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INTRODUCTION

- > Inguinal hernia repair (IHR) is one of the most common surgical procedures.
- > While Robot-assisted IHR using da Vinci surgical system (dV-RIHR) have been increasing as an alternative to a laparoscopic (LIHR) or Open surgical approach.
- > A meta-analysis is needed to guide evidence-based decisions and optimize IHR treatment strategies.

AIM

This study aims to review the latest evidence on dV-RIHR and compare its pooled outcomes with those of standard LIHR and Open procedures.



dV-RIHR









Open IHR

METHODS

> A search of PubMed, Embase, and Scopus covering the period from January 1, 2010 to December 31, 2024 was conducted for studies comparing dV-RIHR, LIHR, and Open approach.

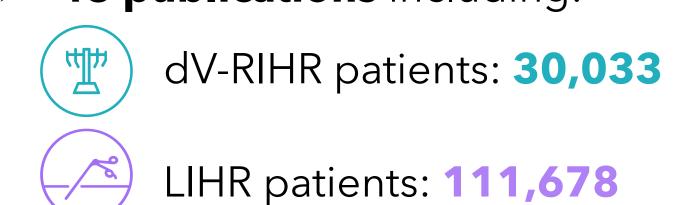
LIHR

- > Publications were excluded for the following: if not in English, pediatric cases, mixed procedures or study arms, no relevant outcomes, or redundant data.
- Outcomes assessed include:

Follow up	Outcomes
Intraoperative	Operative time, conversions, blood transfusions
Index hospitalization	Hospital stay, pain scores (VAS)
Postoperative 30-days	Postoperative complications, surgical site infections, pain event, reoperations, readmissions, mortality
Postoperative 90-days	Need for pain medication, Return to activities of daily living (ADL), return to work
Postoperative 1-year	Hernia recurrence, pain event, pain scores (VAS)
Postoperative 2-years	Hernia recurrence, pain event, pain scores (VAS)

RESULTS

> 48 publications including:



Open patients: 323,240

■ 1b - RCTs 2b - Prospective cohort studies 2c - Database studies

3b - Retrospective cohort studies

RESULTS

Table 1. Comparative analysis by between dV-RIHR vs LIHR:

Outcome	Studies	dV-RIHR N	LIHR N	Effect size	Effect p-value	Heterogeneity	Model	Conclusions
Operative time: Bilateral repair (min)	15	556	996	MD: 24.17 [14.93, 33.42]	p<0.01	I ² = 87%; p<0.01	Random	Favors LIHR
Operative time: Unilateral repair (min)	20	3445	14172	MD: 19.88 [13.57, 26.19]	p<0.01	I ² = 94%; p<0.01	Random	Favors LIHR
Conversion to Open (%)	17	9229	11185	OR: 0.36 [0.17, 0.75]	p<0.01	I ² = 82%; p<0.01	Random	Favors dV-RIHR
1-year Recurrence (%)	11	2792	5508	OR: 0.5 [0.31, 0.78]	p<0.01	$I^2 = 0\%$; p=0.58	Fixed	Favors dV-RIHR
≥2-year Recurrence (%)	9	2921	5347	OR: 0.51 [0.33, 0.79]	p<0.01	I ² = 0%; p=0.58	Fixed	Favors dV-RIHR
Index hospitalization VAS pain (score)	4	156	133	MD: -1.02 [-1.85, -0.19]	p=0.02	I ² = 81%; p<0.01	Random	Favors dV-RIHR
* All other outcomes were compa	rable betv	veen dV-RI	HR and L	IHR.				

Table 2. Comparative analysis by between dV-RIHR vs Open-IHR:

Outcome	Studies	dV-RIHR N	Open N	Effect size	Effect p-value	Heterogeneity	Model	Conclusions
Operative time: Bilateral repair (min)	5	159	287	MD: 26.69 [10.04, 43.34]	p<0.01	I ² =70%; p<0.01	Random	Favors Open
Operative time: Unilateral repair (min)	8	2166	68949	MD: 24.44 [12.1, 36.78]	p<0.01	l ² = 99%; p=0	Random	Favors Open
Index hospitalization VAS pain (score)	2	124	197	MD: -3.37 [-6.30 ; -0.44]	p=0.02	$I^2 = 69\%$; p=0.07	Random	Favors dV-RIHR
30-days Postoperative Pain (%)	3	2249	2236	OR: 0.32 [0.16, 0.67]	p<0.01	$I^2 = 0\%$; p=0.96	Fixed	Favors dV-RIHR
90-days Pain medication (%)	4	855	2715	OR: 0.49 [0.37, 0.66]	p<0.01	I ² = 44%; p=0.14	Fixed	Favors dV-RIHR
* All other outcomes were compar	rable betw	veen dV-RI	HR and C	pen-IHR.				

Figure 1. Detailed Forest-plot for Conversion to open surgery Forest plot between dV-RIHR vs LIHR:

Study or dV-	RIHR Conve	R Conversion LIHR Conversio			on	Odds Ratio	Odds	Odds Ratio	
Subgroup	Events	Total				MH, Random, 95% CI	MH, Random, 95% CI		
Study Type = Retro							:		
Abdelmoaty 2018	32	633	73	1471	22.6%	1.0197 [0.6657; 1.5618]	-	-	
Aghayeva 2020	0	43	0	43	0.0%				
Amundson 2022	0	20	0	147	0.0%				
Chao 2024	0	279	5	763	5.1%	0.2322 [0.0129; 4.1833]	-	<u> </u>	
Choi 2023	0	50	0	50	0.0%				
Hinojosa-Ramirez 202	4 0	20	0	78	0.0%				
Hsu 2022	0	207	2	305	4.7%	0.2925 [0.0140; 6.1245]	- - :		
Khoraki 2019	0	45	1	138		1.0073 [0.0403; 25.1640]	;	•	
Kudsi 2017	0	118	1	157		0.4402 [0.0178; 10.9029]	` :		
Kudsi 2022	1	547	13	606		0.0835 [0.0109; 0.6408]	:		
Muysoms 2018	0	49		64	0.0%				
Peltrini 2023	0			80	0.0%				
Quinn 2024	0	41	0	20	0.0%				
Saito 2020	0	20	0	146					
Shah 2022	30			3692		0.3760 [0.2455; 0.5758]	-		
Total (95% CI)	63					0.4643 [0.2204; 0.9780]	•	_	
Heterogeneity: Tau ² = 0.	_								
Test for overall effect: Z			. 0 (1	5.02), 1	00.0007				
Study Type = Pros									
LeBlanc 2020	0	80	1	80	4.3%	0.3292 [0.0132; 8.2027]			
Study Type = Databa	ise								
Lunardi 2024	80	3345	357	3345	23.8%	0.2051 [0.1601; 0.2627]	-		
Total (95% CI)	143	9229	531	11185	100.0%	0.3616 [0.1741; 0.7511]			
Heterogeneity: Tau ² = 0.								T	
Test for overall effect: Z	= -2.73 (P < 0	.01)	-	-			0.1 0.5	1 2 10	
Test for subgroup differences: Chi ² = 4.22, df = 2 (P = 0.12)						Favors dV-RIHR	Favors LIHR		

RESULTS

Compared to LIHR, patients undergoing dV-RIHR had:

- ↑ Operative time for bilateral repair by **24 minutes**
- ↑ Operative time for unilateral repair by **20 minutes**
- Conversions by 64%
- Index hospitalization pain scores (VAS) by 1.02 points
- 1-year hernia recurrence by **50%**
- 2-year hernia recurrence by 49%
- > All other outcomes were comparable

Compared to Open, patients undergoing dV-RIHR had:

- ↑ Operative time for bilateral repair by **27 minutes**
- ↑ Operative time for unilateral repair by **24 minutes**
- Index hospitalization pain scores (VAS) by 3.37 points
- , 30-day postoperative pain by **68%**
- 90-day pain medications by **51%**
- > All other outcomes were comparable

CONCLUSIONS

- > The da Vinci system is a safe and effective option for benign IHR, offering improved conversion rates, lower pain scores and better recurrence rates at 1- and 2-year follow-ups compared to LIHR.
- > dV-RIHR demonstrates superior pain-related outcomes and comparable results in other metrics when compared to the open approach.
- > Further research is necessary to better understand pain and quality of life outcomes.

TABLES/REFERENCES



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