v. 5, n. 1, 2025

International Journal of Health Science

Acceptance date: 06/01/2025

LAPAROSCOPIC TOTAL OR PARTIAL GASTRECTOMY VERSUS OPEN SURGERY IN GASTRIC CANCER: COMPARISON OF ONCOLOGICAL AND FUNCTIONAL OUTCOMES

Eduardo Ferreira da Silva
Universidade Federal de Catalão
Catalão-GO
https://orcid.org/0009-0002-9703-6327

Cylo Fernandes dos Santos
Universidade Federal de Catalão
Catalão-GO
https://orcid.org/0009-0002-6473-8648

Jaqueline Luche Neves
Fundação Educacional do Município de Assis
Assis – SP
https://orcid.org/0000-0002-5085-9476

Nicole Caly Junqueira
Faculdade de medicina ZARNS
Itumbiara - GO
https://orcid.org/0009-0006-0301-1727

Matheus Akira Ishikiriyama
Fundação Educacional do Município de Assis
Assis – SP
https://orcid.org/0009-0009-1031-5018

Joyce Nunes Vieira
Fundação Educacional do Município de Assis
Assis – SP
https://orcid.org/0009-0002-2914-6284

Giovanna Carolina Igami Nakassa
Universidade do Oeste Paulista, Jaú- SP
https://orcid.org/0009-0009-9464-6286

Ana Beatriz Carvalho de Oliveira Guilherme
Fundação Educacional do Município de Assis
Assis – SP
https://orcid.org/0009-0004-5116-3878

Maria Julia Amaral Mancini
Fundação Educacional do Município de Assis
Assis – SP
https://orcid.org/0009-0002-0625-8961

Barbara Berteli Custodio
Fundação Educacional do Município de Assis
Assis – SP
https://orcid.org/0009-0007-1629-3994

Luana Cristina Moura de Souza
Faculdade de Medicina de Ji, Ji-PR
https://orcid.org/0009-0007-5000-3479

Tawana Pelogia Pelogia Vigatti
Faculdade de Medicina de Ji, Ji-PR
https://orcid.org/0009-0004-2152-0053

Abstract: INTRODUCTION: Gastric cancer, predominantly adenocarcinoma, is the fifth most common neoplasm and the third leading cause of cancer death globally, with a higher incidence in regions such as Asia and Latin America due to cultural factors and the high prevalence of *Helicobacter pylori* [1,2,3]. Gastrectomy, traditionally performed by the open route, is considered the gold standard, but laparoscopy has emerged as an alternative, offering faster recovery and fewer complications, despite technical challenges and a longer learning curve [3,4]. Studies highlight the benefits and limitations of laparoscopy, underscoring the need for an integrative review to consolidate evidence and guide clinical guidelines [6,7,8,9]. METHODS: This integrative review analyzed 45 studies published between 2018 and 2023, comparing laparoscopic and open gastrectomy in the treatment of gastric cancer, focusing on oncological and functional outcomes [9,10]. The search, conducted on databases such as PUBMED and MEDLINE, used specific descriptors and strict filters. The selection process included screening 785 articles, reducing them to 612 after filtering, and a detailed evaluation of 45 full texts, excluding works with insufficient methodology or data [11,12,13]. RESULTS**: Safety and efficacy:** Laparoscopy is comparable to open surgery in intraoperative and postoperative complications, with a lower rate of wound infections and similar oncological control, including adequate resection margins and lymph node dissection [14,15,16]. **Technical aspects:** Initially, surgical time may be longer with laparoscopy due to the learning curve, but it improves with experience [17,18,19]. Laparoscopy reduces blood loss and transfusions [20,21,22]. Procedures such as total gastrectomies are more complex than distal ones, requiring a personalized approach [23,24,25]. **Quality of Life:** Less pain, reduced use of analgesics, accelerated recovery and shorter

hospital stays are all advantages of laparoscopy [26,27,28]. In the long term, laparoscopy also reveals less dumping syndrome and better gastrointestinal functionality [29,30,31]. **Contextual factors:** The laparoscopic technique is effective overall, regardless of demographic differences [32,33,34]. Elderly, obese and patients with comorbidities benefit from less trauma and faster recovery, especially in specialized centers [35,36,37]. DISCUSSION: Open surgery and laparoscopy differ in their approach, invasiveness and recovery [38,39,40]. Open surgery, indicated in complex cases, offers wide visibility and control, but is associated with longer recovery time, pain and risk of infection [41,42]. Laparoscopy, which is minimally invasive, reduces pain, blood loss, length of hospital stay and improves quality of life, but requires specialized training and advanced equipment, and is less indicated in advanced stages of the disease [43,44]. In gastrectomy for gastric cancer, laparoscopy stands out due to less trauma, faster recovery and better functional outcomes, especially in gastrointestinal preservation, reducing complications such as dumping syndrome [44]. Although factors such as age, high BMI and comorbidities influence results, laparoscopy maintains consistent benefits, especially in specialized centers [44]. The choice between techniques should take into account patient characteristics, disease stage and team experience, with further studies needed for clear protocols and individualized decisions. CONCLUSION: The comparison between laparoscopic gastrectomy and open surgery for gastric cancer highlighted the advantages of the laparoscopic technique, such as less tissue trauma, faster recovery, lower risk of infection and superior quality of life [1,2,3,6,7,8,9]. However, it presents challenges such as greater complexity, the need for specialized training and longer surgery times [17,18,19]. Both techniques offer similar oncological outcomes, and the choice must take into account the individual characteristics of each patient [38,39,40,45].

Keywords: Laparoscopic Gastrectomy, Open Gastrectomy, Surgery for Gastric Cancer, Oncologic Outcomes, Functional Recovery.

INTRODUCTION

Gastric cancer is a malignant neoplasm that originates in the cells lining the stomach, with adenocarcinoma being the most prevalent type, responsible for over 90% of cases [1,2]. It is the fifth most common neoplasm in the world and the third leading cause of cancer death, with around 768,000 deaths per year, according to data from GLOBOCAN 2020 [1,2]. The incidence is higher in regions such as East Asia, Latin America and Eastern Europe, due to cultural and dietary factors and the high prevalence of *Helicobacter pylori* infection [2,3]. The condition is more frequent in men, with a peak incidence over the age of 60, and the prognosis strongly depends on the stage at diagnosis, making it essential to invest in screening and prevention strategies, such as eradicating *H. pylori* and promoting healthy eating habits [2,3].

Gastrectomy, the partial or total removal of the stomach, has historically been performed by the open route and is considered the gold standard due to its long experience, consistent and predictable results [3,4]. Direct tissue manipulation in the open approach has ensured precision in cutting and anastomosis techniques, resulting in better results in complex procedures [3,4]. However, laparoscopic gastrectomy has gained prominence in recent years, with studies suggesting that it can offer significant advantages, such as shorter hospital stays and lower postoperative complications, without compromising the effectiveness of the treatment [3,4].

Despite the potential advantages associated with laparoscopic gastrectomy, its adoption as a standard of care still faces substantial barriers, particularly in the Western context [3,4,5,6]. Factors such as the longer time it takes to learn the technique, the need for specialized equipment and the less experience surgeons have with this method contribute to hesitation in its wider implementation [3,4,5,6]. In addition, the variability in demographic and clinical profiles among Western populations raises concerns about the direct applicability of existing evidence, much of which is based on studies carried out predominantly in Asian countries [6,7,8,9].

Another point that requires attention is the lack of uniformity in methodological criteria between the available studies, which makes it difficult to directly compare the open and laparoscopic approaches [6,7,8,9]. While some studies highlight benefits such as less postoperative pain, less blood loss and faster recovery in laparoscopic gastrectomy, others point to challenges related to technical complexity, longer procedure duration and higher costs [6,7,8,9]. This diversity of results highlights the need for an integrative review, capable of gathering and critically evaluating existing information to clarify which factors really influence clinical outcomes [6,7,8,9].

Therefore, an integrative review will not only help to consolidate current knowledge about laparoscopic gastrectomy, but will also provide a basis for further research and the development of more consistent clinical guidelines [7,8,9]. By exploring the technical, clinical and contextual aspects that affect the success of this technique, this review will make it possible to identify gaps in knowledge, point the way to future studies and, above all, provide support for more informed and personalized clinical decision-making [7,8,9].

METHODS

This research is an integrative review, which aims to gather and synthesize existing knowledge on the comparison between laparoscopic and open gastrectomy in the treatment of gastric cancer, considering oncological and functional outcomes [9,10]. The survey of studies was conducted in the PUBMED, VHL and MEDLINE databases, covering articles published between 2018 and 2023, in English. The keywords used included: "Laparoscopic Gastrectomy", "Open Gastrectomy", "Gastric Cancer Surgery", "Oncological Outcomes", and "Functional Recovery". The search strategy combined the descriptors with Boolean operators and applied filters for date, language and type of publication [9,10].

The selection process was structured in three stages. In the first stage, 785 articles were identified from the initial search [10,11]. After applying filters and removing duplicates, 612 studies remained for preliminary analysis [10,11]. In the second stage, screening was carried out based on titles and abstracts, excluding narrative reviews, experimental animal studies, dissertations, theses and articles that did not directly address the comparison between laparoscopic and open gastrectomy in terms of oncological and functional outcomes. After this screening, 168 studies were selected [11,12].

In the third stage, the remaining articles were fully assessed on the basis of relevance, methodological quality and consistency of the data presented [11,12]. Additional exclusion criteria included publications with incomplete data, redundant results or insufficient methodology to meet the objectives of the review [12,13]. At the end of this process, 45 studies were included in the final analysis. These studies served as the basis for a detailed comparison between the laparoscopic and open approaches, contributing to a deeper understanding of clinical and functional outcomes in the treatment of gastric cancer [12,13].

RESULTS

SAFETY AND EFFICACY OF LAPAROSCOPIC GASTRECTOMY

The safety and efficacy of laparoscopic gastrectomy have been widely evaluated in comparative studies, which analyze both the clinical and oncological aspects of this approach in relation to open surgery [12,13]. Several studies indicate that intraoperative and postoperative complication rates are comparable between the two techniques, reinforcing laparoscopy as a safe alternative [12,13].

Complications associated with laparoscopic gastrectomy can vary according to the surgeon's experience and the complexity of the case [12,13,14,15]. Intraoperatively, although laparoscopy reduces tissue trauma, complications such as injuries to adjacent organs and bleeding can occur, especially in more complex surgeries or those performed by less experienced teams [14,15]. In the post-operative period, complications such as wound infections, deep vein thrombosis and fistula formation are common to both techniques [14,15]. However, laparoscopy has advantages, such as a lower rate of wound infections, due to the smaller size of the incisions and less tissue handling [14,15].

Furthermore, oncological results, such as resection margins and the number of dissected lymph nodes, show that the laparoscopic technique does not compromise the quality of oncological treatment, maintaining high standards of tumor control [14,15,16,17]. Obtaining adequate surgical margins, which is essential for successful treatment, is not compromised by laparoscopy. Furthermore, the number of lymph nodes dissected, which is crucial for the staging and prognosis of gastric cancer, is also comparable between the two techniques [14,15,16,17]. Studies indicate that the precision of lymph node dissection in laparoscopy is similar to that obtained in open surgery, guaranteeing equivalent quality in the oncological results [14,15,16,17]. This evidence supports the viability of laparoscopy as an effective approach in the management of gastric cancer [17,18].

TECHNICAL ASPECTS OF LAPAROSCOPY AND OPEN SURGERY

Surgical time in laparoscopic gastrectomy can initially be longer than in open surgery, especially for surgeons learning the technique [17,18]. This factor is attributed to the complexity of the minimally invasive approach, which requires specific skills, such as the use of long instruments and precise manipulation in a restricted field of vision [18,19]. However, studies show that, with increasing experience and refinement of the surgical team's skills, the operating time of laparoscopy tends to match that of open surgery [18,19]. This evolution is especially evident in centers with a high volume of laparoscopic procedures, where the teams are more efficient [18,19,20,21].

One of the most notable benefits of laparoscopic gastrectomy is less blood loss during the procedure compared to open surgery [18,19,20,21]. Magnified visualization and precise control of blood vessels contribute to a reduction in intraoperative bleeding [20,21]. As a result, patients undergoing laparoscopy often require fewer blood transfusions, which reduces the risk of complications related to anemia and improves the patient's overall prognosis [20,21]. This aspect has been consistently highlighted in studies comparing the two techniques [21,22,23].

The learning curve for laparoscopy is a challenge that cannot be ignored [21,22,23]. Unlike open surgery, which is largely mastered by most surgeons, laparoscopy requires additional training and a significant number of cases to achieve proficiency [21,22,23]. This includes mastering specific technical

skills, such as delicate dissection in confined spaces and performing precise anastomoses [22,23,24,25]. However, once this learning curve has been overcome, the benefits of the technique, such as less invasiveness and less physical impact, become evident to both surgeons and patients [22,23,24,25].

Laparoscopic total and distal gastrectomies present significant technical differences [22,23,24,25]. Total gastrectomies, indicated for more advanced cases or tumors located in the proximal portion of the stomach, are more complex procedures due to the need for complete removal of the organ and reconstruction of the gastrointestinal tract, often with a greater extent of lymph node dissection [24,25]. In contrast, distal gastrectomies, common in cases of early gastric cancer or tumors located in the lower portion of the stomach, are less extensive and technically simpler [24,25]. These differences influence both surgical time and functional outcomes, highlighting the importance of a personalized approach for each case [24,25].

RESULTS RELATED TO QUALITY OF LIFE

Recovery after laparoscopic gastrectomy is generally faster and less painful than in open surgery, thanks to the less invasive nature of the technique [24,25]. The small incisions used in laparoscopy reduce surgical trauma, which results in a lower systemic inflammatory response and more efficient healing [24,25,26]. These factors mean that patients experience less pain in the post-operative period, need fewer painkillers and can return to their normal activities more quickly [24,25,26]. In addition, shorter hospital stays reduce the risk of complications related to prolonged hospitalization, such as hospital-acquired infections, and contribute to a more comfortable recovery at home [24,25,26].

With regard to gastrointestinal functionality, laparoscopy can offer significant long-term advantages [25,26,27]. Studies indicate that patients undergoing the laparoscopic technique have a lower incidence of complications such as dumping syndrome, characterized by gastrointestinal and vasomotor symptoms after eating [25,26,27]. Furthermore, the more precise preservation of anatomical structures and less tissue manipulation during laparoscopic surgery can contribute to better absorption of nutrients and a reduction in cases of malabsorption [26,27]. These benefits make laparoscopy an attractive approach for patients seeking a superior quality of life in the postoperative period [26,27].

INFLUENCE OF DEMOGRAPHIC AND CONTEXTUAL FACTORS

Comparative studies between Western and Eastern populations have shown that laparoscopic gastrectomy is a safe and effective technique, regardless of geographical and cultural differences [26,27,28]. Although there are some variations in demographic profiles and approaches to the treatment of gastric cancer between these populations, surgical results, including oncological and functional outcomes, remain consistent [26,27,28]. This reinforces the universal applicability of laparoscopy as a valid alternative to open surgery, highlighting its role in various clinical and regional contexts [26,27,28].

Factors such as advanced age, high body mass index (BMI) and the presence of comorbidities can influence the results of any surgical intervention, including laparoscopic gastrectomy [27,28]. However, evidence suggests that even in these patient groups, laparoscopy offers advantages in terms of less surgical trauma, faster recovery and better postoperative quality of life [27,28]. For example, elderly or obese patients, who traditionally had a higher risk of complications in open surgeries, have shown

positive results with the laparoscopic approach, especially in specialized centers [28,29].

DISCUSSION

Open surgery and laparoscopy are surgical techniques that differ significantly in their approach, invasiveness and patient recovery [28,29]. In open surgery, a large incision in the abdomen allows direct access to the internal organs, which gives the surgeon a wide view and direct contact with the operated area [28,29]. This technique is widely used in complex cases, where manual control and complete visibility are crucial to ensure the effectiveness and safety of the procedure [28,29,30]. However, it is associated with a longer recovery time, a higher risk of infection and greater post-operative discomfort due to the length of the incision [28,29,30].

On the other hand, laparoscopy is a minimally invasive approach that uses small incisions to introduce surgical instruments and a camera, known as a laparoscope [28,29,30]. This technique allows the surgeon to view the inside of the abdomen on a monitor, with precision increased by enlarged, high-definition images [30,31,32,33]. The benefits of laparoscopy include shorter hospital stays, faster recovery, less post-operative pain and smaller scars [30,31,32,33]. However, it requires specialized training, advanced equipment and may be less suitable for cases in advanced stages or in situations that require more extensive interventions [32,33,34,35]. Both techniques have their specific indications and, in many cases, the choice depends on the patient's condition and the experience of the medical team [34,35].

Laparoscopic gastrectomy has emerged as a promising alternative to open surgery in the treatment of gastric cancer, due to several benefits associated with its minimally invasive approach [34,35]. With smaller incisions, the technique significantly reduces surgical trauma, resulting in less postoperative pain, less blood loss and faster recovery [35,36]. These aspects allow patients to be released from hospital earlier, reducing costs and improving the overall treatment experience [35,36]. In addition, the lower physical impact of surgery contributes to a higher quality of life during the recovery period when compared to open surgery [35,36].

The use of high-definition cameras in laparoscopy allows the surgeon to visualize the abdominal structures in detail and accurately, ensuring strict control during the procedure [35,36]. This precision is particularly advantageous in early cases of gastric cancer, where limited resection of the tumor is sufficient to achieve good oncological outcomes [35,36]. However, the technique also presents challenges, such as the long learning curve and dependence on advanced equipment, which can limit its adoption in centers with restricted resources [35,36].

The results related to quality of life after laparoscopic gastrectomy highlight the advantages of this technique compared to open surgery, especially in the context of post-operative recovery [36,37]. The less invasive nature of laparoscopy provides a smoother surgical experience, with less pain and less need for analgesic medication, which contributes significantly to patients' well-being [36,37]. The faster return to daily activities and shorter hospitalization time also have a positive impact on the perception of quality of life, by promoting a more efficient and less stressful recovery in the home environment [36,37].

In addition to aspects related to immediate recovery, long-term gastrointestinal functionality is also a differential of laparoscopy [36,37]. The minimally invasive technique, by better preserving anatomical structures and reducing tissue manipulation, is associated with a lower incidence of complications such as dumping syndrome and malabsorption of nutrients [36,37,38]. These benefits are especially impor-

tant for patients who face significant changes in metabolism and digestion after partial or total removal of the stomach, contributing to more effective adaptation to dietary changes and more balanced nutrition [36,37,38].

However, it is important to consider that the benefits observed in quality of life are directly related to the surgeon's experience and the careful choice of patients who benefit from this technique [36,37,38]. Patients with severe comorbidities or in advanced stages of the disease can face additional challenges, regardless of the approach used [38,39]. Thus, laparoscopy should be seen as part of an individualized therapeutic strategy that takes into account the clinical and demographic characteristics and expectations of each patient in relation to post-operative outcomes [38,39].

Laparoscopic gastrectomy has been shown to be a safe and effective technique in different populations, including Western and Eastern, with consistent results in oncological and functional outcomes, regardless of demographic and cultural variations [38,39,40,41]. Factors such as advanced age, high BMI and the presence of comorbidities, although they can influence surgical results, do not compromise the benefits of laparoscopy, which include less trauma, faster recovery and better quality of life [38,39,40,41]. These results are particularly notable in traditionally higher risk groups, such as the elderly and obese, highlighting laparoscopy as a valid and widely applicable alternative, especially in highly specialized centers [40,41,42].

Therefore, the choice between laparoscopic and open gastrectomy should be carefully planned, taking into account the benefits and limitations of each approach [42,43]. Further studies are needed to establish clearer protocols and identify the patients who benefit most from each technique, contributing to clinical decision-making and the development of more consistent guidelines [42,43,44].

CONCLUSION

In this study, the comparison between laparoscopic gastrectomy and open surgery for gastric cancer presented significant findings to help us make a decision about which method to adopt [1,32,37].

The laparoscopic approach showed promising results in terms of safety and efficacy, minimizing local tissue trauma, damage to adjacent organs and bleeding. The technique has also proved relevant in the post-operative period, as patients undergoing laparoscopic gastrectomy have a faster and less painful recovery time when compared to open surgery. In addition, there is a lower risk of surgical wound infection and an earlier return of gastrointestinal function, which results in a higher quality of life after the procedure. These factors may influence the patient's decision to opt for this approach. [1,32,37,42,45].

Despite the challenges related to the complexity of the laparoscopic technique, which requires a prolonged period of training for the surgeon to achieve proficiency, as well as the need for specialized equipment and the length of the procedure, which tends to be longer, laparoscopy offers satisfactory outcomes [22,23]. This approach provides clinical and oncological results comparable to those of open surgery, including a more detailed surgical view, adequate resection of the margins and precise lymphadenectomy [1, 24,27,45].

Thus, it can be concluded that the laparoscopic gastrectomy approach has similar aspects in relation to oncological prognosis and superior post-operative recovery when compared to open surgery. However, the choice of the most appropriate approach should be based on an individualized analysis of each patient [1, 24,27,45].

REFERENCES

1. Hakkenbrak, Nadia A G et al. "Laparoscopic versus open distal gastrectomy for gastric cancer: A systematic review and meta-analysis." *Surgery* vol. 171,6 (2022): 1552-1561. doi:10.1016/j.surg.2021.11.035

2. Hakkenbrak, Nadia A G et al. "Laparoscopic versus open distal gastrectomy for gastric cancer: A systematic review and meta-analysis." *Surgery* vol. 171,6 (2022): 1552-1561. doi:10.1016/j.surg.2021.11.035

3. Beyer, Katharina. "Surgery Matters: Progress in Surgical Management of Gastric Cancer." *Current treatment options in oncology* vol. 24,2 (2023): 108-129. doi:10.1007/s11864-022-01042-3

4. Kiblawi, Rim et al. "Laparoscopic versus Open Pediatric Surgery: Three Decades of Comparative Studies." *European journal of pediatric surgery : official journal of Austrian Association of Pediatric Surgery ... [et al] = Zeitschrift fur Kinderchirurgie* vol. 32,1 (2022): 9-25. doi:10.1055/s-0041-1739418

5. Manaka, Dai et al. "Re-do laparoscopic esophagojejunostomy for anastomotic stenosis after laparoscopic total gastrectomy in gastric cancer." *Langenbeck's archives of surgery* vol. 407,7 (2022): 3133-3139. doi:10.1007/s00423-022-02632-3

6. Huang, Changming et al. "Laparoscopic vs Open Distal Gastrectomy for Locally Advanced Gastric Cancer: Five-Year Outcomes From the CLASS-01 Randomized Clinical Trial." *JAMA surgery* vol. 157,1 (2022): 9-17. doi:10.1001/jamasurg.2021.5104

7. Rau, Beate et al. "Effect of Hyperthermic Intraperitoneal Chemotherapy on Cytoreductive Surgery in Gastric Cancer With Synchronous Peritoneal Metastases: The Phase III GASTRIPEC-I Trial." *Journal of clinical oncology : official journal of the American Society of Clinical Oncology* vol. 42,2 (2024): 146-156. doi:10.1200/JCO.22.02867

8. Etoh, Tsuyoshi et al. "Five-Year Survival Outcomes of Laparoscopy-Assisted vs Open Distal Gastrectomy for Advanced Gastric Cancer: The JLSSG0901 Randomized Clinical Trial." *JAMA surgery* vol. 158,5 (2023): 445-454. doi:10.1001/jamasurg.2023.0096

9. Yu, Allen T et al. "Open Gastric Surgery for Gastric Cancer." *The Surgical clinics of North America* vol. 105,1 (2025): 1-13. doi:10.1016/j.suc.2024.06.002

10. Gertsen, Emma C et al. "Worldwide Practice in Gastric Cancer Surgery: A 6-Year Update." *Digestive surgery* vol. 38,4 (2021): 266-274. doi:10.1159/000515768

11. Sibio, Simone et al. "Benefits of minimally invasive surgery in the treatment of gastric cancer." *World journal of gastroenterology* vol. 28,30 (2022): 4227-4230. doi:10.3748/wjg.v28.i30.4227

12. Ojima, Toshiyasu et al. "Short-term Outcomes of Robotic Gastrectomy vs Laparoscopic Gastrectomy for Patients With Gastric Cancer: A Randomized Clinical Trial." *JAMA surgery* vol. 156,10 (2021): 954-963. doi:10.1001/jamasurg.2021.3182

13. Pita Araujo, Francisco Antonio et al. "LAPAROSCOPIC VERSUS OPEN SURGERY IN GASTRIC GASTROINTESTINAL STROMAL TUMORS LARGER THAN 5 CM: A SYSTEMATIC REVIEW AND META-ANALYSIS." *Arquivos brasileiros de cirurgia digestiva : ABCD = Brazilian archives of digestive surgery* vol. 35 e1711. 9 Jan. 2023, doi:10.1590/0102-672020220002e1711

14. Ye, Lu et al. "Impact of robotic and open surgery on patient wound complications in gastric cancer surgery: A meta-analysis." *International wound journal* vol. 20,10 (2023): 4262-4271. doi:10.1111/iwj.14328

15. Miyai, Hirotaka et al. "Solo surgery in robot-assisted gastrectomy versus laparoscopic gastrectomy for gastric cancer: a propensity score-matched analysis." *Surgical endoscopy* vol. 37,7 (2023): 5726-5736. doi:10.1007/s00464-023-10113-x

16. Voeten, Daan M et al. "Failure to Cure in Patients Undergoing Surgery for Gastric Cancer: A Nationwide Cohort Study." *Annals of surgical oncology* vol. 28,8 (2021): 4484-4496. doi:10.1245/s10434-020-09510-6

17. Huang, Ze-Ning et al. "Potential survival benefits of open over laparoscopic radical gastrectomy for gastric cancer patients beyond three years after surgery: result from multicenter in-depth analysis based on propensity matching." *Surgical endoscopy* vol. 36,2 (2022): 1456-1465. doi:10.1007/s00464-021-08430-0

18. Romero-Peña, Maritza et al. "Laparoscopic and open gastrectomy for locally advanced gastric cancer: a retrospective analysis in Colombia." *BMC surgery* vol. 23,1 19. 26 Jan. 2023, doi:10.1186/s12893-023-01901-2

19. Maegawa, Felipe B et al. "Gastric Cancer Surgery in the US: a Contemporary Trend Analysis of Lymphadenectomy and the Impact of Minimally Invasive Approaches." *Journal of gastrointestinal surgery : official journal of the Society for Surgery of the Alimentary Tract* vol. 27,9 (2023): 1825-1836. doi:10.1007/s11605-023-05735-4

20. Khorobrykh, Tatyana V et al. "Laparoscopic versus open surgery for locally advanced and metastatic gastric cancer complicated with bleeding and/or stenosis: short- and long-term outcomes." *World journal of surgical oncology* vol. 20,1 216. 25 Jun. 2022, doi:10.1186/s12957-022-02674-3

21. Lombardi, Pietro Maria et al. "Open versus laparoscopic gastrectomy for advanced gastric cancer: a propensity score matching analysis of survival in a western population-on behalf of the Italian Research Group for Gastric Cancer." *Gastric cancer : official journal of the International Gastric Cancer Association and the Japanese Gastric Cancer Association* vol. 25,6 (2022): 1105-1116. doi:10.1007/s10120-022-01321-w

22. Davey, Matthew G et al. "Minimally Invasive and Open Gastrectomy for Gastric Cancer: A Systematic Review and Network Meta-Analysis of Randomized Clinical Trials." *Annals of surgical oncology* vol. 30,9 (2023): 5544-5557. doi:10.1245/s10434-023-13654-6

23. Zhang, Chenggang et al. "Laparoscopic versus open gastrectomy for locally advanced gastric cancer after neoadjuvant chemotherapy: a comprehensive contrastive analysis with propensity score matching." *World journal of surgical oncology* vol. 21,1 350. 9 Nov. 2023, doi:10.1186/s12957-023-03221-4

24. Tanaka, Ryo et al. "Advantages of Laparoscopic Surgery for Gastric Cancer in Elderly Patients Aged Over 80 Years: A Propensity Score Matching Analysis." *World journal of surgery* vol. 45,9 (2021): 2830-2839. doi:10.1007/s00268-021-06157-6

25. Zhu, Zhipeng et al. "Laparoscopic versus open approach in gastrectomy for advanced gastric cancer: a systematic review." *World journal of surgical oncology* vol. 18,1 126. 13 Jun. 2020, doi:10.1186/s12957-020-01888-7

26. Park, Joon Y et al. "Disparities in Utilization and Outcomes of Minimally Invasive Techniques for Gastric Cancer Surgery in the United States." *Annals of surgical oncology* vol. 29,5 (2022): 3136-3146. doi:10.1245/s10434-021-11193-6

27. Du, Getao et al. "Application of radiomics in precision prediction of diagnosis and treatment of gastric cancer." *Japanese journal of radiology* vol. 41,3 (2023): 245-257. doi:10.1007/s11604-022-01352-4

28. Waller, Giacomo C et al. "Minimally Invasive Gastrectomy." *The Surgical clinics of North America* vol. 105,1 (2025): 15-30. doi:10.1016/j.suc.2024.06.003

29. Blumenthaler, Alisa N et al. "Implementation of a perioperative-enhanced recovery protocol in patients undergoing open gastrectomy for gastric cancer." *Journal of surgical oncology* vol. 124,5 (2021): 780-790. doi:10.1002/jso.26591

30. Bittar, Vinicius et al. "Laparoscopic Versus Open Gastrectomy for Advanced Gastric Cancer: A Meta-Analysis of Randomized Controlled Trials." *Journal of gastrointestinal cancer* vol. 55,2 (2024): 652-661. doi:10.1007/s12029-024-01048-0

31. Yoshida, Naohiro et al. "Early gastric cancer detection in high-risk patients: a multicentre randomised controlled trial on the effect of second-generation narrow band imaging." *Gut* vol. 70,1 (2021): 67-75. doi:10.1136/gutjnl-2019-319631

32. Zeng, Furong et al. "Laparoscopic versus open gastrectomy for gastric cancer." *World journal of surgical oncology* vol. 18,1 20. 27 Jan. 2020, doi:10.1186/s12957-020-1795-1

33. Maejima, Kentaro et al. "The Influences of Obesity in Laparoscopic and Open Distal Gastrectomy for Patients with Early Gastric Cancer." *Journal of Nippon Medical School = Nippon Ika Daigaku zasshi* vol. 89,2 (2022): 215-221. doi:10.1272/jnms.JNMS.2022_89-218

34. Akimoto, Eigo et al. "Impact of postoperative intra-abdominal infectious complications on survival outcomes in patients with gastric cancer who underwent laparoscopic surgery." *Surgical endoscopy* vol. 37,1 (2023): 382-390. doi:10.1007/s00464-022-09522-1

35. Zhou, Ming et al. "Risk factors for postoperative pancreatic fistula (POPF) in gastric cancer patients: A systematic review and meta-analysis." *European journal of surgical oncology : the journal of the European Society of Surgical Oncology and the British Association of Surgical Oncology* vol. 49,11 (2023): 107092. doi:10.1016/j.ejso.2023.107092

36. Zhou, Ming et al. "Risk factors for postoperative pancreatic fistula (POPF) in gastric cancer patients: A systematic review and meta-analysis." *European journal of surgical oncology : the journal of the European Society of Surgical Oncology and the British Association of Surgical Oncology* vol. 49,11 (2023): 107092. doi:10.1016/j.ejso.2023.107092

37. Di Carlo, Sara et al. "Laparoscopic versus Open Total Gastrectomy for Locally Advanced Gastric Cancer: Short and Long-Term Results." *Current oncology (Toronto, Ont.)* vol. 29,11 8442-8455. 6 Nov. 2022, doi:10.3390/curroncol29110665

38. Jagric, Tomaz. "The Contribution of the Hunger Hormone Leptin in the Aetiology of Postoperative Anorexia after Laparoscopic and Open Gastrectomy in Gastric Cancer Patients." *Biomolecules* vol. 11,11 1601. 29 Oct. 2021, doi:10.3390/biom11111601

39. Chen, Qi-Yue et al. "Indocyanine green fluorescence imaging-guided versus conventional laparoscopic lymphadenectomy for gastric cancer: long-term outcomes of a phase 3 randomised clinical trial." *Nature communications* vol. 14,1 7413. 16 Nov. 2023, doi:10.1038/s41467-023-42712-6

40. Iwasaki, Hironori et al. "Risk Factor of Sarcopenia After Gastrectomy in Elderly Patients With Gastric Cancer." *Anticancer research* vol. 43,9 (2023): 4207-4212. doi:10.21873/anticanres.16612

41. Morita, Junya et al. "Dietary Intake After Surgery in Patients With Gastric Cancer Who Underwent Laparoscopic-assisted *Versus* Those Who Underwent Conventional Gastrectomy." *Anticancer research* vol. 44,1 (2024): 409-415. doi:10.21873/anticanres.16826

42. Caruso, Stefano et al. "Laparoscopic vs. Open Gastrectomy for Locally Advanced Gastric Cancer: A Propensity Score-Matched Retrospective Case-Control Study." *Current oncology (Toronto, Ont.)* vol. 29,3 1840-1865. 9 Mar. 2022, doi:10.3390/curroncol29030151

43. Osorio, Javier et al. "Improved postoperative outcomes and reduced transfusion rates after implementation of a Patient Blood Management program in gastric cancer surgery." *European journal of surgical oncology : the journal of the European Society of Surgical Oncology and the British Association of Surgical Oncology* vol. 47,6 (2021): 1449-1457. doi:10.1016/j.ejso.2020.11.129

44. Chen, Wei-Zhe et al. "Comparison of laparoscopic and open radical gastrectomy for gastric cancer patients with GLIM-defined malnutrition." *European journal of surgical oncology : the journal of the European Society of Surgical Oncology and the British Association of Surgical Oncology* vol. 49,2 (2023): 376-383. doi:10.1016/j.ejso.2022.09.009

45. Seong-A Jeong, et al. "Comparing surgical and oncologic outcomes between laparoscopic gastrectomy and open gastrectomy in advanced gastric cancer with serosal invasion: A retrospective study with propensity score matching." *European Journal of Surgical Oncology,* vol 48,9 (2022): 1988-1993. doi: https://doi.org/10.1016/j.ejso.2022.05.019.