ROBOT-ASSISTED INCISIONAL HERNIA REPAIR COMPARED WITH LAPAROSCOPIC INCISIONAL HERNIA REPAIR: A SYSTEMATIC REVIEW AND META-ANALYSIS

Jose Peñafiel MD, Phillip Avelino, Lucas Amorim, Louinne Teixeira MD, Gabriela Valladares, MSc, Amanda Cyntia Lima Fonseca Rodrigues, Felipe Rosa MD

INTRODUCTION

Every year, millions of abdominal surgical procedures are performed worldwide, and incisional hernia is a latent complication that can be present, whose incidence is estimated to be around 10-15% of all laparotomies. The number of procedures has increased exponentially with the introduction of the robotic-assisted surgical approach to incisional hernia repair.

However, the potential benefits of surgical robotics in incisional hernia repair with a focus on patient outcomes compared to the laparoscopic technique are unclear.

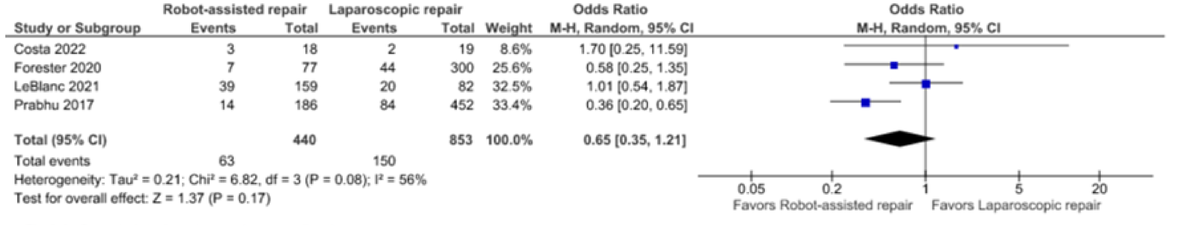
We aimed to perform a systematic review and meta-analysis comparing the efficacy and safety outcomes of robot-assisted and laparoscopic techniques for incisional hernia repair.

METHODS

PubMed, Embase, Scopus, Cochrane databases, and conference abstracts were systematically searched for studies that directly compared robot-assisted incisional hernia repair with laparoscopic techniques and reported safety or efficacy outcomes in follow-up ≥1 month.

The primary endpoints of interest were postoperative complications and hospital length of stay. Statistical analysis was performed using RevMan 5.4.1. Heterogeneity was assessed with I^2 statistics.

Fig. 1 Forest plot of robot-assisted incisional hernia repair compared with laparoscopic repair

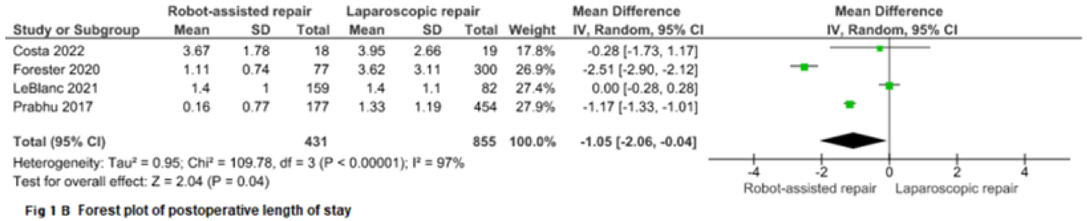


Study or Subgroup	Robot-assisted repair Events	Total	Laparoscopic repair Events	Total	Weight	Odds Ratio M-H, Random, 95% CI
Costa 2022	3	18	2	19	8.6%	1.70 [0.25, 11.59]
Forester 2020	7	77	44	300	25.6%	0.58 [0.25, 1.35]
LeBlanc 2021	39	159	20	82	32.5%	1.01 [0.54, 1.87]
Prabhu 2017	14	186	84	452	33.4%	0.36 [0.20, 0.65]
Total (95% CI)		**440**		**853**	**100.0%**	**0.65 [0.35, 1.21]**
Total events	63		150			

Heterogeneity: Tau² = 0.21; Chi² = 6.82, df = 3 (P = 0.08); I² = 56%
Test for overall effect: Z = 1.37 (P = 0.17)

Odds Ratio M-H, Random, 95% CI
0.05 0.2 1 5 20
Favors Robot-assisted repair Favors Laparoscopic repair

Fig 1 A Forest plot of postoperative complications

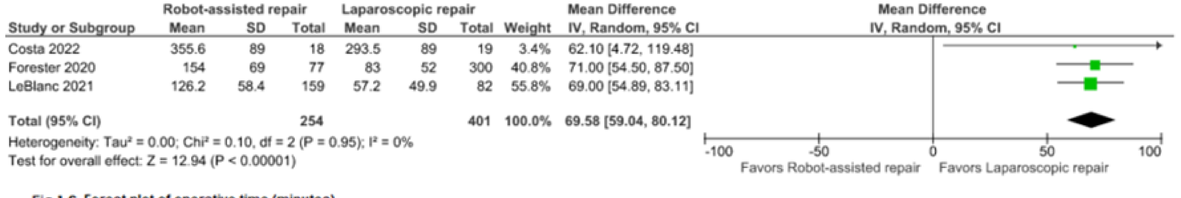


Study or Subgroup	Robot-assisted repair Mean	SD	Total	Laparoscopic repair Mean	SD	Total	Weight	Mean Difference IV, Random, 95% CI
Costa 2022	3.67	1.78	18	3.95	2.66	19	17.8%	-0.28 [-1.73, 1.17]
Forester 2020	1.11	0.74	77	3.62	3.11	300	26.9%	-2.51 [-2.90, -2.12]
LeBlanc 2021	1.4	1	159	1.4	1.1	82	27.4%	0.00 [-0.28, 0.28]
Prabhu 2017	0.16	0.77	177	1.33	1.19	454	27.9%	-1.17 [-1.33, -1.01]
Total (95% CI)			**431**			**855**	**100.0%**	**-1.05 [-2.06, -0.04]**

Heterogeneity: Tau² = 0.95; Chi² = 109.78, df = 3 (P < 0.00001); I² = 97%
Test for overall effect: Z = 2.04 (P = 0.04)

Mean Difference IV, Random, 95% CI
-4 -2 0 2 4
Robot-assisted repair Laparoscopic repair

Fig 1 B Forest plot of postoperative length of stay

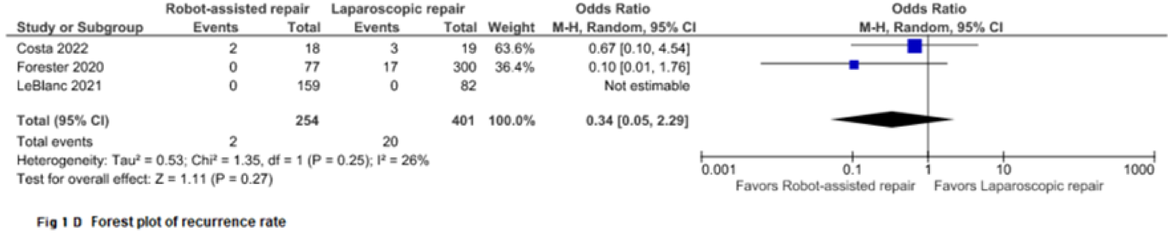


Study or Subgroup	Robot-assisted repair Mean	SD	Total	Laparoscopic repair Mean	SD	Total	Weight	Mean Difference IV, Random, 95% CI
Costa 2022	355.6	89	18	293.5	89	19	3.4%	62.10 [4.72, 119.48]
Forester 2020	154	69	77	83	52	300	40.8%	71.00 [54.50, 87.50]
LeBlanc 2021	126.2	58.4	159	57.2	49.9	82	55.8%	69.00 [54.89, 83.11]
Total (95% CI)			**254**			**401**	**100.0%**	**69.58 [59.04, 80.12]**

Heterogeneity: Tau² = 0.00; Chi² = 0.10, df = 2 (P = 0.95); I² = 0%
Test for overall effect: Z = 12.94 (P < 0.00001)

Mean Difference IV, Random, 95% CI
-100 -50 0 50 100
Favors Robot-assisted repair Favors Laparoscopic repair

Fig 1 C Forest plot of operative time (minutes)



Study or Subgroup	Robot-assisted repair Events	Total	Laparoscopic repair Events	Total	Weight	Odds Ratio M-H, Random, 95% CI
Costa 2022	2	18	3	19	63.6%	0.67 [0.10, 4.54]
Forester 2020	0	77	17	300	36.4%	0.10 [0.01, 1.76]
LeBlanc 2021	0	159	0	82		Not estimable
Total (95% CI)		**254**		**401**	**100.0%**	**0.34 [0.05, 2.29]**
Total events	2		20			

Heterogeneity: Tau² = 0.53; Chi² = 1.35, df = 1 (P = 0.25); I² = 26%
Test for overall effect: Z = 1.11 (P = 0.27)

Odds Ratio M-H, Random, 95% CI
0.001 0.1 1 10 1000
Favors Robot-assisted repair Favors Laparoscopic repair

Fig 1 D Forest plot of recurrence rate

RESULTS

The range of follow-up in the studies was one month to 24 months. Overall, postoperative complications (OR 0.65; 95% CI 0.35-1.21; p =0.17; I^2 = 56%) appeared to occur less frequently in the robot-assisted repair compared to laparoscopic surgery; length of hospital stay (OR -1.05; 95% CI -2.06, -0.04; p=0.04; I^2= 97%); recurrence rate (OR 0.34; 95% CI 0.05-2.29; p = 0.27; I^2 = 26%) were decreased for the robot-assisted group, although a strong statement cannot be made due to the heterogeneity.

However, the robotic-assisted repair had a significantly longer operative time (mean difference 69.58; 95% CI 59.04-80.12; p=0.001; I^2= 0 %.).

CONCLUSION

These results suggest that the robotic approach was associated with longer operative time than laparoscopic repairs, but with shorter length of stay and lower complication and recurrence rates. Further trials are warranted in defining the role of robotic-assisted repair of incisional hernia.