

# **BENEFITS OF ROBOTIC TECHNIQUE IN INGUINAL HERNIA CORRECTION: A LITERATURE REVIEW**

---

***Isabela Rutkowski***

Centro Universitário Estácio de Ribeirão Preto (UNISEB)  
Ribeirão Preto - SP  
<https://orcid.org/0000-0003-0781-6881>

***Hugo Gomes Soares***

Universidade do Estado do Pará (UEPA)  
Marabá - PA  
<https://orcid.org/0000-0001-8398-4575>

***Ana Luiza Masselai***

Universidade Positivo (UP)  
Curitiba - PR  
<https://orcid.org/0000-0002-2322-4627>

***Sérgio Augusto Dutra da Conceição***

Universidade Evangélica de Goiás (UNIEVANGÉLICA)  
Anápolis - GO  
<https://orcid.org/0000-0002-0742-2009>

***Lauiza Maria Fonseca Lobo Silva***

Universidade Tiradentes (UNIT)  
Estância - SE  
<https://orcid.org/0000-0002-4346-1718>

***Luiz Victor Padoan de Oliveira***

Universidade Positivo (UP)  
Curitiba - PR  
<https://orcid.org/0000-0002-9150-2908>

All content in this magazine is licensed under a Creative Commons Attribution License. Attribution-Non-Commercial-Non-Derivatives 4.0 International (CC BY-NC-ND 4.0).



***Nathália Perrelli Valença Silva***

Faculdade de Medicina de Olinda (FMO)  
Olinda - PE  
<https://orcid.org/0000-0003-0479-9633>

***Natalia Nonato Alencar***

Universidade Federal do Tocantins (UFT)  
Palmas - TO  
<https://orcid.org/0000-0002-3618-0600>

***Larissa Carvalho de Souza***

Universidade do Oeste Paulista (UNOESTE)  
Jau - SP  
<https://orcid.org/0000-0001-7223-172X>

***Elisa Barros Campos***

Faculdade de Medicina de Barbacena (FAME)  
Barbacena - MG  
<https://orcid.org/0000-0001-7625-5155>

***Victor Prudêncio Ibiapina de Morais***

Universidade Estadual do Piauí (UESPI)  
Teresina - PI  
<https://orcid.org/0000-0001-5877-7662>

***Josenil Bezerra Nascimento Neto***

Doctort by institution: Universidade Estadual do Piauí (UESPI)  
General Surgeon by the institution: Hospital Getúlio Vargas (HGV)  
Trauma Surgeon by institution: Colégio Brasileiro de Cirurgias  
Teresina -PI  
<http://lattes.cnpq.br/0118442802140504>

**Abstract: Goal:** To identify, through a bibliographical review, the benefits of robotic herniorrhaphy compared to conventional techniques, in adult patients with inguinal hernia and its impacts in the postoperative period. **Methods:** Bibliographic review carried out between October and November 2022, through searches in the SciELO and PubMed databases, 13 studies being included after the inclusion and exclusion criteria. **Review:** The minimally invasive approach to laparoscopic inguinal repair, as well as robotics, proposes an estimable clinical benefit in view of the reduction of costs and the risk of polypharmacy, although there is an increase in cost and surgical time. Laparoscopic and robotic correction did not show significant differences. However, robotic surgery had a longer operative time than the laparoscopic technique and there was no difference in recurrence when comparing the three techniques. For the postoperative period, there was no significant difference between the laparoscopic and robotic techniques regarding the correction of unilateral inguinal hernia. Recovery is better with robotic correction compared to open surgery because it is minimally invasive. **Final considerations:** Robotic inguinal hernia repair surgery and its benefits compared to conventional surgery for adults must be better understood. The surgical management of inguinal hernia is still evolving and the results of the technique must be further investigated in the long term. **Keywords:** Herniorrhaphy; Robotic Surgery; Postoperative Complications.

## INTRODUCTION

Inguinal herniorrhaphy is the surgical treatment of choice for repairing inguinal hernias. Performing the procedure by robotics has become a reality for some centers and has demonstrated its advantages when compared to other open or videolaparoscopic techniques

(AWAD M.A. et al., 2020). The robotic technique is based on the use of devices with movement that resembles the human wrist, known as “Wristed instruments”, which help in the handling of the tweezers, through visualization on a fixed screen, being able to considerably reduce tissue trauma (PIROLLA E.H. et al., 2018).

Studies and research described in the literature seem safe for the use of robotic surgery in inguinal hernia repair (TAM V. et al., 2019). The reduction of direct damage, which according to Podolsky D. and Novitsky Y. (2020), results from the use of narrow 8mm robotic ports for inserting instruments that help with retraction and facilitate electrocautery. The postoperative improvement is notorious due to the shorter surgical time. Smaller notches facilitate cleaning and prevention of possible local infections. The larger intra-abdominal space is also highlighted, which allows for better anatomical visualization for the procedure (AIOLFI A. et al., 2019a).

Because it is a procedure that requires high financial investment and technical proficiency, the evaluation of its benefits has become necessary in view of the techniques already employed in the correction of inguinal hernias. In this context, the aim of the present study is to analyze the benefits of robotic inguinal hernia surgery compared to conventional surgery for adult patients and the impacts of surgical precision on patient recovery.

## **METHODOLOGY**

The present study is a narrative bibliographic review carried out from October to November 2022, developed according to the criteria of the PVO strategy, an acronym that represents “population or research problem”, “variables” and “outcome”, and used for the elaboration of its guiding question: “What are the benefits of robotic herniorrhaphy compared to conventional techniques in adult

patients with inguinal hernia and its impacts in the postoperative period?”. In this sense, the population or problem of this research refers to the comparison between robotic herniorrhaphy and conventional techniques in adult patients with inguinal hernia, combined with their impacts in the postoperative period.

The searches were carried out through searches in the Scientific Electronic Library Online (SciELO) and PubMed Central (PMC) databases. The descriptors with the Boolean term “AND” were used: “Herniorrhaphy”, “RoboticSurgical”, “Procedures”, “Postoperative Complications”, “Herniorrhaphy”, “Robotic Surgery” and “Postoperative Complications”. Inclusion criteria were: articles in English and Portuguese; published in the period from 2017 to 2022 and that addressed the proposed themes, with systematic review and original studies available in full. Exclusion criteria were: duplicate articles, available in summary form and that did not directly address the studied proposal.

After associating the descriptors used in the searched databases, a total of 98 articles were found. Of which, 94 articles belonged to the PubMed database and 1 article to SciELO. After applying the inclusion and exclusion criteria, 12 articles from the PubMed database and 1 article from SciELO were selected, using a total of 13 studies to compose the collection.

## **RESULTS**

Robotic inguinal hernia repair can be performed using two main techniques: the robotic transabdominal preperitoneal repair (rTAPP) and the totally extraperitoneal robotic approach (rTEP), the second being the most prevalent technique used by surgeons (PODOLSKY & NOVITSKY, 2020). In the comparison between traditional and practical surgeries, according to the study by Aiolfi A. et al. (2019a), rTAPP had a success rate of over 99%, with only 0.14% of surgeries requiring

conversion.

To perform the robotic procedure in inguinal repair, the patient is positioned in the Trendelenburg position, in dorsal decubitus. The trochanters of choice generally follow a distance of 15 centimeters between them, in order not to affect the movement of the robotic arms. Regarding the vascular part of the procedure, the epigastric vessels delimit Hesselbach's triangle in its lateral part, one of the locating points used by surgeons, together with the inguinal ligament in the lower part and the edge of the rectus abdominis in the upper region (PIROLLA E.H. et al., 2018).

The rTAPP surgical approach using the da Vinci Xi<sup>®</sup> robot system consists of positioning it in the operating room on the right side of the table, and then the 7 steps of the procedure begin. First, access to the peritoneal cavity is given, then the robot is coupled, and then the peritoneal flap is created with subsequent preperitoneal dissection and reduction of the hernia sac with mesh placement, finally there is flap closure (PODOLSKY & NOVITSKY, 2020). The Versius<sup>®</sup> system, on the other hand, allows the manipulation of each instrument arm with separate headboards and an open console, which resembles traditional laparoscopy portals, and has been seen as something positive and promising in the correction of inguinal hernias (DIXON F. et al., 2022).

The clinical picture of each patient is decisive for the variables of time, surgeon experience and surgical cost, when measuring the benefit of the robotic approach in inguinal hernia repair. The robotic technique has a greater ability to repair incidental contralateral hernias (AWAD M.A. et al., 2020), although the studies are difficult to compare, given the lack of standardization and nonspecificity between bilateral and unilateral hernias and inconsistency between the post-operative period. between the clinical cases. It appears

that the presence of only one surgeon also implies in extending the surgery during the mesh placement and peritoneum closure stage (TAM. V. et al., 2019).

According to Qabbani A. et al. (2021), the robotic procedure can normally last from 25 minutes to 3 hours. In addition, its complication rate is usually around 10%, with recurrence in 1.2% of cases. When comparing the open procedure normally used in the health system, with the robotic one, it is noticed that the duration of the robotic route is significantly longer, however with less readmission and complication.

The complex approach of robotic surgery for robotic hernia repair with intraperitoneal mesh is evaluated in its implication for the postoperative clinical management of pain and length of stay of patients, together with the impact on mortality of patients. Added to these factors, the length of surgery directly implies the benefits and contraindications for surgery, when compared with the traditional laparoscopic technique. The use of running stitch fixation of the peritoneal mesh and intracorporeal self-locking suture to close the fascial defect in robotic inguinal hernia repair contrasts with the "shoelacing" techniques and transfascial sutures of laparoscopic repairs, due to the increased cost due to the longer surgery time, in addition to the decrease in postoperative mortality (PETRO C.C. et al., 2020). According to Solani L. et al. (2021), laparoscopic and robotic surgical correction of inguinal hernia do not present significant differences, with similar results in general complications, postoperative pain, chronic pain and inguinodynia. It is noted that the robotic approach requires a longer operative time when compared to the laparoscopic technique, which may be due to the insertion/disengagement time required during robotic procedures. Despite the scarcity of studies that followed the patient for a period longer than

30 days, there was no difference in inguinal hernia recurrence according to the chosen approach.

Accordingly, Prabhu A.S. et al. (2020), concludes that there was no significant difference between laparoscopic and robotic surgery, when analyzing the postoperative period in surgical repair of unilateral inguinal hernia. Furthermore, the robotic repair had a notably high cost, a longer operating time and an increase in the surgeon's level of frustration and effort when compared to the laparoscopic approach, not interfering with surgical performance. Evaluating each stage of the operative time, it can be concluded that the fitting/disengaging necessary during the procedure was not to blame for the difference in time observed. Despite the known benefits of the robotic approach, there is no association between the technique and significant clinical improvement in the performance or outcome of the procedure, in relation to the laparoscopic approach.

A major concern involved in the surgical repair of inguinal hernia is postoperative pain, which entails increased administration of opioids to treat the patient's acute or chronic pain. Patients report that the interruption of their activities and acute postoperative pain are less when compared to the minimally invasive technique with conventional repair, in addition to reducing the duration of analgesic administration. However, it is not clear that these differences occurred between patients undergoing laparoscopic and robotic techniques (BITTNER IV J.G. et al., 2018).

According to Bittner IV J.S. et al. (2018), the use of analgesics for acute postoperative groin pain in patients undergoing robotic inguinal hernia repair was prescribed for less time and better physical disposition, in contrast to open surgery. While the laparoscopic repair obtained results similar to the open technique for the prescription of analgesics. In this

nuance, the minimally invasive approach to inguinal repair, laparoscopic, as well as robotics, proposes greater clinical benefit in reducing costs and the risk of polypharmacy, although the increased cost and surgical time are reassessed according to the experience of the surgeon and the team.

Bracale U. et al. (2021), compares the postoperative results between surgeries for ventral hernia correction in a robotic and open way, through the analysis of 831 patients. It was concluded that robotic ventral hernia repair has a lower risk of complications and shorter hospital stay. Robotic correction performs better, especially in more complex ventral hernia surgeries. But with longer operative time and an increase in health system costs. Such an increase in costs may be relative when analyzing the sum of expenses between the surgeries, the costs of professionals, reusable and disposable equipment, leading to a similar estimate between the two procedures. Ultimately, robotic correction provides better recovery by adding the benefits of minimally invasive procedures.

## **FINAL CONSIDERATIONS**

Robotic surgery for inguinal hernia repair has benefits compared to conventional surgery for adult patients. Because it is minimally invasive, robotic correction improves postoperative recovery when compared to open surgery. In comparison with the laparoscopic route, there are no significant differences. The robotic procedure has its limitations due to costs and appropriate professional qualification for the application of the technique, which must be adapted for each patient in particular. The robotic surgical management of inguinal hernia is still evolving and the results of the technique must be further investigated in the long term.

## REFERENCES

1. AIOLFI, A. et al. Primary inguinal hernia: systematic review and Bayesian network meta-analysis comparing open, laparoscopic transabdominal preperitoneal, totally extraperitoneal, and robotic preperitoneal repair. **Hernia**, v. 23, n. 3, p. 473-484, 2019a.
2. AIOLFI, A. et al. Robotic inguinal hernia repair: is technology taking over? Systematic review and meta-analysis. **Hernia**, v. 23, n. 3, p. 509-519, 2019b.
3. AWAD, Morcos A. et al. Robotic inguinal hernia repair outcomes: operative time and cost analysis. **JSLs: Journal of the Society of Laparoscopic & Robotic Surgeons**, v. 24, n. 4, 2020.
4. BITTNER IV, James G. et al. Patient perceptions of acute pain and activity disruption following inguinal hernia repair: a propensity-matched comparison of robotic-assisted, laparoscopic, and open approaches. **Journal of robotic surgery**, v. 12, n. 4, p. 625-632, 2018.
5. BRACALE, U. et al. Transversus abdominis release (TAR) for ventral hernia repair: open or robotic? Short-term outcomes from a systematic review with meta-analysis. **Hernia**, v. 25, n. 6, p. 1471-1480, 2021.
6. DIXON, Frances et al. Implementation of robotic hernia surgery using the Versius® system. **Journal of Robotic Surgery**, p. 1-5, 2022.
7. PETRO, Clayton C. et al. Patient-reported outcomes of robotic vs laparoscopic ventral hernia repair with intraperitoneal mesh: the PROVE-IT randomized clinical trial. **JAMA surgery**, v. 156, n. 1, p. 22-29, 2021.
8. PIROLLA, Eduardo Henrique et al. REPARO INGUINAL VIA TÉCNICA ROBÓTICO-ASSISTIDA: REVISÃO DA LITERATURA. **ABCD. Arquivos Brasileiros de Cirurgia Digestiva (São Paulo)**, v. 31, 2018.
9. PODOLSKY, Dina; NOVITSKY, Yuri. Robotic Inguinal Hernia Repair. **Surgical Clinics of North America, Columbia University Medical Center, Comprehensive Hernia Center, Department of Surgery**, v. 100, n. 2, p. 409-415.
10. PRABHU, Ajita S. et al. Robotic inguinal vs transabdominal laparoscopic inguinal hernia repair: the RIVAL randomized clinical trial. **JAMA surgery**, v. 155, n. 5, p. 380-387, 2020.
11. RAMSER, Michaela et al. Erratum to: Robotic hernia surgery I. English version. **Der Chirurg**, v. 92, n. 1, p. 14-14, 2021.
12. SOLAINI, Leonardo et al. Robotic versus laparoscopic inguinal hernia repair: an updated systematic review and meta-analysis. **Journal of Robotic Surgery**, p. 1-7, 2021.
13. TAM, Vernissia et al. Robotic inguinal hernia repair: a large health system's experience with the first 300 cases and review of the literature. **Journal of Surgical Research**, v. 235, p. 98-104, 2019.