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Study on the Application of Celecoxib in Preemptive Analgesia for Orthopedic Surgery

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Abstract: ***Continuous stimulation due to tissue injury after orthopedic surgery can lead to peripheral nerve and central nervous system sensitization, which makes patients more sensitive to pain. Preemptive analgesia refers to the method of analgesia before the spinal cord produces pain sensitization. By inhibiting the conduction of peripheral injury to the central nervous system, the central nervous system sensitization is reduced, so as to achieve the purpose of reducing postoperative pain. Good pain management can enable patients to get out of bed as soon as possible, accelerate postoperative recovery, and reduce hospitalization time and medical-related costs. In recent years, non-steroidal anti-inflammatory analgesics play an important role in preemptive analgesia. This paper mainly studies the application of celecoxib in preemptive analgesia in orthopedic surgery.***

Keywords: Preemptive analgesia, Orthopedic, Surgery celecoxib**.**

1. Introduction

Enhanced recovery after surgery (ERAS) has proposed that good pain management can enable patients to get out of bed as soon as possible, accelerate postoperative recovery, and reduce hospitalization time and medical-related costs [1]. Pain is a major factor affecting rapid recovery. Relevant reports show that pain is the most common cause of delayed discharge after surgery, and it also affects patients ‘ satisfaction with surgery [2,3].

As people pay more and more attention to pain, the application of preemptive analgesia is becoming more and more extensive. Preemptive analgesia refers to the method of analgesia before the pain sensitization of the spinal cord, which reduces pain by inhibiting the strong reaction of peripheral injury to the central conduction. Preemptive analgesia theory has been put forward in related research [4]. It is pointed out that pain block before operation can effectively reduce central nervous sensitization and block pain transmission pathway, so as to achieve the purpose of analgesia. At the same time, preemptive analgesia also reduces the incidence of postoperative adverse reactions [5,6]. Continuous stimulation due to tissue injury after orthopedic surgery can lead to peripheral nerve and central nervous system sensitization, which makes patients more sensitive to pain [7]. Preemptive analgesia takes intervention measures in advance before central sensitization occurs to block the conduction of pain stimulation to the central nervous system and reduce the risk of central sensitization. At present, many studies have shown that it is effective to reduce postoperative pain by early intervention in patients undergoing fracture surgery during the perioperative period, which can reduce postoperative pain and reduce the consumption of other analgesics [8-10].

The most critical way to avoid central sensitization is to reduce the formation of peripheral sensitization, which is largely dependent on the blocking of peripheral nerve activity. Celecoxib plays an important role in preemptive analgesia during perioperative period of orthopedic surgery. It can reduce postoperative pain in patients with fracture, reduce complications, promote early functional exercise, reduce consumption of other analgesic drugs and increase patient satisfaction with surgery, Improve the quality of life of patients after surgery.

2. Pharmacological Study of Celecoxib

After orthopedic surgery, continuous injury and stimulation promote the production of COX-2 in local tissues. COX-2 catalyzes arachidonic acid to produce prostaglandins involved in the process of pain conduction [11]. Celecoxib is a selective COX-2 inhibitor that blocks the production of prostaglandins by inhibiting COX-2 to achieve analgesic pain [12]. At the same time, celecoxib selectively inhibits COX-2 without inhibiting COX-1, reducing the incidence of adverse reactions such as gastrointestinal tract. At present, many studies have shown that patients undergoing orthopedic surgery can effectively reduce the transmission of pain stimulation to the central nervous system and reduce the risk of central sensitization by taking celecoxib before surgery, thus reducing postoperative pain. The onset time of oral celecoxib is about 30 minutes, and generally 2 hours can achieve a stable blood concentration. The plasma half-life of celecoxib is generally 11 hours, all of which are metabolized by the liver [13,14]. Common adverse reactions of opioid analgesics include nausea and vomiting, vertigo, constipation and drowsiness [15]. The analgesic effect of opioids is strong, but there are many adverse reactions, and it is easy to cause patient dependence. Therefore, the use of opioids is gradually reduced in clinical practice and other drugs are used instead. The use of celecoxib can effectively reduce the consumption of opioids after surgery [16]. At the same time, celecoxib has less stimulation to the gastrointestinal tract than opioids, reducing the incidence of adverse reactions in patients.

3. Application

The management of pain in patients after total knee arthroplasty (TKA) has always been a concern. Good pain management can enable patients to carry out rehabilitation exercises as soon as possible and reduce the time of admission. Related studies have shown that preoperative administration

of celecoxib can achieve the effect of preemptive analgesia [17]. In this study, 200 mg celecoxib was given to TKA patients 1 hour before surgery, which can effectively reduce postoperative pain and reduce morphine consumption. The postoperative pain score of the patients in the celecoxib group was about 30 % lower than that in the blank control group. Traditional non-steroidal anti-inflammatory drugs have the effect of inhibiting platelet aggregation. Excessive preoperative use may increase intraoperative blood loss [18]. Celecoxib selectively inhibits COX-2 without interfering with the activity of COX-1, which will not affect coagulation function, will not increase the patient 's intraoperative blood loss and does not have the incidence of gastrointestinal and other adverse reactions. It is proved that celecoxib is safe and effective in TKA preemptive analgesia. In addition, some studies have also shown that multimodal preemptive analgesia with celecoxib combined with other drugs can also improve postoperative pain in TKA patients [19,20]. In Yan Ren's study, patients undergoing TKA surgery were divided into celecoxib treatment group, celecoxib combined with dexmedetomidine treatment group and blank control group. All three groups of patients were treated with preemptive analgesia before operation. The results showed that the multimodal preemptive analgesia scheme of the virtual part of Sele combined with dexmedetomidine was superior to the other two groups. The postoperative VAS pain score and knee joint range of motion of this group were better than those of other groups. In Zhou Yi's study, the multi-mode preemptive analgesia of pregabalin combined with celecoxib also achieved good results.

Arthroscopic knee surgery (AKS) is also an effective treatment for knee osteoarthritis to the end stage. In order to obtain better therapeutic effect, early rehabilitation exercise is necessary. However, fear of pain can cause patients to delay exercise time and affect the recovery of joint function. Relevant studies have shown that preoperative administration of celecoxib can effectively reduce postoperative pain and improve joint mobility in patients undergoing aks [21]. At the same time, the researchers administered celecoxib to patients at three different time periods of 24 hours, 4 hours, and 1 hour before surgery, and compared the postoperative VAS pain scores and joint mobility of the three groups of patients. It is concluded that taking celecoxib 1 hour before surgery may be the best choice.

Total hip arthroplasty (THA) is an effective treatment for hip degenerative changes to the end stage, which can improve the patient's hip dysfunction, improve the quality of life of patients, and reduce the risk of disability [22]. However, postoperative pain makes patients reluctant to perform early rehabilitation exercises, delaying the process of accelerated rehabilitation after surgery. It prolongs the length of hospital stay and increases the medical expenses of patients. Anxiety about postoperative pain can also affect patients' satisfaction with surgery. Celecoxib also played a good effect in the preemptive analgesia program of THA [23,24]. In these two studies, the VAS score of patients after surgery was lower than that of the control group by using celecoxib before surgery. It not only accelerates the process of early rehabilitation of patients, but also does not increase the incidence of adverse events. Importantly, the use of celecoxib has economic effects, is cheap and easy to obtain. Reduce the economic burden of patients. It is a better analgesic scheme.

Celecoxib also has a good effect in the preemptive analgesia of other lower limb surgeries [25]. In the study protocol, patients with femoral neck fractures and femoral shaft fractures were treated with celecoxib three days before surgery and compared with the placebo control group. The results showed that preoperative administration of celecoxib could effectively relieve the early postoperative pain in patients with femoral shaft fracture and femoral neck fracture. At the same time, the incidence of adverse events in the two groups was similar, which proved that the preemptive analgesia regimen of celecoxib was safe and reliable.

Chen's research shows that preoperative administration of celecoxib can relieve early postoperative pain in patients undergoing lumbar spine surgery. Preemptive analgesia with 400 mg celecoxib was given to patients undergoing lumbar spine surgery before surgery. The results showed that it effectively improved the early postoperative pain in patients undergoing lumbar spine surgery and did not increase postoperative blood loss [26].

After spinal surgery, patients usually have obvious pain and are unable to move. Patient-controlled analgesia (PCA) pump analgesia is often used after spinal surgery. However, the opioid analgesics contained in PCA greatly increase the probability of adverse reactions such as nausea and vomiting, skin itching, and vertigo. Therefore, it is very important to reduce the consumption of opioids and replace opioids with other analgesic regimens. Qi HE's research shows that the multimodal analgesia scheme of celecoxib combined with PCA is better than that of PCA alone in patients undergoing spinal surgery. Preemptive analgesia with celecoxib not only effectively reduces the early postoperative pain, but also reduces the consumption of other analgesic drugs [27].

4. Results

In summary, celecoxib for preemptive analgesia in orthopedic surgery has a significant effect, which effectively improves the early postoperative pain and improves the quality of life of patients. It did not increase the incidence of other adverse reactions, but also reduced the consumption of other analgesics. Celecoxib also has a certain economic effect, and the low price reduces the economic burden of patients. It is worth noting that although many studies have shown that the preemptive analgesia of celecoxib is effective, the optimal dose and the optimal time of preoperative administration are still unknown. The optimal use time and dose still need more research and clinical data support. In clinical use, doctors still need to seriously consider according to the specific situation. Preemptive analgesia with celecoxib alone cannot effectively control postoperative pain in patients. However, multimodal analgesia is still needed to relieve pain in patients. In clinical work, the promotion and application of celecoxib preemptive analgesia still need time and experience. In the future, scholars still need to continue to study and research on celecoxib pain management programs, hoping to develop more optimized and safe multi-mode pain management programs.

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