Femoral nerve block in knee surgery for post operative pain relief

Khyati Jethva1*, Gargi Bhavsar2
1 Resident, Dept. of Anesthesia, V.S. General Hospital, Ahmedabad
2 Assistant Professor, Dept. of Anesthesia, V.S. General Hospital, Ahmedabad

ABSTRACT
BACKGROUND: Concept of postoperative analgesia is gaining importance in elective surgeries due to number of advantages such as: minimal psychological stress, improved hemodynamic stability, early physiotherapy and early mobilization. Femoral nerve block is a technique that is easy to master, carrying minimal risk with significant clinical application in postoperative pain relief. MATERIALS AND METHODS: This is a prospective randomized study of 50 patients subjected to knee surgery under subarachnoid anaesthesia using 0.5% bupivacaine 15 mg (3 ml) + 25 mcg Fentanyl (0.5 ml). Femoral block with bolus of 20 ml of 0.125% bupivacaine and clonidine 150 mcg was given through femoral catheter. The demographic, anaesthetic and surgical variable were noted along with the pain intensity using verbal response scale (VRS). RESULTS: Pain was lower in patients who received femoral catheter analgesia. CONCLUSION: Analgesia through femoral catheter is an accepted practice for postoperative pain relief after knee surgery. It is a valid alternative, minimizing the pain intensity and use of analgesia.

Keywords: Femoral nerve block, Bupivacaine, Clonidine, Verbal response scale

INTRODUCTION
The international association for the study of pain had defined pain as “unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage”. Concept of post operative analgesia is gaining importance in elective, emergency and day care surgeries due to number of advantages such as: minimal psychological stress, improved hemodynamic stability and no respiratory embarrassment, relief of sympathetic over activity and prevention of peripheral or central sensitization. Early mobilization and early physiotherapy helps in early return to routine activities. Other added benefits are reduced postoperative complications, elimination of pain and discomfort with minimum side effects. In this study, Inj. Bupivacaine 0.125% and Inj. Clonidine 150 µg has been used as a postoperative analgesic medication by femoral catheter.

Our aim is to study the quality and duration of analgesia, to observe haemodynamic changes, to evaluate side effects and to assess patient satisfaction. Femoral nerve block is very useful in numerous procedures involving the thigh and knee, skin grafting, knee arthroscopy, total knee replacement and patellar surgery. Mechanism of Action: Bupivacaine is highly potent local anaesthetics. Bupivacaine prevent transmission of nerve impulses by inhibiting passage of sodium ions through ion-selective sodium channels in nerve membranes. Failure of sodium ion channel to increase permeability slows the rate of depolarization such that threshold potential is not reached and thus action potential is not propagated. Clonidine is alpha2 adrenergic agonist. Clonidine stimulates inhibitory α2 adrenoreceptors to reduce central neural transmission in spinal neurons. It inhibits substance P release involved in the analgesic effect. Anatomy: Femoral nerve is formed by dorsal divisions of anterior rami of the second, third and fourth lumbar nerves. It runs in the groove between the psoas major and iliacus muscles with a covering of these muscles’ fascia. It enters the thigh passing under the inguinal ligament. It is lateral to the femoral artery, whose pulsations are used to locate the nerve. Femoral nerve supplies the skin of the anterior and medial side of the thigh, knee and a small part of the medial foot. Iliac crest is a thick, curved bony margin, forming laterally the lower margin of the waist. Anterior superior iliac spine is anterior end of the iliac crest. Fold of groin is a shallow curved groove which separates the front of the thigh from the anterior

*Corresponding Author:
Khyati Jethva
E/3 Doctor’s Quarter,
Behind Blood Bank,
Opp. water tank, Civil Hospital,
Amreli, Gujarat – 365601
Email: Khyatijethva13@gmail.com
abdominal wall. It represents the flexion crease of the thigh and overlies the inguinal ligament which extends from the anterior superior iliac spine to the pubic tubercle. Pubic symphysis is formed in the median plane between the right and the left pubic bones. Midinguinal point lies midway between the anterior superior iliac spine and the pubic symphysis. The femoral artery and the head of the femur lie beneath the midinguinal point.

MATERIALS AND METHODS

50 patients of either sex between 15-60 years of age belonging to ASA Grade I and II were included in the study. The patients were assured and explained about the procedure. After obtaining informed consent, femoral nerve block was given in all patients, posted for knee surgery for post operative pain relief using inj. bupivacaine hydrochloride 20 cc 0.125% and inj. clonidine 150 µg by femoral catheter. Knee surgeries were performed under spinal anaesthesia using inj. bupivacaine (0.5%) 15 mg (3 ml) + inj. fentanyl 25 µg (0.5 ml).

After shaving of local parts (inguinal region) patients were taken in the operation theatre. In the operation theatre BP cuff, ECG monitor and pulse oximeter were attached. IV line was secured with 18 gauge cannula and IV fluid was started. Patients were pre-medicated with inj. Glycopyrrolate 0.2 mg IV and inj. Midazolam 0.02 mg/kg IV. No other analgesic was given peroperatively. Additionally, pulse, blood pressure and respiratory rate were also noted.

Under strict aseptic and antiseptic precaution infiltration was done with inj. Xylocaine (2%) 2 ml. Femoral nerve located lateral to femoral artery 2.5 cm below midinguinal point by inserting 16 gauge touhy needle with the help of peripheral nerve locator. Visible quadriceps muscle contractions and patellar dance was looked for confirming the nerve location. 18 gauge catheter was inserted through touhy needle in femoral sheath 3-5 cm in upward direction. To secure the catheter tunneling was made by penetrating the skin with the inner stylet of needle 1- 3mm from the catheter entry site and advance subcutaneously to exit the skin 8 – 10cm laterally and “rail road” the needle over stylet. Remove the stylet and feed the catheter retrogradely through needle and appropriate dressing applied. Post operatively subjective sense of pain was assessed by verbal response scale. patients were given 20 cc inj. bupivacaine 0.125% and inj. clonidine 150µg 1 ml through femoral catheter when pain score was 2 or more.

**Figure 1: Nerve location**

A: Line marking femoral artery  
B: Inguinal crease  
C: Needle entry lateral to femoral artery and aimed approximately 45° cephalad

Post operatively subjective sense of pain was assessed by verbal response scale. patients were given 20 cc inj. bupivacaine 0.125% and inj. clonidine 150µg 1 ml through femoral catheter when pain score was 2 or more. Time of onset of analgesia was noted and vitals were noted. Intensity of pain was evaluated every time using verbal response scale (VRS). When VRS was ≥ 2 then analgesia was given through femoral catheter using 20 ml 0.125% bupivacaine and 150µg clonidine. Duration of analgesia was...
noted. At the time of discharge catheter removed with appropriate dressing.

Pain scoring by 4 pain verbal response scale:
- 0 – No pain
- 1 – Mild pain, bearable
- 2 – Moderate pain, requiring analgesics
- 3 – Severe pain, unbearable

Patient’s satisfaction was noted on verbal scale of:
- 5 – Very satisfied
- 4 – Satisfied
- 3 – Neutral
- 2 – Unsatisfied
- 1 – Very unsatisfied

**RESULTS**

In our study 50 patients of either sex between 15-60 years belonging to ASA Grade-I and II were chosen for elective knee surgery. Postoperative analgesia was given through femoral catheter using 20 ml 0.125% bupivacaine and 150µg clonidine in the postoperative ward when oral response scale was ≥ 2 and patients were observed for analgesic effect. Single bolus dose of bupivacaine with clonidine given through femoral catheter gives mean duration of analgesia for 10.24 hours. As shown in Table-1, 72% patients were having 6-10 hours of analgesia assessed by verbal response scale which was < 2 in this duration.

**Table 1: Total Duration of Analgesia**

<table>
<thead>
<tr>
<th>Duration of Analgesia (in Hr.)</th>
<th>No. of Patients</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6-10</td>
<td>36</td>
<td>72</td>
</tr>
<tr>
<td>11-15</td>
<td>14</td>
<td>28</td>
</tr>
<tr>
<td>16-20</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>21-25</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>50</td>
<td>100</td>
</tr>
</tbody>
</table>

Onset of analgesia was within 6-10 mins after injection in 72% of patients and within 10-15 mins in 24% of patients. All the patients were asked for their satisfaction of postoperative analgesia in the form of score as shown in table-2. Score was ≥ 4 in 88% of patients. Most of the patients were satisfied by this form of analgesia and early ambulation.

**DISCUSSION**

There are various methods of postoperative pain relief. Recent gain in the knowledge of pain control advocates more specific nerve blocks and regional blocks which avoid or lower the requirement for parenteral narcotics when possible. Present study was conducted to evaluate analgesic effects of femoral nerve block for post operative pain relief after elective surgery of knee. Multiple studies have been done for postoperative pain relief by femoral nerve block.

Tetzlaff JE et al in this study, inserted femoral catheter after induction of general anaesthesia and 20 ml of 0.5% bupivacaine was injected. Postoperatively all patients divided in three groups and received 0.625%, 0.125% and 0.25% bupivacaine at the rate of 0.12 ml/kg/hr via catheter. They found that all patients were pain free on emergence from general anaesthesia. Average pain scores indicated good pain control and concluded that low concentrations of bupivacaine provide excellent post operative pain control after all reconstructions.

In another study, G Goldfarb et al studied 30 patients operated for femoral osteosynthesis under general anaesthesia, who were given femoral nerve block in postoperative period using three different combinations in the form of 0.35% bupivacaine with adrenaline 250 µg, 0.35% bupivacaine with clonidine 150 µg , 0.35% bupivacaine with adrenaline 250 µg and clonidine 150 µg with volume of 30 ml. They concluded that addition of clonidine to bupivacaine results in increase duration of analgesia of average 15.1 hours.

Szczkowski MJ Jr et al did study to determine the effects of a single injection femoral nerve block using 30 ml of 0.5 % bupivacaine with
epinephrine 1:200,000 on pain control following total knee arthroplasty. He found that patients who received femoral nerve block used significantly less morphine during first 24 hours after surgery and post-operative pain management improved. Contreras – Dominguez V et.al.\textsuperscript{12} concluded that use of 0.0625% bupivacaine decreases overall consumption of analgesia for anterior cruciate ligament reconstruction of postoperative pain management. In the present study as femoral catheter has been inserted by using nerve locator, chances of nerve injury are very less. Catheter was removed within 48 – 72 hours postoperatively. Analgesia was given in the mean time as per requirement of patient and also during physiotherapy. Infection or any other complication was not noted in any case.

CONCLUSION
Present study was aimed to provide postoperative analgesia and early ambulation. Postoperatively when VRS was 2 or more, analgesia was given through femoral catheter by 20 ml of 0.125% bupivacaine and 150\textmu g clonidine & satisfactory analgesia was noted through verbal response scale. Hence, I conclude that post operative analgesia through femoral catheter with bupivacaine and clonidine is a good choice for sustained adequate pain relief without any side effects in case of knee surgeries. It also provides advantage of early physiotherapy and early mobilization.

ACKNOWLEDGEMENT
We are highly thankful to our Dean Dr. Pankaj Patel and Dr. Varsha Sarvaiya (Head, Department of Anaesthesia) for permitting us to carry out the study and collect data. At last but not the least, I am thankful to my patients as without their co-operation, this study could not have been successfully completed.

REFERENCES:
1. B.D. Chaurasia’s: Human Anatomy: Regional and Applied; Vol. 2: 4\textsuperscript{th} edition.
3. K.D. Tripathi’s Essentials of Medical Pharmacology. 6\textsuperscript{th} edition.
4. Miller’s Anesthesia, Volume 1 (Ch.30), Volume 2 (Ch. 87), 7\textsuperscript{th} edition.
5. Morgan’s clinical anesthesia, Ch. 17, Fourth edition.
8. Boezaart AP. Continuous femoral nerve block.