

Console Times and Outcomes for Completion vs. Conversion in Complex Robotic Pancreatic Surgery

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PROBLEM

Does the complexity and increased operative time of complex robotic pancreatic surgery have an impact on patient outcomes?

BACKGROUND

Evaluation of the feasibility and safety of robotic pancreatic surgery is important as indications for both benign and malignant robot surgery expands. Due to the complexity of these operations, many patients require conversion.

METHODS

Single-center retrospective review of robotic pancreatic cases performed from 2017-2019. Operative indications, final pathologic diagnosis, operative time, console time, conversion rate, operative decision making leading to conversion, hospital/ICU LOS, and perioperative complications were evaluated.

RESULTS

For pancreaticoduodenectomy (whipple) operations, there was a significantly increased console time and total operating room time compared to both open and converted cases. However, there was no difference in either the number or severity of post-operative complications.

For distal pancreatectomy/splenectomy, there was an increased console time for completed cases compared to converted, but no significant difference in total operating room time. Total operating room time for planned open cases was longer and was reflective of more complex/adjacent organ resections.

There was no significant difference in either margin positivity or nodal harvest for completed robotic, converted robotic, or open robotic cases.

Table 1 – Operative Times and Oncologic Outcomes for Pancreatic Surgery

Case Volume	Pancreaticoduodenectomy			P*	Distal Pancreatectomy			P*
	Robotic	Converted	Open		Robotic	Converted	Open	
Case Volume	12	17	34		16	6	8	
Console Time (Minutes, Mean ± SD)	397 (61)	181 (55)	X	N/A	168 (46)	131 (32)	X	
- Fellow	429 (49)	178 (62)	X	N/A	216 (31)	106 (29)	X	
- No Fellow	374 (59)	183 (51)	X	N/A	152 (38)	90 (10)	X	
Total Operating Room Time								
- Fellow	433 (49)	347 (53)	260 (64)	<0.01	220 (42)	241 (38)	211 (76)	0.67
- No Fellow	455 (42)	364 (68)	305 (68)	<0.01	247 (42)	234 (47)	160 (26)	0.02
	422 (48)	334 (40)	232 (42)	<0.01	210 (38)	253 (1)	242 (80)	0.88
Margins				0.40				1.00
- R0	11 (92%)	14 (82%)	32 (94%)		16 (100%)	6 (100%)	8 (100%)	
- R1	1 (8%)	3 (18%)	2 (6%)		0	0	0	
Nodal Harvest (Mean ± SD)	17.3 (4.6)	15.7 (5.6)	16.1 (5.7)	0.90	13.8 (8.3)	14.5 (13)	15 (9.3)	0.81
Pathology								
- Pancreatic Adenocarcinoma	3 (25%)	6 (35%)	14 (41%)		1 (6%)	2 (33%)	2 (25%)	
- Ampullary Adenocarcinoma	3 (25%)	0	2 (6%)		N/A	N/A	N/A	
- Duodenal Adenocarcinoma	0	2 (12%)	3 (9%)		N/A	N/A	N/A	
- Distal CBD Adenocarcinoma	2 (17%)	2 (12%)	1 (3%)		N/A	N/A	N/A	
- Pancreatic Neuroendocrine Tumor	1 (8%)	2 (12%)	3 (9%)		9 (56%)	2 (33%)	2 (25%)	
- IPMN	0	2 (12%)	0		1 (6%)	1 (17%)	1 (12.5%)	
- Serous Cystadenoma	1 (8%)	1 (6%)	0		4 (25%)	0	1 (12.5%)	
- Pancreatitis	1 (8%)	1 (6%)	2 (6%)		0	0	0	
- Other Benign	1 (8%)	1 (6%)	9 (26%)		1 (6%)	1 (17%)	2 (25%)	

*P values are given as robotic and converted cases combined compared to open.

OBJECTIVE

Determine if approaching complex pancreatic operations with a minimally invasive approach puts patients at risk of significantly longer operating room times, and if this translated into clinically relevant complications if these cases then went on to require conversion compared to completed robotic cases or traditional open surgery.

CONCLUSIONS

A robotic approach to complex pancreatic surgery does not result in a higher or differing complication risk profile to either cases that require conversion or to traditional open surgery. While there is an increase in total operating room time for more whipple operations, this does not appear to be clinically relevant in our institution's experience.

Table 2 – Perioperative Complications, Length of Stay for Pancreatic Surgery

Case Volume	Pancreaticoduodenectomy			P*	Distal Pancreatectomy			P*
	Robotic	Converted	Open		Robotic	Converted	Open	
Case Volume	12	17	34		16	6	8	
Surgical Mortality	1 (8%)	0	1 (3%)	0.91	0	0	0	1.00
Surgical Morbidity	7 (58%)	12 (71%)	22 (65%)	0.95	6 (37%)	2 (33%)	5 (63%)	0.20
- Minor Complications	3 (25%)	3 (18%)	4 (12%)	0.33	1 (6%)	0	2 (25%)	0.10
- Major Complications	4 (32%)	9 (53%)	18 (53%)	0.52	5 (31%)	2 (33%)	3 (38%)	0.77
Clavien-Dindo Post-Op Complications								
- 0	5 (42%)	5 (29%)	12 (35%)		10 (63%)	4 (67%)	3 (38%)	
- I	2 (17%)	2 (12%)	2 (6%)		1 (6%)	0	1 (12.5%)	
- II	1 (8%)	1 (6%)	2 (6%)		0	0	1 (12.5%)	
- IIIa	3 (25%)	7 (41%)	8 (23%)		1 (6%)	1 (17%)	3 (38%)	
- IIIb	0	0	5 (15%)		4 (25%)	0	0	
- IVa	0	1 (6%)	4 (15%)		0	1 (17%)	0	
- IVb	0	1 (6%)	0		0	0	0	
- V	1 (8%)	0	1 (3%)		0	0	0	
Post-Operative Pancreatic Fistula				0.46				0.63
- G1	0	1 (6%)	0		1 (6%)	0	1 (13%)	
- G2	1 (8%)	4 (24%)	10 (29%)		5 (31%)	1 (17%)	2 (25%)	
- G3	1 (8%)	1 (6%)	0		0	0	0	
Hospital Length of Stay (Mean ± SD)	9.7 (3.4)	10.9 (4.1)	11.6 (7.4)	0.40	6.4 (2.8)	6.8 (1.3)	6.9 (1.5)	0.69
ICU Length of Stay (Mean ± SD)	2.7 (1.8)	3.6 (2.9)	3.0 (2.1)	0.60	0.9 (1.1)	1.6 (0.9)	1.8 (2.0)	0.37
Discharge Disposition								
- Home	9	16	30		15	6	8	
- Acute Rehab	1	0	2		0	0	0	
- SNF/LTAC	1	1	1		1	0	0	

*P values are given as robotic and converted cases combined compared to open.

REFERENCES

- Shyr et al. Learning Curves for Robotic Pancreatic Surgery from Distal Pancreatectomy to Pancreaticoduodenectomy. *Medicine*, 2018. 97(45).
- Liu et al. International Consensus Statement on Robotic Pancreatic Surgery. *HepatoBiliary Surg Nutr*, 2019. 8(4):345-360.
- Zureikat et al. A Multi-Institutional Comparison of Perioperative Outcomes of Robotic