Surgical Outcomes of Robotic vs Laparoscopic Inguinal Hernia Repair: A Systematic Review

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Aim- To determine whether robotic IHR has superior surgical outcomes compared to laparoscopic IHR, including immediate post-operative complications and long-term complications of chronic groin pain and recurrence.

Summary- A systematic literature search of five databases was performed to identify articles reporting surgical outcomes of robotic IHR or comparing outcomes of robotic and laparoscopic IHR. Data regarding rates of different complications, operative time, hospitalisation time, chronic groin pain, recurrence and 30-day re-admissions was extracted and compared. Robotic IHR was found to have lower rates of complications but a longer operative time compared to laparoscopic IHR.

Introduction

Inguinal hernia repair (IHR) is one of the most commonly performed general surgeries in the UK; the lifetime risk of inguinal hernias is 27% for males and 3% for females (1). Currently, surgical management is via the open or laparoscopic approaches. Laparoscopic IHR has many immediate and long-term complications, including chronic groin pain (CGP) suffered by 6-7% of patients (2) and recurrence. Robotic surgery has been found to overcome limitations of laparoscopy and offer many advantages, including increased precision, 3D visualisation and filtering of the physiologic tremor.

Previous systematic reviews have concluded that robotic IHR is safe and effective, but data on long-term outcomes was lacking. Operative times were found to be longer for robotic IHR (improving with experience) and the rates of post-operative complications were lower (3,4).

Methods

A systematic search was conducted using a key word strategy of the following databases from inception until 21st April 2020:

- PubMed
- Cochrane Library
- EMBASE
- Scopus
- Web of Science

Bibliographies were saved using online reference manager EndNote and screened by title/ abstract and then by full text.

Table 1: Inclusion and exclusion criteria

Inclusion Criteria:	Exclusion Criteria:
Article reports surgical or post-operative outcomes of robotic IHR in adults	Non- English papers (where translated copy is not available)
Article compares surgical outcomes of robotic and laparoscopic IHR in adults	Full text of article is not available or cannot be access via the institutional library
Article reports long-term outcomes of robotic inguinal hernia repair in adults	Non-human or paediatric studies

Outcome measures for which data was extracted included:

1) Operative time
2) Hospitalisation time
3) Overall immediate post-operative complication rate
4) Wound complications
5) Conversion rate
6) Urinary retention
7) Post-operative pain and analgesia
8) Hernia recurrence rate
9) Follow-up time
10) Chronic groin pain
11) Cosmesis
12) 30-day readmission rate

Data was input into Microsoft Excel spreadsheet and standardised. Descriptive statistics were used to summarise patient demographics and the outcomes listed above. Independent t-test was used to compare complication rates between the robotic and laparoscopic groups. A 95% confidence interval was used for all analyses and a P value <0.05 was considered significant. Quantitative data was analysed with random effects metanalyses using RevMan 5.4 software.

Results

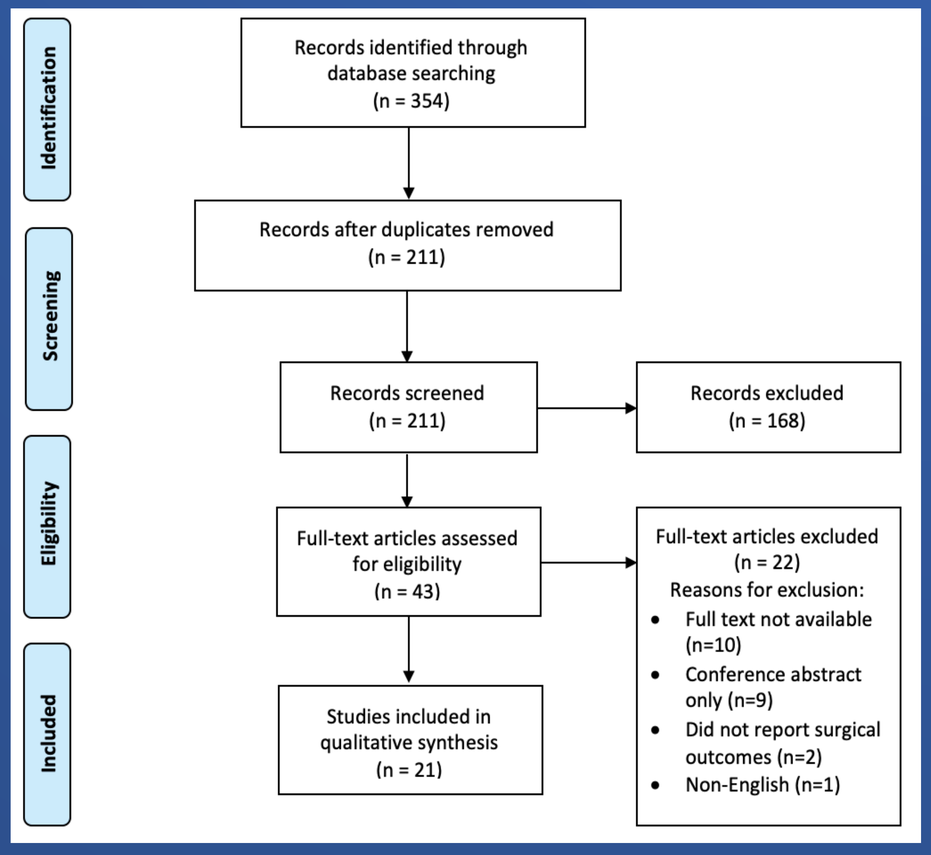

Figure 1: PRISMA flowchart for this systematic review

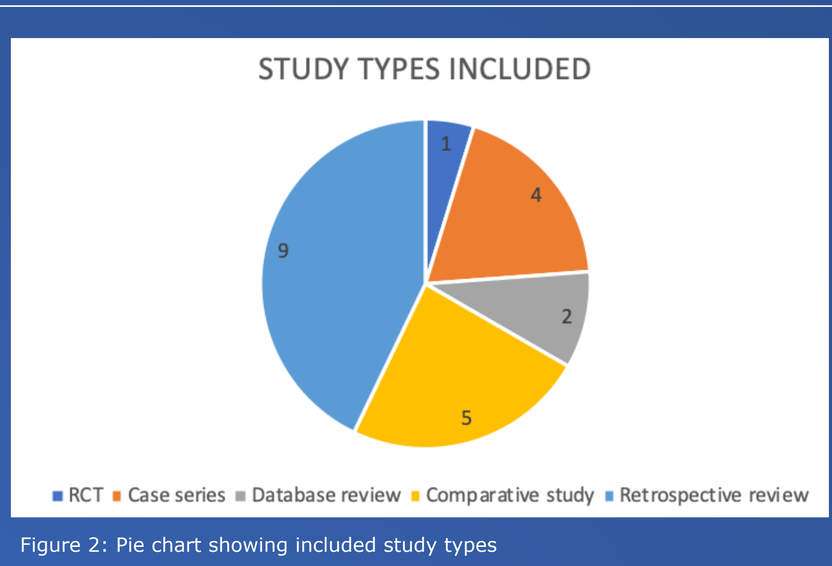

Figure 2: Pie chart showing included study types

The total of 21 studies included reported the outcomes aforementioned. Additionally, five studies reported total cost of procedure (mean $6665 for robotic IHR and $4332 for laparoscopic IHR). There were no significant differences in patient demographics between robotic and laparoscopic IHR.

Table 2: Summary of main outcomes

Outcome:	Robotic (R) or Laparoscopic (L)	Mean value:	Significant or Non-Significant
Operative time	R	96 minutes	Significant (p=0.008)
	L	69 minutes	
Hospitalisation time	R	11 hours	N/A
	L	37 hours	
Overall post-operative complication rate	R	10%	Non-Significant
	L	13%	
Seroma rate	R	3.92	Significant (p=0.03)
	L	21.38	
Conversion rate	R	1.25	Non-Significant
	L	1.00	
Urinary retention rate	R	4.9	Non-Significant
	L	4.25	
Hernia recurrence rate	R	2%	N/A
	L	7%	
CGP rate	R	8%	N/A
	L	20%	
30-day readmission rate	R	4	N/A
	L	4.5	

There was no statistical difference between rates of other wound complications (haematoma and infection) although the average rates of occurrence were lower. Average pain scores and days of analgesia use was lower in the robotic IHR group. Cosmesis was reported to be better following robotic IHR compared to laparoscopic. Risk of bias was low across all studies (see figure 3).

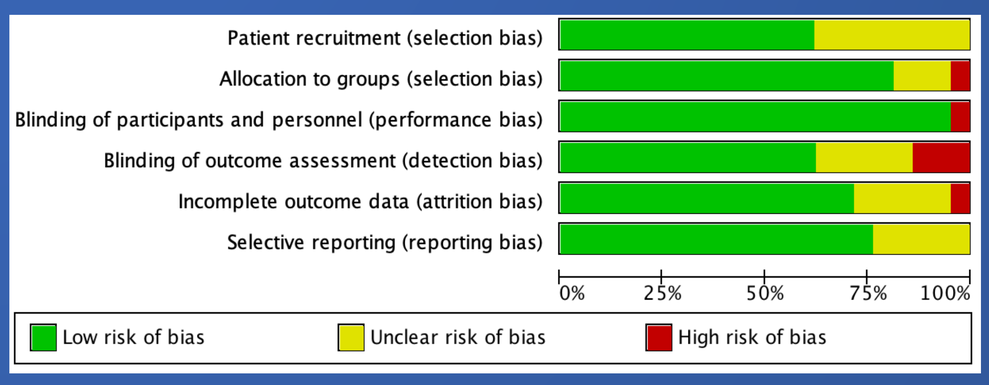

Figure 3: Risk of bias assessment

Overall, the rates of post-operative complications, both short and long-term, were found to be lower for robotic IHR compared to laparoscopic (albeit not always significant). Operative time was significantly longer, but found to decrease over time as the surgeon gains experience with the platform. For recurrence and CGP, robotic IHR showed lower rates and higher patient satisfaction.

Conclusion

Robotic IHR was shown to have better surgical outcomes compared to laparoscopic IHR with regards to immediate post-operative complications, CGP and recurrence. The only outcome found to be inferior for robotic IHR was operative time (which decreased with each progressive case) and costs. Increased control offered by robotic platforms may translate to more precise mesh placement and improved quality of life for patients.

Future work

Although robotic IHR has been shown to have better outcomes, further research into it's long-term outcomes and a full cost-benefit analysis is needed to fully assess whether it could be adopted into clinical practice in the UK.

References

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