

Clinical significance of wound infiltration with ropivacaine for elderly patients in china underwent total laparoscopic radical gastrectomy

A retrospective cohort study

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Abstract

The study aimed to evaluate analgesic effects and postoperative recovery of ropivacaine wound infiltration for elderly patients in China after total laparoscopic radical gastrectomy.

We retrospectively reviewed clinical data of 132 elderly patients who received total laparoscopic gastrectomy and tracheal intubation general anesthesia from cancer center of First Affiliated Hospital of Xiamen University between September 2014 and September 2017, patients were divided into 2 groups according to local injection of drug: group I (ropivacaine group, 0.5% ropivacaine, 40mL in total, n=69), group II (control group, no analgesic, n=63). The demographics, postoperative pain using numeric ratings scale (NRS), rescue analgesics as well as incidence of complications were investigated.

Significantly lower pain scores were observed in group I than in group II at 6, 12, 24, and 48 h postoperatively; the use of remedy analgesia was less in group I than in group II; there was no statistical significance in the incidence of surgical-related complications between the 2 groups. The recovery time were shorter in group I than in group II, meanwhile, postoperative hospital stay, medical expenses, and anesthesia-related complications were significantly less in group I than in group II.

This is a review of ropivacaine infiltration use in the elderly patients underwent total laparoscopic radical gastrectomy. This analysis describes the postoperative analgesic effect and postoperative recovery of wound infiltration with ropivacaine. Multicentered large sample prospective randomized controlled study is needed to evaluate the feasibility, security, and economic practicality.

Abbreviations: ASA = American Society of Anesthesiologists, BMI = body mass index, N = number, NRS = Numeric Pain Intensity Scale, TNM = tumor, node, metastasis.

Keywords: analgesia, elderly, laparoscopy, radical gastrectomy, ropivacaine

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1. Introduction

Gastric cancer is a kind of common malignant tumors in China, with gradual aging of population age structure in China and the development of medical science, the number of patients underwent gastric cancer operation with advanced age (>60 years old) is increasing.^[1] Total laparoscopic radical gastrectomy has the characteristics of small trauma, mild pain, and rapid postoperative recovery. As the pain after laparoscopic surgery is not severe, postoperative analgesia is often ignored. However, studies have shown that most patients still experience mild and moderate pain after laparoscopic surgery and require analgesics, especially the first night after surgery.^[2] To some extent, for old people, the function of various organs declines, and disease resistance ability and compensation ability decline, so it is more likely to cause a series of physiologic function disorders such as breathing, circulation, endocrine disorders, which affects the postoperative recovery. Therefore, it is necessary to carry out postoperative analgesia for elderly patients underwent complete laparoscopic radical gastrectomy.

Local anesthetic wound infiltration holds an important place among the analgesic techniques in the setting of modern surgical procedures.^[3] It can be viewed as a minimally invasive analgesic technique that follows the development of surgery toward less invasive procedures.^[4] The benefit of wound infiltration is based on the recognition of parietal pain as a major component of overall postoperative pain, especially after laparoscopic procedures.^[5] Wound infiltration has a favorable risk-benefit ratio

because it is well tolerated, feasible in almost all patients, and does not hamper postoperative mobilization.^[6] Ropivacaine is a new type of local anesthetic with long-acting amide, which has less adverse reactions to the central nervous system and cardiovascular system, and has been proved safe and effective in postoperative analgesia studies.^[7] The potential for ropivacaine to prevent postoperative pain has been shown after Caesarean section,^[8] iliac crest bone grafting,^[9] and hip arthroplasty,^[10] however, little attention has been focused to investigated with respect to ropivacaine local infiltration for total laparoscopic D2 radical gastrectomy in the elderly patients. Therefore, between January 2012 and September 2013, we applied the ropivacaine local infiltration on 22 patients, compared with control group, the postoperative analgesia method of ropivacaine local infiltration is simple, safe, effective, promotes the postoperative recovery, so ropivacaine local infiltration can provide a better alternative analgesia method for total laparoscopic D2 radical gastrectomy in the elderly patients.^[11] In order to further study the postoperative analgesic effect and better evaluate the safety and effectiveness of postoperative analgesic method, on the basis of the previous studies, we continue to make a retrospective case–controlled study to assess the postoperative analgesic effect and postoperative recovery of wound infiltration with ropivacaine after total laparoscopic D2 radical gastrectomy in the elderly patients.

2. Patients and methods

2.1. Ethics statement

This study was approved by the ethics committee of First Affiliated Hospital of Xiamen University. The clinical information was collected and analyzed with each participant written informed consent. All participants consented that the matched clinical information would be submitted for publication.

2.2. Patients

Date of a total of patients underwent total laparoscopic radical gastrectomy between September 2014 and September 2017 were reviewed, patients were divided into 2 groups according to local injection of drug: group I (local analgesia group, local infusion of 0.5% ropivacaine, 40 mL in total, n=69), group II (control

group, no analgesic, n=63). In the preoperative, all the patients should be diagnosed definitely by gastroscopy and pathology, and according to tumor, node, metastasis (TNM) staging criteria of the 14th edition of Japanese gastric cancer treatment guidelines, preoperative clinical stages all were below IIB by performing preoperative routine upper abdominal computed tomography. The exclusion criteria included <61 or >71 years old, body mass index (BMI) >40 kg/m² or 50 kg body weight, allergic to any of the medications used in the study, chronic use of analgesics, chronic pain, coagulopathy, serious heart and respiratory diseases, chronic hepatic or renal dysfunction, and mental illness in this study.

2.3. Grouping and operation process of local analgesic

Patients received general anesthesia through tracheal intubation anesthesia, which generally includes induction and maintenance of anesthesia, 5-hole method was operated for laparoscopic surgery (Fig. 1), patients were placed horizontal position with 2 legs separated, and pneumoperitoneum was established with maintaining the pressure between ~13 and ~15 mm Hg, a 10 mm Trocar hole below the umbilicus was established as observation hole (a hole) where the laparoscope coming in; adjusted the laparoscope at the degree of 30, under the monitor of laparoscope, a 12 mm Trocar hole which locates both in right clavicular midline and above the umbilical level, was established as the main operating hole (b hole), a 5 mm Trocar hole which locates both right anterior axillary line and below the costal margin was built as ancillary operating hole (c hole), in the left symmetric region, two 5 mm Trocar holes were built for assistants to operate (d, e hole). While the extent of lymph node dissection was defined according to the 14th edition of the Japanese gastric cancer treatment guidelines.^[12] The surgical operation was in the order of regional lymph node dissection, tumor resection and digestive tract reconstruction were performed. Billroth—I anastomosis (Delta anastomosis), Billroth—II anastomosis or Rouxen-Y esophagojejunostomy were performed according to the location of tumor, then expanded observation hole (a hole) to 3 cm, removed out the sample, placed the abdominal cavity drainage tube in the right main operating hole.

After stopping pneumoperitoneum, some patients got injection of 40 mL 0.5% ropivacaine into the 5 Trocar hole in all,

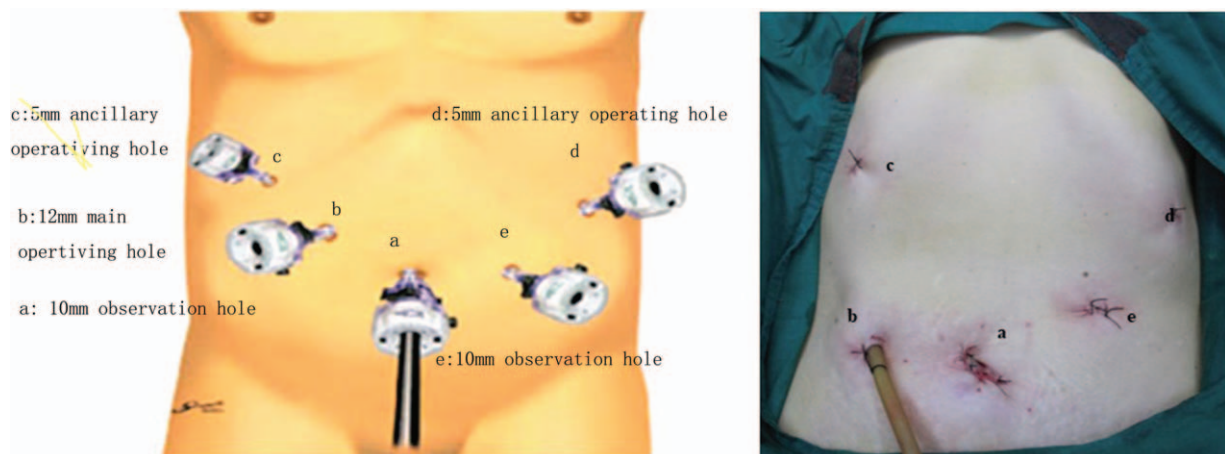


Figure 1. The illustration shows the surgical positions and 5 trocars. the surgeon stood on the right side of the patient with the assistant on the left side, and the camera operator stood between the patient's legs.

respectively, injected 6 mL into 5 mm hole, injected 10 mL into 12 mm hole and injected 12 mL into expanded hole below umbilicus, some patients did not get any injection (Fig. 1).

2.4. Data collection

In our hospital, a team consisting of 2 specialized nurses was blinded to collect multidisciplinary clinical data from all patients underwent total laparoscopic radical gastrectomy between September 2014 and September 2017. These data included preoperative characteristics and clinical outcomes, postoperative pain intensity: Intensities of pain were measured using 11-point numeric rating scale (pain assessment criteria: painless of 0 point; mild pain of 1 to 3 points, tolerable pain; moderate pain ranging from 4 to 6 points, obvious pain, affecting sleep; severe pain ranging from 7 to 10 points, severe pain, unbearable pain that seriously affects sleep). Remedial analgesia: rescue analgesics were administered according to our institutional guidelines and the patient's requirement. When pain scores >4 and patients could not bear the pain, intravenous morphine titration was started using repeated boluses of 2 mg every 5 min until pain scores <4, and morphine consumption was recorded at every time point. Vital signs: blood pressure, heart rate, breathing, frequency, pulse, and blood oxygen saturation were monitored for postoperative patients. Postoperative complication: nausea, vomiting, dizziness, drowsiness, itchy skin, respiratory depression pulmonary infection, urinary system infection, and wound infection were recorded within postoperative 48 h. Postoperative clinical indicators: the leaving bed time, the postoperative gastrointestinal function recovery time, average hospital stay, and medical expenses were recorded and compared. Preoperative characteristics: demographic and clinical variables—age, sex, BMI, American Society of Anesthesiologists (ASA) physical status—were evaluated (Table 1); preoperative surgery-related variables, including TNM stage (n), location of tumor, maximum diameter of tumor, gastrectomy range (n) were investigated (Table 1).

The postoperative analgesic effects were evaluated as the primary outcome. It also assessed postoperative anesthesia-related complications and postoperative surgical complications, which are known to influence postoperative recovery, as well as postoperative clinical indicators, which provide indicators for postoperative recovery.

2.5. Statistical analysis

Statistical analyses were performed using SPSS 16.0 for windows (SPSS 16, Chicago, IL). Continuous numerical data were expressed as median and interquartile range or mean and standard deviation. Categorical data were expressed as frequencies and percentages. Normally distributed numerical data between groups were analyzed using the Student *t* test. Skewed data between groups were analyzed by the Mann–Whitney *U* test. Categorical variables were compared using the Fisher exact test or the Pearson Chi-squared test as applicable. All tests were 2 tailed. $P < .05$ was considered statistically significant.

3. Results

Among a total of 195 patients, data of 132 patients were included in the present analysis. The ropivacaine and control groups comprised 69 and 63 patients, respectively. While 30 patients were excluded because preoperative clinical stages all were above IIB, 22 were excluded because of meeting exclusion criteria, 11 were excluded because of incomplete data (Fig. 2).

3.1. Preoperative characteristics of patients underwent total laparoscopic radical gastrectomy

Patient demographic characteristics are presented in Table 1. Age, sex, BMI, ASA physical status, TNM stage, location of tumor, gastrectomy range, and maximum diameter of tumor were not statistically significant ($P > .05$) (Table 1).

Table 1
Preoperative characteristics of patients underwent total laparoscopic radical gastrectomy.

| Preoperative characteristics | Ropivacaine group (n=69) | Control group (n=63) | P value |
|--------------------------------|--------------------------|----------------------|---------|
| Age (years) | 66±5 | 67±4 | >.05 |
| Women | 29 (42%) | 26 (46%) | >.05 |
| BMI (kg/m ²) | 22.4±1.6 | 22.3±1.4 | >.05 |
| ASA | 69 | 63 | >.05 |
| I | 25 (36%) | 28 (44%) | |
| II | 44 (64%) | 35 (56%) | |
| Location of tumor | 69 | 63 | >.05 |
| Gastric body carcinoma | 15 (21%) | 14 (22%) | |
| Lower gastric carcinoma | 10 (14%) | 12 (19%) | |
| Upper gastric carcinoma | 44 (65%) | 34 (59%) | |
| TNM stage | 69 | 63 | >.05 |
| IA | 8 (11%) | 7 (11%) | |
| IIB | 10 (14%) | 8 (12%) | |
| IIA | 17 (24%) | 15 (23%) | |
| IIb | 34 (51%) | 33 (62%) | |
| Maximum diameter of tumor (mm) | 31±2 | 32±1 | >.05 |
| Gastrectomy range | | | >.05 |
| Total gastrectomy | 27 (39%) | 24 (38%) | |
| Distal gastrectomy | 42 (61%) | 39 (62%) | |

Data are presented as mean±standard deviation or number (%) of patients.

ASA=American Society of Anesthesiologists; BMI=body mass index; TNM=tumor, node, metastasis.

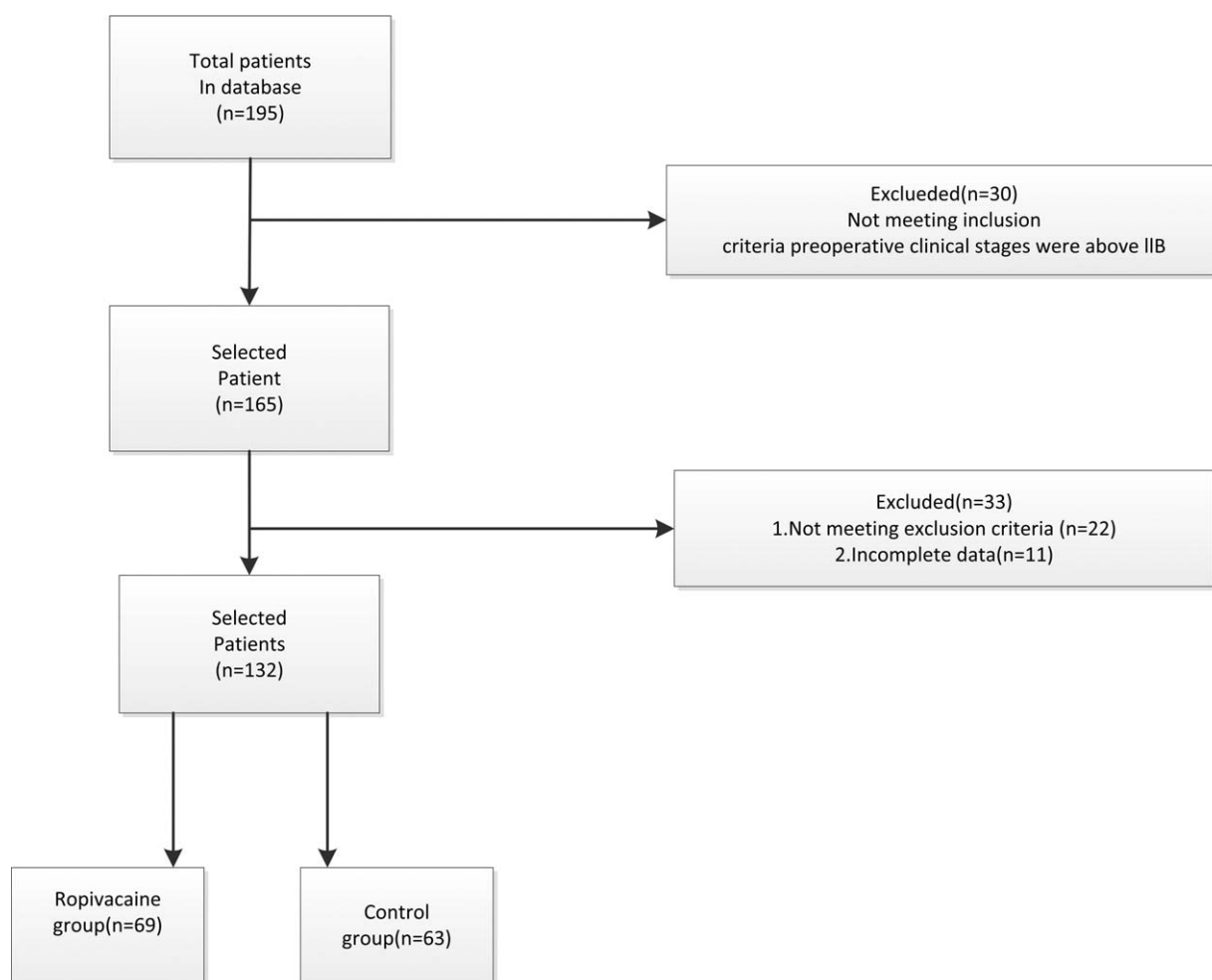


Figure 2. Flowchart indicating patient selection and exclusion criteria.

3.2. Postoperative numeric pain intensity scale score and morphine consumption

With regard to postoperative pain profiles, while group II exhibited higher numeric pain intensity scale (NRS) pain scores than group I at 0 to 48 postoperative hours (Table 2). However, more patients of group II used rescue analgesics than patients of group I in the early postoperative period, and the morphine consumption for group I was less than group II ($P = .0011$, $P = .0011$, and $P = .004$ at postoperative 6 h, 12 h, 24 h, and 48 h, respectively) (Fig. 3).

3.3. Postoperative vital signs

Postoperative blood pressure, heart rate, respiration, frequency, pulse, and oxygen saturation were all within the normal range

between group I and group II. There was not statistical significance in the incidence of postoperative adverse reactions between group I and group II ($P > .05$) (Table 3).

3.4. Postoperative anesthesia-related complications

The incidences of anesthesia-related complications, including nausea, vomiting, dizziness, drowsiness, itchy skin, respiratory depression (Table 4), were not statistically different between the 2 groups ($P < .05$).

3.5. Postoperative surgical-related complications

Patients of the 2 groups were recovered smoothly without severe complications such as death and gastrointestinal bleeding, and

Table 2

Comparison of NRS score between the 2 groups.

| NRS score, h | Group I (n = 69) | Group II (n = 63) | P |
|--------------|------------------------|------------------------|-------|
| 6 | 2.3968 (2.2674–2.5806) | 5.3428 (5.2802–5.4061) | <.001 |
| 12 | 2.3338 (2.1793–2.2720) | 5.4823 (5.2611–5.5463) | <.001 |
| 24 | 2.1787 (1.7967–2.4753) | 3.3863 (3.1001–3.6738) | <.001 |
| 48 | 2.0858 (1.8166–2.2953) | 3.2717 (2.9327–3.6153) | <.001 |

Data are expressed as median [interquartile range (IQR)].
NRS=Numeric Pain Intensity Scale, N=number.

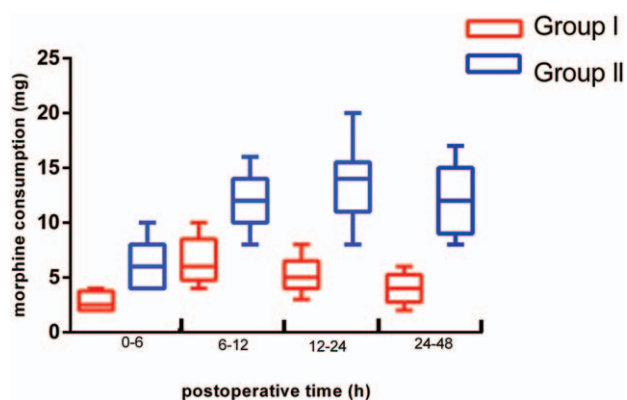


Figure 3. Quartile graph demonstrating morphine consumption during postoperative period.

during 3 months follow-up, there was no death and tumor recurrence. Postoperative surgical-related complications among these patients were shown in Table 4. Complication rate in group I was (8/69): 4 patients got pulmonary infection between the fourth and the fifth day after operation, the symptoms included cough, sputum, and fever; 3 patients got urinary system infection between the fourth and the sixth day after operation, the symptoms included frequent micturition, the urgency of urination, the urine pain, but such complication was cured by anti-inflammation, 1 patient developed wound infection in the fifth day after operation, the symptom included red, swollen, hot, pain. After strengthening local drug exchange, the wound healed after 13 days. Complication rate in group II was (17/63): 6 patients got pulmonary infection between the fourth and the seventh day after operation; 4 patient got urinary system infection between the fourth day and the fifth day, which was cured by anti-inflammation; 7 patients developed wound infection between the fifth day and seventh day after operation, the symptoms included red, swollen, hot, pain. After removal of sutures and strengthening drug exchange, the wound healed after 12 days. Compared the 2 groups, complication rate is lower in

Table 3

Vital signs.

| Variables | Time points | Group I | Group II | P value |
|--------------------------------|-------------|------------|------------|---------|
| Mean arterial pressure (mm Hg) | T1 | 110.3±14.1 | 112±11.8 | >.05 |
| | T2 | 126.2±10.3 | 119.8±9.8 | |
| | T3 | 124.5±8.9 | 129.8±12.2 | |
| | T4 | 128.7±10.2 | 131.8±8.8 | |
| Heart rate (bpm) | T1 | 76.5±11.8 | 71.5±12.3 | >.05 |
| | T2 | 74.6±11.2 | 71.2±9.8 | |
| | T3 | 70.0±10.6 | 69.1±11.0 | |
| | T4 | 75.8±9.8 | 79.2±11.2 | |
| Respiration (rpm) | T1 | 16.5±5.8 | 16.6±3.7 | >.05 |
| | T2 | 16.8±3.0 | 16.2±2.5 | |
| | T3 | 18.6±2.3 | 17.2±3.2 | |
| | T4 | 17.6±2.5 | 19.2±2.5 | |
| Oxygen saturation (%) | T1 | 96.5%±2.5% | 94.9%±2.8% | >.05 |
| | T2 | 97.8%±3.6% | 96.7%±2.7% | |
| | T3 | 96.4%±1.9% | 95.7%±3.2% | |
| | T4 | 96.9%±2.1% | 96.7%±2.7% | |

Data are expressed as mean±standard deviation; T1: at 6 h postoperatively, T2: at 12 h postoperatively, T3: at 24 h postoperatively, T4: at 48 h postoperatively.

Table 4

Postoperative outcomes.

| | Group I (n=69) | Group II (n=63) | P value |
|---|----------------|-----------------|---------|
| The leaving bed time (h) | 52.25±8.72 | 92.68±10.79 | <.001 |
| Gastrointestinal function recovery time (h) | 84.05±5.28 | 108.63±9.46 | <.001 |
| Hospital stay (d) | 10.62±1.27 | 12.85±1.25 | <.001 |
| Medical expense (10,000 Yuan) | 5.25±0.58 | 6.48±0.37 | <.001 |
| Surgical complications | 8 | 17 | <.024 |
| Pulmonary infection | 4 | 6 | |
| Urinary system infection | 3 | 4 | |
| Wound infection | 1 | 7 | |
| Anesthesia-related complications | 34 | 31 | >.99 |
| Nausea | 16 | 14 | |
| Vomiting | 9 | 8 | |
| Dizziness | 9 | 9 | |
| Drowsiness | 0 | 0 | |
| Itchy skin | 0 | 0 | |
| Respiratory depression | 0 | 0 | |

Data are expressed as mean±standard deviation or number of patients.

group I. There was a significant difference between group I and group II ($P < .05$).

3.6. Postoperative clinical index

The leaving bed time, recovery of bowel function, and postoperative hospital stay among the patients of every groups are shown in Table 4, the recovery of bowel function was evaluated by the time to first flatus. The leaving bed time was earlier in group I compared with group II (52.25 ± 8.72 vs. 92.68 ± 10.79 , $P < .05$), the time first flatus was earlier in the group I compared with group II (84.05 ± 5.28 vs. 108.63 ± 9.46 , $P < .05$), the length of postoperative hospital stay was shorter in group I compared with group II (10.62 ± 1.27 vs. 12.85 ± 1.25 , $P < .05$), the medical expenses were less in group I compared with group II (5.25 ± 0.58 vs. 6.48 ± 0.37 , $P < .05$).

4. Discussion

In this retrospective study, we evaluated analgesic effects and postoperative recovery of wound infiltration with ropivacaine in elderly patients after total laparoscopic radical gastrectomy. The results indicated that wound infiltration with ropivacaine decreases postoperative pain with less rescue analgesia. Compared with control group, wound infiltration with ropivacaine has lower postoperative surgical complications including pulmonary infection, urinary system infection, and incision infection. The incidences of anesthesia-related complications were not different between the 2 groups. Patients in ropivacaine group got a faster postoperative recovery than that in control group.

Pain is the most direct feeling for postoperative patients, and patients are often unwilling or afraid to move because of postoperative pain, which results in increased postoperative complications. Compared with the traditional open gastrectomy, the 5-hole method can obviously reduce the pain intensity, severe postoperative complications, and hospital stays, and improve patient's satisfaction [13] with the advantages of small wound, little bleeding, quick recovery, cosmetic, and so on. [14,15] However, the patient still experience moderate pain after surgery (the NRS score is between 4 and 7 points). Therefore, postoperative analgesia is still indispensable after total laparoscopic radical gastrectomy.

Facing the pain stress, elderly patients with gastric carcinoma tend to develop postoperative hypoxemia, hypercapnia, and acidosis. The secretion of catecholamine induces pain, elevated blood pressure, fast heart rate, circulation disorder even cardiovascular and cerebrovascular accident. Therefore, elderly patients are fit for total laparoscopic surgery, simple, convenient, safe, and effective analgesic method becomes a hot spot for clinicians.^[16] Non-steroidal analgesics is the first choice for mild and moderate pain, but there is no any long-term nonsteroidal analgesics that can cover the postoperative first day's pain after single intravenous analgesia. Automatic intravenous opioid analgesia is common postoperative analgesic method, but the application of opioid drugs can cause adverse reactions such as nausea and vomiting, drowsiness, respiratory depression.^[16] Although the effect of epidural automatic analgesia is definite, elderly patients are often accompanied by spine deformation, ligament calcification and bone fusion, which often make it difficult or even impossible to complete the spinal canal puncture.^[17] In addition, compared with traditional open surgery, the pain intensity and pain time of total laparoscopic radical gastrectomy are significantly reduced, so there is not necessary to carry automatic analgesia pump. Trocar-wound pain is the main kind of postoperative pain in patients who underwent total laparoscopic radical gastrectomy, one possible reason is the release of inflammatory medium at wound site,^[18] many studies suggest that local anesthesia infiltration at wound site could decrease postoperative wound pain.^[19,20] Ropivacaine is a kind of local anesthetics of amide derivatives and is associated with less adverse reaction for the central nervous system and cardiovascular system, and the previous study about postoperative analgesia has proven its safety and effectiveness.^[7] Therefore, in this study, ropivacaine is used to decrease postoperative pain in elderly patients underwent total laparoscopic radical gastrectomy.

The surgical wound could cause the release of local inflammatory factors such as the inhibition peptide, prostaglandin, and so on, such factors can induce postoperative pain, however, infiltration with ropivacaine around the surgical wound may decrease postoperative wound pain by preventing the inflammatory factors to stimulate the nerve, accelerating the local blood flow, and removing allogenic substance.^[21] Low concentration of analgesia has the advantages of long valid time and low toxicity, and is associated with limited nonprogressive motor nerve block. At postoperative 6, 12, 24, 48, the NRS score was lower in ropivacaine group than that in control group, the first use of morphine hydrochloride injection was delayed in ropivacaine, and the use of rescue analgesics was less in ropivacaine group than the control group, which indicates that the infiltration with ropivacaine is an effective postoperative analgesia for total laparoscopic radical gastrectomy in elderly patients. Meantime, with regard to postoperative vital signs, patient's postoperative blood pressure, heart rate, breathing, frequency, pulse, and blood oxygen saturation were in normal range. With regard to postoperative anesthesia-related complications, such as nausea and vomiting, there was no statistically significant difference between the 2 groups, which indicates ropivacaine has a good analgesic effect for total laparoscopic radical gastrectomy in elderly patients, and will not aggravate the postoperative pulmonary function, therefore ropivacaine is a kind of safe, acceptable, economic, and effective postoperative analgesia.

Dose is another important issue for ropivacaine, the common concentration for nerve block and epidural anesthesia was 0.5%

to 1.0%, if calculated by 40 mL of 0.5% ropivacaine (200 mg), the plasma mass concentration is 0.95 mg/L, belongs to the scope of security. Pappas-Gogos et al^[22] used 40 mL 0.25% and 0.75% ropivacaine, respectively, for wound infiltration, found that both have a good postoperative analgesia effect, high dose (0.75%) and low dose (0.25%) have the similar effect, without toxic reactions, but there is higher plasma concentration for high dose ropivacaine. In this study, 0.5% ropivacaine was used to locally infiltrate the Trocar incision, which had a good analgesic effect within 48 h after surgery, and toxic symptoms were not found.

In this study, all patients in blank control group had obvious pain within 12 h after surgery, which affected sleep, although some patients become better after rescue analgesia, the patients were physically and mentally injured. By contrast, ropivacaine group has a good postoperative analgesia effect with mild pain within postoperative 48 h, with rescue analgesia for 7 patients only, and it also alleviates psychological trauma in perioperative period. In ropivacaine group, the postoperative analgesia efficacy is definite, patients can breathe deeply and cough normally, which reduces the incidence of pulmonary atelectasis and pulmonary infection after the operation, patient's early self-activity makes urethral catheter removed early, which lowers the risk of urinary system infection, meantime, wound infiltration with anesthetics has certain antibacterial function to lower the postoperative incision infection rate.^[23] The incidence of postoperative complications in ropivacaine group is lower than that in blank control group, so that the average length of stay after surgery is reduced. For ropivacaine group, wound infiltration with ropivacaine decreased postoperative pain, so patients can get self-activity early, the postoperative activity time and the time to first flatus was earlier than that in blank control group, with following advantages such as rapid recovery of intestinal function, early oral diet, less use of parenteral nutrition, lower medical expense. Ropivacaine is a good pain killer, it can reduce postoperative opioid demand and drug-related side-effects such as nausea and vomiting, there was not necessary to use other analgesics.^[19,20] These factors led to a significant reduction in medical expense in the ropivacaine group compared with the control group.

This study had several limitations. First, only 1 concentration of ropivacaine was evaluated in our study. Additional studies are needed to investigate more concentration of ropivacaine. Second, most of the included patients were of Asian descent. Therefore, the present results might not be generalizable to other races or ethnicities.

Despite these limitations, this retrospective review also highlights the benefits of combining the numerical pain scale (0–10) with clinically relevant descriptors such as my pain is better/same/worse during pain assessments. This allows for interpretation of changes in numerical data in a clinically meaningful and statistically meaningful manner. This study can make the surgeon and the patients themselves realize the benefit of Trocar-wound pain in all laparoscopic surgery. But its feasibility, security, and economic practicability need to be further confirmed by multicentric large sample prospective randomized controlled study. Finally, This study showed that the local infiltration of ropivacaine in Trocar-wound effectively decrease the postoperative pain, which provides a simple analgesia method for total laparoscopic radical gastrectomy in elderly patients, promotes postoperative recovery, shortens hospital stay, reduces the medical expense. There is a certain clinical application prospect for promoting to apply in all laparoscopic surgery in elderly patients, but its feasibility, security and economic practicability

need to be further confirmed by multicentric large sample prospective randomized controlled study.

5. Conclusion

In conclusion, wound infiltration with ropivacaine may reduce postoperative pain for patients underwent total laparoscopic radical gastrectomy with advanced age, enable faster recovery, and provide an alternative better analgesia.

Author contributions

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