How to do a safe MIS distal pancreatectomy with and without spleen preservation pdf

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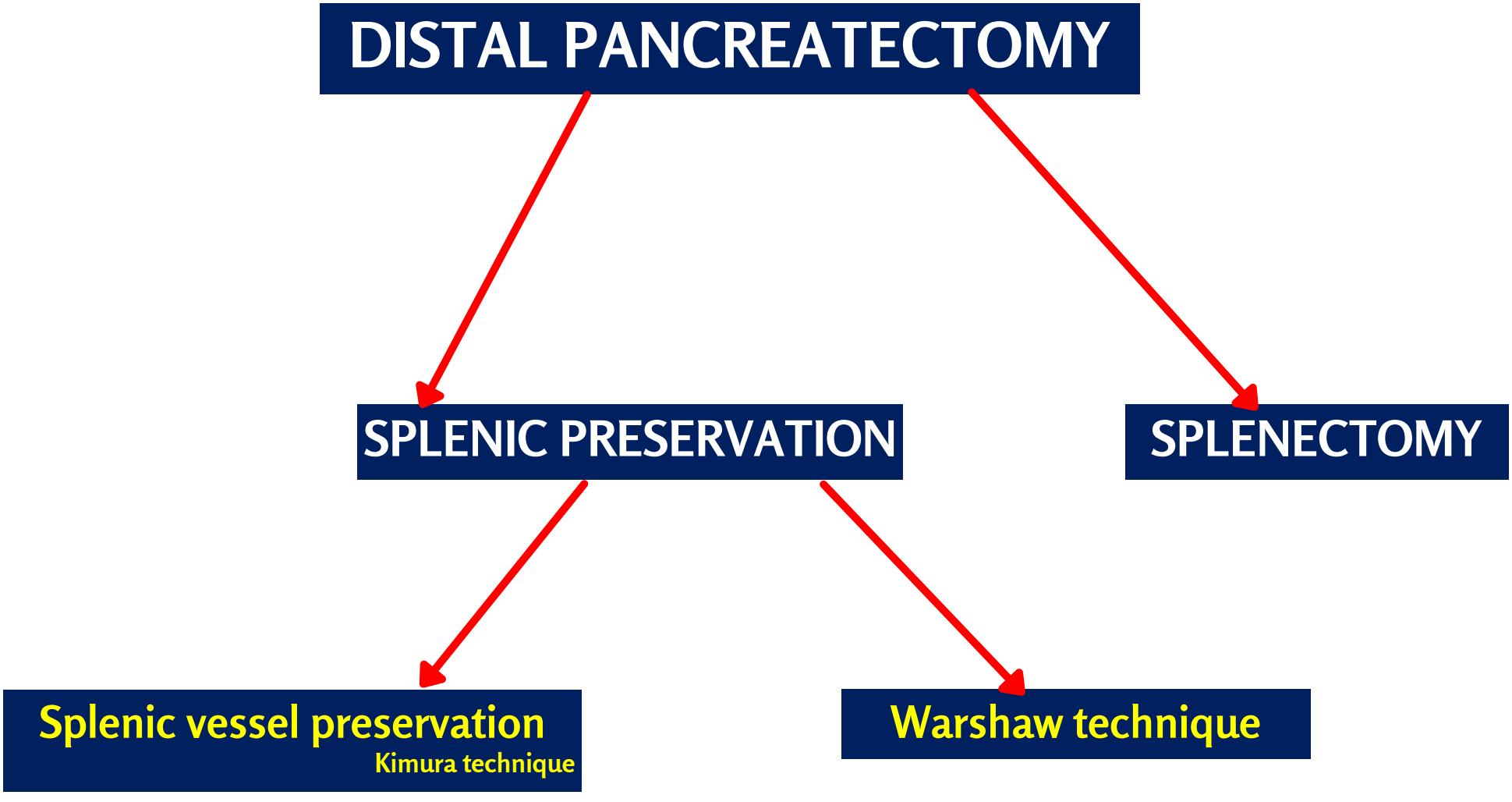


Kimura W, et al. Surgery 1996;120:885–890

Warshaw AL. Arch Surg 1988;123:550-3

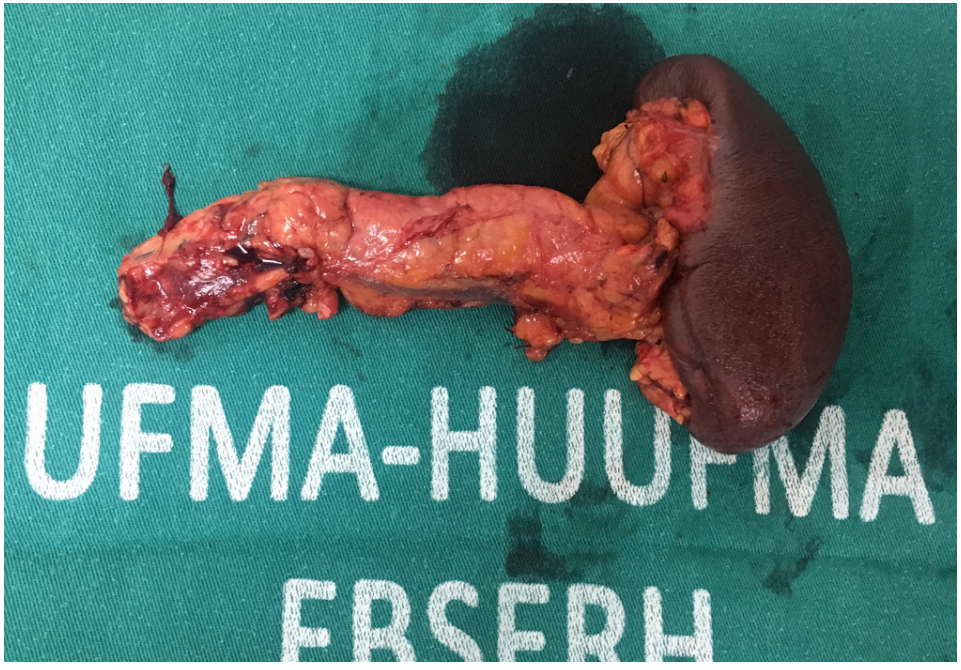
Spleen-preserving distal pancreatectomy

- Benign
- Premalignant
- Low-grade malignant

Risk of inadequate oncological clearance

Complications of splenectomy

- Thrombocytosis
- Thromboembolism
- Infections
- Elevated risk of câncer
  - Lung
  - Ovarian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Splenectomy and tumor size are risk factors for serious perioperative morbidity of laparoscopic distal pancreatectomies

Tab. III. Analysis of potential risk factors for perioperative morbidity after laparoscopic distal pancreatectomies.

PARAMETER	OR	95%CI	P-VALUE
Females	0.96	0.41–2.24	0.917
Age (cont.)	1.02	0.99–1.05	0.113
BMI (cont.)	1.03	0.95–1.12	0.534
Cystic pancreatic neoplasms	0.59	0.22–1.56	0.284
IPMN	0.99	n/a	n/a
NET	0.50	0.20–1.27	0.145
Adenocarcinoma	3.39	1.36–8.48	**0.009**
Meta	3.62	0.85–15.37	0.081
Tail *vs.* body of pancreas	1.35	0.60–3.07	0.468
With splenectomy	3.15	1.34–7.39	**0.009**
Operative time (cont.)	1.01	1.01–1.02	**<0.001**
Operative time >180 min (AUC 0.70, 95%CI 0.59–0.80, P<0.001)	3.49	1.53–7.95	**0.003**
Blood loss (cont.)	1.00	1.00–1.02	**0.023**
Blood loss >250 ml (AUC 0.63, 95%CI 0.52–0.74, P = 0.021)	2.40	1.07–5.39	**0.034**
Tumor size (cont.)	1.02	1.00–1.04	**0.040**
Tumor size > 28 mm (AUC 0.65, 95%CI 0.54–0.76, P = 0.008)	3.37	1.39–8.15	**0.007**

Tab. IV. Multivariate logistic regression model of risk factors for perioperative morbidity after laparoscopic distal pancreatectomies.

PARAMETER	OR	95%CI	P-VALUE
With splenectomy	3.66	1.20–11.18	**0.023**
Tumor size > 28 mm	3.01	1.19–7.59	**0.020**
Adenocarcinoma	1.44	0.48–4.33	0.513

Ann Surg Oncol
DOI 10.1245/s10434-015-4870-z

Annals of
SURGICAL ONCOLOGY
OFFICIAL JOURNAL OF THE SOCIETY OF SURGICAL ONCOLOGY

REVIEW ARTICLE – HEALTHCARE POLICY AND OUTCOMES

18 studies
1,156 patients

Splenic Preservation Versus Splenectomy During Distal Pancreatectomy: A Systematic Review and Meta-analysis

TABLE 2 Characteristics of studies included in subanalysis of SVP versus WT

Study	Year	Nation	Study type	Cases		Mean age, year, SVP/WT	Sex, male, female, SVP/WT	Study quality
				SVP-SPDP	WT-SPDP			
Fernandez-Cruz[39]	2004	Spain	P	9 (lap)	9 (lap)	NA	NA	*****
Melotti[40]	2007	Italy	PCD	27 (lap)	5 (lap)	NA	NA	****
Baldwin[41]	2011	USA	P	5 (lap)	4 (lap)	79.8/81.8	NA	*****
Beane[36]	2011	USA	R	45 (13 open + 21 lap + 11 rob)	41 (5 open + 33 lap + 3 rob)	53.4/56.7	10, 35/19, 22	********
Butturini[42]	2012	Italy	R	36 (lap)	7 (lap)	47.1/44.3	7, 29/1, 6	*******
Hwang[43]	2013	Korea	R	17 (rob)	4 (rob)	43.7/36.8	7,10/0,4	*****
Jean-Philippe[44]	2013	France and Spain	PCD	41 (lap)	84 (lap)	NA	NA	*******
Lv[45]	2013	China	R	12 (lap)	8 (lap)	37.5/42.8	2, 10/3, 5	*****
Matsushima[46]	2014	Japan	R	7 (lap)	17 (lap)	69.0/52.8	4,3/3, 14	*****
Worhunsky[47]	2014	USA	PCD	19 (lap)	31 (lap)	56.0/54.0	9,10/7,24	*******
Zhou[48]	2014	Korea	R	206 (lap)	40 (lap)	49.9/46.6	63,143/5,35	******

SVP splenic vessel preservation, *WT* Warshaw technique, *SPDP* spleen-preserving distal pancreatectomy, *P* prospective study, *PCD* prospectively collected data, *R* retrospective study, *lap* laparoscopic, *rob* robotic, *NA* not available

Shi N, et al. Ann Surg Oncol 2015

Ann Surg Oncol
DOI 10.1245/s10434-015-4870-z

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REVIEW ARTICLE – HEALTHCARE POLICY AND OUTCOMES

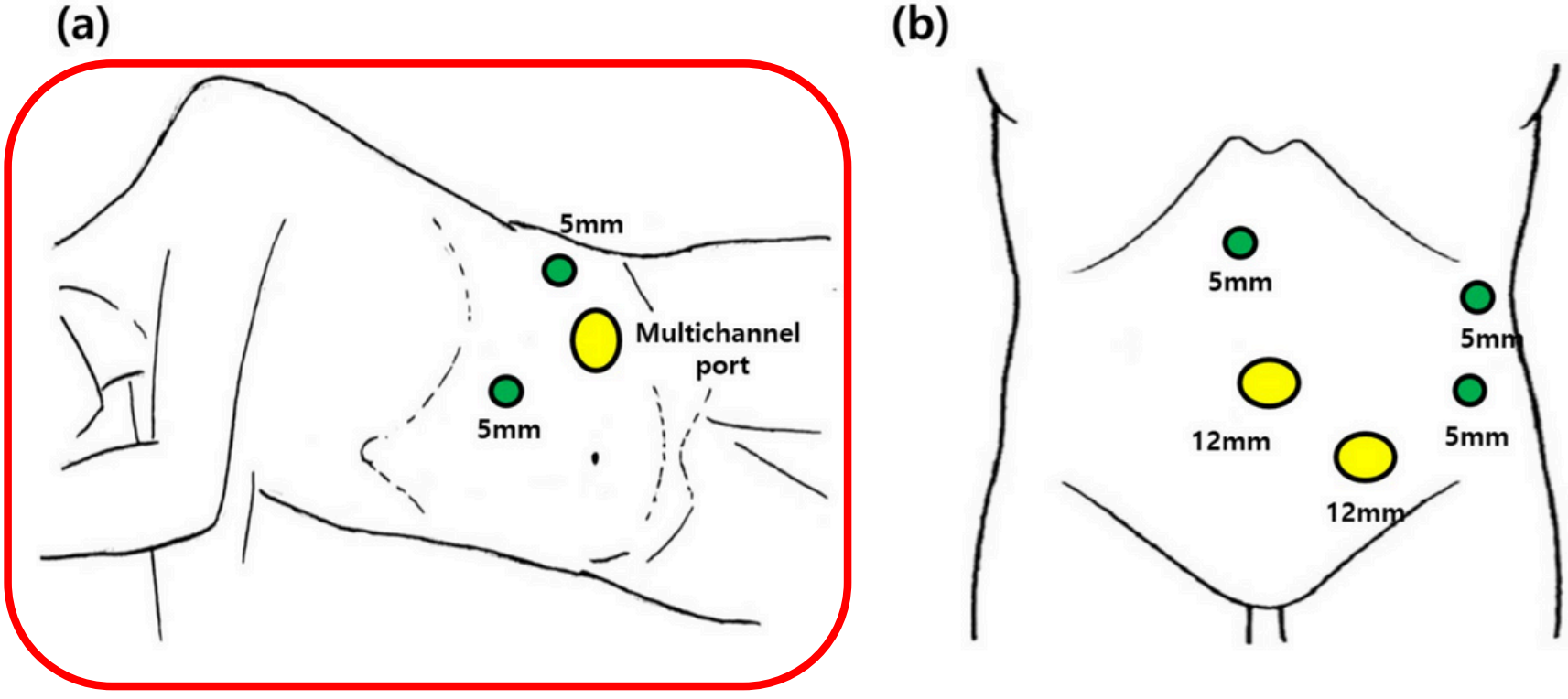
Splenic Preservation Versus Splenectomy During Distal Pancreatectomy: A Systematic Review and Meta-analysis

SPDP vs DPS

	502	vs	654	p
infectious complications	8.71%		15.25%.	0.006
overall morbidity rate	27.49		35.32	0.002
pancreatic fistula rate B/C	6.90%		14.33	0.002

Shi N, et al. Ann Surg Oncol 2015

SPLEEN-PRESERVING DISTAL PANCREATECTOMY



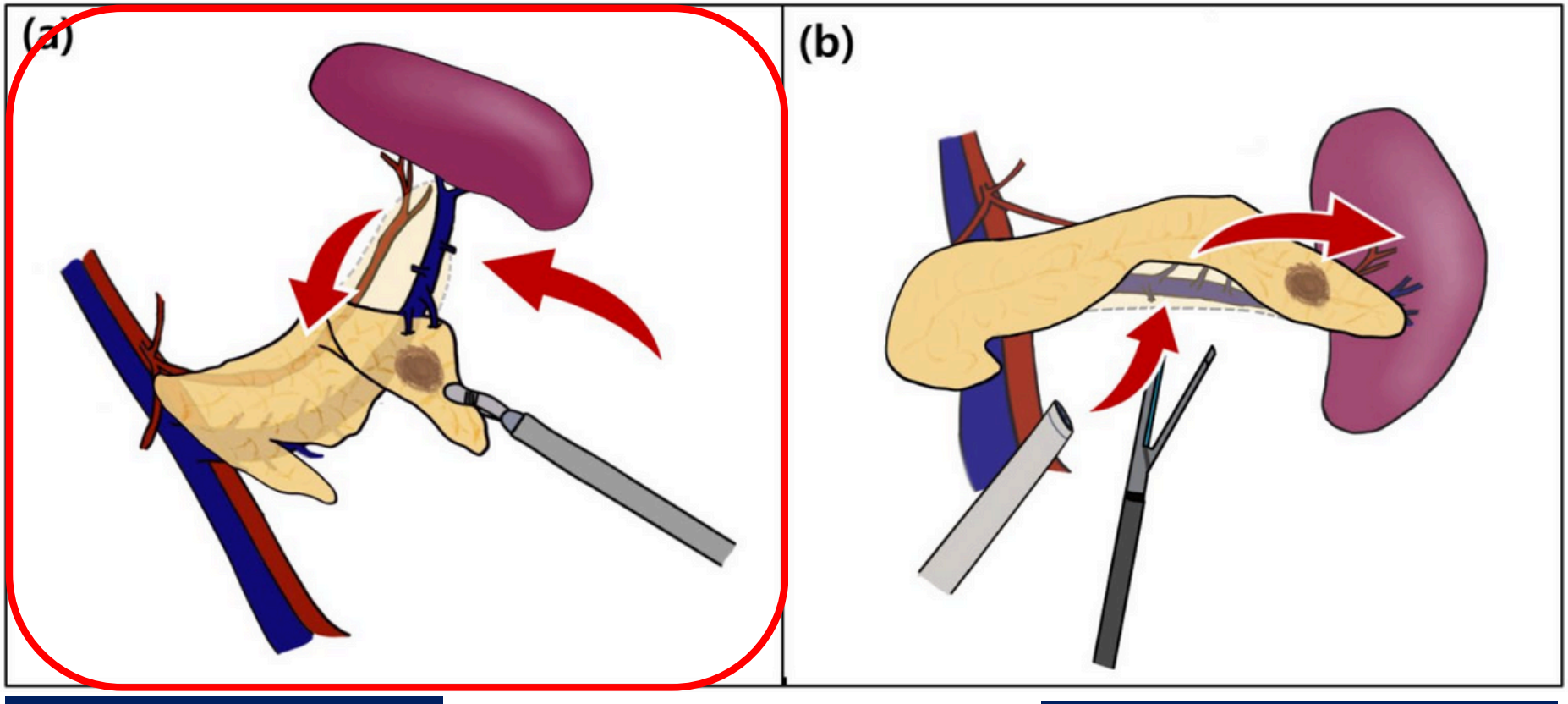
LATERAL APPROACH

CONVENTIONAL APPROACH

TECHNICAL

Park SE, et al. Sci Rep 2025;15:28799

SPLEEN-PRESERVING DISTAL PANCREATECTOMY



LATERAL APPROACH

CONVENTIONAL APPROACH

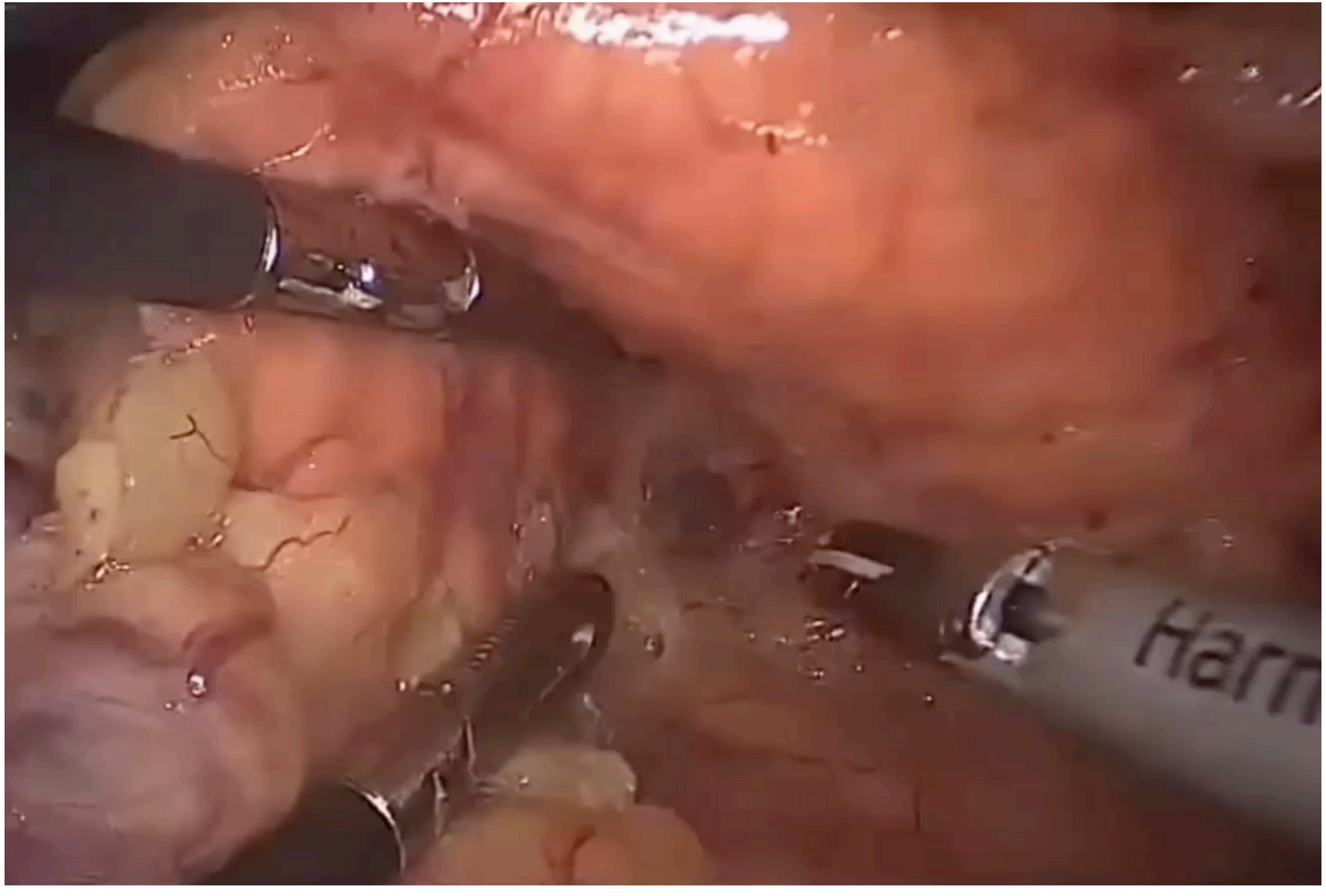
TECHNICAL

Park SE, et al. Sci Rep 2025;15:28799

Gastrocolic omentum is divided

TECHNICAL

SITE OF PANCREATIC DIVISION



PANCREATIC FISTULA IN OBESE PATIENTS

TABLE 3 | Univariate and multivariate analysis of factors related to clinically relevant POPF.

	POPF grade B/C							
	Univariate analysis				Multivariate analysis			
Variables	***p***	**OR**	**95% CI lower**	**95% CI upper**	***p***	**OR**	**95% CI lower**	**95% CI upper**
Laparoscopic approach	**0.001**	4.2	1.810	9.558	**0.003**	4	1.613	10.124
Diabetes	0.413	1.6	0.505	5.270				
Pancreatic body transection	**0.004**	3.9	1.556	9.849	**0.051**	2.6	1	6.973
Male sex	0.077	2.1	0.925	4.564				
Stump closure method other than stapler	**0.004**	3.3	1.478	7.412	**0.019**	3.2	1.197	7.297
ASA ≥ III	**0.030**	2.6	1.097	6.133	0.385	1.5	0.587	3.979
Kimura spleen-preservation	0.750	1.1	0.600	2.031				
Conversion to open	0.106	5.5	0.695	43.923				
Operative time	0.139	1	0.999	1.006				
Final histology PNET	0.702	0.855	0.384	1.905				

Note: In bold: statistically significant difference.
Abbreviations: AUC, area under the curve; CI, confidence interval; OR, odds ratio; PNET, pancreatic neuroendocrine tumor; POPF, post-operative pancreatic fistula.

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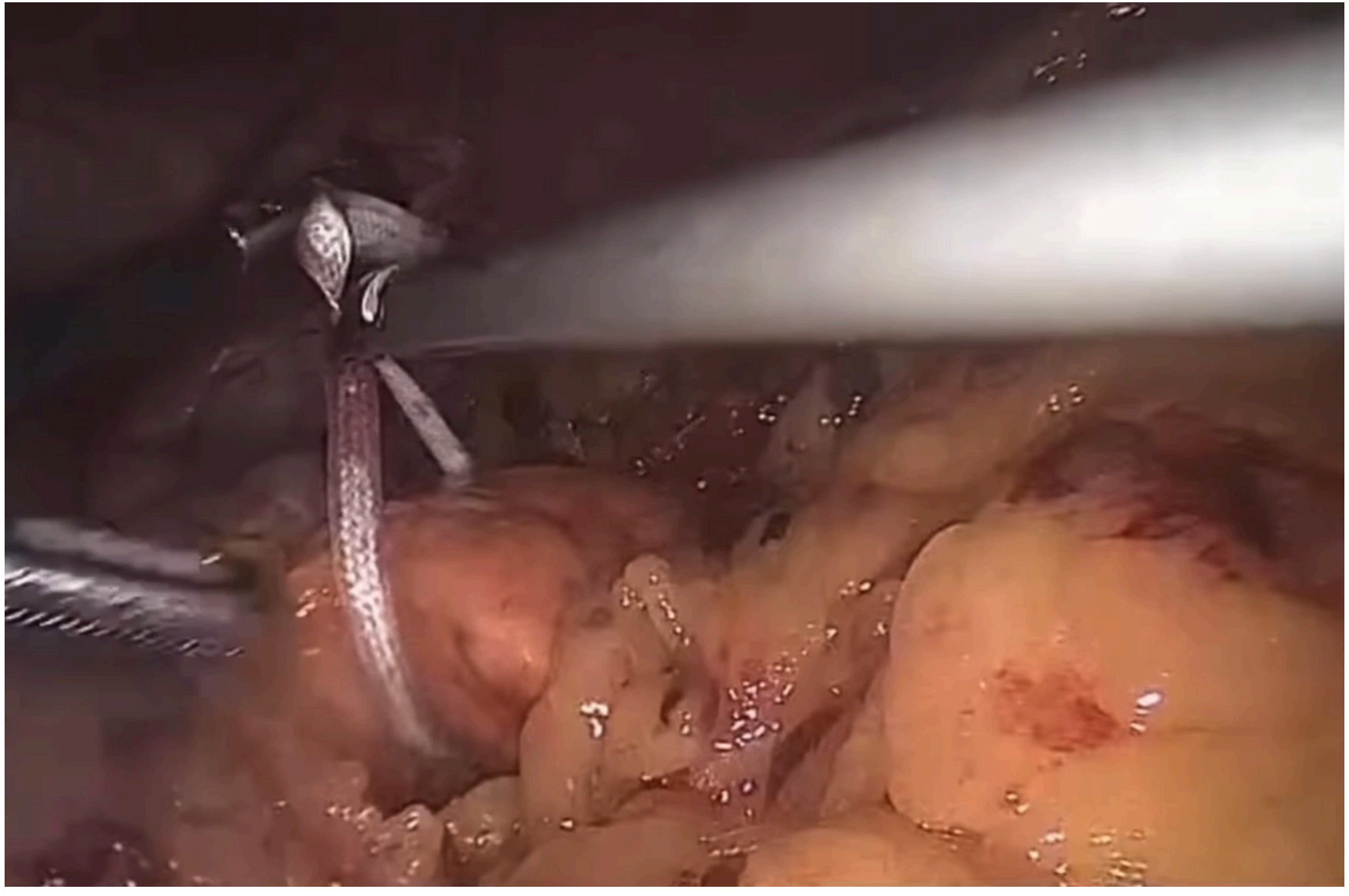
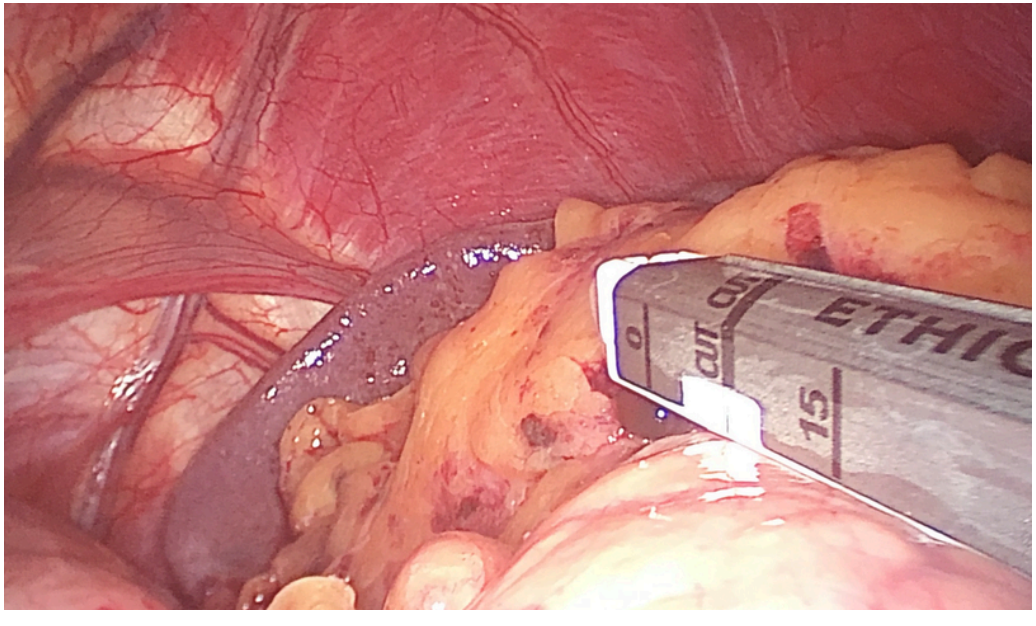
Ausania F, et al. Int J Med Rob Comp Ass Surg 2025;21:70091

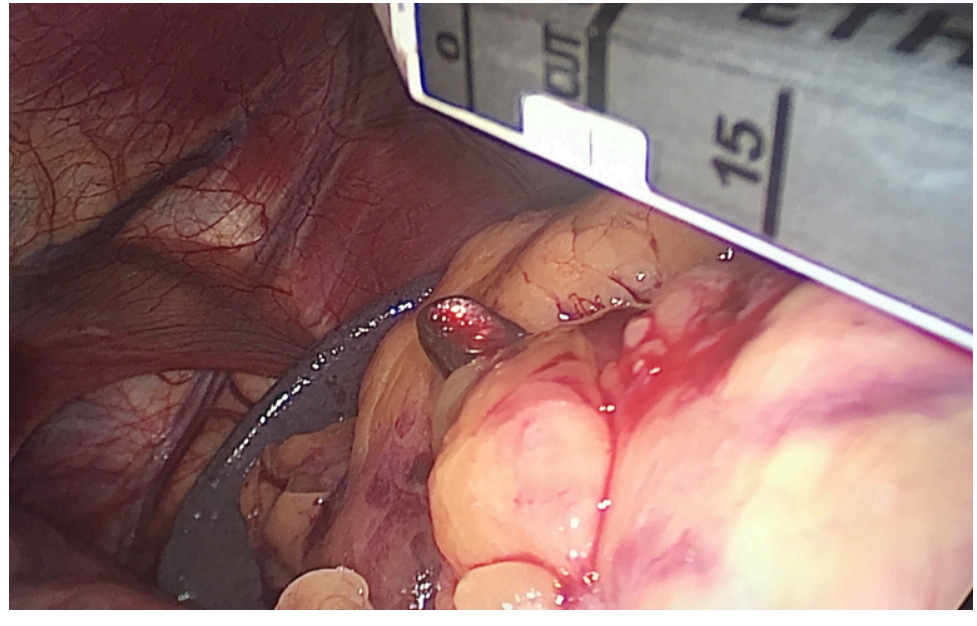
TAPE AROUND THE PANCREAS



PANCREATIC FISTULA IN OBESE PATIENTS

Stapler-based closure
Transection of the pancreas at the pancreatic neck





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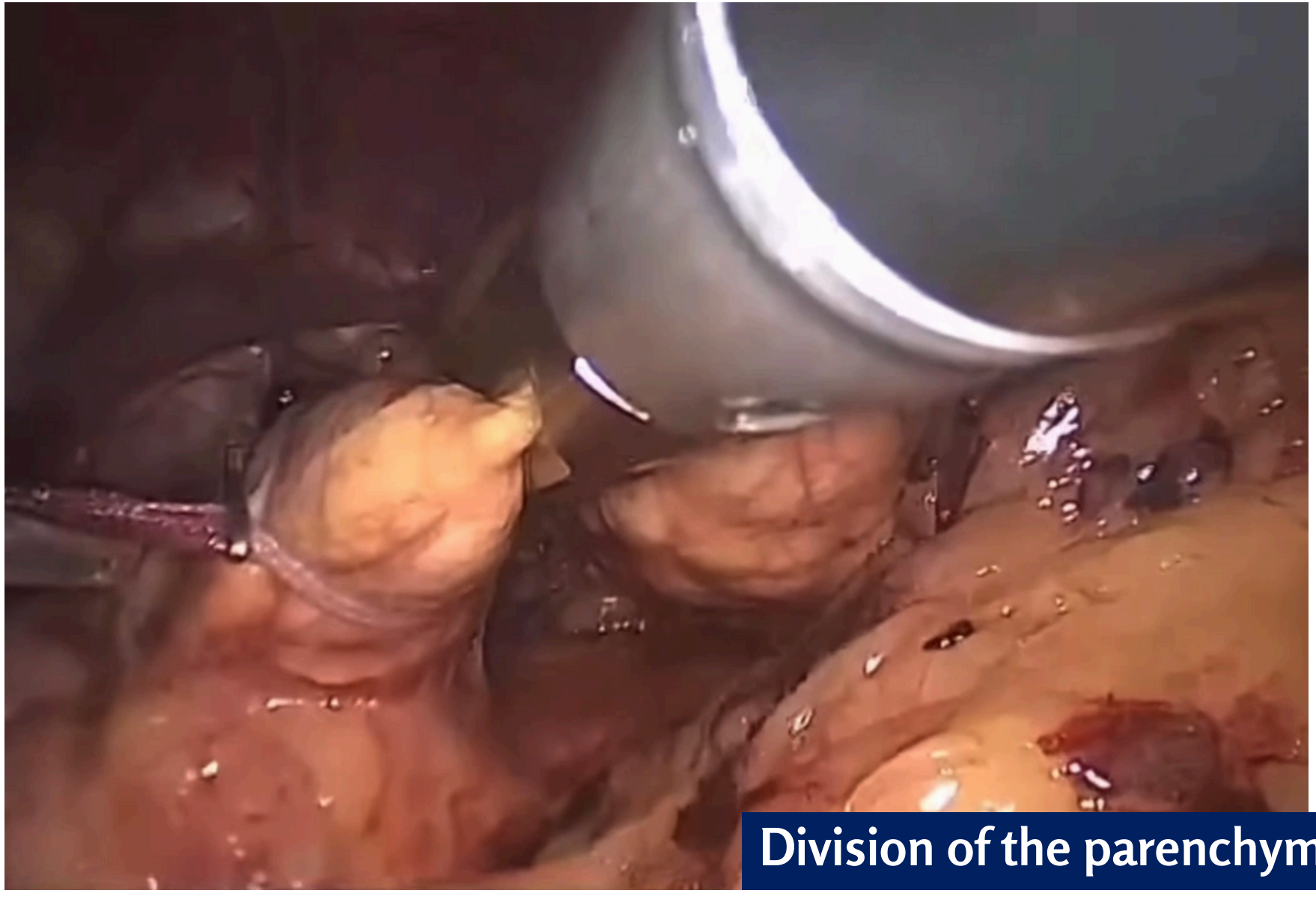
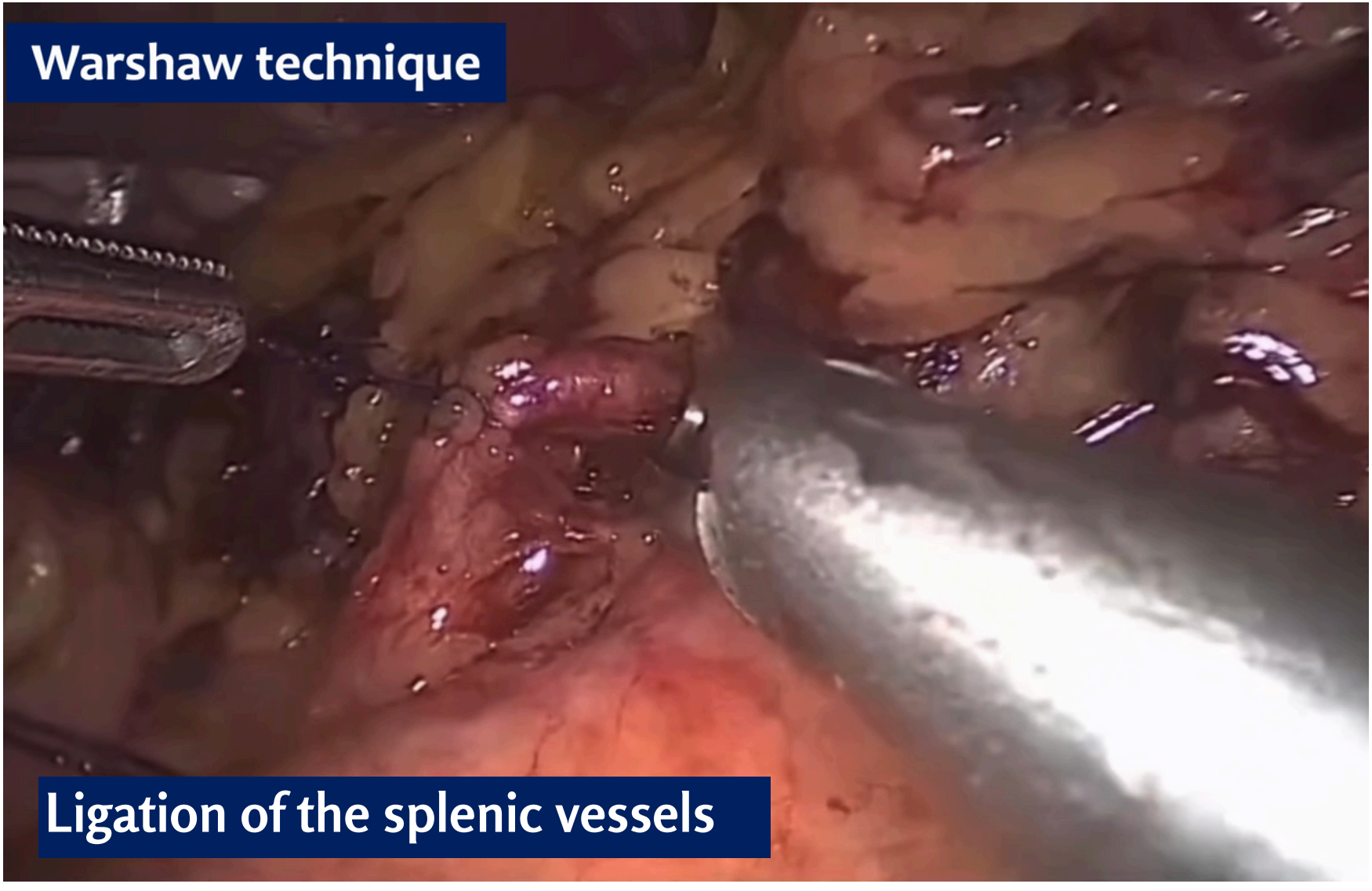
Ausania F, et al. Int J Med Rob Comp Ass Surg 2025;21:70091

Slow and progressive



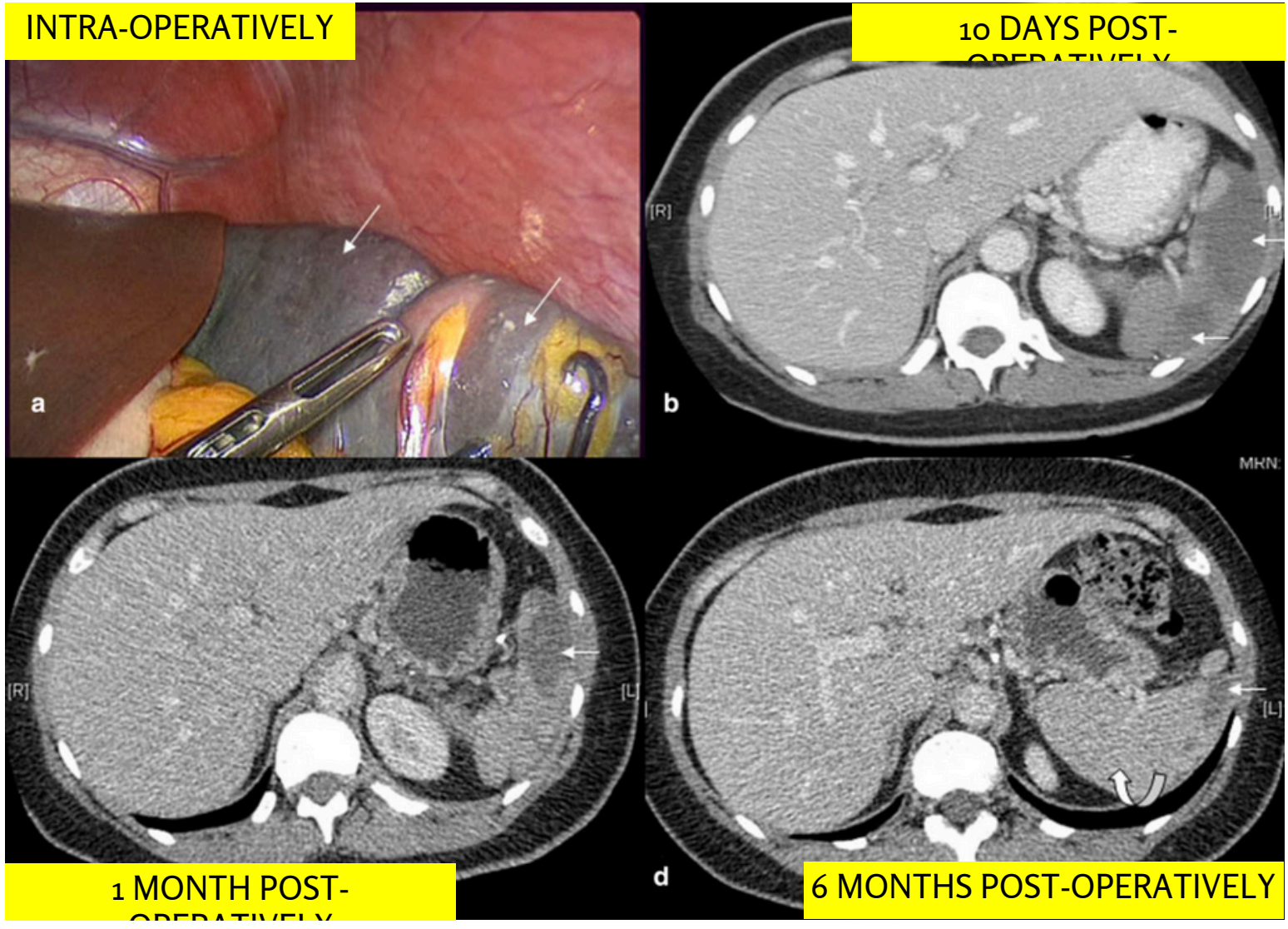
Division of the parenchyma



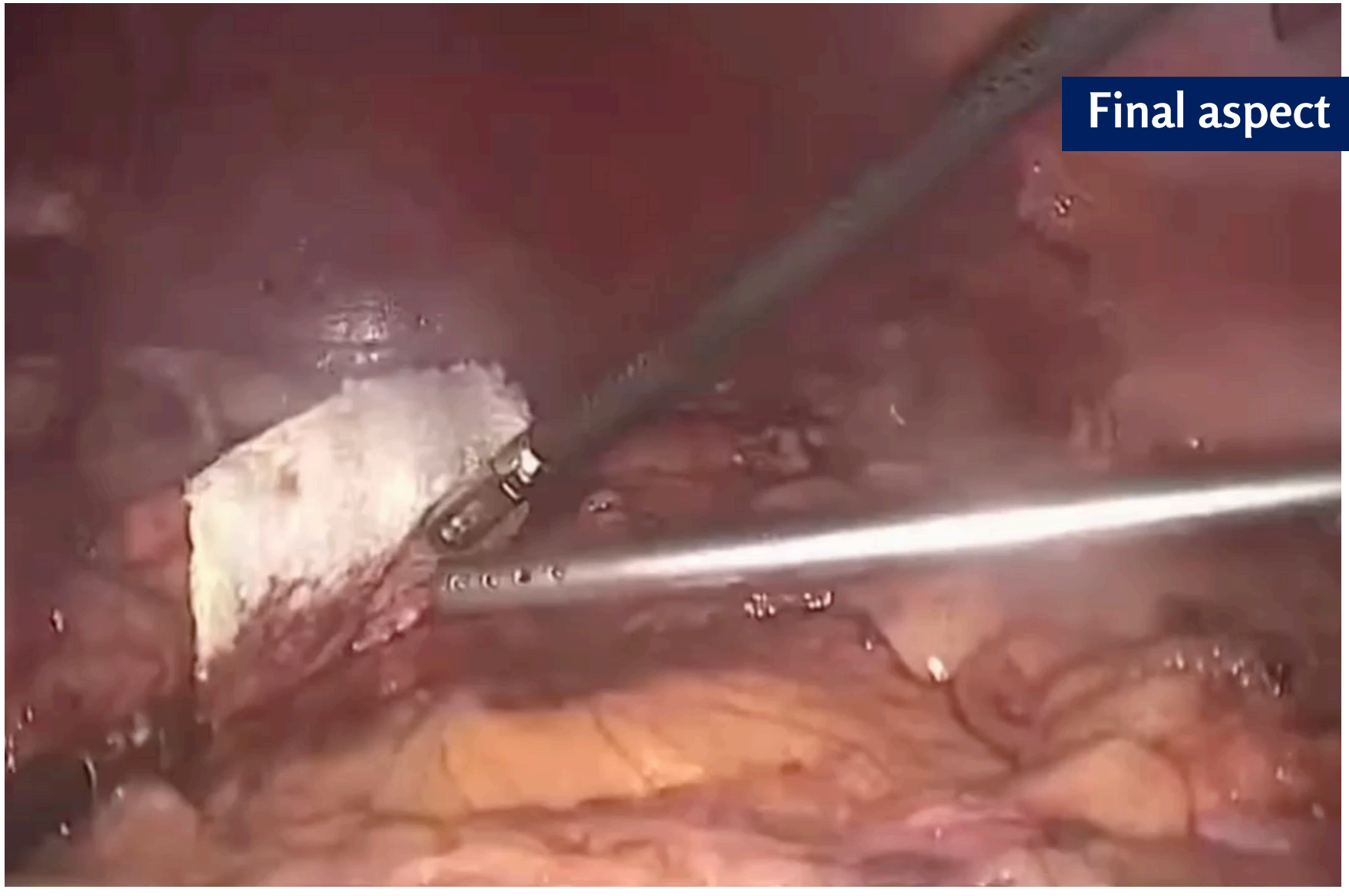
TECHNICAL

SPLENIC INFARCTION

Warshaw technique

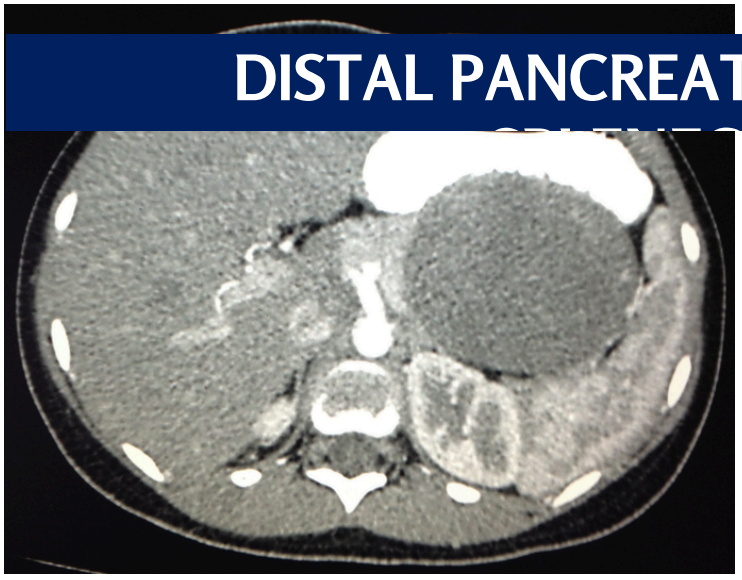


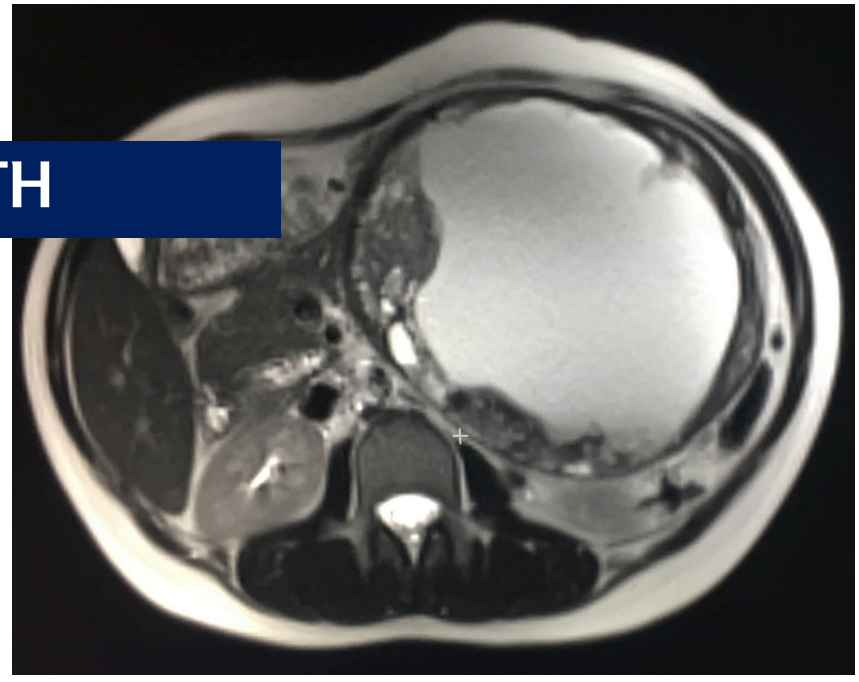
Jain G, et al. HPB 2013, 15, 403–410

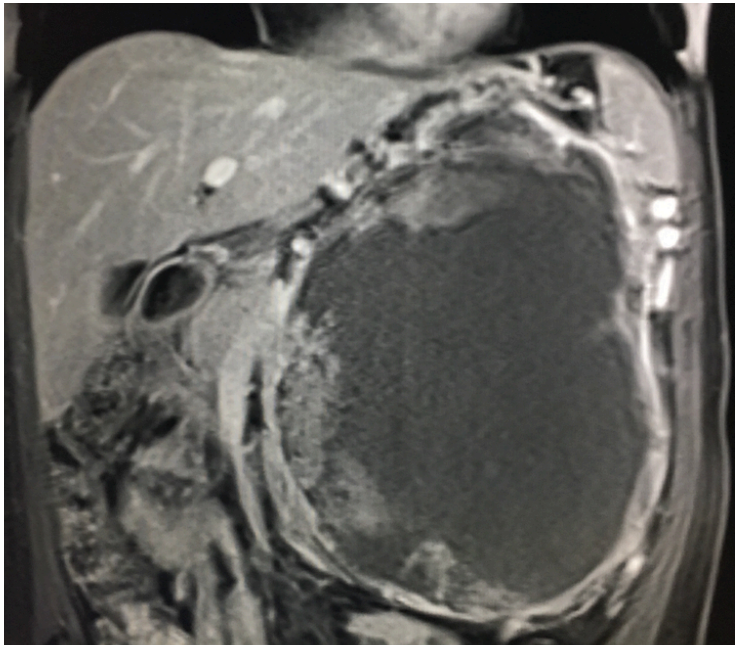

Final aspect

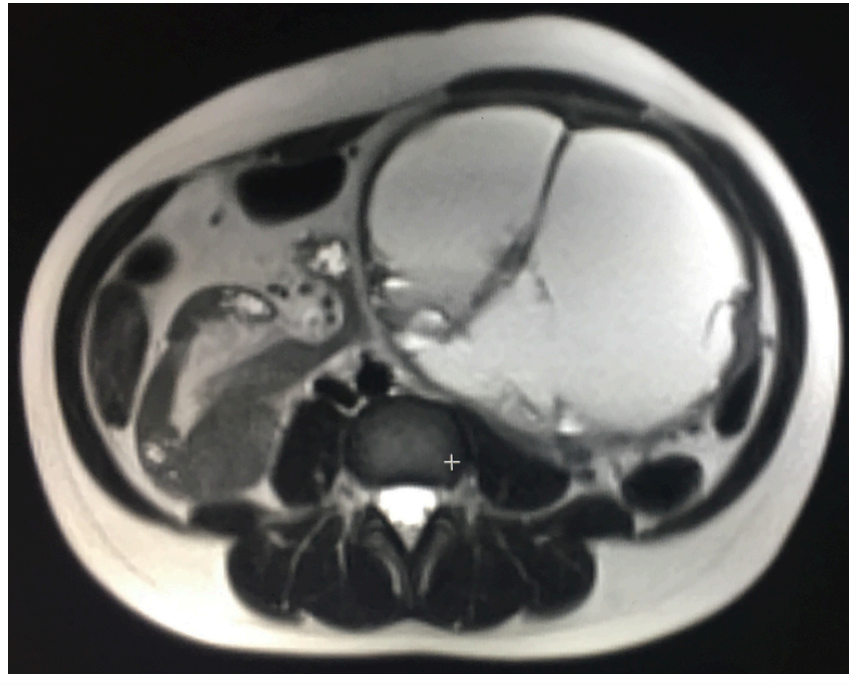
TUMOR SIZE

DISTAL PANCREATECTOMY WITH









Kimura technique

Case Series

ANNALS OF MEDICINE & SURGERY

OPEN

Laparoscopic antegrade spleen-preserving distal pancreatectomy with conservation of the splenic vessels: a prospective multi-centre case series

Table 1

General and intraoperative data.

Characteristics	*N* = 18 (%)
Age (years), mean (range)	39.4 ± 13.3 (16–63)
Sex ratio (female: male)	16: 2
Operative time (median ± SD, min–max minutes)	171 ± 23 (128–210)
Estimated blood loss (median ± SD, min–max ml)	65.7 ± 43 (30–150)
Tumor diameter (cm), median (range)	3.5 (2.5–7)
Location of the tumor	
Body, *n*, (%)	10 (55.6)
Tail, *n*, (%)	8 (44.4)
Presence of compression of the splenic vein	
No, *n*, (%)	14 (77.8)
Yes, *n*, (%)	4 (22.2)

min, minimum; max, maximum.

Nguyen H, et al. Ann Med Surg 2024:86:3211–5

Kimura technique

Case Series

ANNALS OF MEDICINE & SURGERY

OPEN

Laparoscopic antegrade spleen-preserving distal pancreatectomy with conservation of the splenic vessels: a prospective multi-centre case series

Table 2

Short-term outcomes.

Index	*N* = 18
Type of postoperative complications, *n*, (%)	
Pancreatic fistula	12 (66.7)
Bleeding[a] (GI bleeding, peritoneal hemorrhage)	2 (11.1%)
Pancreatic fistula, *n*, (%)	
Grade A	8 (44.4)
Grade B	6 (22.2)
Grade C	0
Re-operations[a]	2 (11.1)
Length of hospital stay (mean ± SD, min–max days)	9.4 ± 1.3 (6–15)
In-hospital mortality, *n*, (%)	0

GI, gastrointestinal; min, minimum; max, maximum.

[a]Two cases required re-operation due to postoperative bleeding, with one instance undergoing laparoscopic surgery and another requiring open surgery due to hemorrhagic shock.

Nguyen H, et al. Ann Med Surg 2024:86:3211–5

DOI:10.1111/hpb.12003 HPB

Kimura *vs* Warshaw

REVIEW ARTICLE

Spleen-preserving distal pancreatectomy with and without splenic vessel ligation: a systematic review

Table 2 Patient characteristics

	Warshaw's technique	SVP technique
Age (years)[a]	52 (47–58)	48 (25–66)
Gender (male : female)	100:195	43:69
Indications:[b]		
Cystic and solitary pseudo papillary neoplasms:	39% (95/247)	30% (37/124)
IPMN	18% (44/247)	31% (39/124)
Neuroendocrine tumours	16% (41/247)	9% (11/124)
Malignancy	4% (10/247)	10% (12/124)
Others (cysts, pancreatitis, trauma)	23% (57/247)	20% (25/124)

[a]Data in weighted mean (range).
[b]Data in percentage (number of patients/ total number of reported patients).
IPMN, intraductal papillary mucinous neoplasm.

Jain G, et al. HPB 2013, 15, 403–410

DOI:10.1111/hpb.12003 HPB

REVIEW ARTICLE

Spleen-preserving distal pancreatectomy with and without splenic vessel ligation: a systematic review

Table 3 Peri-operative outcomes

	Warshaw's technique	SVP technique	*P*-value
Operating time (min)	160 (116–200)	215 (150–367)	< 0.001
Blood loss (ml)	301 (140–507)	391 (58–566)	< 0.001
Length of stay (days)	8 (6–11)	11. (4–21)	< 0.001

All data in weighted mean (range).

Jain G, et al. HPB 2013, 15, 403–410

DOI:10.1111/hpb.12003 HPB

REVIEW ARTICLE

Spleen-preserving distal pancreatectomy with and without splenic vessel ligation: a systematic review

Table 4 Complications

	Warshaw's technique	SVP technique	[a]*P*-value
Splenic complications:			
Post-operative splenectomy	2% (7/356)	0% (0/574)	0.001
Splenic infarction	22% (51/233)	2% (2/103)	<0.001
Perigastric varices	17% (39/232)	0% (0/15)	0.14
Submucosal varices	11% (5/46)	0% (0/15)	0.58
Intra-abdominal collections	6% (7/111)	4% (12)	0.29
Pancreatic fistula	11% (17/148)	16% (41/253)	0.15
Chronic left-sided abdominal pain	38% (5/13)	0% (0/15)	0.048

All data in percentage (number of patients/total number of reported patients).
[a]*P*-values calculated using the chi-square test.

Jain G, et al. HPB 2013, 15, 403–410

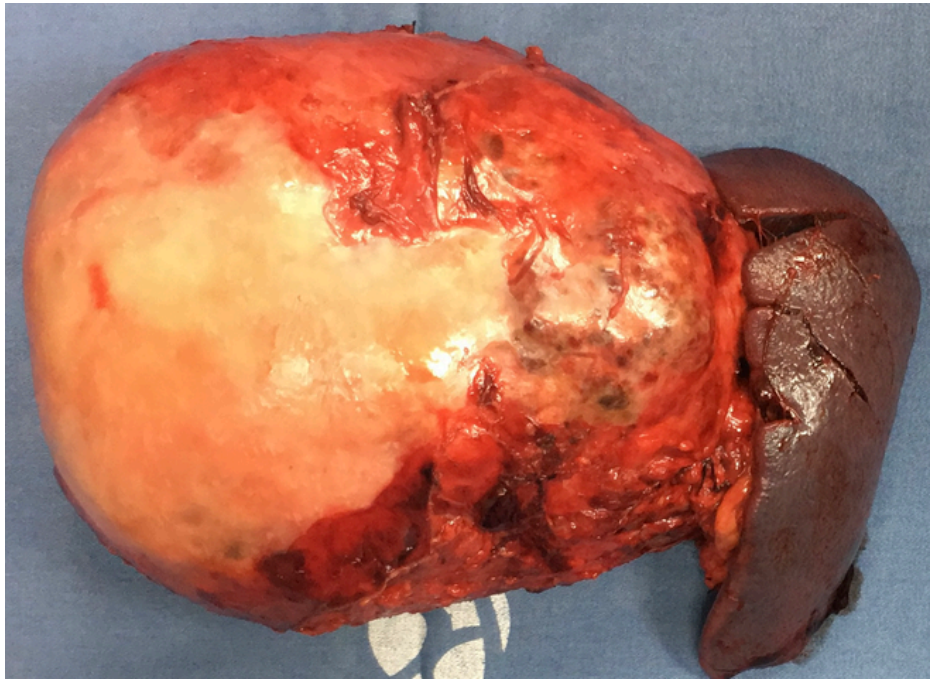
OXFORD Collaborative Research

BJS Open, 2025, zraf038
https://doi.org/10.1093/bjsopen/zraf038
Original Article

Benefit of splenectomy in distal pancreatectomy for neuroendocrine tumours: multicentre retrospective study

Neuroendocrine tumors

TUMOR SIZE



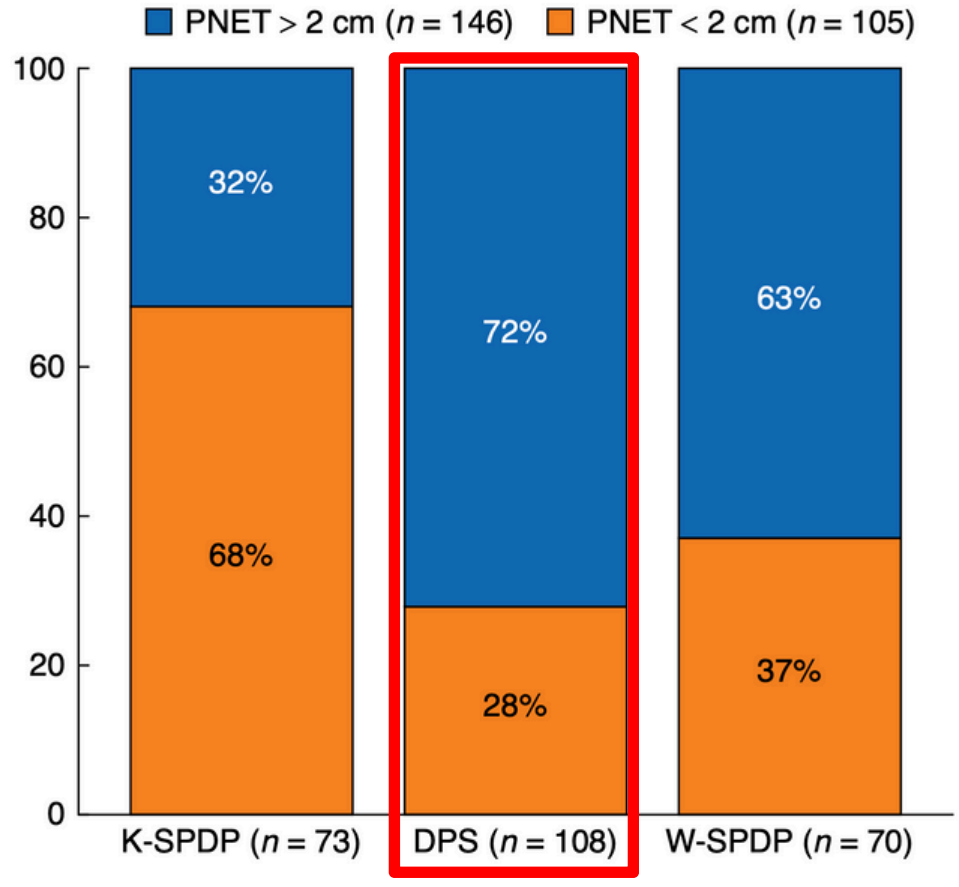


Fig. 1 Distribution of tumour size according to the type of resection

PNET, pancreatic neuroendocrine tumour; K-SPDP, Kimura spleen-preserving distal pancreatectomy; DPS, distal pancreatectomy with splenectomy; W-SPDP, Warshaw spleen-preserving distal pancreatectomy.

Clément E, et al. BJS Open, 2025

Table 3 Comparison between distal pancreatosplenectomy and Warshaw technique after propensity score matching

	Overall ($n = 140$)	DPS ($n = 70$)	W-SPDP ($n = 70$)	P
Patient outcomes				
Age (years), median (i.q.r.)	60 (50–66)	61 (54–68)	59 (47–66)	0.201
Gender, female	77 (55%)	37 (53%)	40 (57%)	0.386
BMI (kg/m^2), median (i.q.r.)	25.8 (25.7–30)	25.8 (23.2–29.8)	25.7 (21.5–30)	0.672
ASA score > 2	10 (7.1%)	6 (8%)	4 (6%)	0.327
Diabetes mellitus	21 (15%)	12 (17%)	9 (13%)	0.478
Cardiovascular disease	9 (6.4%)	3 (4%)	6 (9%)	0.301
Intraoperative outcomes				
Minimally invasive	76 (54.3%)	38 (54%)	38 (54%)	0.999
Transection at the neck	90 (64.3%)	49 (70%)	41 (59%)	0.158
Operative time (min), median (i.q.r.)	180 (179–240)	203 (148–250)	173 (120–210)	0.011
Blood transfusion	9 (6.4%)	7 (10%)	2 (3%)	0.085
Estimated blood loss (ml), median (i.q.r.)	200 (100–400)	200 (62–400)	150 (100–400)	0.436
Postoperative outcomes				
90-day mortality	3 (2.1%)	2 (3%)	1 (1%)	0.559
Reintervention	20 (14.2%)	8 (11%)	12 (17%)	0.179
90-day Clavien–Dindo grade ≥3	23 (16.4%)	10 (14%)	13 (19%)	0.278
Clinically relevant PPH	10 (7.1%)	4 (6%)	6 (9%)	0.275
Clinically relevant POPF	26 (18.6%)	13 (19%)	13 (19%)	0.999
Hospital stay (days), median (i.q.r.)	10 (7–15)	10 (8–16)	9 (7–13)	0.066
Hospital readmission rate	17 (12.1%)	14 (20%)	3 (4%)	0.004
Tumour outcomes				
Tumour size (mm), median (i.q.r.)	27 (16–40)	27 (25–45)	25 (16–40)	0.404
Grade				0.367
G1	65 (46.4%)	31 (44%)	34 (49%)	
G2	69 (49.3%)	36 (51%)	33 (47%)	
G3	2 (0.1%)	1 (1%)	1 (1%)	
Unknown	4 (0.3%)	2 (3%)	2 (3%)	
R0 resection	132 (94.3%)	64 (91%)	68 (97%)	0.145
Number of analysed lymph nodes, median (i.q.r.)	7 (2–14)	8 (2–13)	7 (1–14)	0.476
Lymph node status				0.168
pN0	85 (60.7%)	41 (59%)	44 (63%)	
pN1–2	33 (23.6%)	19 (27%)	14 (20%)	
pNx	22 (15.7%)	10 (14%)	12 (17%)	

DPS, distal pancreatectomy with splenectomy; W-SPDP, Warshaw spleen-preserving distal pancreatectomy; BMI, body mass index; ASA, American Society of Anesthesiologists; POPF, postoperative pancreatic fistula; PPH, postpancreatectomy haemorrhage.

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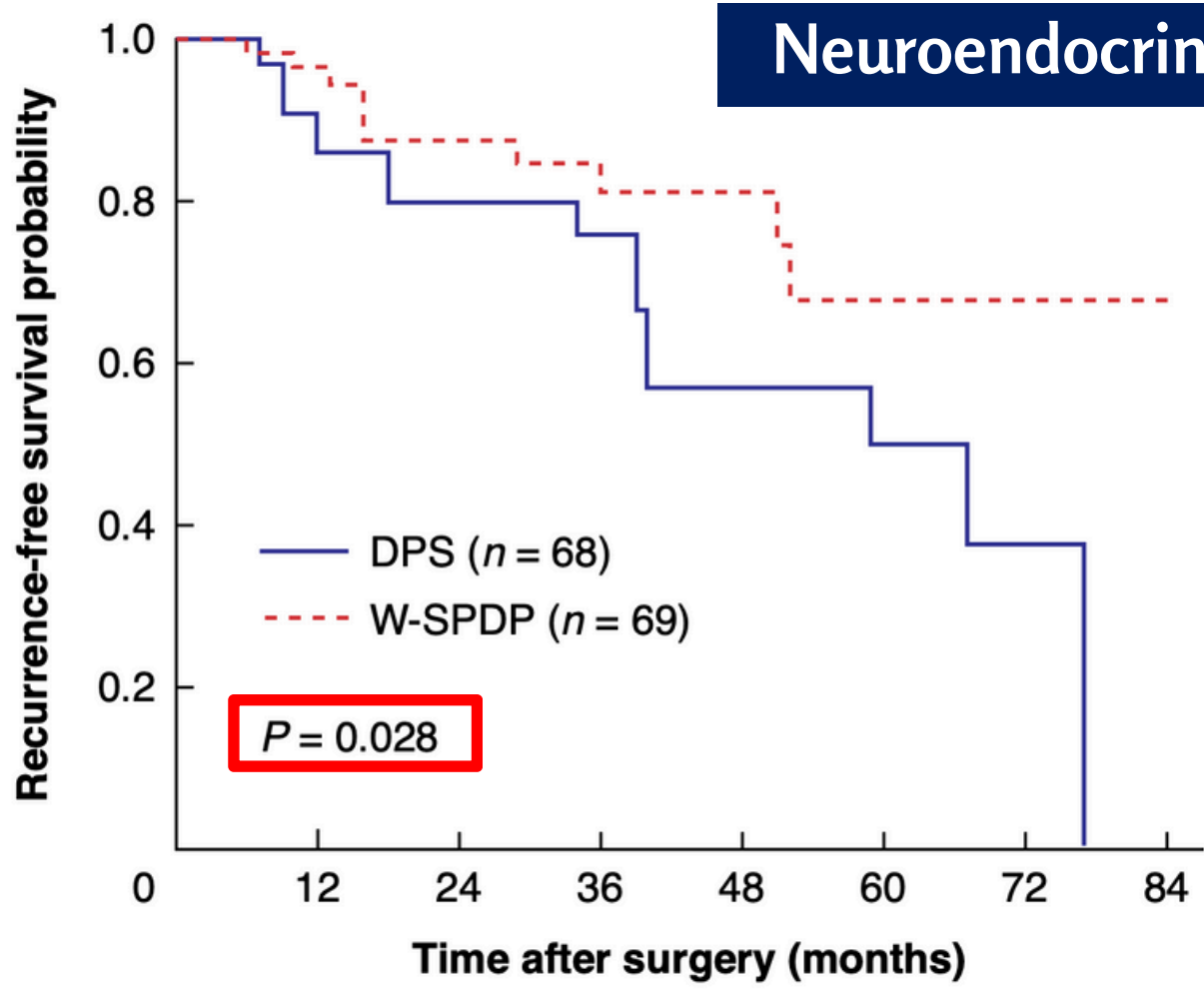
Lymph nodes

Neuroendocrine tumors

After PSM



No. at risk									
DPS	68	68	44	23	17	8	5	2	–
W-SPDP	69	64	49	31	19	10	5	2	1

Clément E, et al. BJS Open, 2025

ABCD Arq Bras Cir Dig
2019;32(3):e1461
DOI: /10.1590/0102-672020190001e1461

Original Article

LAPAROSCOPIC DISTAL PANCREATECTOMY WITH OR WITHOUT SPLEEN PRESERVATION: COMPARATIVE ANALYSIS OF SHORT AND LONG-TERM OUTCOMES

Sergio Renato **PAIS-COSTA**[1,2,3], Guilherme Costa Crispim de **SOUSA**[2,3], Sergio Luiz Melo **ARAUJO**[2,3], Olímpia Alves Teixeira **LIMA**[1,2,3], Sandro José **MARTINS**[3], Orlando J. **TORRES**[4]

TABLE 1 – Epidemiological characteristics and early results

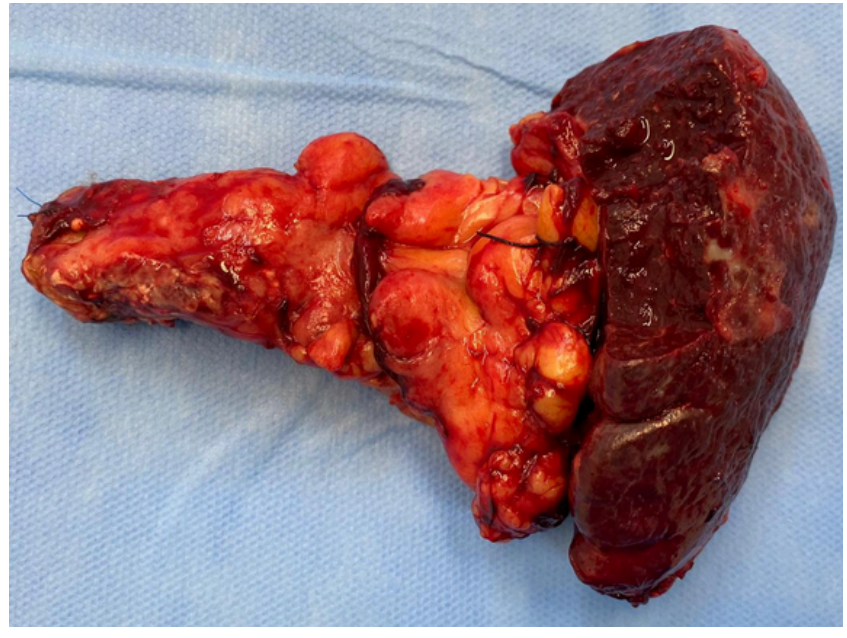
Groups	1 (Splenectomy)	2 (Spleen preservation)	p
n	32	26	0.87
Age*	51.0 years (20 – 78)	47.9 years (21 – 75)	0.43
Gender			
Female	20 (62.5 %)	17 (65.8 %)	0.85
Male	12 (37.5%)	12 (34.6 %)	
BMI*	28.5 kg/m² (18.3 – 38.3)	25.6 kg/m² (18 – 38.8)	0.06
Lesion size*	4.9 cm (2 – 12)	4.3 cm (1.8 – 7.5)	0.2
Resected lymph nodes*	7.07 (3-12)	2.72 (1-6)	0.000*
Postoperative complications	7 (22 %)	6 (23 %)	0,93
Pancreatic fistula (grades B and C)	4 (12.5%)	3 (10.3%)	0.76

*=Variables described in means, *"*=spleen excluded

SPLEEN-PRESERVING DISTAL PANCREATECTOMY

Should be avoided :

- in tumours invading the splenic vessels
- suspicious lymph nodes in the splenic hilum



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Warshaw technique

AHBPS
Annals of Hepato-Biliary-Pancreatic Surgery

Original Article

PANCREATIC DUCTAL

Outcome after spleen-preserving distal pancreatectomy by Warshaw technique for pancreatic body cancer

- Tumor was resectable without neoadjuvant therapy
- Located over 5 cm from the splenic hilum
- Not classified as T4
  - No invasion of the celiac axis, superior mesenteric artery, and/or the common hepatic artery
  - Not invade adjacent organs (stomach, duodenojejunal junction, splenic colonic flexure, left kidney)

Zhou E, et al. Ann Hepatobiliary Pancreat Surg 2025;29:177-86

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Table 3. Postoperative complications

	SPDP group (n = 21)	DPS group (n = 63)	*p*-value
Overall complications	12 (57.1)	32 (50.8)	0.801[a)]
Clavien-Dindo classification			0.387[a)]
I	4 (19.0)	5 (7.9)	
II	7 (33.3)	18 (28.6)	
IIIa	1 (4.8)	9 (14.3)	
Severe morbidity	1 (4.8)	9 (14.3)	0.439[a)]
Pancreatic fistula, Grade B	8 (38.1)	21 (33.3)	0.792[a)]
DGE, Grade B	0 (0)	8 (12.7)	0.192[a)]
Postoperative hemorrhage	0 (0)	1 (1.6)	> 0.999[a)]
Chyle leakage, Grade A	3 (14.3)	4 (6.3)	0.359[a)]
Abdominal infection	1 (4.8)	3 (4.8)	> 0.999[a)]
Ascites	1 (4.8)	3 (4.8)	> 0.999[a)]
Pulmonary infection	2 (9.5)	1 (1.6)	0.153[a)]
Incision complications	0 (0)	1 (1.6)	> 0.999[a)]
Splenic infarction	6 (28.6)	-	
Left-side portal hypertension	2 (9.5)	-	

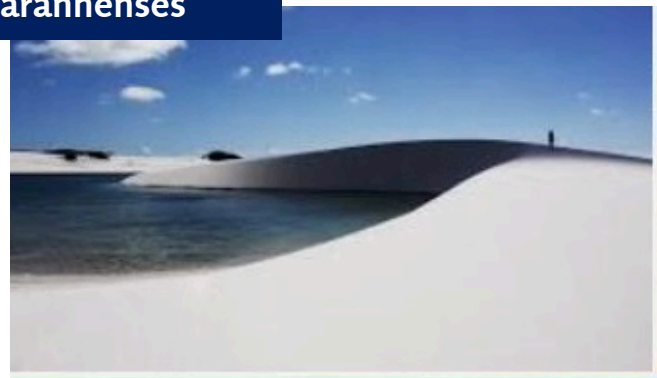
Values are presented as number (%).
SPDP, spleen-preserving distal pancreatectomy; DPS, distal pancreatectomy with splenectomy; DGE, delayed gastric emptying; NA, not available.
[a)]Fisher's exact test.

CONCLUSION

- Spleen-preserving distal pancreatectomy (SPDP) is safe
- SPDP is associated with better short-term outcomes than distal pancreatectomy with splenectomy (DPS)
- Lateral approach
- Stapler-based closure
- Transection of the pancreas at the pancreatic neck
- Kimura vs Warshaw?
- SPDP for PDAC is still under debate

Risk of inadequate oncological clearance

Lençóis Maranhenses






Thanks!