

ORIGINAL ARTICLE

Hepato-pancreatectomy: how morbid? Results from the national surgical quality improvement project

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Abstract

Background: Simultaneous resection of both the liver and the pancreas carries significant complexity. The objective of this study was to investigate peri-operative outcomes after a synchronous hepatectomy and pancreatectomy (SHP).

Methods: The American College of Surgeons National Surgical Quality Improvement Project database was queried to identify patients who underwent SHP. Resections were categorized as '< hemihepatectomy', '≥ hemihepatectomy' (hemihepatectomy and trisectionectomy), 'PD' (pancreaticoduodenectomy and total pancreatectomy) and 'distal' (distal pancreatectomy and enucleation).

Results: From 2005 to 2013, 480 patients underwent SHP. Patients were stratified based on the extent of resection: '< hemihepatectomy + distal' ($n = 224$), '≥ hemihepatectomy + distal' ($n = 49$), '< hemihepatectomy + PD' ($n = 83$) and '≥ hemihepatectomy + PD' ($n = 24$). Although the first three groups had a reasonable and comparable safety profile (morbidity 33–51% and mortality 0–6.6%), the '≥ hemihepatectomy + PD' group was associated with an 87.5% morbidity (organ space infection 58.3%, re-intubation 12.5%, reoperation 25% and septic shock 25%), 8.3% 30-day mortality and 18.2% in-hospital mortality.

Conclusions: A synchronous hemihepatectomy (or trisectionectomy) with PD remains a highly morbid combination and should be reserved for patients who have undergone extremely cautious selection.

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Introduction

Hepatic and pancreatic resections are complex operations requiring considerable expertise. Early attempts at liver resection were fraught with mortality rates up to 20% owing to parenchymal haemorrhage and liver failure.¹ However, advancements in peri-operative anaesthetic management,² surgical technique (including portal vein embolization),³ and post-operative care have resulted in substantial improvements in morbidity and mortality, with less than 5% mortality associated with a major hepatectomy in several recent studies.^{4–9} Similarly, for pancreaticoduodenectomy (PD) while morbidity remains considerably high (41–52%),^{10–12} mortality has improved from 25% to 1.7% in the last few decades.^{11–16}

What remains controversial is the safety of synchronous hepatectomy with pancreatectomy (SHP). Most studies

evaluating outcomes of SHP are limited to single institution series. The first Japanese study on 'hepato-pancreaticoduodenectomy' reported a 79% morbidity and 24% mortality in 24 patients with advanced hepatobiliary cancers.¹⁷ However, more recent Japanese studies have shown a modest improvement in post-operative morbidity and mortality after SHP.^{18,19} Ebata *et al.*¹⁸ demonstrated a temporal reduction in mortality from 31% in the 1980s to 14% in the 2000s. While the short- and long-term outcomes of SHP have been extensively studied in Asia, there is a paucity of literature on outcomes of SHP in the West. In 2004, Memorial Sloan Kettering reported an overall post-operative morbidity of 47% and post-operative mortality of 18% in 17 patients who underwent SHP for advanced hepatobiliary cancers.²⁰ More recently, Hemming *et al.* revealed an overall morbidity of 35% and no peri-operative deaths in 40 patients undergoing SHP.²¹ However, owing to the small size and heterogeneous mix of surgical procedures in these single-institution studies, the experience of SHP in the West remains limited. Thus, the objective of this study was to

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Table 1 Clinical characteristics

	<Hemi-hepatectomy + Distal (n = 224)	≥Hemi-hepatectomy + Distal (n = 49)	<Hemi-hepatectomy + PD (n = 183)	≥Hemi-hepatectomy + PD (n = 24)	P-value
Age	58 (21–84)	58 (20–86)	64 (25–88)	53 (26–78)	0.001
Race					
White	170 (75.9)	35 (71.4)	144 (78.7)	17 (70.8)	0.460
Black	26 (11.6)	5 (10.2)	12 (6.6)	2 (8.3)	
Asian	9 (4.0)	3 (6.1)	14 (7.7)	2 (8.3)	
Other	19 (8.5)	6 (12.2)	13 (7.1)	3 (12.5)	
Female	129 (57.6)	24 (49)	191 (55.2)	9 (37.5)	0.232
BMI	28 (16–68)	26 (17–40)	27 (17–50)	26 (17–40)	0.071
Any Comorbidity (n = 380)	45 (26.5)	6 (16.2)	37 (24.5)	3 (15.8)	0.528
Smoker	27 (12.1)	7 (14.3)	32 (17.5)	1 (4.2)	0.213
Diabetes	43 (19.2)	3 (6.1)	35 (19)	3 (12.5)	0.114
COPD	5 (2.2)	2 (4.1)	7 (3.8)	0 (0)	0.652
HTN on medication	104 (46.4)	14 (28.6)	91 (49.7)	6 (25)	0.011
TIA (n = 273)	2 (1.6)	0 (0)	0 (0)	0 (0)	0.656
CVA (n=273)	1 (0.8)	0 (0)	2 (1.9)	0 (0)	0.766
Sepsis	4 (1.8)	3 (6.1)	6 (3.3)	0 (0)	0.303
Pre-operative chemotherapy (n = 272)	5 (4.0)	3 (10)	8 (7.8)	1 (6.3)	0.423
Pre-operative Radiotherapy (n = 272)	4 (3.2)	0 (0)	3 (1.9)	0 (0)	0.695
Creatinine	0.8 (0.3–2.4)	0.9 (0.4–1.6)	0.8 (0.3–2.43)	0.84 (0.6–1.3)	0.472
Albumin	3.9 (1–5.1)	3.9 (2–4.8)	3.8 (1.6–5)	3.8 (2.1–5.1)	0.109
Bilirubin	0.6 (0.1–2.2)	0.6 (0.1–8.9)	0.6 (0.6–11.5)	0.7 (0.1–8.9)	<0.001
Platelet	228 (40–588)	225 (106–428)	250 (23–620)	278 (166–590)	0.011
INR	1 (0.8–1.9)	1 (0.8–1.7)	1 (0.74–9.1)	1 (0.91–1.2)	0.878
ASA Class > 3	158 (70.5)	37 (75.5)	126 (68.9)	20 (83.3)	0.442

ASA, American Society of Anesthesiologist; TIA, transient ischaemic attack; HTN, hypertension; COPD, chronic obstructive pulmonary disease; BMI, body mass index; CVA, cerebral vascular attack; INR, International normalized ratio.

determine the short-term outcomes of SHP in North America using the American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP).

Patients and methods

The ACS-NSQIP Participant Use File was queried to identify all patients who underwent any hepatic or pancreatic resections from 1 January 2005 to 31 December 2013. The ACS-NSQIP is a nationally validated, outcomes-based and risk-adjusted programme used to measure and assess the quality of surgical care in participating institutions. Initially introduced in 1991 to assess post-operative morbidity and mortality in the Veteran Affairs (VA) Health System, the success of the VA-NSQIP sub-

sequently led to the expansion of NSQIP into the private sector. Currently, there are 569 sites enrolled in ACS-NSQIP, which represents 10% of 5686 hospitals in the United States. Trained and certified surgical clinical nurse reviewers prospectively collect and report pre-, intra- and post-operative outcomes on each patient into an electronic clinical registry.

Current procedural terminology (CPT) codes were used to determine cases in which patients underwent both hepatic and pancreatic resections. CPT code 47120 (partial lobectomy) was classified as '< hemihepatectomy'. CPT codes 47122 (trisegmentectomy), 47125 (total left lobectomy) and 47130 (total right lobectomy) were classified as '≥ hemihepatectomy'. CPT codes 48120 (enucleation), 48140 (distal pancreatectomy), 48145 (distal pancreatectomy with pancreatojejunostomy) and

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