Feasibility of Non-Routine Indwelling Urinary Catheter Placement in Postoperative Gastric Cancer Patients Under Enhanced Recovery After Surgery: A Postprint

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Abstract

Objective To explore the feasibility of not routinely retaining an indwelling urinary catheter in gastric cancer patients following Enhanced Recovery After Surgery (ERAS). Methods A retrospective analysis was performed on clinical data of patients who underwent elective radical gastrectomy for gastric cancer in the General Surgery Department of Nanjing General Hospital from June 2016 to March 2017 under the ERAS protocol; selected patients had a urinary catheter inserted during anesthesia induction, which was immediately removed at the end of surgery, and this time point was established as the observation starting point; the time to first postoperative urination, first urination volume, and proportion of re-catheterization were recorded; risk factors for delayed first urination and re-catheterization were analyzed. Results One hundred thirty-seven patients were enrolled in this study, including 90 males (65.7%) and 47 females (34.3%), with a mean age of X58.9 ± 10. 1) years; the time to first postoperative urination was (}5. 3 ± 2. 1) hours, the first spontaneous urination volume was (298. 9101. 3) ml, and the re-catheterization rate was 11.7% (16/137); compared with the open surgery group, the robotic surgery group exhibited a higher rate of spontaneous urination and lower rates of induced urination, re-catheterization, and urinary tract irritation symptoms (all P 均 <0. 01); using 6 hours postoperative as the cutoff for first urination time, compared with the }6h group, the >6 h group had greater intraoperative fluid infusion volume, greater intraoperative urine output, and delayed time to first spontaneous urination and first ambulation (all P 均 <0.01). Conclusion Immediate removal of the urinary catheter after surgery is feasible in ERAS gastric cancer patients; intraoperative controlled fluid infusion and multimodal analgesia are fundamental prerequisites for not routinely retaining an indwelling urinary catheter; robotic surgery facilitates

early recovery of spontaneous urination.

Full Text

The Feasibility of Non-conventional Indwelling Catheter in Enhanced Recovery After Surgery for Gastric Cancer Patients

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Abstract

Objective: This study aimed to explore the feasibility of non-conventional indwelling catheter management in gastric cancer patients undergoing Enhanced Recovery After Surgery (ERAS).

Methods: Clinical data were retrospectively analyzed for patients who underwent radical gastrectomy with ERAS protocols in the Department of General Surgery, Nanjing General Hospital of Nanjing Military Region from June 2016 to March 2017. All urinary catheters were inserted during anesthesia induction and removed immediately after surgery. The first postoperative urination time, volume, and recatheterization rate were recorded from this observation start point. Risk factors for delayed first urination and recatheterization were analyzed.

Results: A total of 137 patients were included, comprising 90 males (65.7%) and 47 females (34.3%) with a mean age of 58.9±10.1 years. The first postoperative urination occurred at (5.3±2.1) hours with a volume of (298.9±101.3) ml. The recatheterization rate was 11.7% (16/137). Subgroup analysis by surgical approach showed the robotic surgery group had a higher automatic urination rate, lower induced urination rate, lower recatheterization rate, and lower urinary tract irritation incidence compared to the open surgery group ($P<0.01$). Using 6 hours as the cutoff for first postoperative urination time, the >6h group had greater intraoperative infusion volumes and urine output, which delayed both first urination and mobilization time compared to the 6h group ($P<0.01$).

Conclusions: Immediate catheter removal after gastric cancer surgery is feasible in ERAS patients. Intraoperative controlled infusion and multimodal analgesia are essential prerequisites for non-conventional indwelling catheter management. Robotic surgery is advantageous for early postoperative recovery of

spontaneous urination.

Keywords: Enhanced recovery after surgery; gastric cancer; non-conventional indwelling catheters

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Introduction

Enhanced Recovery After Surgery (ERAS) is a multimodal perioperative care pathway designed to reduce surgical stress and accelerate patient recovery through evidence-based interventions. Professor Jiang Zhiwei first introduced this concept to gastric cancer patients in China, drawing from 10 years of clinical experience. ERAS encompasses five core components: nutritional support, anesthetic management, minimally invasive techniques, multimodal analgesia, and optimized catheter and fluid management.

Traditional practice involves routine preoperative or intraoperative urinary catheterization to prevent bladder injury and postoperative urinary retention. However, catheter-associated urinary tract infection (CAUTI) is a common complication, with infection rates correlating positively with catheter duration. The ERAS Society guidelines recommend shortening catheterization time or omitting catheters when possible to reduce CAUTI and other complications. While previous studies have demonstrated the safety of early catheter removal after colorectal surgery, limited evidence exists for gastric cancer patients.

1. Materials and Methods

1.1 Clinical Data We retrospectively analyzed clinical data from patients undergoing elective radical gastrectomy at our institution between June 2016 and March 2017. Inclusion criteria were: (1) age 18-75 years; (2) pathologically confirmed gastric cancer; (3) no severe organ dysfunction; (4) no preoperative malnutrition (BMI >18.5 kg/m^2); (5) ability to understand and voluntarily participate. Exclusion criteria included: (1) gastrointestinal obstruction; (2) history of urinary tract disease; (3) benign prostatic hyperplasia; (4) urinary tract tumors; (5) inability to express urinary sensation. This study was approved by our hospital ethics committee (approval number: 2017NZKY-011-02).

1.2 Perioperative Urethral Management Protocol All patients underwent preoperative assessment and bladder emptying before anesthesia. Following sterile technique, a 12Fr double-lumen balloon catheter was inserted after anesthesia induction and removed immediately after surgery. Postoperative monitoring began when patients returned to the ward. Patients were assessed hourly for urinary sensation. Those without urge to urinate continued observation. Patients with urinary sensation but difficulty voiding received interventions including warm water perineal washing, lower abdominal heat application or massage, listening to running water, and assisted ambulation to toilet. If these measures failed, catheter reinsertion was performed. Urinary retention

was defined as inability to void within 6 hours postoperatively or bladder volume >400 ml on ultrasound with inability to void. Urinary tract irritation symptoms (frequency, urgency, dysuria, hematuria) were assessed by patient report. Urinary tract infection was diagnosed by urine culture with colony count >100/ml.

The comprehensive ERAS protocol is detailed in .

1.3 Observation Indicators Data collected by a single researcher included: (1) perioperative baseline characteristics and history of urinary dysfunction; (2) intraoperative blood loss and fluid management; (3) postoperative hospital stay; (4) first postoperative urination time and volume; (5) pain scores at first urination (Visual Analogue Scale); (6) recatheterization rate.

1.4 Statistical Analysis Data were analyzed using SPSS 19.0 software. Continuous variables are expressed as mean±standard deviation and compared using t-tests. Categorical data are expressed as percentages and compared using chi-square tests. $P<0.05$ was considered statistically significant.

2. Results

2.1 General Clinical Characteristics A total of 137 patients were enrolled, including 90 males (65.7%) and 47 females (34.3%) with mean age 58.9±10.1 years. Mean operative time was (190.5±80.2) minutes, intraoperative blood loss was (153.4±56.3) ml, intraoperative fluid infusion was (1561.9±538.7) ml, and intraoperative urine output was (551.4±195.5) ml. Postoperative recovery room stay was (40.5±7.6) minutes, and postoperative hospital stay was (5.4±2.0) days.

2.2 Patient Urination Status The first spontaneous urination occurred at (5.3±2.1) hours postoperatively with a volume of (298.9±101.3) ml. When stratified by surgical approach, the robotic surgery group demonstrated significantly higher spontaneous urination rates, lower induced urination rates, lower recatheterization rates, and lower urinary tract irritation incidence compared to the open surgery group ($P<0.01$) .

Using 6 hours as the threshold for first postoperative urination time, the >6h group (n=52) showed greater intraoperative fluid infusion (1787.6±154.5 ml vs. 1268.3±183.2 ml, $P<0.001$) and urine output (614.2±101.6 ml vs. 442.3±61.2 ml, $P<0.001$) compared to the 6h group (n=85). The >6h group also had larger first voided volumes (322.6±63.2 ml vs. 223.3±43.6 ml, $P<0.001$) and delayed first mobilization time (7.0±1.6 hours vs. 3.2±1.1 hours, $P<0.001$). Pain scores at first urination did not differ significantly between groups .

3. Discussion

3.1 Feasibility of Non-conventional Catheter Management Postoperative urinary catheters increase CAUTI risk and patient discomfort. Our study demonstrates that immediate catheter removal after gastric cancer surgery is feasible, with 88.3% of patients achieving spontaneous urination without recatheterization. This aligns with international studies reporting recatheterization rates of 11.7-27.8% after early catheter removal in abdominal surgery. The 11.7% recatheterization rate in our cohort is acceptable and comparable to colorectal surgery data, confirming that routine catheterization is unnecessary for most gastric cancer patients.

3.2 Essential Prerequisites for Catheter Avoidance 3.2.1 Optimal Anesthesia Management Epidural anesthesia can cause prolonged parasympathetic blockade and urinary retention. General anesthesia has less impact on voiding reflexes and allows earlier recovery. Our ERAS protocol employs short-acting anesthetics (propofol, remifentanil, cisatracurium) with dexmedetomidine (0.6 g/kg), facilitating rapid awakening within 33-40 minutes. Dexmedetomidine also reduces catheter-related bladder discomfort. This optimized anesthesia approach supports early spontaneous voiding.

3.2.2 Restrictive Fluid Management ERAS advocates controlled intraoperative fluid administration. Our patients received mean infusion of (1561.9±538.7) ml with urine output of (551.4±195.5) ml, preventing bladder overdistension and enabling immediate catheter removal. The >6h urination group received significantly more intraoperative fluids (1787.6±154.5 ml), highlighting the importance of restrictive fluid management.

3.2.3 Effective Multimodal Analgesia Our multimodal analgesia regimen (NSAIDs, acetaminophen, local anesthetics) minimizes opioid use, reducing bladder dysfunction and facilitating early mobilization. Effective pain control enables patients to ambulate early and void spontaneously, which is crucial for successful catheter avoidance.

3.3 Minimally Invasive Surgery Facilitates Catheter Avoidance Minimally invasive surgery reduces surgical stress and pain, promoting early recovery. The robotic surgery group demonstrated superior outcomes with higher spontaneous urination rates (82.2% vs. 27.8%, $P<0.001$) and lower recatheterization rates (5.6% vs. 27.8%, $P<0.001$) compared to open surgery. Smaller incisions, reduced pain, and faster recovery in robotic surgery provide favorable conditions for early spontaneous voiding and catheter avoidance.

4. Conclusion

Immediate postoperative catheter removal is safe and feasible in ERAS gastric cancer patients without increasing urinary tract infection risk. Key enabling factors include optimized anesthesia, restrictive fluid management, multimodal

analgesia, and minimally invasive surgical approaches. For patients with risk factors such as benign prostatic hyperplasia or prior cesarean section, enhanced monitoring and preoperative bladder training are recommended. Future prospective randomized controlled trials with larger sample sizes and objective bladder volume assessment using postoperative ultrasound are needed to provide high-quality evidence for clinical practice.

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**** Accelerated Recovery Perioperative Management Protocol for Gastric Cancer Patients

**** Comparison of Urination Status Between Robotic and Open Surgery Groups (%)

**** Comparison of Patients with Different First Urination Times After Elective Radical Gastrectomy (n=85 vs n=52)

Note: Figure translations are in progress. See original paper for figures.