*Trends in Oncology* Vol 6 Issue 3 2024

**Original Research Article**

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# Application of Exact Femoral Nerve Block Technique in Patella Fracture Anesthesia and Postoperative Analgesia

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**Abstract: Objective:** To analyze the application effect of exact FNB technique in patella fracture surgery. **Methods:** 82 patients with patella fracture in our hospital were selected for the study from June 2023 to June 2024, and were divided into 41 cases of the control group with conventional anesthesia and 41 cases of the observation group with exact FNB technique by random number table method, and the application effects of the two groups were compared. **Results:** The DBP and SBP at 5min, 10min, 20min and 30min after anesthesia in the observation group were significantly higher than those in the control group, and HR, postoperative 6h, 12h, 24h and 48h VAS scores and the incidence rate of adverse reactions were significantly lower than those in the control group ($P < 0.05$). **Conclusion:** When treating patellar fracture, adopting the exact FNB technique can strengthen the effect of anesthesia and analgesia, and is safer.

**Keywords:** Exact Femoral Nerve Block Technique; Patella fracture; Anesthesia; Analgesia

## Introduction

Patellar fracture is a frequently occurring disease, which is often treated with surgery, usually with EA, postoperative intravenous pump analgesia, or CEA, but the above techniques have limited effect, and there are some drawbacks in terms of complications, anesthesia operation, and analgesic effect. In addition, some patients with spinal deformity, significant hemodynamic disorders, and coagulation abnormalities cannot undergo EA[1]. Recently FNB technology is becoming more and more mature, in the knee and its lower surgery, the use of a wide range of both the anesthetic level, or analgesic level, belong to the hot spot of research.FNB can be used for patellar surgical region, can achieve complete anesthesia, easy to operate, basically does not affect the physiology, including the gastrointestinal system, gastrointestinal function, etc., and is highly safe[2]. The exact FNB is an important condition to improve the anesthetic effect and effective analgesia, but there are not many studies about it. This study takes patients with patellar fracture as the object to analyze the effect of the application of exact FNB technique.

## 1. Data and Methods

### 1.1 General Information

Eighty-two patients with patellar fracture in our

hospital were selected to carry out the study from June 2023 to June 2024, and were evenly divided into 41 cases in the control group, 22 men and 19 women, aged 18-73 years old, with an average age of (43.66±5.79) years; 41 cases in the observation group, 23 men and 18 women, aged 19-74 years old, with an average age of (43.71±5.72) years. 5.72) years old. The general information of the two groups ($P > 0.05$) was comparable.

Inclusion criteria: suffering from patellar fracture; for the long-term taking of analgesics; not allergic to opioids, amide local anesthetics; informed consent to this study. Exclusion criteria: important organ dysfunction; coagulation dysfunction; mental illness; cognitive abnormalities.

### 1.2 Methods

#### 1.2.1 Control Group

The group performs conventional anesthesia: that is, the CSEA is implemented, the supine position is selected, the patient is guided to bend the knee with the healthy fat, and the lumbar anesthesia needle is applied, the model is 25G pen-point type, and the positioning is carried out, which can be L3-4 or L2-3, and the epidural puncture is carried out. Using the epidural puncture needle as a route, the lumbar anesthesia needle is placed in, targeting the arachnoid membrane, or the spinal membrane, and a slow puncture is initiated. Observe the cerebrospinal fluid, and after it flowed out, choose 0.5% ropivacaine (Guangdong Jiabo Pharmaceuticals; State Pharmaceutical License H20113381), a total of 2 ml, and end the lumbar anesthesia needle, place it at about 3 cm of the epidural catheter, and fix it well. Drug solution configuration: choose 1% ropivacaine, a total of 1ml, choose 10% glucose injection, a total of 1ml, mix the two. Postoperative analgesic treatment, choose 0.375% ropivacaine, a total of 200 ml, select tropisetron (Beijing Huasu Pharmaceuticals; National Drug License H20020563), the dosage of 5mg, select dezocine (Nanjing Youke Pharmaceuticals; National Drug License H20193318), the dosage of 5mg, will be mixed with all three. Control the speed of medication, 5ml/h.

#### 1.2.2 Observation Group

This group performs the exact FNB technique: choose the supine position, take the nerve stimulator, with the help of portable ultrasound guidance, combine the two, put in the catheter, uphold the concept of asepsis. With the help of a high-frequency ultrasound probe, the location of the femoral nerve was clarified and the puncture site was sought. Choose 1.5% lidocaine, implement local anesthesia, set the parameters of the machine, the frequency is set at 2Hz, the wave width is set at 0.3ms, the current is set at 1mA, with the help of ultrasound guidance, the stimulation needle is placed near the femoral nerve, observe the quadriceps muscle, if it is obvious contraction, or patellar lifting action, and at the same time carry out the return pumping, if there is no return, then choose 5% dextrose, push in for the patient to make sure that the nerve is wrapped in liquid, and then put in the catheter. Then put in the catheter, control the length of the catheter, ensure that it is higher than the tip of the needle 5cm. after putting in the catheter, connect it to the stimulator, set the current parameters, customized 0.5mA-1.0mA, if there is a patellar lifting performance, or observation of the quadriceps muscle, obvious contraction, then the catheter will be fixed, if there is no such performance, the need to use ultrasound, to further verify the position, such as in the nerve sheath, the need for the catheter to be retained. To fix the catheter, 0.5% ropivacaine was selected, totaling 20ml, which was injected into the catheter, and one finger was taken to press the distal end of the puncture to promote the diffusion of the local anesthetic, with attention to the cephalad side. After the operation is completed, analgesia is carried out, 0.15% ropivacaine is selected, totaling 240ml, the loading volume is set at 15ml, the background dose is controlled, and 5ml/h is made, PCA is carried out, 5ml each time, and then it is locked, and it lasts for 0.5h.

### 1.3 Observation Index.

Evaluation of vital signs[3]: monitor HR, DBP and SBP before anesthesia, 5min, 10min, 20min and 30min after anesthesia.Evaluation of the degree of pain: take VAS scale[4], 0-10 points, the higher the score, the more severe the degree. Evaluation of adverse reactions: including urinary retention, nausea and vomiting and postoperative hypotension [5].

### 1.4 Statistical Methods

SPSS28.0 processed the data, $\overline{x}\pm s$ and (%) expressed the measurement and count data, respectively, t and $x^2$, $P < 0.05$, the difference is statistically significant.

## 2. Results

### 2.1 Comparison of Vital Signs between the Two Groups

DBP and SBP in the observation group were significantly higher than those in the control group at 5min, 10min, 20min and 30min after anesthesia, and HR were significantly lower than those in the control group ($P < 0.05$). See **Table 1** for details.

**Table 1** Comparison of vital signs between the two groups [$n(\overline{x} \pm s)$]

| Indicator | Group | Cases | Before Anesthesia | 5 min After Anesthesia | 10 min After Anesthesia | 20 min After Anesthesia | 30 min After Anesthesia |
|---|---|---|---|---|---|---|---|
| DBP (mmHg) | Observation | 41 | 88.74±4.23[b] | 81.24±4.16a | 81.25±1.23[a] | 84.35±5.22[a] | 85.74±3.25[a] |
| | Control | 41 | 88.62±4.38 | 71.33±4.10 | 71.54±1.29 | 61.25±3.97 | 57.61±4.19 |
| SBP (mmHg) | Observation | 41 | 151.63±7.46[b] | 146.56±5.56[a] | 141.41±4.28[a] | 143.51±5.44[a] | 146.52±5.51[a] |
| | Control | 41 | 152.54±7.15 | 136.26±4.41 | 123.34±4.34 | 116.26±5.39 | 114.24±5.36 |
| HR (beats/min) | Observation | 41 | 77.67±4.27[b] | 74.35±3.64[a] | 72.15±3.98[a] | 70.24±4.28[a] | 67.25±3.35[a] |
| | Control | 41 | 77.59±4.42 | 77.56±4.15 | 75.64±4.25 | 74.25±3.64 | 70.54±4.16 |

Note: Comparison with the same moment in the control group, [a]$P < 0.05$, [b]$P > 0.05$.

### 2.2 Comparison of Pain Levels between the Two Groups

The postoperative VAS scores of 6h, 12h, 24h and 48h in the observation group were significantly lower than those of the control group ($P < 0.05$). See **Table 2** for details.

**Table 2** Comparison of pain levels between the two groups [$n(\overline{x} \pm s)$]

| Group | Cases | Pre-operation (points) | 6h Post-operation | 12h Post-operation | 24h Post-operation | 48h Post-operation |
|---|---|---|---|---|---|---|
| Observation | 41 | 5.24±1.11 | 2.24±0.12 | 1.72±0.15 | 1.26±0.14 | 0.72±0.18 |
| Control | 41 | 5.27±1.09 | 2.98±0.14 | 2.28±0.16 | 1.59±0.13 | 1.26±0.21 |
| $t$ | / | 0.123 | 25.697 | 16.350 | 11.060 | 12.501 |
| $P$ | / | 0.902 | 0.000 | 0.000 | 0.000 | 0.000 |

Note: Compared with the group before the intervention treatment, [a]$P < 0.05$.

### 2.3 Comparison of Adverse Reactions in the Two Groups

Comparing the incidence of adverse reactions, the observation group is lower ($P < 0.05$). See **Table 3** for details.

**Table 3** Comparison of adverse reactions between the two groups [$n$ (%)]

| Group | Cases | Urinary Retention | Nausea and Vomiting | Postoperative Hypotension | Incidence Rate |
|---|---|---|---|---|---|
| Observation Group | 41 | 0 | 1 | 1 | 4.88 |
| Control Group | 41 | 2 | 4 | 4 | 24.39 |
| $x^2$ | / | / | / | / | 6.248 |
| $P$ | / | / | / | / | 0.012 |

## 3. Discussion

Patella fracture is common in the elderly, usually caused by violence, either indirect or direct, and surgical treatment is preferred. In knee joint activity, the patella is crucial, and its anatomical characteristics are obvious, both to implement surgical repositioning, as well as to carry out early rehabilitation, strengthen the functional exercise, if the postoperative rehabilitation is poor, it is easy to cause complications, including traumatic arthritis, knee dysfunction and so on [6]. For patellar fracture, its local pain and swelling are significant, especially 24-48h after surgery, which is not conducive to early rehabilitation.

In patellar fracture surgery, general anesthesia is generally not taken and does not include special cases, so it is mostly chosen as CSEA, SA or CEA,

etc. For postoperative patients, epidural analgesia and intravenous analgesia are mostly chosen. For some patients, especially those who have taken anticoagulants for a long time, vascular sclerosis and hypertension, their vertebral space is narrower, which is not conducive to vertebral puncture, with greater difficulty, and may increase the amount of bleeding, leading to failure of puncture, and when performing intrathecal anesthesia, it leads to hemodynamic changes, which has a number of disadvantages[7]. With FNB, both the knee joint and the lower part of the body are suitable for carrying out FNB, which involves selecting the appropriate amount of drug, observing the femoral nerve within the femoral triangle, injecting the drug, and with the help of ultrasound technology, obtaining an imaging image, which allows the identification of the nerves and the nearby structures, which enables the checking of anatomical variations, and focusing on the position of the puncture needles, and at the same time, monitoring the diffusion of the drug[8]. With the help of ultrasound guidance, a nerve stimulator is taken, and based on the traditional puncture technique, combined with visualization technology, the drug can be injected accurately, the exact FNB can be achieved, and the anesthetic effect can be strengthened, which can enhance the analgesic effect. The results of the study showed that compared with the control group, the DBP and SBP of the observation group were higher at 5min, 10min, 20min and 30min after anesthesia, and the HR was lower ($P < 0.05$), which represented that the adoption of the exact FNB technique could stabilize the vital signs, and the hemodynamic fluctuation was small. The VAS scores of 6h, 12h, 24h and 48h postoperatively in the observation group were all lower ($P < 0.05$), which indicated that the application of the exact FNB technique was effective in analgesia and could significantly reduce pain. The incidence of adverse reactions was lower in the observation group ($P < 0.05$), indicating that the implementation of the exact FNB technique was safer and had fewer adverse reactions, such as urinary retention and hypotension. It indicates that the application of the exact FNB technique can enhance the anesthetic effect of patellar fracture as well as strengthen the analgesic effect, which is safe and effective, and even if accompanied by cardiopulmonary and cerebrovascular diseases and higher age, it is also applicable, which can improve the effect of the operation and achieve a good prognosis.

In conclusion, when treating patellar fracture, adopting the exact FNB technique can enhance the anesthesia and analgesia effect, and be safer.

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