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Postoperative Analgesia Effect Observation of Intercostal Nerve Block with Pentazocine and Ropivacaine

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Pentazocine; Intercostal nerve block; Video-assisted thoracoscopic surgery; Postoperative analgesia

1. Abstract

1.1. Objective

This study aims to observe single intercostals nerve block with pentazocine and ropivacaine, whether can enhance postoperative analgesia effect.

1.2. Methods

Choose sixty patients received general anesthesia undergoing video-assisted thoracoscopic lobectomy surgery. The patients were randomly allocated into three groups (n=20each): ropivacaine (group R), pentazocine (group P) and pentazocine combined with ropivacaine (group P+R). At the time of subcutaneous suturing of the thoracotomy wound, intercostal nerves were block by the same thoracic surgery doctor in three groups. Follow up and record the patients visual analogue scales（VAS) in quiet and cough at the time of extubation and 1h ,2h ,6h ,8h ,12h ,24h after extubation. Record the related postoperative adverse reactions incidence and the usage of analgesics in the early postoperative period . One-Way ANOVA was conducted with P less than 0.05 as significant level using SPSS software version 23.0.

1.3. Results

Compared with group P, T3~T5 cough VAS score was obviously lower in group R ($p<0.05$), T2~T6 cough VAS score was significantly lower in group P+R ($p<0.05$), group R T2~T6 cough VAS score was higher than that in group P+R($p<0.05$). Patients of group P+R use analgesics in postoperative tenth hour, significantly later than group R.

1.4. Conclusions

Intercostal nerve block with pentazocine and ropivacaine can significantly enhance the early postoperative analgesia effect of the video-assisted thoracoscopic surgery, postpone the use of analgesics in the early postoperative period.

2. Introduction

Postoperative analgesia effect observation of intercostal nerve block with pentazocine and ropivacaine Epidural analgesia is the gold standard for postoperative analgesia in thoracic surgery patients [1]. In recent years, a large number of studies at home and abroad have found that intercostal nerve block analgesia is of the same effect as epidural analgesia, and the adverse reactions such as urinary retention and hypotension are small. At present, most reports on intercostal nerve block in China are mainly using local anesthetics alone, but the limited analgesic duration is limited, limiting its wide application in clinical practice. In this study, we investigated the characteristics of pain after thoracoscopic lobectomy and observed the postoperative analgesia of a single intercostal nerve block after thoracoscopic lobectomy.

3. Data and Methods

General data A total of 60 patients (N=60) undergoingvideo-assisted thoracoscopic lobectomy surgery under elective general anesthesia from October 2021 to December 2021 was selected. The observation was approved by the Ethical committee of our hospital and informed consent was obtained from the patients. Inclusion criteria ASA I-II, age 25 - 75 years old, BMI 20 - 25 kg/m2, no previous severe hypertension, heart disease, diabetes and other complications, no history of ropivacaine and other drug allergies, no history of drug use, no hematological diseases, no history of chronic pain, and normal liver and kidney function. Exclusion criteria: severe hypertension, heart disease, history of diabetes,

abnormal coagulation function, thoracic and spinal deformity, bilateral surgery, rethoracotomy 48 hours after surgery, failure to accurately score the pain, and failure of intercostal nerve block.

Anesthesia methods All patients were intramuscularly injected with phenobarbital sodium 0.1g and atropine 0.5mg 30 minutes before operation. After entering the room, an upper extremity venous channel was established, and non-invasive blood pressure, electrocardiogram, and blood oxygen saturation were routinely monitored. Anesthesia induction in the three groups was performed with midazolam, sufentanil, etomidate and cisatracurium. Intraoperative anesthesia was maintained with propofol, cisatracurium and remifentanil pump. Sufentanil was added intermittently according to the MAP monitoring value, and the infusion rate of propofol and remifentanil was adjusted. The three groups of patients were all under direct vision under thoracoscope by the same thoracic surgeon before the chest was closed. For intercostal nerve block, select the site where the three incisions of the thoracoscope are located and one intercostal space adjacent to the incision above and below the incision, and the block puncture point is selected at the rib angle corresponding to each intercostal space. The pentazocine group (P group) was given pentazocine 0.5mg/kg , diluted with normal saline, 4ml per segment; the ropivacaine group (R group) was given 0.5% ropivacaine 4ml per segment; The tazocine combined with ropivacaine group (P+R group) used pentazocine 0.5mg/kg + 0.5% ropivacaine 4ml per segment. The doctor who performed the intercostal nerve block was not involved in the preparation of the drug solution and the data collection. After the operation, the endotracheal tube will be removed, the patient's vital signs will be stable, and the patient will be sent to the PACU for observation, and then returned to the ward after being fully awake. During the operation, if the systolic blood pressure was higher than 20% of the base value, intravenous injection of urapidil was given; if the heart rate was lower than 50 beats/ min, atropine 0.5 mg was given intravenously; the intravenous injection was repeated if necessary. The patient was awake after the operation, and if the VAS score was > 4, the ward doctor was given intramuscular injection of nisone 60 mg. Observation indicators were followed up and recorded immediately after extubation (T1) , postoperative 1 h (T 2) , postoperative 2 h (T3) , postoperative 6 h (T4) , postoperative 8 hours (T5) , postoperative 12 hours (T6) , postoperative 24 h (T7) at rest and when coughing VAS Rating : 0 Score : no pain when turning over and coughing ; 1-3 Points : Mild pain , tolerable ; 4-6 Minute: Moderate pain , which interferes with sleep ; 7-9 Points : severe pain; 10 points: Unbearable pain. The occurrence of adverse reactions such as hypotension, respiratory depression, nausea and vomiting, and neuroparesthesia after operation were recorded. Post-operative recording of patients twenty four The number and timing of analgesic (Nisone) doses within an hour. Statistical analysis SPSS23.0 software was used for statistical processing of recorded data; measurement data were expressed as mean ± standard deviation, and the comparison between groups was performed by one-way ANOVA with completely random design ; enumeration data was by chi-square test; $p<0.05$ The difference was considered statistically significant.

4. Result

There were no differences in ASA grade, gender, weight, age and operation time among the three groups of patients. No statistical significance ($p>0.05$) 2. Comparison of postoperative conditions VAS scores at rest at each time point after the operation in the three groups were all lower than 3 points, and the scores at each time point in the P+R group were lower than those in the P and R groups, but there was no significant difference between the three groups ($p>0.05$). Three groups of patients at T1 , T7 There was no statistically significant difference in pain scores between time points ($p > 0.05$) ; and P group compared, R Group T3 , T4 , T5 when coughing V A S Scores were significantly lower ($p < 0.05$) , P + R Groups T 2 - T 6 V A S when coughing at various points Scores were significantly lower ($p < 0.05$) , R Groups in T 2 - T 6 Time .Rated compared to P + R group height, the difference was statistically significant ($p < 0.05$) (see Table 1). The vital signs of the three groups of patients were stable after operation, and no other adverse reactions such as hypotension and respiratory depression occurred. Although there were cases of nausea and vomiting, there was no significant difference between the groups ($p>0.05$) The three groups of patients used the same amount of nisone within 24 hours after operation, but the time of use was different. The first time of using analgesics in group P was about 3 hours after operation, which was about 4 hours earlier than that in group R ; The time of first use of analgesics in the P+R group was mostly in the 10th hour after the operation, which was significantly delayed compared with the R group. (see Table 2).

Table 1: Comparison of VAS scores during cough atvarious postoperative time points in the threegroups (x±s).

组别	例数	T1	T2	T3	T4	T5	T6	T7
R组	20	0.6±0.7	2.1±1.2	2.4±1.1	2.9±0.9	3.6±0.8	3.3±0.6	1.7±0.8
P组	20	0.7±0.8	2.1±0.8	4.1±1.2 *	4.8±0.7 *	4.6±0.8 *	3.9±0.9	2.1±0.9
P+R组	20	0.5±0.7	1.3±1.1 * ▲	1.6±0.8 * ▲	1.4±0.6 * ▲	2.5±0.6 * ▲	2.8±0.7 * ▲	1.9±0.6

Note: Compared with Group R, * $p<0.05$ Comparison with the P group ▲ $p<0.05$.

Table 2: Comparison of analgesic use in the three groups within 24 hours after surgery.

group	Group R	Group P	P+R group
Nisone usage time (nth hour after surgery)	7.3±1.0	2.9±0.9	10.0±1.2

5. Discussion

In recent decades, minimally invasive surgery has developed rapidly, especially with the continuous improvement of thoracoscopy technology. It provides a good platform for the minimally invasive treatment of the lung, making it gradually become the mainstream of surgery. In the United States, thoracoscopic lobectomy has been recommended and become one of the [2] routine procedures in the treatment of lung cancer. Although thoracoscopic lobectomy is a minimally invasive surgery, Vogt [3] and others believe that patients after thoracoscopic surgery can still feel severe pain, especially within a few hours after surgery, and this pain is closely related to the operation of thoracic surgeons. The rib is used as a support for thoracoscopic instruments, resulting in rib injury and secondary inflammatory changes. In addition, there are many reasons for postoperative pain after thoracoscopic surgery, such as repeated friction of intercostal nerves and muscles during operation of instruments, and repeated stimulation of the pleura by the closed thoracic drainage tube with the breathing movement. Therefore, postoperative analgesia is particularly important in providing comfortable postoperative recovery conditions for patients undergoing thoracoscopic surgery, increasing the trust of clinicians , and reducing fear and anxiety about continued postoperative treatment. 20th century, Braun et al. first used intercostal nerve block in clinical practice and achieved success. It has been widely used in various thoracic and [4] abdominal surgeries and pain treatment. The traditional blind intercostal nerve block increases the chances of complications such as incomplete [5] block, pneumothorax, local anesthetic entering the intercostal artery by mistake, and even liver injury [6]. The thoracoscopic direct-view descending intercostal nerve block is simpler, more accurate, and greatly reduces the discomfort of the patient [7]. And the intercostal nerve block only blocks unilateral sympathetic nerve conduction, which has a slight impact on hemodynamics. For those patients who are elderly, poor general condition or difficult to change position, and coagulation mechanism disorders and other patients who are not suitable for epidural anesthesia, intercostal nerve block shows its own advantages for postoperative analgesia in special patients [8] .Ropivacaine is more suitable and safe for patients to use for intercostal nerve block, not only because of its weak negative effect on the excitability of the central nervous system and cardiac conduction system, but also because of its strong controllability. Adjusting the concentration of the solution can flexibly regulate the separation block of motor and sensory nerves, and has a small impact on the movement of respiratory muscles of patients after surgery. In 2002, Gottschalk [9] found that local anesthetics and opioids have synergistic effects in analgesia . Some data show that opioid receptors that are usually in an inactive state are converted into an active substance state due to the stimulation of inflammatory factors. The reason may be: the low pH during inflammation promotes the combination of opioid receptors and G protein, which excites the analgesic effect of opioids; inflammatory mediators and stimulation destroy the barrier function of the perineurium, which is conducive to the binding of Opioid to its receptors. However, the mechanism of action of opioids on peripheral nerves remains unclear. It is currently believed that the combination of opioids and their peripheral receptors can inhibit the excitability of afferent nerve endings, block the propagation of action potentials, reduce the release of neurotransmitters, and prevent the conduction of pain stimuli on the nerves. GottschalK [9] and other studies believe that opioids can play a role in the regulation of pseudo-descending pain when they enter the body. Combined with the upward blocking effect of local anesthetics, the analgesic effect is enhanced. The synthetic opioid derivative selected in this experiment, pentazocine [10], mainly excites κ- receptors, followed by sigma receptors, and has a certain effect on μ receptors. Antagonism. Activated κ -receptors, mainly distributed in the brain and spinal cord, can produce central analgesia and mild sedative effects. Pentazocine has significant analgesic and sedative effects, and can reduce hyperalgesia caused by remifentanil during recovery from general anesthesia. It is commonly used clinically for the treatment of postoperative pain and cancer pain. Pentazocine is favored by doctors and patients because of its definite analgesic efficacy, few side effects and non-addictive properties. Local anesthetics combined with opioids have good anesthetic effects and no obvious adverse reactions, and are widely used in clinical anesthesia. In recent years, pentazocine, tramadol, dexmedetomidine, and ketorolac tromethamine have also been added to local anesthetics for nerve block anesthesia. At present, there have been many literature reports on the clinical effect of ropivacaine combined with pentazocine in peripheral nerve block, but the effect of the combination of the two in intercostal nerve block has not been confirmed. VAS score of the pentazocine combined with ropivacaine group at each time point from T 2 to T 6 was significantly better than the ropivacaine alone group and the pentazocine alone group, indicating that the pentazocine group Zocine has a good analgesic effect, and the combined application of the two can make the effect superimposed. As for the comparison of effective postoperative analgesia, it can be seen from the experimental results that: after about 8 hours, the pain scores of the two groups were significantly different between the combined use of the two drugs and the single use of ropivacaine, which may be related to the difference between the two groups. The effective analgesic maintenance time of pivacaine is about 8 hours close. The effective analgesia time of intercostal nerve block was as long as 10 hours when the two were used in combination, which was longer than that of ropivacaine alone. Opioid (opioid) binding sites in primary afferent tissues has been reported in the literature.

showed that because opioid-binding proteins have bidirectional axonal transport functions, opioids can penetrate the neural membrane and act on the posterior horn of gray matter, which also provides a reasonable explanation for the prolonged analgesic time. The results of this experiment showed that there was no significant difference in the adverse reactions of opioids for postoperative analgesia between combined pentazocine and ropivacaine alone, but the analgesic time was significantly increased, which may be related to opioids. Peripheral nerve pathways were strengthened, and analgesia time was prolonged, which was consistent with the findings of Skinner [11]. The results of this experiment showed that the three groups of patients used the same number of analgesics within 24 hours after operation, all were once, but the time of use was different. Group P used analgesics about 3 hours after operation, about 4 hours earlier than group R; patients in group P+R used analgesics more than 10 hours after operation, which was similar to group R significantly delayed the patient's medication time. This also shows from another perspective that the combined use of the two can prolong the postoperative analgesia time, reduce the frequency of postoperative analgesics, and effectively avoid the risks of respiratory depression caused by a large number of repeated application of narcotic analgesics. Ithelps toreduce the indwel ing time ofthe drainage tube, improve therecovery oflung function, and reduce the incidence of complications.

6. Conclusion

In conclusion, pentazocine combined with ropivacaine can enhance the early analgesic effect of intercostal nerve block after thoracoscopic surgery, prolong the block time, and effectively reduce postoperative pain score and the occurrence of adverse reactions. , prolonging the dosing interval of analgesics, the patients' satisfaction with the overall postoperative analgesia is higher, which is in line with the development trend of modern analgesic technology and has a certain clinical value.

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