

Introduction

Colorectal cancer is the third leading cancer in men and the second leading cancer in women, while rectal cancer comprises 30% of total colorectal cancer cases (Duhoky et al., 2025, Long et al., 2024). In addition, rectal cancer is one of the deadliest cancers in the world. Surgical resection is considered the standard treatment, but minimally invasive surgery (MIS) has been increasingly used because of its advantages over open surgery (Duhoky et al., 2025, Matsuyama et al., 2021). However, conventional laparoscopic surgery involves several limitations in rectal procedures within the confined space of the pelvis, such as limited degrees of freedom, impaired hand-eye coordination, lack of tactile feedback, and a high conversion rate of 9%-16% (Duhoky et al., 2025, Asklid et al., 2021). Robotic-assisted laparoscopic surgery has been introduced to overcome the limitations of conventional laparoscopic surgery by providing improved articulation and dexterity of surgical instruments, a stabilized three-dimensional view, optimized surgeon ergonomics, tremor filtering, and motion scaling (Asklid et al., 2021, Matsuyama et al., 2021). Therefore, this review aimed to assess whether robotic-assisted surgery has better short-term perioperative outcomes than conventional laparoscopic surgery.

Objectives

Compare short-term perioperative outcomes, including operative time, conversion, length of hospitalization, blood loss, and complication rates, between robotic-assisted and conventional laparoscopic approaches in adult patients with clinical Stage I-III rectal adenocarcinoma who undergo rectal cancer surgery.

Methods

The literature search was performed using PubMed with terms such as “rectal cancer,” “rectal adenocarcinoma,” “robotic surgery,” “laparoscopic surgery,” and “rectal resection.” Inclusion criteria were studies reporting clinical outcomes in adults with Stage I–III rectal adenocarcinoma that underwent robotic-assisted versus conventional laparoscopic surgery. Excluded studies were those that lacked a comparative laparoscopic control group or did not report perioperative outcome measures. The primary outcome measures were operative time and conversion rate to laparoscopic operation, whereas secondary measures were length of hospitalization, estimated blood loss, and overall postoperative complications.

Results

Six studies were included in the analysis. Robotic-assisted surgery was associated with reduced conversion rates and shorter length of hospital stay than conventional laparoscopic surgery. The overall operative time was generally longer, for robotic-assisted surgery, although there was a wide variation between the studies and one study found no difference. Blood loss was similar or lower for laparoscopic surgery in the studies that reported this. The rates of postoperative complication varied between studies with a few showing fewer complications after robotic-assisted surgery and others reporting similar or higher rates. There are a number of outcomes which were not reported consistently across the studies.

Cohort Study	Mertens et al., 2026	Jayne et al., 2017	Matsuyama et al., 2021	Long et al., 2024	Duhoky et al., 2025	Asklid et al., 2021
Study Design	Cohort Study	RCT	Comparative Study	Comparative Study	Cohort Study	Cohort Study
Sample Size	Robotic: 3578 Laparoscopic: 2296	Robotic: 237 Laparoscopic: 234	Robotic: 2843 Laparoscopic: 2843	Robotic: 111 Laparoscopic: 111	Robotic: 680.9 Laparoscopic: 1057.5	Robotic: 827 Laparoscopic: 869
Conversion	Robotic: 326 Laparoscopic: 370	Robotic: 28 Laparoscopic: 19	Robotic: 19 Laparoscopic: 58	Robotic: 0 Laparoscopic: 2	Robotic: 37.4 Laparoscopic: 41.7	Robotic: 69 Laparoscopic: 156
Operative Time (min)	Robotic: 351 min Laparoscopic: 314 min	Robotic: 298.5 min Laparoscopic: 261 min	Robotic: 352 min Laparoscopic: 383	Robotic: 187 min Laparoscopic: 185 min	Robotic: 220 min Laparoscopic: 181 min	Robotic: 5.77 min Laparoscopic: 5.49 min
Postoperative Complications	Robotic: 1319 Laparoscopic: 844	Robotic: 78 Laparoscopic: 73	NR	Robotic: 15 Laparoscopic: 14	Robotic: 484.4 Laparoscopic: 300.9	Robotic: 297 Laparoscopic: 271
Blood Loss (mL)	Robotic: 100 mL Laparoscopic: 75 mL	Not Reported (NR)	Robotic: 15 mL Laparoscopic: 20 mL	Robotic: 50 mL Laparoscopic: 50 mL	NR	NR
Length of Stay (days)	Robotic: 6 d Laparoscopic: 7 d	Robotic: 8 d Laparoscopic: 8.2 d	Robotic: 13 d Laparoscopic: 14 d	Robotic: 5 d Laparoscopic: 7 d	Robotic: 6 d Laparoscopic: 6 d	Robotic: 7.82 d Laparoscopic: 8.6 d

Figure 1: Comparison of short-term perioperative outcomes between robotic-assisted and conventional laparoscopic surgery.

Discussion

In conclusion, the robotic-assisted surgery option seems to be associated with better conversion rates and shorter lengths of hospitalization than traditional laparoscopic surgery. On the other hand, it is usually associated with longer operation time, which might be a disadvantage for specific cases. Although in most cases, both procedures are connected with comparable volumes of blood loss and postoperative morbidity, there were significant discrepancies among the included trials to support the superiority of robotic-assisted surgery over conventional laparoscopic approaches. These variations might be caused by differences in the design of trials, populations of patients, surgeons’ skills, or ways of outcome reporting. Thus, robotic-assisted surgery can be conditionally recommended for particular outcomes during the postoperative period, but it is too early to recommend it as a universally better option than conventional laparoscopic surgery.

Conclusion

The study concluded that robotic-assisted surgeries were associated with improved conversion rates and length of a hospital stay with an increased operative time, while blood loss and complication rates varied among the studies. Thus, it can be assumed that robotic-assisted surgery could be clinically beneficial for some short-term post-operative outcomes, but more research is needed to prove that it is superior to conventional laparoscopic surgery.

References

