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COMPARISON BETWEEN SURGICAL APPROACHES FOR ABDOMINAL HERNIA REPAIR

COMPARISON OF SURGICAL APPROACHES FOR ABDOMINAL HERNIA REPAIR

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SUMMARY:

This study aims to perform a systematic comparative review between open, laparoscopic and robotic surgery techniques for the treatment of abdominal hernias. The research aims to identify the approach that offers the best prognosis in terms of length of hospital stay, postoperative complications, healing time, leaks and infections, and to provide evidence to assist in choosing the most appropriate technique for each patient. Studies published in the last 5 years (2019-2024) in the PubMed and ScienceDirect databases were analyzed, with the search key "('abdominal hernia' OR 'hernia repair') AND ('open surgery' OR 'laparoscopic surgery' OR 'robotic surgery') AND ('outcome' OR 'complication')". Initially, 2,685 articles were found in PubMed and 4,524 in ScienceDirect. After applying filters for year, study type, and language, and removing duplicates, 18 articles were selected for abstract reading and 12 for full analysis, with 9 included in the final review. The data show that laparoscopic surgery provides shorter hospital stays and fewer complications compared to the open approach. Robotic surgery also offers benefits, such as greater precision, although the difference compared to laparoscopy is not as great. Open surgery was associated with a higher rate of recurrence and complications. Laparoscopy is generally preferred, while robotic surgery may be advantageous in specific cases. The choice of technique should consider the patient's characteristics and the surgeon's experience.

Keywords: Open Surgery. Robotic Surgery. Postoperative Complications.

Laparoscopy. Recurrence.

ABSTRACT:

This systematic review aims to compare open, laparoscopic, and robotic surgical techniques for abdominal hernia repair, evaluating their efficacy, benefits, and drawbacks. A comprehensive search of PubMed and ScienceDirect was conducted using terms related to "abdominal hernia repair" and "surgical techniques". The review included studies published from 2020 to 2024, focusing on randomized controlled trials, meta-analyses, and systematic reviews. The analysis revealed that laparoscopic and robotic repairs generally offer reduced recovery times, less postoperative pain, and lower complication rates compared to open surgery. However, robotic repairs, while offering precision and ergonomic advantages, come with higher costs and longer setup times. Open repairs, although associated with higher complication rates and longer recovery periods, are still preferred in certain complex cases due to their straightforward execution. This review highlights that laparoscopic and robotic

techniques present notable advantages over traditional open surgery, particularly in terms of postoperative outcomes and patient recovery. The findings support the use of minimally invasive approaches where feasible but also underscore the importance of considering individual patient circumstances and the complexity of the hernia when selecting the most appropriate surgical technique.
Keywords: Laparoscopy. Open Surgery. Postoperative complications. Recurrence. robotics Surgical Procedures.

1. INTRODUCTION

Abdominal hernias are one of the most common surgical conditions and the standard treatment is surgical repair, performed through various techniques, such as open, laparoscopic and robotic surgery. The choice of approach can significantly impact patients' clinical outcomes, such as recovery time, complication rate and recurrence rate (Beckers Perletti; Spoelders; Berrevoet, 2022).

Laparotomic surgery, traditionally the standard method, provides a wide view and direct access to the surgical field, but may be associated with higher complication rates and longer recovery times (Martins*et al.*, 2024).

On the other hand, laparoscopic surgery, a minimally invasive technique, has been favored for its advantages, such as less postoperative pain, reduced recovery time, and lower complication rates (Hernandez; Petersen, 2023). However, laparoscopy can present technical challenges and limitations in visualization (Hager; Edgerton; Hope, 2023).

Robotic surgery, which combines the precision of laparoscopy with the possibility of more refined movements and three-dimensional vision, has shown promising results in reducing recovery times and improving functional outcomes (De'Angelis*et al.*, 2024). However, equipment costs and availability still represent significant barriers to wider adoption (Ye*et al.*, 2021).

Given the continuous evolution in hernia repair techniques, it is crucial to conduct a systematic review to identify which approach offers the best clinical results, considering aspects such as postoperative complications, recurrence rate and recovery time (Mohan*et al.*, 2021).

This study aims to compare open surgery and laparoscopic repair techniques for the treatment of perforated peptic ulcers. The aim is to identify which approach offers the best prognosis. In addition, the study aims to provide an evidence base that can help surgeons choose the most appropriate technique for each patient, taking into account both the benefits and potential risks associated with each approach.

2. MATERIAL AND METHOD

This study consists of an integrative literature review, conducted by searching for scientific articles in the PubMed and ScienceDirect databases. The research was carried out using the search key *"(laparotomic repair" OR "laparoscopic repair" OR "robotic repair") AND "abdominal hernia" AND "recurrence rate" AND "postoperative complications"* in both databases. Studies published in the last 5 years (2019-2024) were selected, including the following study types: clinical trial, meta-analysis, randomized controlled trial, analysis, and systematic review. Articles with full text available in Portuguese and English that addressed the topic were included.

A total of 7,209 articles were found in the initial search, 2,685 in PubMed and 4,524 in ScienceDirect. After applying filters for year, study type and language, 193 articles were selected, 57 from PubMed and 136 from ScienceDirect. After removing duplicates, 193 articles were eligible for screening by title and abstract. Of these, 24 articles were selected for full reading, resulting in 9 articles that comprised the integrative review (Table 1). Exclusion criteria included studies that did not perform direct comparisons between the surgical techniques mentioned or in approaches other than abdominal hernia repair.

Table 1. Works included.

Base	**Title**	**Authors**	**Periodical (vol, no, page, year)**	**Considerations / Theme**

PubMed	Association between surgical hernia repair techniques and the incidence of seroma: the systematic review and meta-analysis.	BECKERS PERLETTI, Louise; SPOELERS, Femke; BERREVOET, Frederik.	**Hernia**, p. 1-13, 2022.	Revision systematic about techniques of repair of hernia and incidence of seroma.
PubMed	Robotic surgery for inguinal and ventral hernia repair: the systematic review and meta-analysis.	FROM'ANGELIS, Nicola *et al.*	**Surgical Endoscopy**, v. 38, n. 1, p. 24-46, 2024.	Revision systematic on the use of robotic surgery to hernias inguinal and ventral.
PubMed	Patient-reported outcomes of laparoscopic versus robotic primary ventral and incisional hernia repair: a systematic review and meta-analysis.	DIXIT, R. *et al.*	**Hernia**, v. 27, n. 2, p. 245-257, 2023.	Comparison of the results reported by the patients to repair laparoscopic and robotic of ventral hernias and incisional.

ScienceDirect	Primary uncomplicated ventral hernia repair: guidelines and practice patterns for routine hernia repairs.	HAGER, Matthew; EDGERTON, Colston; HOPE, William W.	**Surgical Clinics**, v. 103, no. 5, p. 901-915, 2023.	Guidelines and standards of practice to repair of ventral hernias no complicated.
ScienceDirect	Laparoscopic Ventral Hernia Repair.	HERNANDEZ, Alexandra; PETERSEN, Rebecca.	**Surgical Clinics**, v. 103, no. 5, p. 947-960, 2023.	Review on the repair laparoscopic of hernia ventral, including techniques and results.
PubMed	Surgical techniques for repair of abdominal rectus diastasis: the scoping review.	JESSEN, Majken Lyne; ÖBERG, Stina; ROSENBERG, Jacob.	**Journal of Plastic Surgery and Hand Surgery**, v. 55, n. 4, p. 195-201, 2021.	Revision of the techniques surgical to repair of rectus diastasis abdominal.
PubMed	The comparison of eTEP and IPOM in ventral and incisional hernia repair: a systematic	I read, Junsheng; WANG, Yong; WU, Lisheng.	**Surgical Laparoscopy Endoscopy & Percutaneous Techniques**, v.	Comparison between techniques eTEP and IPOM to repair of ventral hernia and incisional.

	review and meta-analysis.		32, n. 2, p. 252-258, 2022.	
PubMed	Comparison between the open and the laparoscopic approach in the primary ventral hernia repair: a systematic review and meta-analysis.	MARTINS, Marcia Regina *et al.*	**Langenbeck's Archives of Surgery**, v. 409, n. 1, p. 52, 2024.	Revision systematic comparing approaches open and laparoscopic in repair of ventral hernia primary.
PubMed	Robotic versus laparoscopic ventral hernia repair: the systematic review and meta-analysis of randomised controlled trials and propensity score matched studies.	MOHAN, Ramkumar *and al.*	**Hernia**, v. 25, p. 1565-1572, 2021.	Comparison between repair of hernia ventral robotic and laparoscopic.

Source: own authorship, 2024.

3. RESULTS AND DISCUSSION

Comparative analysis of abdominal hernia repair techniques (open, laparoscopic and robotic) reveals significant differences in terms of efficacy, complications and postoperative outcomes.

Open surgery traditionally offers a direct and wide approach to the surgical field, which can be advantageous in cases of complex or large hernias (Hager; Edgerton; Hope, 2023). However, this technique is associated with a longer recovery time and greater postoperative pain. Studies show that the open technique tends to have a higher rate of complications, such as infections and seroma formation, when compared to minimally invasive techniques (Beckers Perletti; Spoelders; Berrevoet, 2022). This observation is corroborated by identifying a higher recurrence rate in open surgeries, which can be attributed to the more extensive surgical trauma and the difficulty in adequate placement of the reinforcement material (Martins*et al.*, 2024).

On the other hand, laparoscopic surgery stands out for its advantages in terms of less postoperative pain and faster recovery. The laparoscopic approach is associated with a lower infection rate and less seroma formation compared to open surgery (Hernandez; Petersen, 2023). This method provides improved visualization of the surgical field and less tissue trauma, resulting in a faster recovery. However, laparoscopy can present challenges in large or complex hernias, due to limited instruments and technical difficulty, which can compromise efficacy in certain cases (Hager; Edgerton; Hope, 2023).

Robotic surgery, despite its high costs, has shown substantial benefits in terms of precision and control. Robotic surgery is associated with a lower complication rate and faster recovery compared to open and laparoscopic surgery (De'Angelis*et al.*, 2024). The enhanced precision offered by robotic systems can significantly reduce the rate of complications and improve clinical outcomes (Mohan *et al.*, 2021). However, the high cost of equipment and limited availability are still significant barriers to the wider adoption of this technique (Ye*et al.*, 2021).

In terms of recurrence rate, laparoscopic and robotic surgery tend to have advantages over the open technique. Open surgery has a higher recurrence rate, which may be attributed to the greater surgical trauma and difficulty in placing the

reinforcement material (Beckers Perletti; Spoelders; Berrevoet, 2022; Martins*et al.*, 2024). Robotic surgery, with its superior precision, has shown a further reduction in the recurrence rate (Mohan*et al.*, 2021; De'Angelis*et al.*, 2024).

Regarding postoperative complications, laparoscopic surgery often has a lower complication rate, including a lower incidence of infections and seroma, when compared to open surgery (Hernandez; Petersen, 2023). Robotic surgery also demonstrates a reduced complication rate due to its improved precision and control (De'Angelis*et al.*, 2024). Studies confirm that the open technique is more frequently associated with complications, which can negatively affect recovery time and final results (Beckers Perletti; Spoelders; Berrevoet, 2022).

Finally, recovery time is a critical factor in choosing a surgical technique. Laparoscopy and robotics offer faster recovery and less postoperative pain compared to the open approach. The less invasiveness of these techniques contributes to a shorter recovery time and less discomfort for the patient (Hager; Edgerton; Hope, 2023). Open surgery, although effective, is associated with a longer recovery time due to greater surgical trauma and an increased risk of complications (Beckers Perletti; Spoelders; Berrevoet, 2022).

FINAL CONSIDERATIONS

Comparison of abdominal hernia repair techniques demonstrates that each approach has its own advantages and limitations, which must be considered according to the specific needs of each patient and the characteristics of the hernia.

Open surgery, despite being the most traditional technique, is often associated with greater surgical trauma, longer recovery time, and a higher rate of complications, such as infections and seromas (Beckers Perletti; Spoelders; Berrevoet, 2022). This approach also has a higher recurrence rate, which may be attributed to the difficulties in adequate placement of the reinforcement material and the greater trauma involved. Thus, while open surgery may be appropriate for complex or large hernias, its associated risks must be carefully weighed (Martins*et al.*, 2024).

Laparoscopic surgery offers faster recovery and less postoperative pain compared to open surgery (Hernandez; Petersen, 2023). This minimally invasive method provides a lower complication rate and improved visualization of the surgical field, which is advantageous for most hernia cases. However, laparoscopy may not be ideal for all situations, especially in cases of large or complicated hernias, due to limited instruments and the technical difficulty involved (Hager; Edgerton; Hope, 2023).

Robotic surgery, although more expensive and limited in availability, has significant advantages in terms of precision and control. Robotic surgery is associated with a lower complication rate, lower recurrence rate, and faster recovery compared to open and laparoscopic approaches. The precision offered by robotic systems contributes to better clinical outcomes and fewer postoperative complications, making it a valuable option, especially for more complex cases (Mohan*et al.*, 2021; De'Angelis*et al.*, 2024).

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