PERIOPERATIVE OUTCOMES OF OPEN AND ROBOTIC VENTRAL HERNIA REPAIR: A PROPENSITY SCORE MATCHED ANALYSIS OF 16,246 PATIENTS

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Background

Ventral hernia repair (VHR) is one of the most common procedures in general surgery. While open repair is the standard of care, robotic VHR (R-VHR) has gained popularity due to potential better clinical outcomes and surgical ergonomics. Outcomes between these approaches on large cohorts are an active area of study.

Methods

Study population

Patients >18 undergoing open or robotic VHR with 30-day follow up reported in the ACHQC registry.

Analysis

Propensity score matching adjusted for demographics, comorbidities, hernia and operative characteristics was used to create comparable open vs robotic approach cohorts (n = 8,123).

Logistic regression was used for postoperative outcomes and multivariate logistic regression was used to compare risk factors for GI complications.

Results

After PSM

Patients in the robotic repair cohort had a higher BMI, larger hernia width, and more incisional hernias than the open VHR cohort.

Postoperative outcomes

Patients who underwent R-VHR had shorter LOS (p<0.001), lower rates of GI complications at 30 days compared to open VHR (0.9% vs 1.6%, p<0.001), less overall surgical site occurrences and infections (p<0.001), and less procedural interventions p<0.001) with a higher seroma rate p<0.001). Readmission rates, reoperations and hernia recurrence were similar between groups (overall 2.9%, 0.2%, and 1%, respectively).

Multivariate analysis

Robotic approach was found to be protective factor for GI complications (OR 0.58), SSO/SSI (OR 0.71) , and occurrences that required a procedural intervention (OR 0.44).

Characteristics	Robotic (n=*8123*)	Open (n=*8123*)	*p*
Age, median (IQR)	57 (47-67)	57 (47-67)	NS
Male sex, *% (n)*	52 (4234)	55 (4435)	0.62
Race, *% (n)*			
White	81 (6538)	85 (6845)	<0.001
Non white	19 (1574)	15 (1251)	
BMI, *median* (IQR)	32 (28-36)	32 (28-36)	0.002
Hypertension, *% (n)*	49 (3969)	46 (3768)	0.002
Diabetes, *% (n)*	17 (1353)	17 (1369)	NS
Hepatic Insufficiency *% (n)*	0.56 (44)	1.1 (81)	<0.001
Dialysis, *% (n)*	0.46 (37)	0.60 (49)	NS
COPD, *% (n)*	5.1 (411)	5.9 (482)	0.015
ASA class, *% (n)*			
1	7.6 (617)	10.5 (847)	
2	48.1 (3900)	46.1 (3725)	<0.001
3	42.8 (3467)	41.3 (3337)	
4	1.5 (119)	2.2 (175)	
Hernia Width, *median* (IQR)	4 (2-6)	2 (1.5-6)	<0.001
Recurrent, *% (n)*	21 (1730)	21 (1715)	0.39
Primary indication, *% (n)*			
Fistula	0.1 (7)	0.2 (16)	0.041
Infected Mesh	0.2 (5)	0.3 (23)	NS
Bowel obstruction	4.2 (338)	4.3 (347)	NS

Table 1. Demographics, comorbidities, and perioperative characteristics of PSM cohorts

30- day Outcomes	Robotic *n* = 8123	Open *n* = 8123	*p*
Length of stay, *median (IQR)*	0 (0-1)	0 (0-3)	<0.001
GI complications, *% (n)*	0.9 (74)	1.6 (131)	<0.001
SSI, *% (n)*	0.6 (54)	2.4 (197)	<0.001
SSO or SSI, *% (n)*	7.5 (611)	9.1 (736)	<0.001
SSO or SSI with Intervention, *% (n)*	1.4 (113)	3.2 (257)	<0.001
Seroma, *% (n)*	5.6 (456)	3.3 (270)	<0.001

Table 2. Univariate analysis of postoperative complications within 30 days of surgery.

	Length of stay (0 vs ≥1)				GI complications			
	U		M		U		M	
	OR (95% CI)		OR (95% CI)		OR (95% CI)		OR (95% CI)	
Age (55 to 65)	1.26 (1.19 - 1.34)		1.14 (1.05-1.24)		1.48 (1.12 - 1.95)		1.02 (0.78-1.34)	NS
BMI (27 to 32)	1.24 (1.18 – 1.29)		0.93 (0.87-0.99)	NS	0.94 (0.71 - 1.25)	NS		
ASA (<3 vs ≥3)	3.13 (2.93 - 3.35)		1.43 (1.30-1.58)		4.04 (2.93 - 5.56)		1.90 (1.35-2.67)	
Recurrent Hernia	4.48 (4.13 - 4.86)		1.58 (1.42-1.77)		2.73 (2.06 – 3.61)		1.11 (0.82-1.51)	NS
Frailty score (<3 vs ≥3)	3.20 (2.57 - 3.98)				2.48 (1.34 - 4.59)			
Wound status (clean vs other)	8.49 (6.79 - 10.61)		6.08 (4.44-8.33)		3.96 (2.59 - 6.08)		2.14 (1.38-3.34)	
Incisional hernia vs primary	9.49 (8.76-10.31)		2.07 (1.84-2.32)		4.97 (3.37-7.33)		1.20 (0.74-1.96)	NS
Hernia width (3 to 6)	7.07 (6.41 – 7.79)		5.34 (4.77-5.97)		6.31 (4.76 - 8.36)		2.23 (1.55-3.21)	
Robotic vs Open Approach	1.02 (0.96 - 1.09)	NS			0.56 (0.42 - 0.75)		0.58 (0.43-0.78)	
Mesh location: Onlay vs Sublay	1.69 (1.44 - 1.98)		1.46 (1.20-1.79)		0.51 (0.21 - 1.25)	NS		
Concomitant Procedures	1.27 (1.16 - 1.40)		1.74 (1.49-2.03)		1.07 (0.71 - 1.59)	NS		
	SSO/I				**SSOPI**			
	U		M		U		M	
	OR (95% CI)		OR (95% CI)		OR (95% CI)		OR (95% CI)	
Age (55 to 65)	0.97 (0.88 - 1.07)	NS	0.89 (0.80 – 1.003)	NS	0.99 (0.83 - 1.20)	NS	0.95 (0.77 – 1.16)	
BMI (27 to 32)	1.41 (1.31 – 1.53)		1.24 (1.13-1.35)		1.48 (1.26 – 1.73)		1.17 (0.99-1.39)	
ASA (<3 vs ≥3)	2.50 (2.22 - 2.81)		1.61 (1.41-1.83)		2.87 (2.30 - 3.58)			
Recurrent Hernia	2.17 (1.92 - 2.48)		1.21 (1.06-1.39)		2.98 (2.42 – 3.67)		1.43 (1.12-1.82)	
Frailty score (0 to 1)	1.49 (1.40 – 1.59)		1.16 (1.08-1.26)		1.62 (1.45 – 1.82)		1.24 (1.09-1.41)	
Wound status (clean vs other)	2.07 (1.64 - 2.62)		1.29 (0.98-1.69)	NS	4.18 (3.03 - 5.76)		2.17(1.47-3.20)	
Incisional hernia vs primary	2.63 (2.32 - 2.98)		1.45 (1.22-1.73)		3.33 (2.56 – 4.35)		1.21 (0.85-1.72)	NS
Hernia width (3 to 6)	1.94 (1.72 – 2.19)		1.44 (1.25-1.67)		2.20 (1.75 – 2.77)		1.76 (1.34-2.31)	
Robotic vs Open Approach	0.82 (0.73 - 0.91)		0.71 (0.63-0.81)		0.43 (0.35 - 0.54)		0.44 (0.34-0.56)	
Mesh location: Onlay vs Sublay	1.40 (1.09 - 1.78)		1.13 (0.88-1.46)	NS	2.20 (1.52 - 3.18)		1.62 (1.10-2.38)	
Concomitant Procedures	1.02 (0.87 - 1.20)	NS			1.18 (0.88 - 1.58)	NS		

Figure 1. Univariate (U) and Multivariate (M) logistic regression for LOS, GI Complications, SSO/SSI, and SSO/SSI requiring procedural intervention (SSOPI)

Conclusions

Robotic ventral hernia repair may offer advantages over the traditional open approach. Although seroma formation is slightly more common with robotic repair, this cohort also demonstrated shorter LOS, less SSI/SSO, and less GI complications. Therefore, robotic ventral hernia repair is a safe and often favorable option in carefully selection patients undergoing ventral hernia repair.

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