COMPARISON OF LUMBAR SQUARE MUSCLE BLOCK AND TRANSVERSUS ABDOMINIS PLANE BLOCK IN RAPID POSTOPERATIVE REHABILITATION AFTER GYNECOLOGICAL LAPAROSCOPIC SURGERY

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ABSTRACT

Objective*: To compare the efficacy of ultrasound guided Quadratus Lumborum Block (QLB) and Transversus Abdominis Plane Block (TAPB) in gynecological laparoscopic surgery combined with general anesthesia for rapid postoperative recovery of patients.*

Methods: *Eighty patients undergoing elective gynecological laparoscopic surgery under general anesthesia from January 2019 to January 2020 in our hospital, ASA class I-III, aged 18-65 years, were selected, and all patients voluntarily accepted this trial and signed the relevant informed consent forms, and all passed the ethics committee of our hospital. The patients were randomly divided into 2 groups of 40 cases each, the lumbar square muscle block group (Group Q) and the transversus abdominis plane block group (Group T), respectively. After admission, the subjects in both groups underwent ultrasound-guided lumbar square block or ultrasound-guided transversus abdominis plane block (20 ml of 0.375% ropivacaine bilaterally, 40 ml in total) according to the group. Patient Controlled Intravenous Analgesia (PCIA) was administered at the end of surgery. Real-time data such as Mean Arterial Pressure (MAP) and Heart Rate (HR) were recorded at each time of patient entrance (T0), immediately before skin incision (T1), 1 minute after skin incision (T2), 5 minutes after skin incision (T3), and end of operation (T4), and the correlation between the data at different time points was calculated. The total duration of surgical anesthesia was recorded; the intraoperative use of various types of anesthetic drugs was counted; the postanesthesia care unit (PACU) stay and the total time of tracheal tube removal were recorded; the total duration of intravenous anesthesia at each time (2h, 4h, 8h, 24h, 48h after surgery, i.e., T5, T6, T7, T8, T9) was recorded. Total cortisol concentrations in the serum of patients in both groups were recorded before and 8h(T7), 24h(T8) and 48h(T9) after surgery; The total amount of postoperative sufentanil used, the time of first analgesic pump pressure and the total number of pressure; the time of anal venting, the time of first bed activity, the postoperative satisfaction score, the postoperative additional analgesia and the incidence of postoperative adverse effects were recorded. Postoperative discharge time of patients were recorded.*

Results: *The amount of sufentanil supplementation in group Q was significantly less than that in group T ($P<0.05$).ΔMBPT2-T1, ΔHRT2-T1, ΔMBPT3-T1, ΔHRT3-T1 in group Q are much smaller than group T ($P<0.05$).The resting and motor VAS scores of group Q at 2h, 4h, 8h, 24h and 48h after surgery were significantly lower than those of group T ($P<0.05$). The postoperative serum total cortisol concentrations increased to some extent at all times in both groups, and the increase in cortisol concentrations was smaller in patients in group Q compared with group T ($P<0.05$). The first postoperative anal exhaust time, the first time of getting out of bed and the time of feeding in group Q were shorter than those in group T ($P<0.05$).The postoperative satisfaction of group Q was better than that of group T ($P<0.05$).*

Conclusion: *Compared with transversus abdominis plane block, ultrasound-guided lumbar square muscle block can reduce the amount of perioperative opioids in patients undergoing gynecological laparoscopy, better maintain intraoperative hemodynamic stability, and more always cortisol hormone secretion, reduce the degree of stress response of the body, shorten the time to first anal venting, time to first bed activity, and time to have food after surgery, and accelerate the turnaround, which is more conducive to rapid postoperative recovery of patients undergoing gynecological laparoscopy. The application of general anesthesia combined with ultrasound-guided lumbar square muscle nerve block in gynecological laparoscopic surgery is worth promoting in clinical work.*

Keywords: *Ultrasonic guidance, transverse abdominal plane block, lumbar square muscle block, gynecologic laparoscopic surgery.*

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Introduction

Laparoscopic operation has been widely used in gynecologic surgery because of its advantages such as less trauma, less bleeding, lower incidence of various perioperative complications, shorter hospital stay, and faster functional recovery of all systems[1]. However, the incidence of Post-Laparoscopic Pain Syndrome (including incisional pain, epigastric distension, intercostal tingling, shoulder pain, etc.) due to trauma to the pneumoperitoneum, surgical incision and related organs during gynecologic surgery remains high[2]. In recent years, multimodal analgesia, which is a combination of regional nerve block-based over-the-top analgesia and real-time analgesia, has been playing an increasingly important role in clinical work to achieve rapid surgical recovery.

Rafi[3] et al, proposed transversus abdominis plane block (TAP) in 2001, which can be divided into lateral entry method (also known as mid-axillary method), subcostal margin method, and posterior method according to the location of the puncture point, among which posterior TAP block has the characteristics of long duration of action and wide range of block[4, 5]. The lumbar square block (QLB) was first proposed by Blanco[6] in 2007, and currently there are three block accesses: lateral approach, posterior approach and anterior approach, while the anterior block via the lumbar square muscle is safer and easier to position. The lumbar square muscle block produces a T6 to L1 segmental range block, and in addition, the local anesthetic of the lumbar square muscle block can diffuse through the thoracolumbar fascia into the paraspinal space thereby blocking part of the sympathetic nerve, providing more complete and more extensive analgesia than the transversus abdominis plane block of the transversus abdominis fascia[7]. Clinical experience indicates that the application of general anesthesia combined with transversus abdominis plane block or lumbar square muscle block results in earlier bedtime and shorter postoperative hospital stay compared to general anesthesia alone, which is highly beneficial for rapid postoperative recovery. There is no clinical evidence as to which nerve block is more suitable for gynecological laparoscopic surgery: lumbar square nerve block or transversus abdominis plane block.

In this study, the effect of gynecologic laparoscopic surgery under general anesthesia was compared and evaluated by lumbar square block and transversus abdominis plane block, respectively, to reduce postoperative pain. The aim was to find the best method and route of anesthesia analgesia for gynecologic laparoscopic surgery in order to more effectively improve the rapid postoperative recovery of patients undergoing gynecologic laparoscopic surgery.

Materials and methods

General information

This study was approved by the Ethics Committee of our hospital, and informed consent was signed with the patients.Eighty patients undergoing gynecological laparoscopic surgery under elective general anesthesia in our hospital from January 2019 to January 2020 were selected as the research subjects.The random number table method was used to divide the study subjects into two groups, 40 cases in the lumbar square muscle block group (Q group) and 40 cases in the transversus abdominis plane block group (T group).

Inclusion criteria:

- General anesthesia for elective gynecologic laparoscopic surgery;
- ASA class I-III;
- Age 18-65 years old;
- Ethical, voluntarily subjected to the trial and signed the informed consent form.

Exclusion criteria:

- Allergy to ropivacaine;
- Preoperative BMI >40kg/m^2;
- Recent use of antipsychotics, alcohol or drug abuse;
- Ultrasound showing unclear anatomy;
- Those with language communication disorders;
- Infection at the puncture site;
- Inability to understand the VAS score and the use of PCIA pump;

Midway withdrawal criteria:

- Subjects requesting withdrawal of informed consent;
- Serious adverse events occur;
- Patient compliance is too poor.

Methods

Patients entered the operating room, vital signs (ECG, SpO_2, and BP) were routinely monitored, venous access was opened, arterial puncture was performed, and central venous pressure and invasive arterial blood pressure were monitored. The experienced nerve block operators in our hospital were assigned to perform the corresponding nerve block operation according to the random number table method: patients in group Q were placed in lateral decubitus position with their backs to the operator, their legs slightly flexed, and the towel was used for routine disinfection. Wisonic type ultrasonic diagnostic instrument (hua sheng electronic medical apparatus and instruments, China) low frequency convex array probe, the probe vertical long axis of the body is placed in the iliac crest above the axillary mid-line, along the long axis of the body in the horizontal scan to find a typical three-tier abdominal muscle organization TAP muscle group, light moving in the direction of axillary line after the probe found oval waist muscle, slight adjustment direction of probe, visible "clover" (by the waist muscle, psoas major, vertical spinal muscular, of vertebral transverse process), from 0.5 to 1 cm in the plane outside the probe into the needle, pointing in the direction of the ventral and dorsal direction by patients tip end point between the waist the psoas major muscle and fascia. After no blood and no gas were extracted, 20ml 0.375% ropivacaine was injected, and the local anesthetic with low echo in the fascial space between the lumbar muscle and the psoas major was found to be successful.The contralateral block was performed in the same way. Patients in group T were in the supine position with water, legs slightly flexed, and routine disinfection and towel laying. Wisonic type ultrasonic diagnostic instrument (hua sheng electronic medical apparatus and instruments, China) high-frequency linear array probe, the probe vertical long axis of the body is placed in the iliac crest above the axillary mid-line, along the long axis of the body in the horizontal scan to find a typical three-tier abdominal muscle organization TAP muscle group (by the external oblique muscle, internal oblique muscle and abdominal transverse muscle and fascia), to probe the inner needle plane into the 0.5 to 1 cm from the ventral to dorsal, tip end point between the internal oblique muscle and transverse abdominal muscle fascia layer, after withdrawing no blood, no gas, 0.375% ropivacaine 20 ml was injected, and the block was successful when a hypoechoic local anesthetic was diffused in the plane of the transversus abdominis muscle. The contralateral side was blocked using the same method.

The anesthesia was induced by midazolam 0.04 mg/kg, sufentanil 0.5ug/kg, cis-atracurium 0.2 mg/kg, etomidate 0.4 mg/kg, and mechanical ventilation after tracheal intubation using visual laryngoscope. Anesthesia maintenance: sevoflurane (2%) + remifentanil (0.1ug/kg/min) + propofol (4.5mg/kg/h). The depth of anesthesia was monitored intraoperatively by bispectral index (BIS), and the BIS value was maintained at 40-60. Sufentanil, vasoactive drugs and other related drugs were given as needed. All patients were given ondansetron 0.08 mg/kg and dexamethasone 0.1 mg/kg intravenously 10 min before the end of surgery, and all intravenous patients were given self-controlled analgesia at the end of surgery, analgesic formula: sufentanil 2 ug/kg, ondansetron 0.15 mg/kg, diluted to 100 ml with 0.9% NaCl; background infusion rate: 2 ml/h, self-controlled analgesic dose. If the analgesic effect is not good, the patient is instructed to press the analgesic pump for additional drugs to enhance analgesia when the postoperative VAS score ≥4. If PCIA is not effective, certain analgesic remedial measures will be taken by the gynecologist in the ward according to the patient's request.

Post-operative follow-up visits were performed by the same dedicated follow-up staff according to the data collection requirements to record relevant data indicators in real time.

Statistical methods

The data were statistically analyzed using SPSS 22.0 software. The Levene test was used for chi-square analysis of repeated measures design measures. Normally distributed measurement data were analyzed by t-test, and approximate t-test was used when they did not conform to normal distribution, and the results were expressed as mean±standard deviation (x±s); the chi-square test was used for comparison of count data, $P<0.05$ was considered a statistically significant difference.

Results

The study was conducted by excluding the study subjects and then the random number was deferred to the next patient until 80 patients were successfully included. A total of 97 patients were screened for this study, of which 80 patients successfully completed the study, 40 in group Q and 40 in group T. The blocking effect was satisfactory, and all patients were free of puncture-related complications such as local anesthetic intoxication and visceral injury, and the overall study procedure is detailed below, see Figure 1.

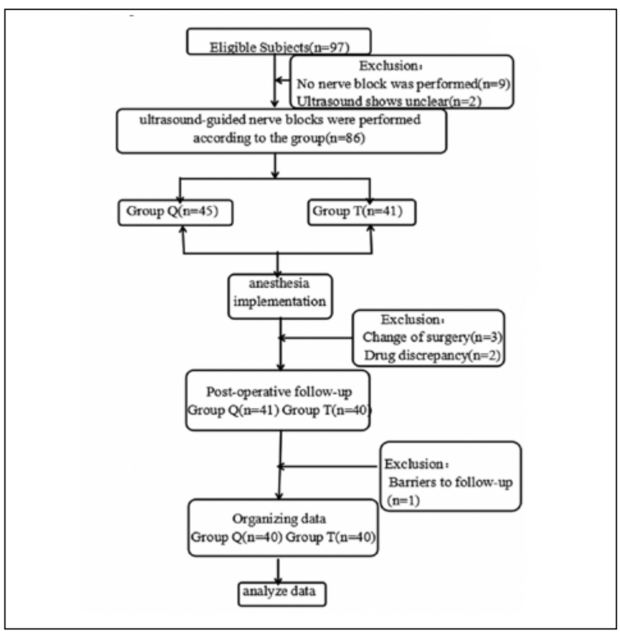

Figure 1: Flow chart.

Comparison of preoperative general conditions between two groups of patients

The differences in age, Body Mass Index (BMI) and ASA classification between the two groups were not statistically significant, P>0.05.See Table 1.

	Group Q (n=40)	Group T (n=40)	P value
Age (y)	45.58±1.32	47.15±1.43	0.16
BMI (kg/m^2)	22.32±1.52	23.68±1.75	0.24
ASA classification (I/II/III)	1/38/1	2/34/4	0.56

Table 1: Comparison of preoperative general conditions between the two groups.

Comparison of intraoperative general conditions between the two groups

There was no statistically significant difference between the two groups in terms of admission MAP, HR, duration of surgery, access volume and intraoperative use of remifentanil, propofol and cis-atracurium, P>0.05. See Table 2.

	Group Q (n=40)	Group T (n=40)	P
T_0MAP (mmHg)	82.21±0.13	85.76±0.32	0.72
T_0HR (bpm)	76.15±0.33	75.32±0.14	0.78
T_0surgery (min)	185.00±10.67	180.00±10.32	0.57
Input (ml)	1900.00±12.13	1800.00±11.43	0.62
Output (ml)	355.00±9.92	350.00±10.19	0.65

Table 2: Comparison of intraoperative general conditions between the two groups. *Note: T_0MAP refers to the MAP when the patient enters the room; T_0HR refers to the HR when the patient enters the room; T_0 surgery refers to the duration of the surgery.*

Comparison of the use of various anesthetic drugs between the two groups

The amount of additional intraoperative sufentanil in group Q was significantly less than that in group T, P<0.05. There were no statistically significant differences in the intraoperative doses of remifentanil, propofol, and cis-atracurium and the total doses of PCIA sufentanil used in the first 24 h and the second 24 h after surgery between the two groups, P>0.05. See Table 3.

	Group Q (n=40)	Group T (n=40)	P
Rifentanil dosage(mg)	1.12±0.13	1.35±0.34	0.72
Propofol dosage(mg)	810.24±9.67	818.67±10.32	0.53
Cis-atracurium dosage(mg)	14.78±3.56	15.32±3.21	0.49
Additional intraoperative sufentanil(ug)	5.25±0.27	10.25±0.56	0.001
Total doses of PCIA sufentanil used in the first 24 h (ug)	42.76±0.08	45.65±0.13	0.25
Total doses of PCIA sufentanil used in the second 24 h (ug)	48.15±0.37	50.23±0.52	0.67

Table 3: Comparison of the use of various anesthetic drugs between the two groups.

Comparison of Δ MBP and ΔHR between the two groups of patients at each time point

Δ $MBPT_2$-T_1, Δ HRT_2-T_1, Δ $MBPT_3$-T_1, and Δ HRT_3-T_1 were significantly smaller in Q group than the T group, P<0.05; the differences about Δ $MBPT_1$-T_0, Δ HRT_1-T_0, Δ $MBPT_4$-T_1, and Δ HRT_4-T_1 between the two groups of patients were not statistically significant, P>0.05. See Table 4.

	Group Q (n=40)	Group T (n=40)	P
Δ MBP_{T1-T0}	-2.32±0.03	-3.45±0.05	0.45
Δ HR_{T1-T0}	-8.43±0.12	-9.25±0.07	0.41
Δ MBP_{T2-T1}	1.52±0.04	3.45±0.05	0.002
Δ HR_{T2-T1}	0.99±0.03	3.23±0.06	0.03
Δ MBP_{T3-T1}	5.12±0.07	8.35±0.08	0.021
Δ HR_{T3-T1}	3.85±0.04	6.45±0.09	0.02
Δ MBP_{T4-T1}	1.47±0.05	3.18±.09	0.27
Δ HR_{T4-T1}	6.54±0.12	7.52±0.15	0.73

Table 4: Comparison of Δ MBP and Δ HR between the two groups of patients at each time point.

VAS scores during resting and exercise were compared between the two groups at each time point

Patients in group Q had significantly lower resting and exercise VAS scores at T_5, T_6, T_7, T_8, and T_9 postoperatively than patients in group T, P<0.05. See Table 5 and Table 6.

		Group Q (n=40)	Group T (n=40)	P
VAS scores at rest	T_5	1.23±0.12	2.35±0.16	0.000
	T_6	0.99±0.08	2.09±0.10	0.000
	T_7	0.42±0.05	1.39±0.09	0.000
	T_8	0.33±0.06	0.97±0.08	0.002
	T_9	0.16±0.09	0.87±0.12	0.000

Table 5: Comparison of VAS scores at rest at each postoperative time point in the two groups.

		Group Q (n=40)	Group T (n=40)	P
VAS scores during exercise	T_5	2.12±0.12	3.25±0.22	0.000
	T_6	1.89±0.08	2.52±0.15	0.000
	T_7	1.13±0.05	2.32±0.13	0.000
	T_8	0.89±0.13	1.73±0.10	0.000
	T_9	0.51±0.06	1.23±0.09	0.000

Table 6: Comparison of VAS scores during exercise at each postoperative time point in the two groups.

Comparison of total serum cortisol concentration between two groups of patients

The postoperative serum total cortisol concentrations of patients in both groups increased to some extent at all times, and the degree of increase in cortisol concentrations in patients in group Q was small compared with group T, P<0.05. See Table 7.

	Group Q(n=40)	Group T(n=40)	P
T_0	22.63±1.21	23.12±1.31	0.12
T_7	33.67±1.32	40.32±1.54	0.03
T_8	35.45±1.54	43.23±1.64	0.04
T_9	25.32±1.35	36.21±1.52	0.01

Table 7: Comparison of total serum cortisol concentrations between the two groups of patients.

Comparison of time to first anal discharge, time to first bed activity, time to eating, analgesic satisfaction, additional analgesia and adverse reactions after surgery between two groups of patients

The time to first postoperative anal discharge, time to first bed activity, and time to eating were shorter in group Q than in group T and the patient satisfaction was also better than in group T, P<0.05; there were no statistically significant differences in time to extubation, PACU stay, additional analgesia, and adverse reactions between the two groups, P>0.05. See Table 8.

	Group Q (n=40)	Group T (n=40)	P
Time of first anal venting (d)	1.89±0.05	2.13±0.07	0.03
First time out of bed (d)	2.05±0.03	3.12±0.07	0.04
First feeding time (d)	2.12±0.03	3.25±0.06	0.01
Analgesic satisfaction	2.45±0.08	2.13±0.15	0.02
Time of extraction (min)	29.76±3.12	30.12±2.78	0.52
PACU time (min)	62.76±2.43	65.87±1.96	0.32
Extra analgesia [n(%)]	0(0)	0(0)	0.45
Nausea and vomiting [n(%)]	1(2.5)	2(5.0)	0.53
Postoperative to discharge time (d)	7.54±1.03	6.92±1.87	0.31

Table 8: Comparison of various postoperative observation indicators between the two groups of patients.

Discussion

Accelerate rehabilitation Surgery (Enhance Recovery After Surgery, ERAS) concept first put forward by the Danish surgeons Kehlet[8, 9], the idea is on the basis of the multidisciplinary cooperation, based on evidence-based medical evidence of applying evidence-based medical evidence of the perioperative management of a series of optimization measures, to reduce the operation of the patient's physical and psychological trauma stress, achieve the goal of fast rehabilitation.Since the beginning of the 21st century, the concept of accelerated rehabilitation surgery has been booming in China and gradually penetrated into the daily work and life of all clinical surgical systems, showing its unique advantages in the field of gynecological surgery[10].

In 2019, the American Society for EnhancedRecovery (ASER) updated the "Guidelines for the Perioperative Management of Gynecological Tumors"[11], which was implemented in a standardized, standardized, process-oriented but individualized manner in three stages of preoperative, intraoperative and postoperative perioperative period.The implementation of ERAS in gynecological surgery depends on the cooperation of multiple departments, among which the department of anesthesiology plays a very important role, and the multi-mode analgesia, which belongs to the scope of anesthesia, is one of the necessary conditions for the realization of ERAS. Compared with traditional surgical methods, laparoscopic surgical modality has become the trend and goal of surgical development with its characteristics of less trauma, lower complication rate and faster recovery. In the field of gynecological surgery, after the successful laparoscopic hysterectomy performed by American gynecologist Reich[12] in 1988, the laparoscopic surgical approach has become the preferred method for all types of gynecological clinical procedures with the continuous efforts of numerous gynecologists at home and abroad. Although laparoscopic surgery is a minimally invasive procedure, it still has certain adverse effects. One study[2, 13] showed that postoperative surgical incisional pain (79.2%), epigastric distension (62.3%), shoulder pain (45.7%) and quarter rib pain (18.1%) can occur in patients undergoing gynecologic laparoscopic surgery. The three types of pain, epigastric distension, intercostal stabbing pain, and shoulder pain, are called postoperative laparoscopic pain syndrome, and sometimes their pain level even exceeds that of incisional pain. The high incidence of postoperative pain affects more patients' outcome resulting in poor prognosis[14].

In recent years, multimodal analgesia based on regional nerve blocks has played an important role in achieving rapid surgical recovery. Regional nerve block refers to the injection of local anesthetic around the nerve trunk, plexus, or ganglion to block its impulse conduction and produce anesthesia in the area it innervates. Since the first transversal abdominal plane block (TAP) was proposed by Rafi[3] and others in 2001, a series of fascial plane blocks have been derived, including the lumbar square block (QLB), the inferior ilioinguinal and iliogastric nerve block (Ilioinguinal and Iliohypogastric Nerve, IIIH), and the transversalis fascial block (Transversalis

Fascia Plane Block (TFP). Compared with general anesthesia alone, patients with general anesthesia combined with transversalis fascia plane block or lumbar square block have earlier bedtime and shorter postoperative hospital stay, which is very beneficial for rapid postoperative recovery.

Transversus abdominis plane block was proposed by Rafi et al. in 2001, and this technique has good analgesic effect against the skin, muscle and mural peritoneum of the anterior abdominal wall[3]. With the development of ultrasound level, the ultrasound-guided TAP block technique was described by Hebbard et al[15] in 2007. The transversus abdominis plane block is the most clinically used nerve block technique in the abdominal wall today. The anterior branches of the T6 to T12 intercostal nerves and the anterior branch of the L1 spinal nerve, which travel between the internal oblique and transversus abdominis muscles, innervate the anterior abdominal wall, and the TAP block achieves analgesia by injecting local anesthetic drugs into the plane between the internal oblique and transversus abdominis muscles to block the aforementioned nerves. The transversus abdominis plane can be divided into lateral approach (also known as mid-axillary approach), subcostal margin approach, and posterior approach according to the location of the needle penetration point of the nerve block. The degree of diffusion of local anesthetic in the TAP layer varies with different TAP block methods, which in turn produces different analgesic effects. Therefore, in order to achieve the best block effect, the location of the surgical incision when performing transversus abdominis plane block is also one of the reference criteria for selecting different puncture routes. For example[16, 17]: the lateral approach is more suitable for abdominal incision surgery below the umbilical level; the subcostal approach for upper abdominal surgery; and the posterior approach for laparoscopic surgery. Meanwhile, TAPB block not only provides somatic analgesia but also has a certain effect on visceral pain[18]. For gynecological laparoscopic surgery, preoperative ultrasound-guided transversus abdominis plane block (posterior approach) combined with postoperative patient-controlled intravenous analgesia (PCIA) can be used for analgesia.

The lumbar square muscle block was proposed by Blanco(6) in 2007 and the technique has good analgesic effect against the skin, muscle and mural peritoneum of the extensive abdominal wall. In lumbar square muscle block the local anesthetic drug is diffused along the thoracolumbar fascia. The thoracolumbar fascia is divided into three layers: a deep layer located posterior to the erector spinae muscle, a middle layer located between the erector spinae and lumbar square muscles, and a superficial layer located anterior to the lumbar square muscle, which continues inward to the lumbaris major fascia and outward to the transversus abdominis fascia[19]. The thoracolumbar fascia continues from the thoracic to the lumbar spine, providing an anatomical basis for the diffusion of local anesthetic drugs in a cephalocaudal direction[20]. Lumbar square muscle nerve block drugs can diffuse into the paraspinal space of the thoracic spine thereby blocking part of the sympathetic nerves, thus its effectiveness in post-laparoscopic pain syndrome. According to the location of the nerve block entry point, lumbar square muscle blocks can be divided into external QLB (QLB1), posterior QLB (QLB2), and anterior QLB (QLB3) [21, 22]. Among them, the use of the anterior dorsal approach is safer to operate and has the widest range of block[23]. For gynecological laparoscopic surgery procedures preoperative ultrasound-guided lumbar square muscle block (anterior approach) combined with postoperative PCIA can be used for analgesia.

Ropivacaine is a long-acting amide local anesthetic with low cardiovascular toxicity and neurotoxicity along with sensorimotor dissociation, which makes nerve block anesthesia with ropivacaine application safer and faster postoperative motor recovery[24]. The concentration range of ropivacaine for nerve block is not uniformly defined, and most nerve blocks apply ropivacaine in the unilateral injection volume range: 20 mL to 40 mL and concentration range: 0.25% to 0.5%[25, 26]. Bilateral transversus abdominis plane blocks or lumbar square blocks using 0.375% ropivacaine with 20 ml on each side are safe and can meet clinical needs[27, 28]. Both transversus abdominis plane blocks and lumbar square blocks can reduce opioid consumption after abdominal surgery, effectively reduce postoperative pain, increase patient satisfaction, and speed up the postoperative recovery process[29-13].

The results of this study showed that the intraoperative sufentanil addition in group Q was significantly less than that in group T, which indicated that the multimodal analgesic protocol of PCIA after lumbar square muscle nerve block was better than that of PCIA after transversus abdominis plane nerve block in reducing the use of perioperative opioids. The difference between the mean arterial pressure and heart rate at 1 min and 5 min after and before skin incision in group Q was significantly lower than that in group T. This indicates that the multimodal analgesic regimen of PCIA after lumbar square muscle nerve block was better than that of PCIA after transversus abdominis plane nerve block in maintaining hemodynamic stability; the resting and exercise VAS scores at 2h, 4h, 8h, 24h and 48h after surgery in group Q were significantly lower than those in group T, which indicates that This indicates that the multimodal analgesic protocol of PCIA after lumbar square muscle nerve block is better than the multimodal analgesic protocol of PCIA after transversus abdominis plane nerve block in reducing postoperative pain; there was no significant difference in the comparison of preoperative blood cortisol concentrations between the two groups (P>0.05), but in the comparison of postoperative cortisol concentrations at 8h, 24h and 48h, the increase in group Q was small and the difference was statistically significant (P<0.05); the time to first anal venting, time to first bed activity and time to eating are significantly shorter in group Q than in group T. This indicates that the multimodal analgesic protocol of PCIA after lumbar square muscle nerve block is better than the multimodal analgesic protocol of PCIA after lumbar square muscle block in accelerating postoperative recovery. This indicated that the multimodal analgesia protocol of lumbar square muscle nerve block combined with postoperative PCIA was better than the multimodal analgesia protocol of transversus abdominis plane nerve block combined with postoperative PCIA in accelerating postoperative recovery. However, there was no significant difference in the length of time from surgery to hospital discharge between the two groups, considering the influence of various factors.

Among lumbar square block and transversus abdominis plane block, lumbar square block is more advantageous than transversus abdominis plane block. It has been shown[32-35] that with the same dose of ropivacaine, the lumbar square block lasts longer than the transversus abdominis plane and its block plane is more extensive than that of the transversus abdominis plane. At the same time, the local anesthetic of lumbar square muscle block can also diffuse through the thoracolumbar fascia into the paraspinal space of the thoracic spine and thus block some sympathetic nerves, thus reducing the postoperative pain syndrome after laparoscopy. The thoracolumbar fascia contains a high density of mechanoreceptors and pain receptors[36], both of which are directly involved in the production of chronic low back pain and back pain. Therefore, lumbar square muscle block can produce satisfactory analgesia for both somatic and visceral pain through drug diffusion blockade to the thoracolumbar fascia and paravertebral space. Since the thoracolumbar fascia is rich in adipose tissue and relatively less vascular, a single lumbar square block has a long duration of blockade, a wide range of blocking planes and a higher safe dose.

Conclusion

Ultrasound-guided lumbar square muscle block compared with transversus abdominis plane block can reduce the amount of perioperative opioids in patients undergoing laparoscopic gynecologic uterine surgery, better maintain intraoperative hemodynamic stability, and more always cortisol hormone secretion, reduce the degree of stress response of the body, shorten the time to first postoperative anal venting, time to first bed activity, and time to feeding, and speed up the turnaround, which is more conducive to rapid patient recovery.

The application of general anesthesia compounded with ultrasound-guided lumbar square muscle nerve block for laparoscopic uterine surgery is worth promoting in clinical work.

References

1) Querleu D, Leblanc E, Ferron G, et al. Laparoscopic surgery in gynaecological tumors. Bull Cancer, 2006, 93(8): 783-789.
2) Kwon YS, Kim JB, Jung HJ, et al. Treatment for postoperative wound pain in gynecologic laparoscopic surgery: topical lidocaine patches. J Laparoendosc Adv Surg Tech A, 2012, 22(7): 668-673.
3) Rafi AN. Abdominal field block: a new approach via the lumbar triangle. Anaesthesia, 2001, 56(10): 1024-1026.
4) Eslamian L, Jalili Z, Jamal A, et al. Transversus abdominis plane block reduces postoperative pain intensity and analgesic consumption in elective cesarean delivery under general anesthesia. J Anesth, 2012, 26(3): 334-338.
5) Pellegrino A, Damiani GR, Speciale D, et al. Transversus abdominis plane block associated with locoregional anesthesia with a laparotenser for gynecologic surgery in an awake state. J Minim Invasive Gynecol, 2013, 20(2): 230-233.
6) Blanco R, Ansari T, Riad W, et al. Quadratus Lumborum Block Versus Transversus Abdominis Plane Block for Postoperative Pain After Cesarean Delivery: A Randomized Controlled Trial. Reg Anesth Pain Med, 2016, 41(6): 757-762.
7) Sebbag I, Qasem F, Dhir S. Ultrasound guided quadratus lumborum block for analgesia after cesarean delivery: case series. Rev Bras Anestesiol, 2017, 67(4): 418-421.

8) Wilmore DW, Kehlet H. Management of patients in fast track surgery. BMJ Clinical Research, 2001, 322(7284): 473-476.
9) Bajsová S, Klát J. ERAS protocol in gynecologic oncology. Ceska Gynekol, 2019, 84(5): 376-385.
10) Myriokefalitaki E, Smith M, Ahmed AS. Implementation of enhanced recovery after surgery (ERAS) in gynaecological oncology. Arch Gynecol Obstet, 2016, 294(1): 137-143.
11) Nelson G, Bakkum-Gamez J, Kalogera E, et al. Guidelines for perioperative care in gynecologic/oncology: Enhanced Recovery After Surgery (ERAS) Society recommendations-2019 update. Int J Gynecol Cancer, 2019, 29(4): 651-668.
12) Querleu, D; Leblanc, E; Ferron, G; et al.[Laparoscopic surgery in gynaecological tumors]..Bull Cancer.2006,93(8):783-9
13) Zheng B, Hur HC, Johnson S, et al. Validity of using Fundamentals of Laparoscopic Surgery (FLS) program to assess laparoscopic competence for gynecologists. Surg Endosc, 2010, 24(1): 152-160.
14) De Oliveira GS, Fitzgerald PC, Marcus RJ, et al. A dose-ranging study of the effect of transversus abdominis block on postoperative quality of recovery and analgesia after outpatient laparoscopy. Anesth Analg, 2011, 113(5): 1218-1225.
15) Ekmekci P, Kazak Bengisun Z, Kazbek BK, et al. Ultrasound guided TAP block for the treatment of postoperative prolonged pain an alternative approach. Agri, 2012, 24(4): 191-193.
16) Tran TM, Ivanusic JJ, Hebbard P, et L. Determination of spread of injectate after ultrasound-guided transversus abdominis plane block: a cadaveric study. Br J Anaesth, 2009, 102(1): 123-127.
17) Finnerty O, Sharkey A, Mc Donnell JG. Transversus abdominis plane block for abdominal surgery. Minerva Anestesiol, 2013, 79(12): 1415-1422.
18) Smith DI, Hawson A, Correll L. Transversus Abdominis Plane Block and Treatment of Viscerosomatic Abdominal Pain. Reg Anesth Pain Med, 2015, 40(6): 731-732.
19) Seki K, Kuroiwa K, Tanaka T, et al. Postoperative numerical rating scale in patients undergoing gynecological laparotomy under general anesthesia combined with either single epidural injection or transverses abdominis plane block. Masui, 2014, 63(10): 1093-1096.
20) Willard FH, Vleeming A, Schuenke MD, et al. The thoracolumbar fascia: anatomy, function and clinical considerations. J Anat, 2012, 221(6): 507-536.
21) Kadam VR. Ultrasound-guided quadratus lumborum block as a postoperative analgesic technique for laparotomy. J Anaesthesiol Clin Pharmacol, 2013, 29(4): 550-552.
22) Ueshima H, Otake H, Lin JA. Ultrasound-Guided Quadratus Lumborum Block: An Updated Review of Anatomy and Techniques. Biomed Res Int, 2017, 2017(13): 2752876.
23) Spence NZ, Olszynsk P, Lehan A, et al. Quadratus lumborum catheters for breast reconstruction requiring transverse rectus abdominis myocutaneous flaps. J Anesth, 2016, 30(3): 506-509.
24) Diéguez P, Casas P, López S, et al. Ultrasound guided nerve block for breast surgery. Rev Esp Anestesiol Reanim, 2016, 63(3): 159-167.
25) Elsharkawy H, El-Boghdadly K, Barrington M. Quadratus Lumborum Block: Anatomical Concepts, Mechanisms, and Techniques. Anesthesiology, 2019, 130(2): 322-335.
26) Song L, Huang D, Li Y. Posteromedial quadratus lumborum block provides successful analgesia after laparoscopic rectal cancer surgery. J Clin Anesth, 2019, 55(22): 28-30.
27) McGlade DP, Kalpokas MV, Mooney PH, et al. A comparison of 0.5% ropivacaine and 0.5% bupivacaine for axillary brachial plexus anaesthesia. Anaesth Intensive Care, 1998, 26(5): 515-520.
28) Pellegrino A, Damiani GR, Speciale D, et al. Transversus abdominis plane block associated with locoregional anesthesia with a laparotenser for gynecologic surgery in an awake state. J Minim Invasive Gynecol, 2013, 20(2): 230-233.
29) Blanco R, Ansari T, Girgis E. Quadratus lumborum block for postoperative pain after caesarean section: A randomised controlled trial. Eur J Anaesthesiol, 2015, 32(11): 812-818.
30) Blanco R, Ansari T, Riad W, et al. Quadratus Lumborum Block Versus Transversus Abdominis Plane Block for Postoperative Pain After Cesarean Delivery: A Randomized Controlled Trial. Reg Anesth Pain Med, 2016, 41(6): 757-762.
31) Vrsajkov V, Mani N, Mihajlovi D, et al. Transversus abdominis plane block can improve analgesia after laparoscopic cholecystectomy. Rev Bras Anestesiol, 2018, 68(2): 149-153.
32) Blanco R, Ansari T, Riad W, et al. Quadratus Lumborum Block Versus Transversus Abdominis Plane Block for Postoperative Pain After Cesarean Delivery: A Randomized Controlled Trial. Reg Anesth Pain Med, 2016, 41(6): 757-762.
33) Murouchi T, Iwasaki S, Yamakage M. Quadratus Lumborum Block: Analgesic Effects and Chronological Ropivacaine Concentrations After Laparoscopic Surgery. Reg Anesth Pain Med, 2016, 41(2): 146-150.
34) Baytar C, Yilmaz C, Karasu D, et al. Comparison of Ultrasound-Guided Subcostal Transversus Abdominis Plane Block and Quadratus Lumborum Block in Laparoscopic Cholecystectomy: A Prospective, Randomized, Controlled Clinical Study. Pain Res Manag, 2019, 2019(13): 2815301.
35) Oksüz G, Bilal B; Gürkan Y, et al. Quadratus Lumborum Block Versus Transversus Abdominis Plane Block in Children Undergoing Low Abdominal Surgery: A Randomized Controlled Trial. Reg Anesth Pain Med, 2017, 42(5): 674-679.
36) Langevin HM, Bishop J, Maple R, et al. Effect of Stretching on Thoracolumbar Fascia Injury and Movement Restriction in a Porcine Model. Am J Phys Med Rehabil, 2018, (97)3: 187-191.

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