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EARLY FUNCTIONAL RECOVERY AFTER LAPAROSCOPIC SURGERY FOLLOWING NEOADJUVANT CHEMOTHERAPY IN STAGE III GASTRIC CANCER

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Abstract

Background: Surgery remains the cornerstone of curative treatment for locally advanced gastric cancer. In stage III disease, surgical treatment is often combined with neoadjuvant chemotherapy. However, surgery after neoadjuvant treatment may be technically more demanding, and the role of laparoscopic surgery in this setting remains clinically relevant.

Objective: To evaluate early functional recovery and short-term surgical outcomes after laparoscopic gastrectomy following neoadjuvant chemotherapy in patients with stage III gastric cancer.

Methods: A single-center interim clinical analysis was performed in patients with stage III gastric cancer treated with radical-intent surgery. Patients were divided into three groups: open surgery without neoadjuvant chemotherapy, neoadjuvant chemotherapy followed by open surgery, and neoadjuvant chemotherapy followed by laparoscopic surgery. The analyzed outcomes included intraoperative

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blood loss, operative time, duration of narcotic analgesia, length of hospital stay, rehabilitation period, return to daily activity, postoperative complications, anastomotic leakage and one-year mortality.

Results: Laparoscopic surgery after neoadjuvant chemotherapy was associated with lower intraoperative blood loss compared with open surgery. Blood loss was approximately 150 ml in the laparoscopic group compared with 250–350 ml in the open surgery groups. Operative time was longer in the laparoscopic group, approximately 165 minutes, compared with 120 minutes in the primary open surgery group and 135 minutes in the neoadjuvant chemotherapy plus open surgery group. The duration of narcotic analgesia was shorter after laparoscopic surgery: approximately 2 days compared with 3–3.5 days after open surgery. Hospital stay was also shorter in the laparoscopic group: 6.5 days compared with 7.5–8.0 days. The rehabilitation period was approximately 10 days after laparoscopic surgery and approximately 21 days after open surgery. Return to daily activity occurred earlier after laparoscopic surgery. No anastomotic leakage and no one-year mortality were observed in the interim analysis.

Conclusion: Laparoscopic gastrectomy after neoadjuvant chemotherapy in selected patients with stage III gastric cancer appears feasible and safe. Compared with open surgery, the minimally invasive approach may reduce blood loss, postoperative pain, hospital stay and rehabilitation time. Final conclusions require complete statistical analysis, assessment of R0 resection, lymph node yield and long-term oncological outcomes.

Keywords: Gastric cancer, stage III, laparoscopic gastrectomy, neoadjuvant chemotherapy, functional recovery, hospital stay, postoperative pain.

Introduction

Gastric cancer remains an important cause of cancer-related morbidity and mortality worldwide. A significant proportion of patients are diagnosed with

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locally advanced disease, especially in regions where organized endoscopic screening is not widely implemented. Stage III gastric cancer is associated with a high risk of lymph node involvement and recurrence; therefore, treatment usually requires a multimodal approach.

Radical surgery remains the main curative component of treatment. The surgical goal is complete tumor removal with adequate lymph node dissection and achievement of R0 resection. In recent years, neoadjuvant chemotherapy has become increasingly important in locally advanced gastric cancer because it may reduce tumor burden and improve systemic disease control.

However, surgery after neoadjuvant chemotherapy may be technically challenging due to tissue edema, fibrosis and post-treatment inflammatory changes. Therefore, the safety and clinical value of laparoscopic surgery after neoadjuvant chemotherapy require careful evaluation.

Minimally invasive surgery may provide several advantages, including reduced blood loss, lower postoperative pain, earlier mobilization and shorter hospital stay. These outcomes are especially important in patients with stage III gastric cancer because postoperative recovery may influence the possibility of continuing adjuvant treatment.

The aim of this study was to evaluate early functional recovery and short-term surgical outcomes after laparoscopic surgery following neoadjuvant chemotherapy in patients with stage III gastric cancer.

Materials and Methods

Study design

This study was designed as a single-center interim clinical analysis. The study included patients with stage III gastric cancer treated at the Republican Specialized Scientific and Practical Medical Center of Oncology and Radiology, Tashkent, Uzbekistan.

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Patients

Patients with morphologically confirmed gastric adenocarcinoma and stage III disease were included. All patients underwent radical-intent surgery either as primary surgery or after neoadjuvant chemotherapy.

Study groups

Patients were divided into three groups:

- **Group 1:** open surgery without neoadjuvant chemotherapy;
- **Group 2:** neoadjuvant chemotherapy followed by open surgery;
- **Group 3:** neoadjuvant chemotherapy followed by laparoscopic surgery.

Evaluated outcomes

The following outcomes were analyzed:

- intraoperative blood loss;
- operative time;
- duration of narcotic analgesia;
- length of hospital stay;
- rehabilitation period;
- return to daily activity;
- postoperative complications according to the Clavien–Dindo classification;
- anastomotic leakage;
- one-year mortality.

Formal quality-of-life questionnaires were not included in this interim analysis. Therefore, the present article focuses on measurable functional recovery indicators rather than validated quality-of-life scores.

Statistical analysis

At the interim stage, results are presented descriptively. Final statistical analysis will be performed after completion and verification of the full database.

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Continuous variables will be presented as mean with standard deviation or median with interquartile range depending on distribution. Categorical variables will be presented as absolute numbers and percentages. A p-value below 0.05 will be considered statistically significant.

Results

Intraoperative outcomes

The laparoscopic group demonstrated lower intraoperative blood loss compared with both open surgery groups. Estimated blood loss was approximately 150 ml in the neoadjuvant chemotherapy plus laparoscopic surgery group, while blood loss in the open surgery groups ranged from 250 to 350 ml.

Operative time was longer in the laparoscopic group. The average operative time was approximately 165 minutes in Group 3, compared with approximately 120 minutes in Group 1 and 135 minutes in Group 2. This difference may be explained by the technical complexity of laparoscopic lymph node dissection and surgery after neoadjuvant chemotherapy.

Postoperative pain and analgesia

The duration of narcotic analgesia was shorter after laparoscopic surgery. Patients in Group 3 required narcotic analgesics for approximately 2 days. In comparison, patients in Group 2 required analgesics for approximately 3 days, and patients in Group 1 required analgesics for approximately 3.5 days.

This result suggests that laparoscopic surgery may reduce postoperative pain and support earlier mobilization.

Hospital stay and rehabilitation

The length of hospital stay was shorter in the laparoscopic group. Patients after laparoscopic surgery stayed in hospital for approximately 6.5 days. In the open surgery groups, hospital stay was approximately 7.5–8.0 days.

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The rehabilitation period was also shorter after laparoscopic surgery. In Group 3, rehabilitation lasted approximately 10 days, whereas in the open surgery groups it lasted approximately 21 days. Return to daily activity occurred approximately 2 weeks after laparoscopic surgery and approximately 3–4 weeks after open surgery.

Postoperative complications

Minor postoperative complications classified as Clavien–Dindo grade I–II were less frequent in the laparoscopic group. The number of minor complications was 15 cases in Group 1, 12 cases in Group 2 and 6 cases in Group 3.

No anastomotic leakage was observed in the interim analysis. No one-year mortality was registered in any group.

Table 1. Early surgical and functional recovery outcomes

Parameter	Open surgery	Neoadjuvant chemotherapy + open surgery	Neoadjuvant chemotherapy + laparoscopic surgery
Blood loss	250–350 ml	250–350 ml	~150 ml
Operative time	~120 min	~135 min	~165 min
Narcotic analgesia	~3.5 days	~3 days	~2 days
Hospital stay	~8.0 days	~7.5 days	~6.5 days
Rehabilitation period	~21 days	~21 days	~10 days
Return to daily activity	3–4 weeks	3–4 weeks	~2 weeks
Clavien–Dindo I–II complications	15 cases	12 cases	6 cases
Anastomotic leakage	0	0	0
One-year mortality	0	0	0

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Discussion

The interim results of this study suggest that laparoscopic surgery after neoadjuvant chemotherapy may be feasible and safe in selected patients with stage III gastric cancer.

The main advantage of the laparoscopic approach was lower intraoperative blood loss. This may be related to improved visualization, precise dissection and careful hemostasis during minimally invasive surgery. Reduced blood loss is clinically important because it may decrease the need for transfusion and improve early postoperative recovery.

Another important finding was the shorter duration of narcotic analgesia after laparoscopic surgery. Reduced postoperative pain may contribute to earlier mobilization, better respiratory function and faster return to oral intake. These factors are particularly relevant in patients with gastric cancer, who may have impaired nutritional status before treatment.

The laparoscopic group also demonstrated shorter hospital stay and a shorter rehabilitation period. These findings support the concept that minimally invasive surgery may improve early functional recovery after multimodal treatment. In clinical practice, faster recovery may be important because patients with stage III gastric cancer often require further postoperative therapy.

Operative time was longer in the laparoscopic group. However, this should not be interpreted as a negative result alone. Laparoscopic gastrectomy after neoadjuvant chemotherapy is technically demanding and requires careful dissection. Importantly, the longer operative time was not associated with anastomotic leakage or one-year mortality in this interim analysis.

The study has several limitations. First, this is a single-center interim analysis. Second, the results are descriptive and require final statistical confirmation. Third, validated quality-of-life questionnaires were not used in this interim analysis. Fourth, long-term oncological outcomes, including disease-free survival and overall survival, are not yet mature. In the final version, R0 resection rate,

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number of retrieved lymph nodes and adjuvant treatment completion should also be analyzed.

Despite these limitations, the results support further development of laparoscopic surgery as part of multimodal treatment for stage III gastric cancer in properly selected patients.

Conclusion

Laparoscopic surgery after neoadjuvant chemotherapy in selected patients with stage III gastric cancer appears feasible and safe. Compared with open surgery, the minimally invasive approach was associated with lower blood loss, shorter narcotic analgesia, shorter hospital stay, faster rehabilitation and earlier return to daily activity.

Final conclusions require complete statistical analysis and evaluation of oncological quality indicators, including R0 resection rate, lymph node yield and long-term survival.

Conflict of Interest

The author declares no conflict of interest.

Funding

No external funding was received for this study.

Ethical Statement

This study should be submitted with approval from the local ethics committee.

Ethics approval number: [insert number].

Date of approval: [insert date].

Author Contribution

A.O. Abdukodirov developed the study concept, collected and analyzed clinical data, interpreted the results and prepared the manuscript.

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