Identifying risk factors for postoperative pancreatic fistula after minimally invasive distal pancreatectomy

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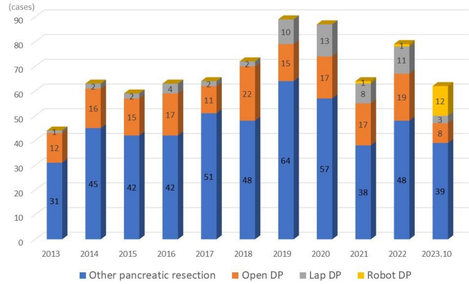
Introduction and Aim

- Postoperative pancreatic fistula (POPF) is considered one of the most significant morbidities after distal pancreatectomy (DP), and there have been numerous attempts to prevent POPF preoperatively and intraoperatively.
- This study was conducted to evaluate the risk factors for POPF following minimally invasive DP(MI-DP).

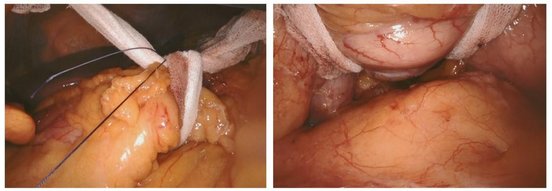
Patients and Methods

- From April 2013 to October 2023, 72 patients underwent MI-DP. One case underwent open surgery due to tumor progression, thus 71 cases were enrolled in this study.
- The primary endpoint was the incidence of clinically relevant POPF (CR-POPF), which was diagnosed according to the International Study Group of Pancreatic Fistula (ISGPF) as Grade B or C.

Pancreatic resection in our institution



Stomach Lifting Technique



The ingenuity of our institution is in devising stomach mobilization technique to improve the field of view during surgery. We covered the stomach with gauze and fixed it to the abdominal wall to secure a view of the pancreas.

Patient clinical characteristics of MI-DP

		Total (n=71)	
Gender	M : F	32 : 39	
Age	median (years)	71	(30-88)
BMI	median (kg/m2) (range)	22.2	(17.3-34.7)
HgA1c	median (%) (range)	5.8	(4.2-10.9)
Operation time	median (min) (range)	278	(117-638)
Intraoperative blood loss	median (ml) (range)	88.8	(0-1649)
Spleen preservstion	cases	19	(27%)
postoperative hospital stay	median (days) (range)	7	(4-33)

Pathologcal diagnosis

	(n=71)	
PDAC	24	(34%)
IPMN	18	(24%)
MCN	9	(13%)
SCN	5	(7%)
Neuroendocrine tumor	6	(9%)
Others	9	(13%)

Post operative pancreatic fistula (ISGPS)

POPF	(n=71)	(%)
None	22	
Biochemical Leak	36	
Grade B	13	18.3%
Grade C	0	0%

The risk factors of POPF

		POPF positive (n=13)	POPF negative (n=58)	p value
Gender	male (n=32)	11/13 (85%)	21/58 (36%)	<0.01
Age	median (years)	69	64	0.32
BMI	median (kg/m²)	20.7	22.3	0.94
HgA1c	median (%)	6.8	5.9	0.09
Tumor size	median (mm)	15	24	0.21
Disease	PDAC (n=24)	4/13 (31%)	20/58 (34%)	1.00
Operative time	median (min)	281	291	0.67
Intraoperative blood loss	median (ml)	50	62.5	0.46
Spleen preservation	positive (n=19)	4/13 (31%)	15/58 (26%)	0.74
Pancreatic thickness	median (mm)	14	12	0.03
Mein pancreatic duct size	median (mm)	2	2	0.66
Stapler	ECHELON® (n=50)	9/13 (69%)	41/58 (71%)	1.00
PGA felt wrapping	positive (n=43)	9/13 (69%)	34/58 (59%)	0.55
Pre-firing compression	positive (n=24)	1/13 (8%)	23/58 (40%)	0.048

Multivariate analysis

	odds ratio	95%CI	p value
Gender (male, n=32)	11.3	1.97-65.2	0.01
Pancreatic thickness (over 13mm, n=37)	7.98	1.35-47.2	0.02
Pre-firing compression (positive, n=24)	0.08	0.01-0.77	0.03

The predictive factors associated with POPF after MI-DP

Clinical predictor for POPF [1-3)]

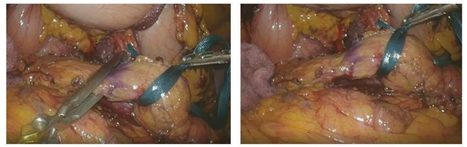
Soft pancreatic texture, higher Body Mass Index (BMI), elevated intraoperative blood loss, longer operative time, pancreatic division at the body and pancreatic thickness

No risk factors for POPF [1-3)]

age, gender, malignant pathology, types of stump closure, octreotide therapy, history of diabetes, chronic pancreatitis, splenectomy, multi-organ resection, main duct ligation, preoperative serum albumin levels, PGA felt wrapping and extended lymphadenectomy

1. S Hirono et. al. Pranreatology. 2021; 21: 480-6.
2. Tao Xia et. al. PLoS One. 2017; 24: 12:e0172857.
3. AS Mendoza et. al. Surg Endosc. 2016; 30: 649-56.

Pancreatectomy Using the Pre-firing Compression Technique



The prolonged pre-firing compression (PFC) technique to reduce POPF has been described by Nakamura in Japan. In our institute, the pancreas was compressed with an intestinal clamp at least 10 min for thick pancreas. After the procedure, the pancreatic parenchyma was divided with a linear stapler using PFC technique.

Nakamura et al. Surg Endosc. 2011; 25: 867-71

Conclusion

- Pancreatic thickness may be used to identify patients who are at a high risk of developing POPF after MI-DP.
- To prevent POPF, pre-compression using the removable clip was useful in cases with pancreatic thickness of 13 mm or more.