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Meta analysis of ultrasound-guided lumbar quadratus muscle block on the arcuate ligament for postoperative pain relief and adverse reactions in abdominal surgery

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Abstract: *The purpose of this article is to evaluate the postoperative analgesic effect and incidence of adverse reactions of ultrasound-guided quadrilateral ligament block (QLB) in patients undergoing abdominal surgery using meta-analysis and systematic evaluation methods. Pub Med, Cochrane Library, EMBase, China National Knowledge Infrastructure, Wanfang Database, VIP Network, and China Biomedical Full text Database were searched from database establishment to January 10, 2024. Randomized controlled trials (RCTs) were collected on the analgesic effect of QLB on the arcuate ligament under ultrasound guidance for abdominal surgery, with the control group receiving simple general anesthesia. The experimental group patients were treated with QLB combined general anesthesia on the arcuate ligament under ultrasound guidance. The main outcome measures were resting state pain scores at 1 hour, 2 hours, 6 hours, 12 hours, 24 hours, and 48 hours postoperatively, as well as motor state pain scores at 2 hours, 6 hours, 12 hours, 24 hours, and 48 hours postoperatively. The secondary outcome measure was the amount of propofol, sufentanil, and remifentanil used during surgery; The number of cases of rescue analgesia and the number of effective compressions of the analgesic pump within 48 hours after surgery; The incidence of postoperative nausea, vomiting, dizziness, pruritus, respiratory depression and urinary retention; Awakening time, first time out of bed, first time passing gas, and length of hospital stay. Perform meta-analysis on the data using Rev Man 5.4 software. A total of 8 RCT studies were included, with a total of 556 cases, including 278 cases in the control group and 278 cases in the experimental group. The meta-analysis results showed that compared with the control group, the experimental group had 1 hour (MD=-1.65, 95% CI -1.90-1.41, P<0.0001), 2 hours (MD=-3.10, 95% CI -3.25-2.95, P<0.0001), 6 hours (MD=-2.85, 95% CI -2.99-2.71, P<0.0001), 12 hours (MD=-3.24, 95% CI -3.34-3.14, P<0.0001), 24 hours (MD=-3.15, 95% CI -3.25-3.06, P<0.0001), and 48 hours (MD=-0.46, 95% CI -3.25-3.06, P<0.0001) after surgery.% CI -0.47~-0.45, P<0.0001) Resting state pain score and postoperative 2 hours (MD=-2.17, 95% CI -2.43-1.92, P<0.0001), 6 hours (MD=-1.89, 95% CI -2.10-1.69, P<0.0001), 12 hours (MD=-1.58, 95% CI -1.79-1.37, P<0.0001), 24 hours (MD=-1.07, 95% CI -1.24-0.90, P<0.0001), 48 hours (MD=-0.81, 95% CI -1.00-0.61, P<0.0001), exercise state pain score and intraoperative propofol (MD=-70.17, 95% CI -0.90, P<0.0001) -73.31 to -67.03, P<0.0001) Sufentanil (MD=-10.56, 95% CI -11.43-9.69, P<0.0001), remifentanil dosage (MD=-0.45, 95% CI -0.48-0.42, P<0.0001), number of rescue analgesia cases at 48 hours post surgery (RR=0.09, 95% CI 0.04-0.20, P<0.0001), effective number of pump presses at 48 hours post surgery (MD=-5.10, 95% CI -5.56-4.64, P<0.0001), incidence of postoperative nausea and vomiting (RR=0.13, 95% CI 0.07-0.23, P<0.0001) The incidence rate of postoperative urinary retention was significantly lower (RR=0.14, 95% CI 0.05 ~ 0.42, P=0.0005), the time to wake up after surgery (MD=-4.97, 95% CI -5.92 ~ 4.01, P<0.0001), the time to first get out of bed after surgery (MD=-7.19, 95% CI -8.12 ~ -6.27, P<0.0001), the time to first exhaust after surgery (MD=-10.13, 95% CI -11.99 ~ -8.28, P<0.0001), and the time to stay in hospital (MD=-1.07, 95% CI -1.33 ~ -0.82, P<0.0001). There was no statistically significant difference in the incidence of postoperative dizziness (RR=0.38, 95% CI 0.14-0.99, P=0.05), itching (RR=0.33, 95% CI 0.05-2.12, P=0.24), and respiratory depression (RR=0.17, 95% CI 0.02-1.86, P=0.15) between the two groups of patients.The existing clinical evidence shows that ultrasound guided QLB combined with general anesthesia on the arcuate ligament is better than general anesthesia alone for postoperative analgesia in abdominal surgery. It can reduce the amount of anesthesia, nausea, vomiting, urinary retention and other adverse reactions during the operation, shorten the time of recovery, the time of the*

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first next time, the time of the first exhaust and the time of hospitalization, and accelerate the postoperative recovery of patients.

Keywords: *Ultrasound; Arched ligament; Lumbar quadratus muscle block; Abdominal surgery; Meta analysis*

1. Introduction

Abdominal surgery, due to visceral traction, local nerve damage, peritoneal injury, subcutaneous emphysema and other harmful stimuli [1-2], can easily lead to tissue ischemia, release of a large amount of inflammatory mediators, and cause severe postoperative pain. Postoperative pain stimulation from physical and visceral pain not only reduces the patient's quality of life, but also leads to a series of complications such as cardiovascular disease, and even poses a threat to the patient's life. At present, the most commonly used medication for patient controlled intravenous analgesia (PCIA) during and after surgery is opioid receptor agonists [3]. However, adverse drug reactions such as nausea, vomiting, constipation, headache, and itching can reduce the quality of postoperative recovery for patients. Multiple Enhanced Recovery After Surgery (ERAS) guidelines [4-6] indicate that the use of multimodal analgesic regimens during the perioperative period can reduce pain and reduce opioid related adverse reactions, with nerve block being an important pain management method. Traditional quadratus lumborum block has been used for abdominal and hip surgery for many years, but the main approach is the posterior approach, which has a slow onset and unstable blocking effect. In 2020, Li et al. [7] proposed a new approach, which involves injecting local anesthetic drugs above the lateral arcuate ligament to achieve fast onset and long maintenance time. Multiple small sample clinical studies [8-9] have shown that general anesthesia combined with QLB-LSAL can provide good analgesic effects for abdominal surgery. However, due to the short clinical application time of QLB-LSAL, there are not many reports of its adverse reactions, and there is no consensus on which is better or worse compared to simple general anesthesia. Therefore, this study intends to conduct a meta-analysis of randomized controlled trials (RCTs) that have been completed both domestically and internationally, screen literature that meets quality standards, and systematically evaluate and compare the analgesic effects and adverse reactions of QLB-LSAL combined with postoperative PCIA composite general anesthesia and simple general anesthesia combined with postoperative PCIA on abdominal surgery patients, in order to provide reference for clinical practice.

2. Materials and Methods

2.1 Literature search

Computer searches of Pub Med, Cochrane Library, EMBase, CNKI, Wanfang Database, VIP, and China Biomedical Full text Database were conducted from database establishment to January 10, 2024, to search for a randomized controlled study on the use of ultrasound-guided QLB on the arcuate ligament for abdominal surgery. Chinese search terms include ultrasound, ultrasound-guided ultrasound, B-ultrasound, arcuate ligament, lumbar quadratus block, open surgery, and laparoscopy. The English search terms include ultrasonic guided, ultrasonic, type-b ultrasonic, acute ligament, quadratus lumbar block, laparotomy, and laparoscopy. Follow the requirements of Cochrane Collaboration Network for literature search.

2.2 Inclusion and Exclusion Criteria

Literature inclusion criteria: ① Research type: randomized controlled trial; ② Research subjects: Patients undergoing open surgery or laparoscopic surgery; ③ Intervention measures: Comparison of QLB combined general anesthesia and simple general anesthesia on the arcuate ligament under ultrasound guidance; ④ Main outcome measures: resting state pain score at 1 hour, 2 hours, 6 hours, 12 hours, 24 hours, and 48 hours after surgery, and motor state pain score at 2 hours, 6 hours, 12 hours, 24 hours, and 48 hours after surgery; ⑤ Secondary outcome measures; The amount of propofol, sufentanil, and remifentanil used during surgery; The number of cases of rescue analgesia and the number of effective compressions of the analgesic pump within 48 hours after surgery; The incidence of postoperative nausea, vomiting, dizziness, pruritus, respiratory depression and urinary retention; Awakening time, first time out of bed, first time passing gas, and length of hospital stay. Exclusion

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criteria for literature: Repeated studies, case reports, literature reviews, animal experiments, and non living studies.

2.3 Literature screening and extraction

Two researchers independently conducted literature screening using Note Express 3.2 literature management software. After removing duplicate literature, reading titles, and abstracts, they screened out literature that did not meet the inclusion criteria, and then read the entire text for detailed evaluation. Finally, literature that met the PICOS principle was included. If there is disagreement during the screening process, it shall be resolved through consultation between two researchers or a third researcher. Two researchers independently extracted data and then checked it. If there were any discrepancies, a third-party review was conducted.

2.4 Research quality evaluation

Two researchers independently evaluated the quality of literature that met the inclusion criteria using the Cochrane Handbook 5.1.0 risk bias assessment tool. The evaluation included randomized methods, allocation concealment, blinding of researchers and subjects, blind evaluation of research results, completeness of outcome data, selective reporting of results, and other biases. If there are any differences, they can be discussed or evaluated by the third researcher.

2.5 Statistical processing

RevMan5.4 software was used for statistical analysis of the data, and continuous data were represented as standard mean difference (SMD) and its 95% confidence interval (CI); The binary data is represented by the relative hazard ratio (Odds ratio, OR) and its 95% CI. Apply I2 and Q for heterogeneity testing. When $P \geq 0.1$ and $I2 \leq 50\%$, it indicates that there is not much heterogeneity among the studies, and a fixed effects model is used for analysis; When $P<0.1$ and $I2>50\%$, it indicates significant heterogeneity, and a random effects model is used for analysis. A funnel plot was used to evaluate publication bias for indicators that were included in a large number of studies. For continuous data represented by median and interquartile spacing, if there is no response from the original author, an online calculator should be used (http://www.math.hkbu.edu.hk/ ~Convert tongt/papers/median2mean. HTML) [10-11] to mean and standard deviation. For research data presented only in images, if there is no result in contacting the original author, Web Plot Digitizer will be used to extract the data [12].

3. Results

3.1 Literature screening results

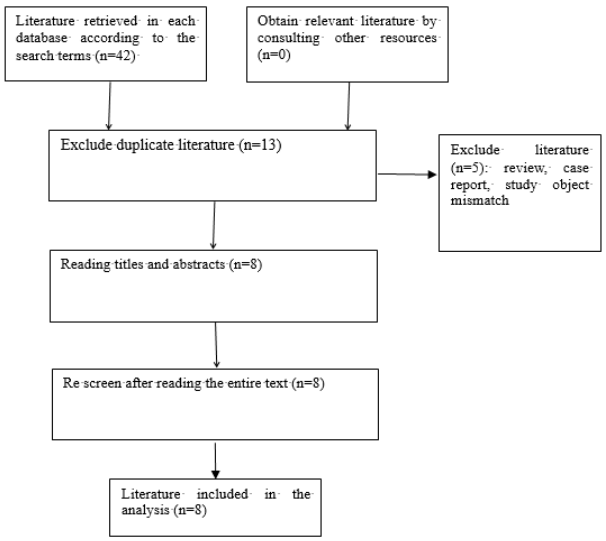

Figure 1: Literature Screening Process

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According to the retrieval method in the article, a total of 42 articles were retrieved, and after layer by layer screening based on inclusion and exclusion criteria, 8 RCTs were ultimately obtained. See Figure 1.

3.2 Basic information and bias risk assessment of included literature

The basic characteristics of the included literature are shown in Table 1; The risk assessment of literature bias is shown in Figure 2.

Table 1: Basic characteristics of included studies

literature	sample size		Age (years)		Gender (male/female)		BMI(kg/cm²)		ASA classification (Level I/II/III)		Surgical type	operative time（min）		Local anesthetic dosage		Outcome indicators	
	Experimental group	control group	Experimental group	control group	Experimental group	control group	Experimental group	control group	Experimental group	control group		Experimental group	control group	Experimental group	control group	Experimental group	control group
Yang TT 2022,a[13]	29	30	50.4±8.8	49.2±9.2	0/29	0/30	23.1±2.0	23.2±2.1	2/27/0	3/27/0	Radical hysterectomy	262.9±61.1	277.1±77.1	0.375% ropivacaine 20 ml		1、3-6、8-12、14-15、17、19、22-23、25	
Yang TT 2022,b[14]	40	40	69.1±3.1	68.5±2.8	28/12	25/15	23.2±2.1	23.6±2.4	2/25/13	3/21/16	radical nephrectomy	113.0±28.1	105.2±29.2	0.375% ropivacaine 20 ml		1、4-6、14-17、22-23、25	
Wang CC 2022[15]	28	28	54.82±7.68	54.89±7.46	13/15	13/15	24.85±2.43	23.98±2.95	11/17/0	9/19/0	Laparoscopic kidney	135.86±44.95	134.11±35.82	0.5 %ropivacaine 0.4ml/kg		2-12、14-17、23-25	
Lin LQ2022[16]	30	30	65.3±7.4	64.4±9.0	19/11	22/8	22.7±3.1	23.3±2.7	0/20/10	2/20/8	Laparoscopic radical gastrectomy for gastric			0.5% ropivacaine 20ml		2-16、23-25	
Wang LP 2022[17]	40	40	45±10	46±12	0/40	0/40			24/16/0	22/18/0	Laparoscopic gynecological surgery	126±23	129±25	0.4% ropivacaine 25ml+dexamethasone 5mg		1、3-6、13、16-17、20、21	
Wang LP 2023[18]	30	30	47.4±9.9	50.1±8.9	18/12	20/10	23.1±2.2	22.3±2.3	17/13/0	15/15/0	laparoscopic cholecystectomy	43±6.8	41.7±6.9	3Ml 0.375% ropivacaine+dexamethasone 5mg to 20ml		2-12、14-17、21、23-24	
Cao T 2023[19[	50	50	48.52±2.33	48.39±2.47	0/50	0/50					Laparoscopic total hysterectomy			0.4% ropivacaine 20 ml		2-6、12、14、18-20	
Zhang Y 2023[20]	31	30	71.2±6.1	71.3±6.9	14/17	17/13	22.74±4.12	22.03±2.63	0/11/20	0/15/15	Colon cancer surgery			0.4% ropivacaine 0.5ml/kg		3-6、8-14、16-18、22-23、25	

1、2、3、4、5、and 6 are the resting state pain scores at 1 hour, 2 hours, 6 hours, 12 hours, 24 hours, and 48 hours after surgery, respectively; 7、8、9、10、and 11 are pain scores at postoperative 2 hours, 6 hours, 12 hours, 24 hours, and 48 hours, respectively; 12. 13 and 14 are the intraoperative doses of propofol, sufentanil, and remifentanil, respectively; 15、16 refers to the number of cases of rescue analgesia and the number of effective compressions of the analgesic pump 48 hours after surgery; 17、18、19、20、21 were the incidence of postoperative nausea and vomiting, dizziness, pruritus, respiratory depression and urinary retention respectively; 22、23、24、and 25 are the awakening time, first time out of bed, first time exhaust, and hospitalization time, respectively.

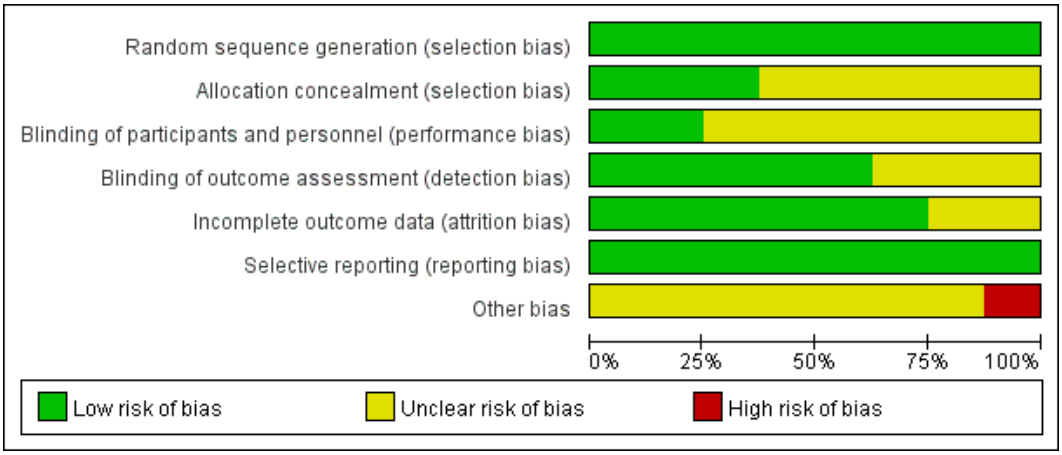

Figure 2: Bias Risk Assessment Chart

3.3 Meta analysis results

3.3.1 Resting state pain scores at different time points after surgery for two groups of patients

Three articles [13-14,17] compared the resting state pain scores at 1 hour post surgery, showing significant heterogeneity (I2=96%, P<0.0001). Using a random effects model, meta-analysis results showed that the resting state pain scores in the experimental group were significantly lower than those in the control group at 1 hour post surgery (MD=-1.65, 95% CI -1.90-1.41, P<0.0001) (Figure 3-A). Four articles [15-16,18-19] compared the resting state pain scores at 2 hours post surgery, showing significant heterogeneity (I2=99%, P<0.0001). Using a random effects model, meta-analysis results showed that the resting state pain scores at 1 hour post surgery in the experimental group were significantly lower than those in the control group (MD=-3.10, 95% CI -3.25-2.95, P<0.0001) (Figure 3-B). Seven articles [13,15-20] compared the resting state pain scores at 6 hours post surgery, showing significant heterogeneity (I2=97%, P<0.0001). Using a random effects model, meta-analysis results showed that the resting state pain scores in the experimental group were significantly lower than those in the control group at 6 hours post surgery (MD=-2.85, 95% CI -2.99-2.71, P<0.0001) (Figure 3-C). Eight articles [13-20] compared the resting state pain scores at 12 hours post surgery, showing significant heterogeneity (I2=96%, P<0.0001). Using a random effects model, meta-analysis results showed that the resting state pain scores in the experimental group were significantly lower than those

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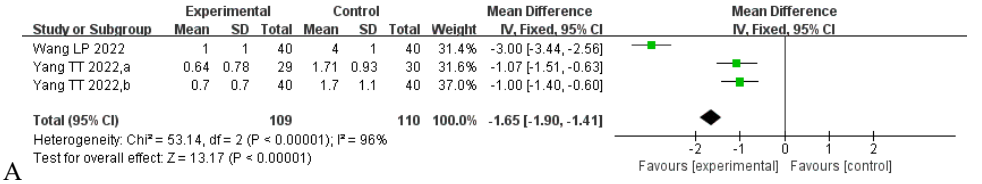
in the control group at 12 hours post surgery (MD=-3.24, 95% CI -3.34-3.14, P<0.0001) (Figure 3-D). Eight articles [13-20] compared the resting state pain scores at 24 hours after surgery, showing significant heterogeneity (I2=99%, P<0.0001). Using a random effects model, meta-analysis results showed that the resting state pain scores in the experimental group were significantly lower than those in the control group (MD=-3.15, 95% CI -3.25-3.06, P<0.0001) (Figure 3-E). Eight articles [13-20] compared the resting state pain scores at 48 hours post surgery, showing significant heterogeneity (I2=89%, P<0.0001). Using a random effects model, meta-analysis results showed that the resting state pain scores in the experimental group were significantly lower than those in the control group (MD=-0.46, 95% CI -0.47-0.45, P<0.0001) at 48 hours post surgery (Figure 3-F).



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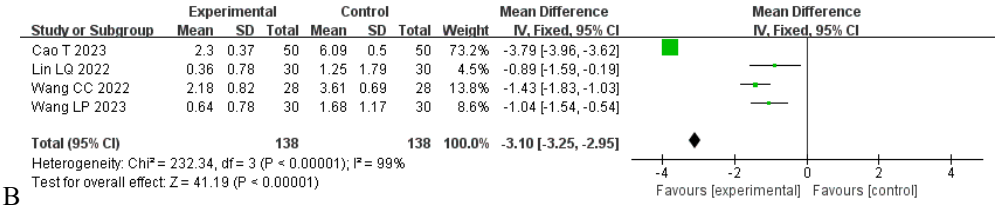

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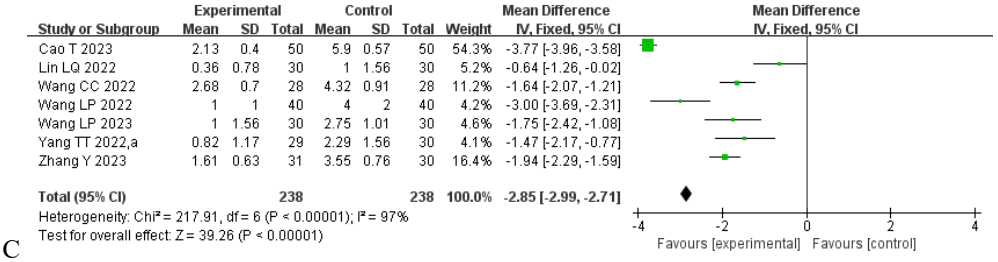

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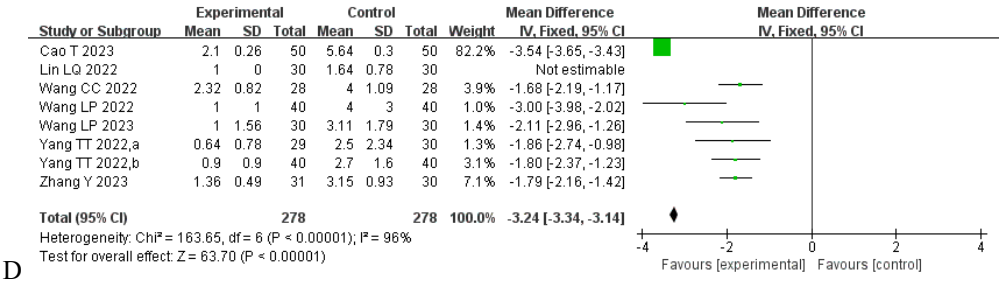

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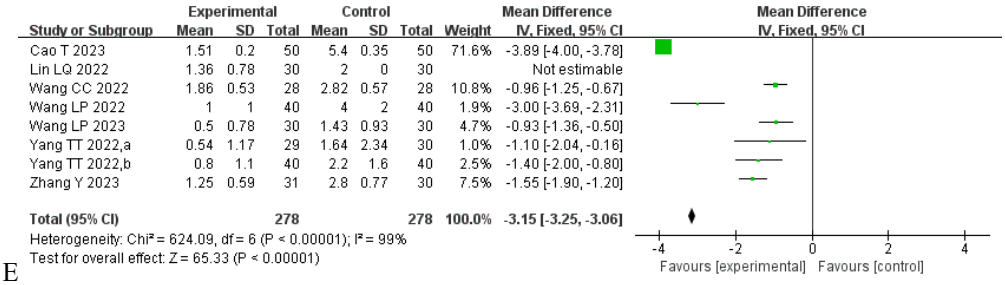

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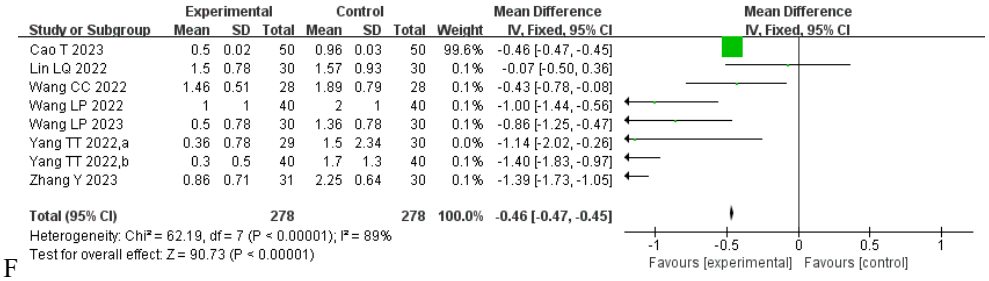
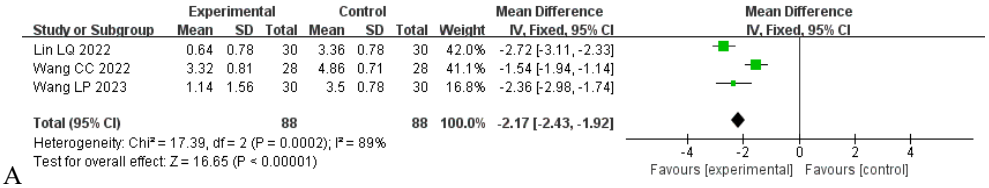


F

Figure 3: Resting state pain scores at different time points after surgery

3.3.2 Postoperative pain scores of two groups of patients at different time points

Three articles [15-16,18] compared the postoperative 2-hour motor state pain scores, showing significant heterogeneity (I2=89%, P=0.0002). Using a random effects model, meta-analysis results showed that the experimental group had significantly lower motor state pain scores than the control group at 2 hours post surgery (MD=-2.17, 95% CI -2.43-1.92, P<0.0001) (Figure 4-A). Five articles [13,15-16,18,20] compared the postoperative pain scores at 6 hours and showed significant heterogeneity (I2=77%, P=0.002). Using a random effects model, meta-analysis results showed that the pain scores at 6 hours after surgery in the experimental group were significantly lower than those in the control group (MD=-1.89, 95% CI -2.10-1.69, P<0.0001) (Figure 4-B). Five articles [13,15-16,18,20] compared the postoperative pain scores at 12 hours and showed significant heterogeneity (I2=67%, P=0.02). Using a random effects model, meta-analysis results showed that the pain scores at 12 hours after surgery in the experimental group were significantly lower than those in the control group (MD=-1.58, 95% CI -1.79-1.37, P<0.0001) (Figure 4-C). Five articles [13,15-16,18,20] compared the postoperative 24-hour motor state pain scores, showing significant heterogeneity (I2=87%, P<0.00001). Using a random effects model, meta-analysis results showed that the experimental group had significantly lower postoperative motor state pain scores than the control group (MD=-1.07, 95% CI -1.24-0.90, P<0.00001) (Figure 4-D). Five articles [13,15-16,18,20] compared the postoperative pain scores at 48 hours and showed significant heterogeneity (I2=87%, P<0.00001). Using a random effects model, meta-analysis results showed that the pain scores at 48 hours after surgery in the experimental group were significantly lower than those in the control group (MD=-0.81, 95% CI -1.00~0.61, P<0.00001) (Figure 4-E)



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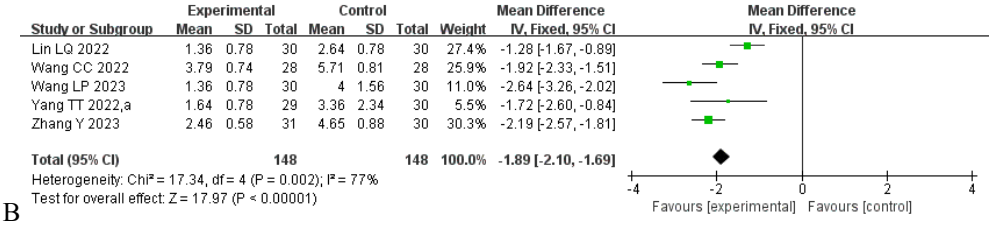

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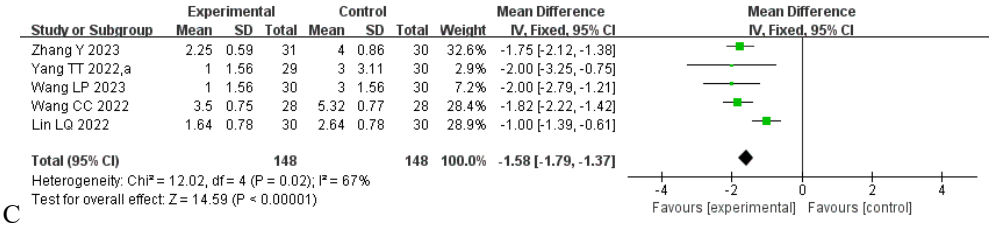

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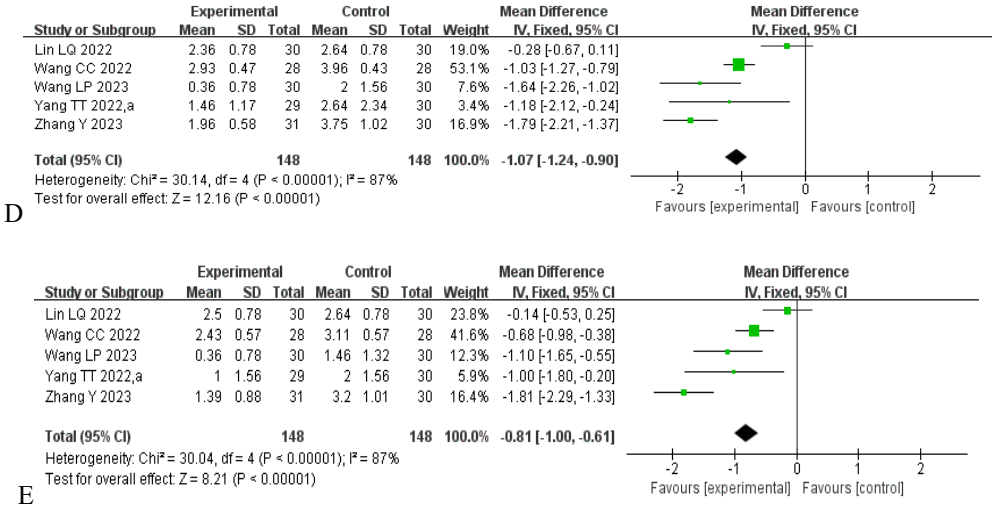

Figure 4: Postoperative pain scores at different time points during exercise

3.3.3 Intraoperative anesthesia dosage for two groups of patients

Six articles [13,15-16,18-20] compared the intraoperative propofol dosage, showing significant heterogeneity (I2=99%, P=0.02). Using a random effects model, meta-analysis results showed that the intraoperative propofol dosage in the experimental group was significantly lower than that in the control group (MD=-70.17, 95% CI -73.31-67.03, P<0.0001) (Figure 5-A). Seven articles [13-16, 18-20] compared the intraoperative use of remifentanil, showing significant heterogeneity (I2=83%, P<0.0001). Using a random effects model, meta-analysis results showed that the intraoperative use of remifentanil in the experimental group was significantly lower than that in the control group (MD=-0.45, 95% CI -0.48-0.42, P<0.0001) (Figure 5-B). Three articles [16-17,20] compared the amount of sufentanil used during surgery, showing significant heterogeneity (I2=78%, P=0.01). Using a random effects model, meta-analysis results showed that the amount of sufentanil used during surgery in the experimental group was significantly lower than that in the control group (MD=-10.56, 95% CI -11.43-9.69, P<0.0001) (Figure 5-C).

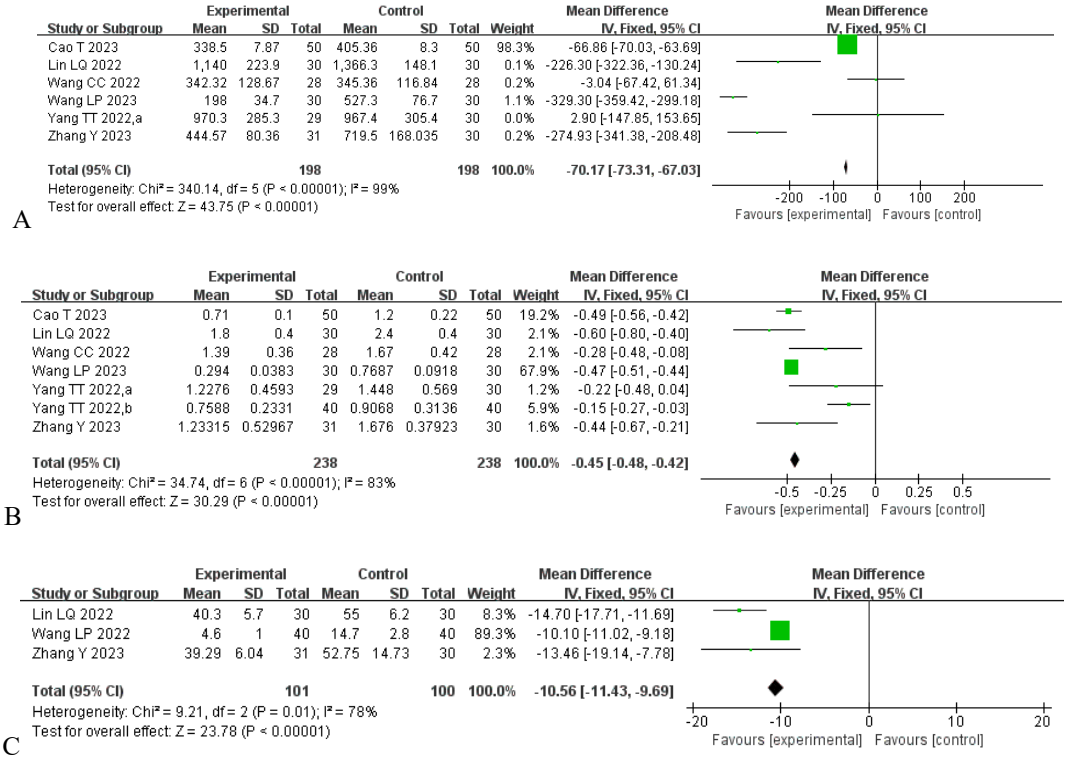

Figure 5: Intraoperative Anesthetic Dosage

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3.3.4 Number of rescue analgesia cases in two groups of patients 48 hours after surgery

Five articles [13-16, 18] compared the number of cases of postoperative rescue analgesia at 48 hours, with no significant heterogeneity (I2=0%, P=0.43). Using a fixed effects model, meta-analysis results showed that the number of cases of postoperative rescue analgesia in the experimental group was significantly lower than that in the control group (RR=0.09, 95% CI 0.04-0.20, P<0.0001) (Figure 6).

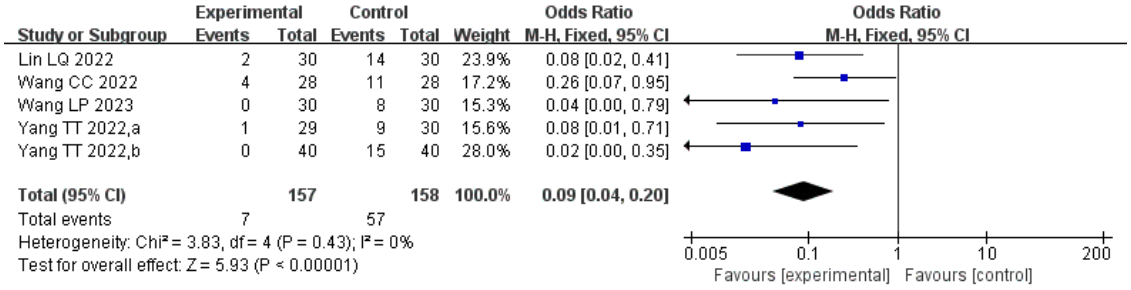

Figure 6: Number of cases of rescue analgesia 48 hours after surgery

3.3.5 Effective number of compressions of analgesic pumps in two groups of patients 48 hours after surgery

Six articles [14-18,20] compared the effective press frequency of the analgesic pump at 48 hours after surgery, showing significant heterogeneity (I2=95%, P<0.00001). Using a random effects model, meta-analysis results showed that the effective press frequency of the analgesic pump at 48 hours after surgery in the experimental group was significantly lower than that in the control group (MD=-5.10, 95% CI -5.56-4.64, P<0.00001) (Figure 7).

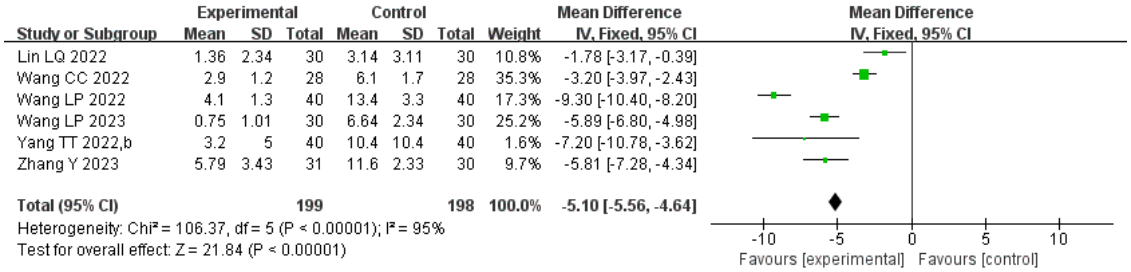

Figure 7: Effective number of compressions of the analgesic pump 48 hours after surgery

3.3.6 Incidence of postoperative adverse reactions

Six studies [13-15, 17-18, 20] mentioned the occurrence of postoperative nausea and vomiting without significant heterogeneity (I2=23%, P=0.26). Using a fixed effects model, meta-analysis results showed that the incidence of postoperative nausea and vomiting in the experimental group was significantly lower than that in the control group (RR=0.13, 95% CI 0.07-0.23, P<0.0001) (Figure 8-A). Two studies [19-20] mentioned the occurrence of postoperative dizziness without significant heterogeneity (I2=0%, P=0.82). Using a fixed effects model, meta-analysis results showed that there was no statistically significant difference in the incidence of postoperative dizziness between the two groups of patients (RR=0.38, 95% CI 0.14-0.99, P=0.05) (Figure 8-B). Two studies [13,19] mentioned the occurrence of postoperative itching without significant heterogeneity (I2=0%, P=0.33). Using a fixed effects model, meta-analysis results showed that there was no statistically significant difference in the incidence of postoperative itching between the two groups of patients (RR=0.33, 95% CI 0.05-2.12, P=0.24) (Figure 8-C). Two studies [17,19] mentioned the occurrence of postoperative respiratory depression without significant heterogeneity (I2=38%, P=0.20). Using a fixed effects model, meta-analysis results showed that there was no statistically significant difference in the incidence of postoperative respiratory depression between the two groups of patients (RR=0.17, 95% CI 0.02-1.86, P=0.15) (Figure 8-D). Two studies [17,18] mentioned the occurrence of postoperative urinary retention, without obvious heterogeneity (I2=0%, P=0.78). Using the fixed effect model, the Meta analysis results showed that the incidence of postoperative urinary retention in the test group was significantly lower than that in the control group (RR=0.14, 95% CI 0.05~0.42, P=0.0005) (Figure 8-E).

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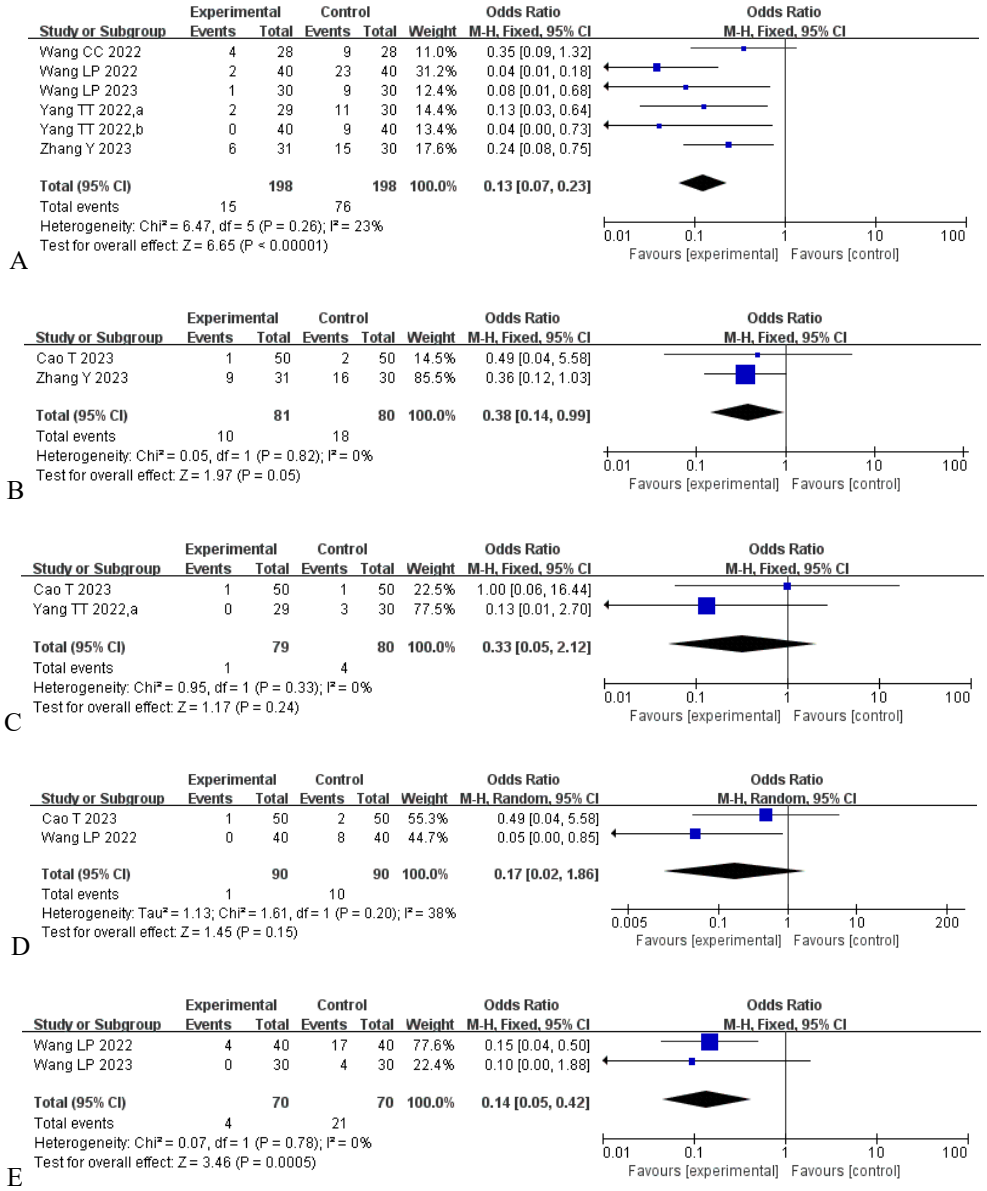

Figure 8: Incidence of postoperative adverse reactions

3.3.7 Postoperative recovery indicators

Three articles [13-14,20] compared postoperative recovery time and showed significant heterogeneity (I2=92%, P<0.0001). Using a random effects model, meta-analysis results showed that the experimental group had significantly shorter postoperative recovery time than the control group (MD=-4.97, 95% CI -5.92-4.01, P<0.0001) (Figure 9-A). Six articles [13-16,18,20] compared the first postoperative time of getting out of bed, showing significant heterogeneity (I2=94%, P<0.0001). Using a random effects model, meta-analysis results showed that the experimental group had significantly shorter postoperative time of getting out of bed than the control group (MD=-7.19, 95% CI -8.12-6.27, P<0.0001) (Figure 9-B). Three articles [15-16,18] compared the postoperative first exhaust time and showed significant heterogeneity (I2=91%, P<0.0001). Using a random effects model, meta-analysis results showed that the experimental group had significantly shorter postoperative first exhaust time than the control group (MD=-10.13, 95% CI -11.99~-8.28, P<0.0001) (Figure 9-C). Five articles [13-16,20] compared hospital stay without significant heterogeneity (I2=58%, P=0.05). Using a fixed effects model, meta-analysis results showed that the hospital stay in the experimental group was significantly shorter than that in the control group (MD=-1.07, 95% CI -1.33-0.82, P<0.0001) (Figure 9-D).

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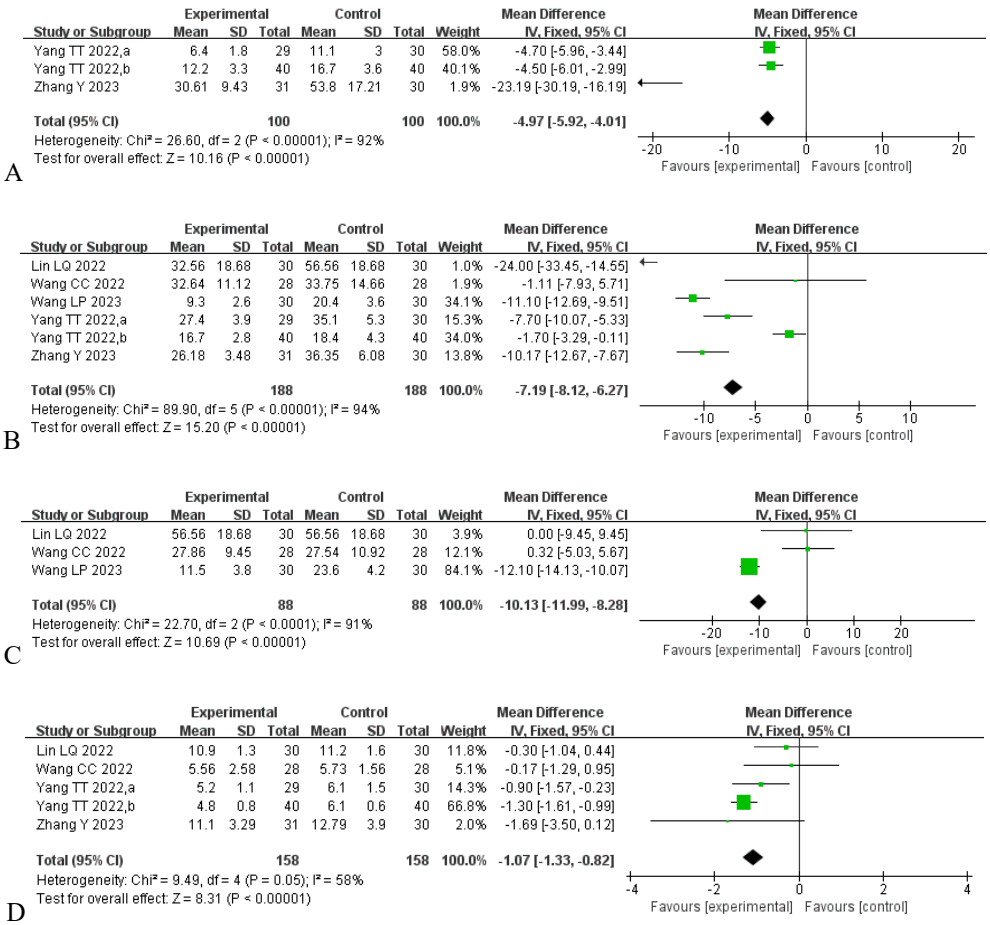

Figure 9: Postoperative recovery indicators

3.3.8 Publication bias

A funnel plot was drawn based on the resting state pain scores of two groups of patients at 12 hours post surgery. The funnel plot was symmetrically distributed, and the results indicated a relatively small publication bias. (Figure 10)

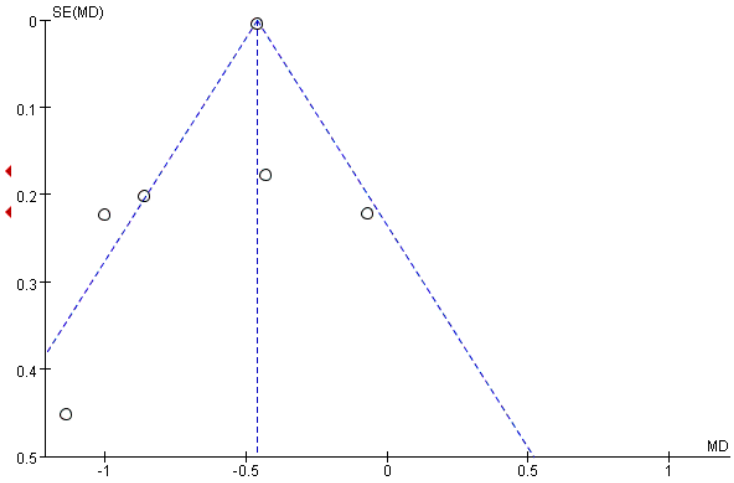

Figure 10: Funnel plot of publication bias in resting state pain scores at 12 hours post surgery

4. Discussion

This study included 8 RCTs and 556 patients, aiming to directly evaluate the postoperative analgesic effect and adverse reactions of ultrasound-guided QLB combined with general anesthesia for

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abdominal surgery. Due to the large trauma and complex pain mechanisms after abdominal surgery, most patients who use traditional pain relief methods cannot effectively control pain. Numerous studies have shown [21-22] that using a multimodal analgesic regimen of opioid drugs combined with other adjunctive drugs for pain management in abdominal surgery patients has a good effect on maintaining respiratory and circulatory stability, reducing postoperative complications, and shortening hospital stay. Therefore, the pain management of patients undergoing abdominal surgery often adopts a multimodal analgesic regimen of opioid drugs combined with nerve block. In recent years, QLB-LSAL [7,23] has been gradually applied in clinical practice. Its injection point is located at the anterior lateral edge of the lumbar quadratus muscle above the level of the lateral arcuate ligament, crossing the obstruction of the arcuate ligament. Local anesthetic drugs quickly spread directly through the thoracolumbar fascia to the thoracic paravertebral space, which is directly connected to the lumbar paravertebral space. Therefore, injection of the drug for 5 minutes can block the T7-L1 skin segment and produce a sufficient analgesic effect covering the abdominal surgical range.

This meta-analysis showed that compared to the simple general anesthesia group, the QLB-LSAL composite general anesthesia group had a significant decrease in postoperative pain scores in both resting and moving states, and the amount of opioid drugs used during surgery was significantly reduced. There were fewer times of postoperative relief analgesia, proving that the lateral arcuate ligament upper lumbar quadratus muscle block combined with general anesthesia has better perioperative analgesic efficacy. Analysis of reasons: Simple general anesthesia [24-25] cannot directly block the transmission of harmful stimuli caused by surgery to the lower central nervous system, but rather exerts its effects by inhibiting the hypothalamus, cerebral cortex, and other parts. Surgery may cause increased secretion of catecholamines and inflammatory mediators during surgery, circulatory fluctuations, and postoperative hyperalgesia; QLB-LSAL can not only block the transmission of pain stimuli to the central nervous system, but also block some sympathetic nerves in the thoracolumbar fascia, achieving the effect of blocking physical and visceral pain, reducing the production of catecholamines and inflammatory mediators in children [26]. The above effects may also cause the decrease of opioid dosage during and after the operation in QLB-LSAL group, thus reducing the related side effects (nausea and vomiting, urinary retention) and accelerating the time to get out of bed after the operation.

5. Result

In summary, the application of QLB-LSAL guided by general anesthesia combined with ultrasound in patients undergoing abdominal surgery is significantly better than that of general anesthesia alone. The former can significantly reduce the use of opioids, reduce the incidence of adverse reactions, accelerate gastrointestinal function recovery, reduce postoperative pain scores, shorten hospitalization time, and promote rapid recovery of patients.

There are currently several shortcomings in this system evaluation: (1) The concentration and dosage of local anesthetics in the included literature are not completely the same, which may increase clinical heterogeneity; (2) The number of included literature is insufficient, with relatively few high-quality literature. Considering the aforementioned shortcomings and limitations in the quantity and quality of existing original research, the conclusions of this study still need to be validated through large sample size, multi center, and high-quality RCTs.

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