An Easy Solution for Successful Lumbar Plexus Block in Arthroplasty Surgery of Patients with Poorly Defined Landmarks

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An Easy Solution for Successful Lumbar Plexus Block in Arthroplasty Surgery of Patients with Poorly Defined Landmarks

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Abstract

Lumbar plexus block (LPB) provides excellent postoperative analgesia after major joint surgeries of lower limb (Hip and Knee joint) and when combined with sciatic nerve block it provides excellent surgical condition for such surgeries even in high risk patients. Various techniques, i.e. anatomical landmarks, nerve stimulator, ultrasound, CT (computed tomography) or MRI (Magnetic resonance imaging) guidance have been described for localization of lumbar plexus. We used combination of nerve stimulator and fluoroscopy for lumbar plexus block in six patients of arthroplastic surgery scheduled under block anaesthesia and had poorly defined anatomical landmarks thus resulted failed attempts for localization of transverse process of 4th lumbar vertebrae with nerve stimulator needle. With help of fluoroscopy transverse process of 4th lumbar vertebra was identified and block was given using nerve stimulator. Block was successful in all patients and no serious complication occurred in any of the patients.

Key words: Arthroplasty, fluoroscopy, lumbar plexus block, nerve stimulator guided nerve block, parasacral sciatic nerve block.

Introduction

Background: Lumbar plexus block is becoming popular regional anaesthetic technique for lower limb orthopedic surgeries due to its efficacy to provide stable hemodynamic and excellent postoperative analgesia in relatively older age group patients of arthroplastic surgery. When combined with sciatic nerve block it gives excellent surgical condition even in high risk patients [1,2]. Lumbar plexus block is a safe and effective alternative for analgesia in hip and knee surgery it provides effective postoperative analgesia of the lower extremity following joint arthroplasty.[3]

Lumbar plexus block (LPB) is traditionally performed using surface anatomical landmarks [4,5]. However; anatomical landmarks can vary among patients and can result in a failure to contact the transverse process and also to elicit quadriceps muscle contraction which is mainstay of successful lumbar plexus block [6,7]. Repeated attempts to locate the transverse process may result inadvertent renal or vascular injury. [8,9]

Although ultrasound guidance is becoming standard for nerve blocks but it is shown to be of limited value in lumbar plexus block due to difficulty in localization of lumbar plexus [10, 11]. Steep learning curve and non-availability of ultrasound machine in most of the operation theatre are also deterrent for its routine use. Availability of CT or MRI for every case is also farfetched possibility at present.

As Image intensifier is now part and parcel of every orthopaedic operation room. We have suggested the use of image intensifier to identify transverse process of fourth lumbar vertebrae and nerve stimulator to locate lumbar plexus in cases of arthroplasty surgery where anatomical landmarks could not be ascertained with surety due to either obesity or deformity. This technique prevents multiple attempts to locate transverse process and easily identifies lumbar plexus.

Patients and technique

We have used combined block (lumbar plexus block with parasacral sciatic block) in 28 patients scheduled for arthroplastic surgery during January 2011 and April 2011.

In all patients anatomical landmarks were marked on the skin with ink-marker (figure-1). In Six patients (2 males, 4 females) of age group between 38 -89 yrs where landmarks were not well defined (Table-1) and transverse process of fourth lumbar vertebra was identified and block was given using nerve stimulator. Block was successful in all patients and no serious complication occurred in any of the patients.
[5] modification of Winnie’s [4] technique. After cleaning and antisepsis preparation a skin wheal was raised one cm medial and one cm cephalad to the point where intercristol line cuts the perpendicular line from posterior superior iliac spine [5] (point corresponding to lateral margin of transverse process) (figure-1). An insulated needle (Stimuplex A® 100-mm needle (B. Braun Medical, Germany) was inserted and connected to a nerve stimulator (Stimuplex® NHS12; B. Braun Medical, Germany). Needle was directed perpendicular to skin (up to 6-8cm depth). If TP could not be contacted needle was redirected cephalad or caudal to contact TP of 4th lumbar vertebra. Once transverse process was contacted needle was pulled back 0.5 cm and advanced under the transverse process (with initial current setting of 1.5 mA) until quadriceps femoris muscle twitches were elicited (i.e., cephalad patellar movements). The position was judged adequate when quadriceps contractions were still elicited by impulses of 0.3 to 0.5 mA. Local anaesthetic mixture 20ml of 1.5% xylocaine with adrenaline (1:20000) and bupivacaine 0.5% 10ml was injected in 3-5ml aliquots with repeated aspiration to avoid inadvertent vascular injection.

In six patients when two attempts (two separate needle pass with each cephalad and caudal redirection) could not locate the transverse process of 4th lumbar vertebra or an appropriate nerve stimulation (quadriceps/patellar contraction) fluoroscopy was used. Image intensifier (Philips BV Libra) was placed in such a way to get AP view of lumbar area (figure-2). The transverse process of fourth lumbar vertebrae was identified. A skin wheal was raised at point corresponding to lateral margin of transverse process and an insulated needle (Stimuplex A® 100-mm needle (B. Braun Medical, Germany) was inserted and connected to a nerve stimulator (Stimuplex® NHS12; B. Braun Medical, Germany). Needle was directed towards transverse process under fluoroscopic guidance (figure-3 A and B) till it contacted transverse process. The needle was then pulled back 0.5 cm and advanced under the transverse process (figure-4 A and B) (with initial current setting of 1.5 mA) until quadriceps femoris muscle twitches were elicited (i.e., cephalad patellar movements). The position was judged adequate when quadriceps contractions were still elicited by impulses of 0.3 to 0.5 mA. Local anaesthetic mixture 20ml of 1.5% xylocaine with adrenaline (1:200000) and 10ml bupivacaine 0.5% was injected in 3-5ml aliquots with repeated aspiration to avoid inadvertent vascular injection.

Sciatic nerve was located with initial current of 1.5mA and once targeted response of planter flexion at 0.3-0.6mA was obtained 20ml of 1.5% xylocaine with adrenaline (1:200000) and 10ml bupivacaine 0.5% was injected in 3-5ml aliquots with repeated aspiration to avoid inadvertent vascular injection.

Conduct of anaesthesia:

Localization was possible at first needle pass in all six patients and all patients had effective anaesthesia to carryout scheduled surgery. Supplementary sedation was provided with 0.5 to 1.0mg of Injection Midazolam and 25µg of Injection Fentanyl whenever required. No patient required more than 200 µg of Injection Fentanyl and, 5.0mg of injection Midazolam during total surgery time of 2hrs to 3hrs including pre-procedure sedation.

Discussion

Understanding of Surface anatomy and Anatomical landmarks is basic essential for successful nerve blocks. New gadgets like ultrasound, CT and MRI improves precision and help in localization even in difficult anatomical situations. However, they only help in anatomical localization whereas Nerve stimulator helps to locate functional component of nerve/block. The combination of nerve stimulator and ultrasound have shown better results in various nerve blocks.[13] Winnie’s [4] classical approach and Capdevila[5] modification is landmark based Posterior approach to lumbar plexus block. This is simple and effective approach[14 ]results in high success rate.[15] However, sex dependent variation and patient to patient anatomical variation are limitation for successful outcome.[6] Inclusion of fluoroscopy for visualization of TP and use of nerve stimulator for functional localization of lumbar plexus resulted in successful block in our six patients where localization based on anatomical landmarks failed.

Clinical implications:

We have used this approach as a rescue technique when conventional landmarks based approach have failed to locate the transverse process of 4th lumbar vertebra and desired neural stimulation response. With the help of fluoroscopy cent percent successful localization was possible at first attempt. This made us to think that, if fluoroscopy is used as a standard component of technique rather than a rescue technique in difficult situation during lumbar plexus localization with nerve stimulator, may increase
success rate and would decrease complications of repeated needle introduction which is associated with high risk of visceral injury.

**Conclusion**

During nerve stimulator guided lumbar plexus block use of fluoroscopy helps in localization of transverse process (TP) of 4th lumbar vertebra if localization is difficult due to obesity or poorly defined landmarks. It seems an easy solution to increase the success rate of lumbar plexus block. However, more studies are required to prove its definitive role.

**References**

Table shows demographical data, co-morbidity type of surgery, surgical time and plausible cause of difficulty in localization of transverse process of 4th lumbar vertebra by nerve stimulator needle.

<table>
<thead>
<tr>
<th>Case No#</th>
<th>Age &amp; Sex</th>
<th>Wight</th>
<th>Surgery and surgical time (min)</th>
<th>Co-morbid condition</th>
<th>Plausible cause of difficulty in localization</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>38 yrs Female</td>
<td>76 Kg</td>
<td>THR 130 min</td>
<td>Hypertension, Diabetes Mellitus</td>
<td>Obesity</td>
</tr>
<tr>
<td>2</td>
<td>54 yrs Male</td>
<td>Aprox 60kg</td>
<td>DHS 120 min</td>
<td>Severe COPD</td>
<td>Degenerative spine</td>
</tr>
<tr>
<td>3</td>
<td>68 yrs Female</td>
<td>65kg</td>
<td>THR 130 min</td>
<td>Severe COPD, LVF</td>
<td>Obesity</td>
</tr>
<tr>
<td></td>
<td>Age</td>
<td>Sex</td>
<td>Procedure Duration</td>
<td>Comorbidities</td>
<td>Other Observations</td>
</tr>
<tr>
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<td>---------------------------------------------</td>
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<tr>
<td>4</td>
<td>60 yrs</td>
<td>Female</td>
<td>TKR 180 min</td>
<td>CVA, Fast AF</td>
<td>Deviated midline (scoliosis)</td>
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<tr>
<td>5</td>
<td>52 yrs</td>
<td>Female</td>
<td>THR 110 min</td>
<td>Hypertension, Diabetes Mellitus, Hypothyroid</td>
<td>Degenerative spine</td>
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<td></td>
</tr>
<tr>
<td>6</td>
<td>89 yrs</td>
<td>Male</td>
<td>THR 150 min</td>
<td>Hypertension, Diabetes Mellitus, Parkinson’s’</td>
<td>Degenerative Spine, Intervertebral space could not be felt</td>
</tr>
</tbody>
</table>
Illustration 2

Figure 1
Illustration 3

Figure 2
Illustration 4

Figure 3a
Illustration 5

Figure 3b
Illustration 6

Figure 4a
Illustration 7

Figure 4b
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