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COMPARISON OF THE RESULTS OF MINIMALLY INVASIVE SURGERY (LAPAROSCOPIC AND ROBOTIC) AND OPEN SURGERY IN THE TREATMENT OF COLORECTAL CANCER: A LITERATURE REVIEW

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Abstract: Objective: To evaluate and compare the results of minimally invasive surgery (laparoscopic and robotic) and open surgery in the treatment of colorectal cancer in adult patients, in order to determine which approach is more effective in terms of safety, oncological effectiveness and post recovery time. -operative. Methodology: A literature review was carried out through searches in the PubMed and SciELO databases. 1423 articles were found, of which 14 studies that met the inclusion criteria were selected to compose the analysis. Result: The different types of studies analyzed indicate that there are no significant differences between minimally invasive surgical approaches (laparoscopic and robotic) and open surgery in the treatment of colorectal cancer, when considering criteria such as overall and disease-free survival rate. Likewise, both techniques do not present significant differences in relation to positive resection margins. However, there were studies with discordant results regarding the number of positive lymph nodes, where one of them found no differences, while another showed a higher success rate in laparoscopic surgery. Minimally invasive surgery results in lower rates of postoperative complications, reduced length of stay, earlier return of bowel function, less impact on the immune system, and shorter recovery time compared to open surgery, although it is more expensive and has a prolonged surgical time. In addition, minimally invasive laparoscopic and robotic techniques were compared, with laparoscopy showing a lower incidence of incisional hernia, and robotics showing better preservation of anorectal function. However, both minimally invasive techniques did not show significant differences regarding the overall survival rate. Conclusion: Laparotomy is a highly invasive technique and presents a high risk of postoperative complications. New less invasive techniques, such as laparoscopy

and robotics, have shown significant results in comparison and have improved the prognosis of patients with colorectal cancer.
Keywords: Colorectal neoplasms; Laparoscopy; Robotic Surgical Procedures; Postoperative period.

INTRODUCTION

Colorectal cancer (CRC) is a disease with high morbidity and mortality, being the third most common type of cancer worldwide (HAGGAR; BOUSHEY, 2009). Although radiotherapy and chemotherapy are increasingly used in the treatment of CRC (BARRESI et al., 2015), surgical resection is the most effective therapeutic approach, with more than 90% of patients with CRC undergoing this procedure (SHI et al., 2020).

The conventional surgical technique for treating RCC is laparotomy, which is highly invasive and carries high risks of postoperative complications such as morbidity, infections, fascial rupture, intestinal paralysis, and wound pain. 2009). However, to minimize postoperative morbidity, several less invasive techniques have been adopted, with emphasis on laparoscopy, which presents less surgical trauma and blood loss (SCHLOTTMANN; PATTI, 2017). The laparoscopic approach, however, is more complex and has a prolonged surgical time, requiring greater skill from the surgeon and presenting limitations that may result in the conversion to the open technique (BONJER et al., 2015; GUILLOU et al., 2005).

With the aim of reducing postoperative morbidity as well as recovery time and increasing surgical safety, laparoscopic and robotic techniques have been widely used in colorectal procedures compared to open surgical techniques. Laparoscopic surgery has been shown to minimize intraoperative blood loss, post-surgical complications, have smaller incisions, promote rapid recovery and reduce hospitalization time. In addition, robotic systems, such as Senhance and da Vinci, aim to standardize laparoscopic surgery and provide more accurate procedures (SASAKI et al., 2022). The introduction of these robotic systems in procedures previously performed by open surgery allows greater freedom within a confined field, such as the pelvis, through the intuitive handling of instruments with seven degrees of autonomy and three-dimensional fields of view (TOLSTRUP et al., 2018).

In this literature review, the objective is to evaluate and compare the results of minimally invasive surgery (laparoscopic and robotic) and open surgery in the treatment of colorectal cancer in adult patients, in order to determine which approach is more effective in terms of safety, oncological effectiveness and postoperative recovery time.

METHODOLOGY

This is a bibliographic review developed according to the PVO strategy, an acronym that represents population or research problem, variables and outcome. The guiding research question was: "What is the impact of minimally invasive surgery, including laparoscopic and robotic approaches, in the treatment of colorectal cancer compared to open surgery, in terms of safety, oncological effectiveness and postoperative recovery time, reported in the literature? The studied population refers to patients diagnosed with colorectal cancer who underwent minimally invasive surgery and open surgery. For the literature search, the PubMed and SciELO databases were used, and the descriptors were combined with the Boolean term "AND": "Colorectal neoplasms", "Laparoscopy", "Robotic Surgical Procedures" and "Postoperative Period". Inclusion criteria were: articles in English, published between 2012 and 2023, which addressed the themes proposed for this research, studies of the systematic review type, meta-analysis and randomized clinical trials, available in full.

Duplicate articles, abstracts that did not directly address the subject studied and those that did not meet the other inclusion criteria were excluded. In all, 1423 articles were found after associating the descriptors used in the searched databases, 1421 belonging to the PubMed database and 2 articles to the SciELO database. After applying the inclusion and exclusion criteria, 13 articles from the PubMed database and 1 article from SciELO were selected, totaling 14 studies used to compose the collection.

RESULTS

SECURITY

Morarasu et al. (2023) compared the aspects and outcomes of robotic-assisted laparoscopic surgery (CLAR) and conventional laparoscopic surgery (CLC) in the treatment of colorectal neoplasia. Although it has been concluded that CLAR is a safe and effective method for this therapy, there is still no consensus on which method is superior. However, some advantages of CLAR over CLC have been demonstrated: (1) the conversion rate to open surgery in CLC was 15.8%, while in CLAR it was only 2.9%, which is significantly lower; (2) HPLC is associated with a clearer microscopic view of the anatomy, which allows for a safer and more effective operation; and (3) HPLC is related to reduced mortality from postoperative complications and improved recovery. On the other hand, CLAR required approximately 38 minutes more duration compared to CLC. As robotic surgery is more advanced, it can make the operation more delicate, and the patient can recover faster after surgery.

Overall rates of postoperative complications were similar in the open, LAP (laparoscopic surgery) and RAP (robotic surgery) groups. The incidences of anastomotic bleeding, thrombosis and cardiopulmonary complications were similar between the three groups. Regarding postoperative wound infection and intestinal obstruction, due to the small sample size, there was no statistically significant difference between the three groups, but the proportion of patients with complications gradually decreased. Studies have shown that the incidence of intestinal obstruction after RAP is lower than in open and LAP groups (YANG et al., 2018).

CLC has demonstrated benefits such as less blood loss during the procedure and reduced post-surgical recovery and hospitalization time. However, it has technical disadvantages, such as a two-dimensional view and limitations of laparoscopic instruments, due to its long and rigid shape. Therefore, CLAR was incorporated to counteract these disadvantages. This therapeutic technique offers a stable three-dimensional view, greater agility in the manipulation of instruments and reduction of physiological tremor (QUINTANA et al., 2018).

New minimally invasive surgery techniques are being developed for the treatment of colorectal cancer, aiming at faster intestinal recovery, reduction of pain, hospitalization and mortality, in addition to aesthetic advantages. These techniques include minilaparoscopy, natural orifice transluminal endoscopy (ETLON), and single-incision laparoscopy (LIU). So far, Ohtani et al. (2018) stated that the LIU was used only in benign colorectal pathologies, but it results in a decrease in parietal trauma, being considered a refinement of laparoscopy, with only an incision of approximately 50mm that allows the entry of several laparoscopic instruments. There are still doubts about the safety of the LIU for the resection of colorectal neoplasms, since there is no evidence of long-term results. However, this recent technique can be associated with a postoperative morbidity equivalent to conventional laparoscopic surgery, with the

advantage of a faster postoperative recovery (OHTANI et al., 2018).

The article by Kulkarni and Arulampalam (2020) addresses the comparison between laparoscopic surgery and the open approach regarding the occurrence of surgical site infections in colorectal procedures. Through a meta-analysis, the authors analyzed a set of existing studies on the subject, with the aim of providing scientific evidence to support the choice of the most appropriate surgical technique. The results obtained indicated that laparoscopic surgery presents a significant reduction in the incidence of surgical site infections compared to the open approach. This finding is extremely relevant, since the occurrence of postoperative infections is a challenge faced by surgeons and can lead to serious complications for patients. Through this meta-analysis, the authors provide valuable information that may influence surgical practices and improve clinical outcomes in colorectal procedures. However, it is important to consider other variables, such as the patient's profile and the surgeon's experience, when deciding the most appropriate surgical approach in each specific case.

ONCOLOGICAL EFFECTIVENESS

To compare the oncological effectiveness of surgical treatments for colorectal cancer using the minimally invasive approach compared to the open technique, criteria such as overall and disease-free survival rates, oncological recurrence, positive resection margins and number of resected lymph nodes were used. In the research sources of this review, it was identified that the TNM staging of colorectal cancer is a good predictor of overall and disease-free survival rates (ZHOU et al., 2019; SHENG et al., 2018).

Among the studies analyzed in this review, no significant differences were found in overall and disease-free survival rates when comparing open and laparoscopic surgical techniques (ISHIYAMA et al., 2023; ZHOU et al., 2019; SALIBASIC et al., 2019; GAVRIILIDIS et al., 2018). However, laparoscopic surgery in patients over 80 years old has demonstrated less intraoperative blood loss, lower incidence of postoperative complications (ZHOU et al., 2019) and shorter recovery time (QUINTANA et al., 2018). On the other hand, laparoscopic surgery is more expensive and requires a longer operative time (SALIBASIC et al., 2019).

Furthermore, no significant differences were found in survival rates when comparing minimally invasive approaches - laparoscopic or robotic (BAEK et al., 2021). However, cohort studies have suggested benefits of laparoscopic surgery, such as a lower incidence of incisional hernia (SHENG et al., 2018). In a study conducted by Quintana et al. (2018), 2-year colorectal cancer recurrence rates were higher in patients undergoing open surgery, but it is important to note that these patients had a more advanced age and neoplastic stage, which may have influenced the results.

Regarding positive resection margins, no significant differences were observed between open and laparoscopic techniques (ISHIYAMA et al., 2023). Likewise, no significant differences were found when comparing laparoscopic and robotic approaches, although the robotic approach had a slightly larger resection margin (BAEK et al., 2021).

The number of resected lymph nodes is directly associated with patient survival (GAVRIILIDIS et al., 2018; ZHOU et al., 2019). However, there were disagreements between studies regarding this variable in the sources used in this review. According to Gavriilidis et al. (2018), there was no difference in the number of resected lymph nodes between the groups undergoing laparoscopic transverse

colectomy and open transverse colectomy. However, Zhou et al. (2019) noted that the laparoscopic approach had a higher success rate in this regard compared to the open approach, although this did not result in significant differences in overall and disease-free survival rates. Furthermore, no significant differences were found in the number of lymph nodes removed when comparing laparoscopic and robotic techniques (BAEK et al., 2021).

Regarding the postoperative period, the laparoscopic approach has been shown to be more advantageous compared to the open technique. Despite having a longer surgical time, this technique offers several benefits, such as shorter hospital stays, lower incidence of complications and reduction in disease recurrence (MORARASU et al., 2023). In addition, in the short term, minimally invasive surgery has advantages, such as faster return of bowel function, less postoperative pain and less impact on the immune system (MARTÍNEZ-MARTÍNEZ; ARBONÉS-MAINAR et al., 2022).

A marker used to identify early complications after abdominal surgery is C-reactive protein (CRP). In uncomplicated postoperative cases, an increase in CRP levels is expected in the first 48 hours, followed by a further decrease. On the other hand, patients with severe complications usually have higher CRP values after this initial period (STRAATMAN et al., 2017). Another surgical approach for the treatment of colorectal cancer is the robotic technique, which allows for better preservation of anorectal function, resulting in a better long-term quality of life for patients (GRASS et al., 2021).

CONCLUSION

Minimally invasive surgical techniques, such as robotic-assisted laparoscopy and conventional laparoscopy, have been shown to be safe and effective in the treatment of colorectal neoplasms. Although there are still debates about which method is superior, studies point to some advantages of robotic-assisted laparoscopic surgery, such as a lower rate of conversion to open surgery, a clearer microscopic view of the anatomy, and reduced mortality from postoperative complications. On the other hand, conventional laparoscopic surgery has benefits such as less blood loss and reduced post-surgical recovery time. Furthermore, the literature suggests that minimally invasive surgery, whether laparoscopic or robotic, may result in similar overall and disease-free survival rates compared to the open approach. However, it is important to consider the patient's profile, the surgeon's experience and other individual factors when deciding on the most appropriate surgical technique in each case.

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