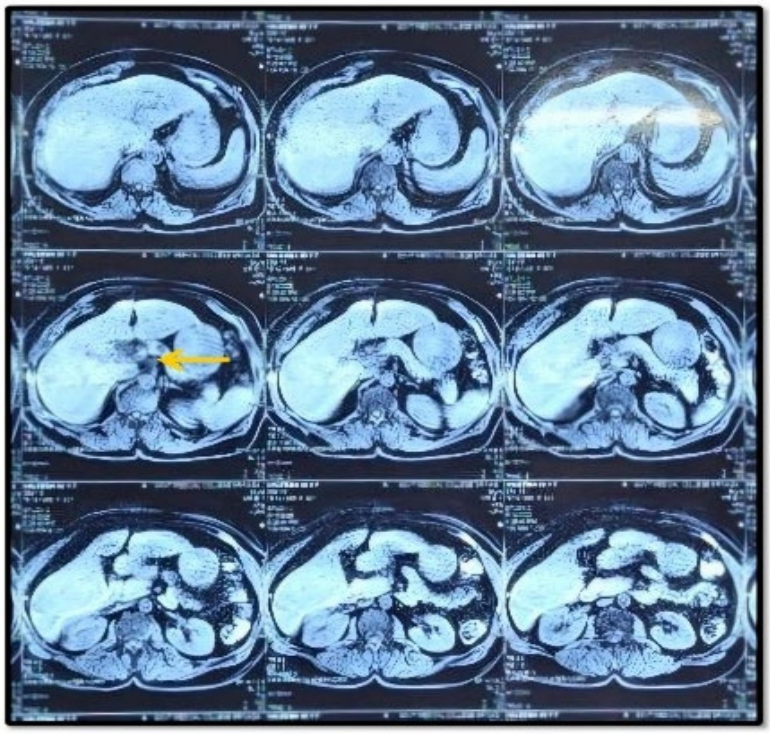

Figure 2: Axial Section of CECT Abdomen/Pelvis showing a pancreatic body lesion measuring approximately 15×13×14 mm (arrow); the remaining pancreatic parenchyma is unremarkable and the main pancreatic duct is not dilated

the identification and preoperative assessment of the pancreatic lesion before surgical intervention.

Further axial CECT imaging demonstrated a pancreatic body lesion measuring approximately 15×13×14 mm. The remaining pancreatic parenchyma appeared normal, with no dilatation of the main pancreatic duct (Figure 2).

Magnetic resonance cholangiopancreatography (MRCP) further characterized the pancreatic lesion and

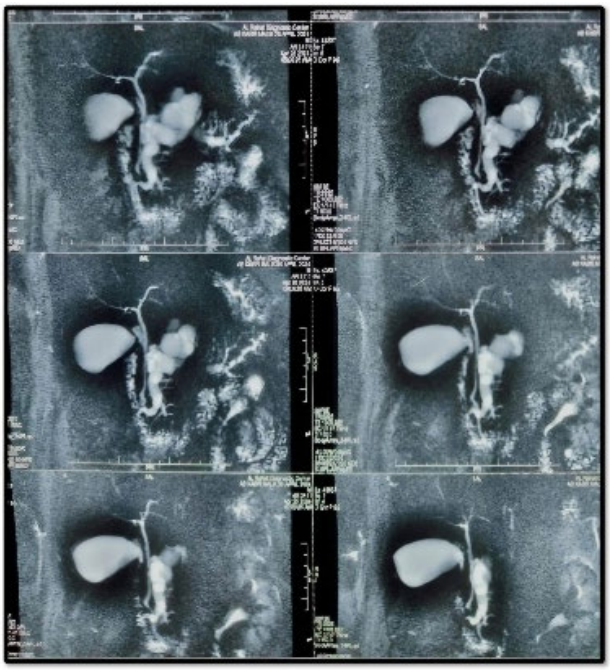

Figure 3. MRCP Demonstrating a Cystic Lesion in the Pancreatic Body Region with Communication with the Main Pancreatic Duct

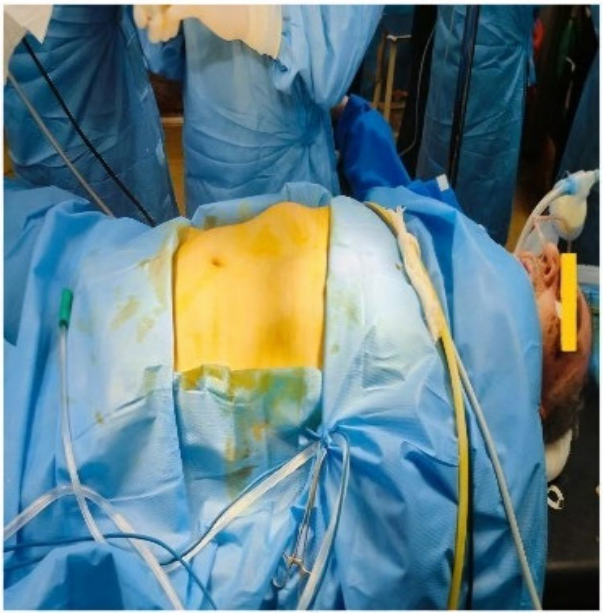

Figure 4: Port Placement for Laparoscopic RAMPS, Showing the 5 mm Retraction Port, Two 10 mm Working Ports, 5 mm Assistant Port and 12 mm Optical/Specimen Retrieval Port

demonstrated a cystic lesion in the pancreatic body region with communication with the main pancreatic duct (Figure 3).

The laparoscopic approach involved standardized port placement, including working, assistant, retraction and

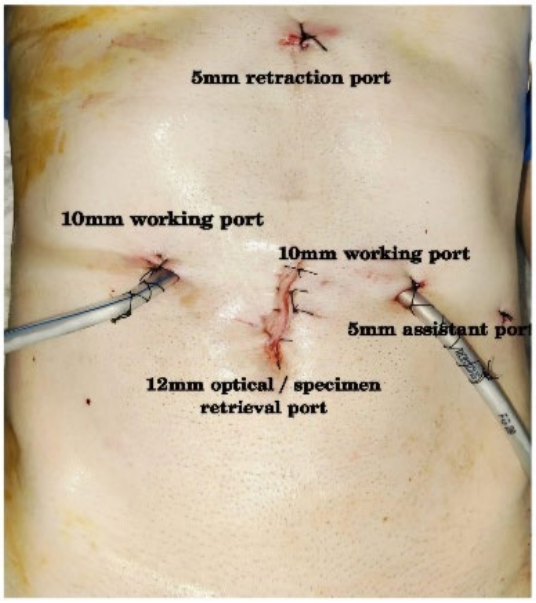

Figure 5: Preoperative Positioning of the Patient for Laparoscopic RAMPS

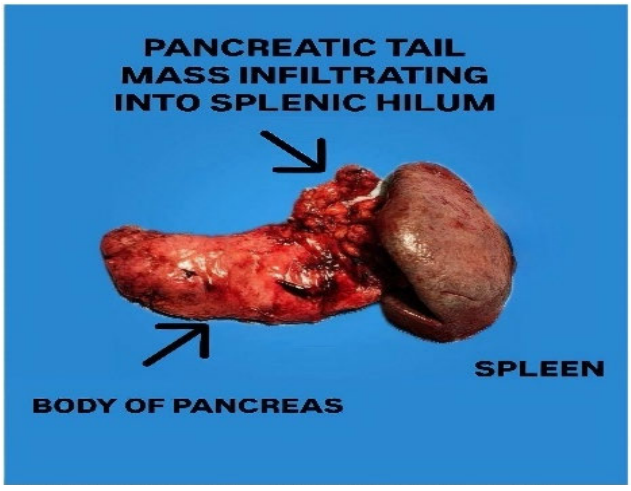

Figure 6: Representative Gross Specimen Following Laparoscopic Distal Pancreatectomy and Splenectomy, Demonstrating a Pancreatic Tail Mass Extending Toward The Splenic Hilum

optical/specimen retrieval ports (Figure 4). Appropriate preoperative positioning was used to facilitate laparoscopic access and operative exposure during Lap-RAMPS (Figure 5).

Representative gross specimens obtained following distal pancreatectomy and splenectomy demonstrated lesions involving the pancreatic body and tail. Figure 6 shows a pancreatic tail mass extending toward the splenic hilum, while Figure 7 and 8 demonstrate representative tumors involving the pancreatic body and tail, respectively. These images illustrate the resected pancreatic specimens obtained during the surgical procedure.

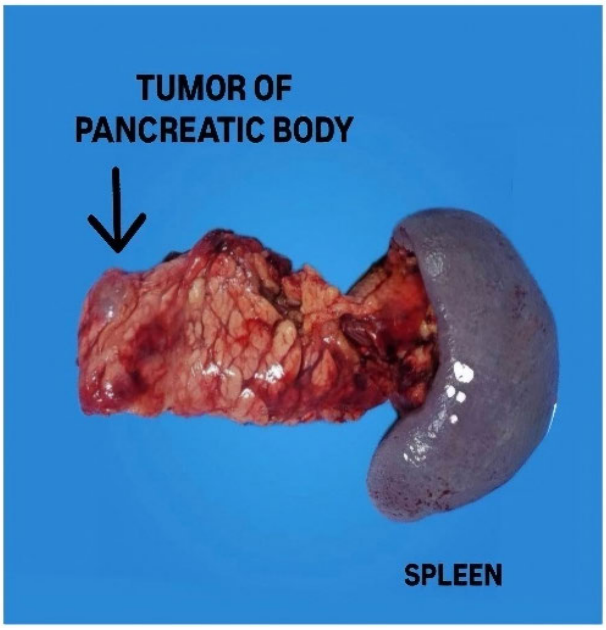

Figure 7: Representative Gross Specimen Following Laparoscopic Distal Pancreatectomy and Splenectomy, Demonstrating a Tumor Involving the Pancreatic Body With The Spleen

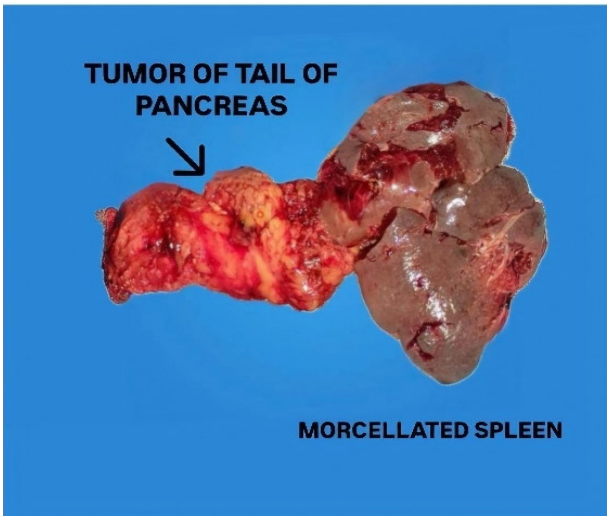

Figure 8: Representative Gross Specimen Following Laparoscopic Distal Pancreatectomy and Splenectomy, Demonstrating a Tumor Involving the Pancreatic Tail with the Associated Splenic Specimen

DISCUSSION

Radical antegrade modular pancreatosplenectomy (RAMPS), introduced by David Strasberg in 2003, represents a significant advancement in the surgical management of distal pancreatic malignancies. The technique was developed to improve oncological outcomes by ensuring adequate posterior retroperitoneal margin clearance and systematic lymphadenectomy [9]. Conventional distal pancreatectomy has historically been associated with suboptimal oncological clearance due to anatomical limitations in achieving negative posterior margins. Since its introduction, RAMPS has been increasingly adopted in tertiary care centres due to its theoretical oncological advantages without significantly increasing perioperative morbidity. The present study was conducted to evaluate the clinicopathological profile, operative feasibility and early postoperative outcomes of RAMPS in a cohort of 30 patients and to compare these findings with existing literature [10].

The demographic distribution in the present study demonstrated a mean patient age of 57 years, with most patients belonging to the fifth and sixth decades of life. This finding is consistent with the global epidemiology of pancreatic malignancies, which predominantly affect middle-aged and elderly populations [11]. Pancreatic cancer is known to have a relatively higher incidence in older individuals due to cumulative exposure to carcinogenic risk factors, genetic mutations and chronic inflammatory changes within pancreatic tissue. Similar demographic patterns have been reported in studies by Watanabe *et al.*, Zhang *et al.* and Kwon *et al.*, reinforcing the consistency of disease distribution across different populations. The male predominance (60%) observed in this study is also consistent with epidemiological data demonstrating higher pancreatic cancer incidence in males. This gender disparity may be attributed to higher rates of smoking, alcohol consumption, occupational exposure and metabolic syndrome-related risk factors among males in many populations [12].

Clinical presentation in pancreatic malignancies is often nonspecific, particularly in distal pancreatic tumours. In the present study, abdominal pain was the most common presenting symptom (73.3%), followed by weight loss and anorexia. These findings are consistent with classical presentations of distal pancreatic lesions. The absence of jaundice in most patients is expected, as distal pancreatic tumours do not typically cause biliary obstruction, unlike pancreatic head tumours where common bile duct compression frequently results in obstructive jaundice. Delayed presentation remains a major challenge in pancreatic cancer management, as early-stage disease is often asymptomatic [13]. Consequently, patients frequently present at advanced stages, emphasizing the importance of early diagnostic imaging and clinical suspicion in patients presenting with unexplained abdominal symptoms or systemic manifestations such as unexplained weight loss [14].

Assessment and optimization of comorbid conditions is an important aspect of preoperative evaluation in pancreatic surgery. In this study, 63.3% of patients had either no comorbidities or a single comorbid condition, indicating that most patients were medically fit for major abdominal surgery. Careful preoperative optimization of chronic diseases such as diabetes mellitus, hypertension and cardiovascular disorders is essential to minimize perioperative complications [15]. Similar patient selection strategies have been emphasized in previous RAMPS studies, where strict inclusion criteria contributed to low perioperative morbidity and mortality rates. Careful patient

selection is particularly important in minimally invasive RAMPS procedures, as technical complexity may amplify the risk associated with poor physiological reserve [16].

In the current study, laparoscopic RAMPS was successfully completed in 90% of cases, with a conversion rate of 10%. This finding is consistent with previously published laparoscopic RAMPS series, which have reported conversion rates ranging from 5-15%. Conversion to open surgery is usually attributed to dense peri-pancreatic adhesions, vascular anatomical variations, intraoperative bleeding or difficulty in achieving adequate oncological margins. RAMPS is technically demanding because it requires meticulous dissection along the posterior retroperitoneal plane and en bloc removal of the spleen and surrounding lymphatic tissue. These technical challenges necessitate advanced laparoscopic surgical skills and a thorough understanding of pancreatic anatomy. Despite these challenges, minimally invasive RAMPS has gained popularity due to its potential benefits, including reduced postoperative pain, shorter hospital stay and faster recovery. Intraoperative complications were observed in 13.3% of patients but none required abandonment of the procedure and there was no intraoperative mortality. These results demonstrate that RAMPS can be performed safely in experienced surgical centres. Similar complication rates have been reported in previous studies comparing RAMPS with conventional distal pancreatectomy, which have demonstrated comparable perioperative morbidity rates. The absence of intraoperative mortality in this study further supports the safety profile of the procedure when performed with appropriate surgical expertise and perioperative management protocols. Histopathological examination revealed that 70% of lesions were malignant, reaffirming malignancy as the primary indication for RAMPS. The majority of malignant lesions were pancreatic ductal adenocarcinomas, which is consistent with global disease prevalence data. Other lesions included neuroendocrine tumours and cystic neoplasms, reflecting the broader spectrum of indications for distal pancreatic resection. The high proportion of malignant lesions underscores the importance of achieving oncological clearance, particularly with respect to posterior retroperitoneal margins and regional lymph node dissection [17].

Complete R0 resection was achieved in all malignant cases in the present study. This finding is clinically significant because RAMPS was specifically designed to improve posterior margin clearance compared to conventional distal pancreatectomy. Previous studies have reported R0 resection rates ranging from 85-95% in RAMPS procedures. Although these results are encouraging, the small sample size of the present study limits definitive conclusions regarding oncological superiority over conventional surgical approaches. Long-term survival and recurrence data were also not available due to limited follow-up duration. Postoperative outcomes in the present study were favourable, with 80% of patients experiencing uneventful recovery. Minor complications occurred in 20% of patients, while no major complications or postoperative mortality were recorded. These findings suggest that RAMPS is associated with acceptable postoperative morbidity when performed in experienced centres. Minor complications such as transient pancreatic fistula or delayed gastric emptying were managed conservatively according to standard postoperative care protocols. Statistical analysis demonstrated no significant association between age group and nature of lesion or between comorbidity status and postoperative complications ($p>0.05$). However, a statistically significant association was observed between operative approach and intraoperative complications ($p = 0.031$), indicating higher technical difficulty in cases requiring conversion to open surgery. These findings should be interpreted cautiously due to the small sample size and limited statistical power of the study.

Comparison with existing literature shows that both open and laparoscopic RAMPS approaches have demonstrated acceptable perioperative morbidity and improved oncological outcomes. Meta-analyses have shown that RAMPS may provide superior posterior margin clearance and improved lymph node retrieval compared to conventional distal pancreatectomy. The success of laparoscopic RAMPS in 90% of patients in this study further supports the feasibility of minimally invasive pancreatic surgery in experienced centres. Despite these encouraging findings, the study has certain limitations. The small sample size, single-centre design and short follow-up period limit the generalizability of results. Long-term oncological outcomes such as disease-free survival and overall survival could not be assessed. Additionally, the absence of multivariate statistical analysis limits evaluation of independent predictors of surgical outcomes.

In conclusion, RAMPS is a safe and effective surgical technique for distal pancreatic malignancies, providing satisfactory oncological clearance with acceptable perioperative morbidity. The procedure can be safely performed laparoscopically in experienced centres with proper patient selection and surgical expertise. Future multicentre studies with larger sample sizes and long-term follow-up are necessary to further validate these findings and establish definitive oncological benefits.

CONCLUSIONS

Radical Antegrade Modular Pancreatosplenectomy (RAMPS)-predominantly performed laparoscopically (90%)-is a safe, feasible and oncologically effective procedure for distal pancreatic malignancies.

Key Takeaways

- **High Oncological Clearance:** Achieved a 100% R0 resection rate across all malignant cases through systematic lymphadenectomy and clear posterior margins
- **Favourable Safety Profile:** Showed 0% mortality and an 80% complication-free recovery rate, demonstrating low perioperative morbidity

- **Clinical Utility:** Reaffirms RAMPS as a viable standard of care that combines the recovery benefits of minimally invasive surgery with rigorous oncological principles
- **Next Steps:** While short-term outcomes are excellent, prospective, multicentre randomized trials with longer follow-ups are needed to confirm its long-term survival benefits, recurrence rates and potential in borderline resectable cases

REFERENCES

[1] Alemi, F. *et al.* "Anatomical and Technical Considerations for Achieving R0 Resection in RAMPS: 21-Patient Study." *Surgery Today*, vol. 52, 2022, pp. 981-990.

[2] Aosasa, S. *et al.* "RAMPS for Resection Margin and SMA Involvement: Surgical Approach Study." *Pancreas*, vol. 50, 2021, pp. 567-574.

[3] Atsushi, T. *et al.* "RAMPS vs Conventional Distal Pancreatectomy: 3-Year Local Recurrence and Survival Analysis in 58 Matched Patients." *Annals of Surgical Oncology*, vol. 30, 2023, pp. 501-510.

[4] Borys, M. *et al.* "Laparoscopic RAMPS versus Laparoscopic Distal Pancreatectomy with Splenectomy: Comparison of Perioperative Outcomes." *Annals of Surgical Oncology*, vol. 28, 2021, pp. 5901-5910.

[5] Cao, F. *et al.* "RAMPS Improves Lymph Node Harvest and R0 Resection Rates: Meta-Analysis of Six Retrospective Studies." *Surgical Oncology*, vol. 41, 2022.

[6] Chun, Y.S. "Role of Radical Antegrade Modular Pancreatosplenectomy (RAMPS) in Pancreatic Cancer." *Annals of Surgical Oncology*, vol. 25, no. 1, 2018, pp. 46-50. https://doi.org/10.1245/s10434-016-5675-4.

[7] Dai, M. *et al.* "MIRROR Trial: Prospective Study on Minimally Invasive RAMPS Outcomes (250 Patients)." *Trials*, vol. 24, 2023.

[8] Davis, C.H. *et al.* "Posterior RAMPS and Adrenalectomy in 3467 Distal Pancreatectomies: Perioperative Outcomes." *HPB*, vol. 25, 2023, pp. 1103-1115. https://doi.org/10.1016/j.hpb.2022.12.001.

[9] De Rooij, T. *et al.* "Minimally Invasive versus Open Distal Pancreatectomy: Systematic Review and Meta-Analysis." *Annals of Surgery*, vol. 264, 2016, pp. 257-267. https://doi.org/10.1097/SLA.0000000000001660.

[10] Grossman, A. *et al.* "Single Institution Results of Radical Antegrade Modular Pancreatosplenectomy for Adenocarcinoma of the Body and Tail of the Pancreas in 78 Patients." *Journal of Hepato-Biliary-Pancreatic Sciences*, vol. 23, no. 7, 2016, pp. 432-441. https://doi.org/10.1002/jhbp.362.

[11] Huang, J. *et al.* "Laparoscopic vs Open RAMPS: Perioperative Outcomes in 60 Patients." *Surgical Endoscopy*, vol. 36, 2022, pp. 4900-4910.

[12] Ishida, J. *et al.* "Preoperative Evaluation and Surgical Technique Optimization in RAMPS: 40-Patient Series." *Asian Journal of Surgery*, vol. 45, 2022, pp. 755-762.

[13] Jiang, Z. *et al.* "Laparoscopic RAMPS vs Laparoscopic Distal Pancreatectomy: Meta-Analysis of 242 Patients." *Surgical Endoscopy*, vol. 39, 2025, pp. 2501-2512. https://doi.org/10.1007/s00464-025-11551-5.

[14] Kang, C.M. *et al.* "Conventional Laparoscopic Distal Pancreatectomy vs Laparoscopic RAMPS for Left-Sided Pancreatic Cancer." *Surgical Endoscopy*, vol. 29, 2015, pp. 2298-2306.

[15] Katz, M.H. *et al.* "Long-Term Survival after Multidisciplinary Management of Resected Pancreatic Adenocarcinoma." *Annals of Surgical Oncology*, vol. 16, 2009, pp. 836-847. https://doi.org/10.1245/s10434-008-0295-2.

[16] Kiritani, S. *et al.* "Local Recurrence and Survival after RAMPS vs. Standard Retrograde Pancreatosplenectomy." *Pancreatology*, vol. 21, no. 6, 2021, pp. 1234-1242.

[17] Kuriyama, N. *et al.* "Posterior vs. Anterior RAMPS: Perioperative Outcomes and MD-CT Diagnostic Accuracy for Adrenal Invasion." *World Journal of Surgery*, vol. 45, 2021, pp. 1012-1020.