

# Pericapsular nerve group (PENG) block: A feasibility study of landmark based technique

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## ABSTRACT

**Background:** Pericapsular nerve group (PENG) block is a new ultrasound guided nerve block. It was used primarily to relieve pain in hip fracture; now, many new indications have been added. However, dependency on ultrasound guidance for this block limits its use where ultrasound facility is poor or not available. We have suggested a landmark based technique to increase the benefit of this novel nerve block. **Aim and Objectives:** To do a feasibility study to assess the successful placement of block needle, clinical efficacy of the block and block-related complications. **Material and Methods:** Total 10 patients (4 males and 6 females) with fracture hip and scheduled for hip surgery under spinal anaesthesia were selected for the study. In 4 patients ultrasound guided PENG block using out-of-plane approach and in 6 patients landmark based nerve stimulator guided block was given with 20ml 0.25% bupivacaine and 8mg dexamethasone. Pain relief before and after 30 minutes of block was assessed by numeric rating scale (NRS) and comfort during spinal position was assessed by ease of spinal position score (EOSP). **Results:** All 10 patients had successful block; NRS at rest was 6 (6-9) Vs 2 (0-2) and on 15 °limb elevation was 8 (8-10) Vs 3 (2-4). All patients could sit comfortably during spinal anaesthesia and median (range) EOSP score was 3 (2-3). No complication was observed. **Conclusion:** Landmark based technique for PENG block is a feasible option and can be used safely where ultrasound facility is not available.

**Key words:** Fracture hip pain, landmark based nerve block, pericapsular nerve group block, spinal positioning, ultrasound guided nerve block

## Access this article online

Website: [www.ijaweb.org](http://www.ijaweb.org)

DOI: 10.4103/ija.IJA\_388\_20

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## INTRODUCTION

Neuraxial anaesthesia (NA) is a commonly used technique for fractured hip surgery. However, positioning for NA is difficult due to severe pain in fractured limb and regional techniques like femoral nerve block and fascia iliaca block have been used to reduce the pain during positioning.<sup>[1,2]</sup> Pericapsular nerve group block or PENG block is a novel regional nerve block to provide analgesia in fractured hip patients.<sup>[3,4]</sup> It is primarily an ultrasound-guided (USG) technique where target area is the pelvic rim (superior pubic ramus) near iliopectineal eminence, deep to fascia of iliopsoas muscle.<sup>[3]</sup> Articular branches of femoral nerve and accessory obturator nerves, which cross over the bony rim, are primary targets of the PENG block<sup>[3]</sup> however, by increasing volume of local anaesthetic drug; other nerves (obturator, femoral, genitofemoral, and lateral femoral cutaneous nerve)

can be blocked.<sup>[5]</sup> With increased understanding of local anaesthetic drug spread (through contrast study), the indications of this block are increasing.<sup>[6,7]</sup> Other than its perioperative use and analgesia for hip surgeries, PENG block has been used for surgical anaesthesia to reduce the dislocated hip and varicose vein stripping procedure.<sup>[8,9]</sup> There is still a scope to increase its use in other surgical indications. However, use of ultrasound for PENG block is a limiting factor. This is because, ultrasound is not yet available to everyone particularly

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**How to cite this article:** Jadon A, Sinha N, Chakraborty S, Singh B, Agrawal A. Pericapsular nerve group (PENG) block: A feasibility study of landmark based technique. *Indian J Anaesth* 2020;64:710-3.

in developing countries like India and other such parts of the world.<sup>[10]</sup> India in particular, also has legislative restrictions, which further limits the availability of ultrasound.<sup>[11]</sup> We speculated that a landmark-based technique might be a useful alternative to USG technique to increase its utility. To assess the safety and effectivity of the landmark based PENG block we conducted a feasibility study.

**Aim and objectives**

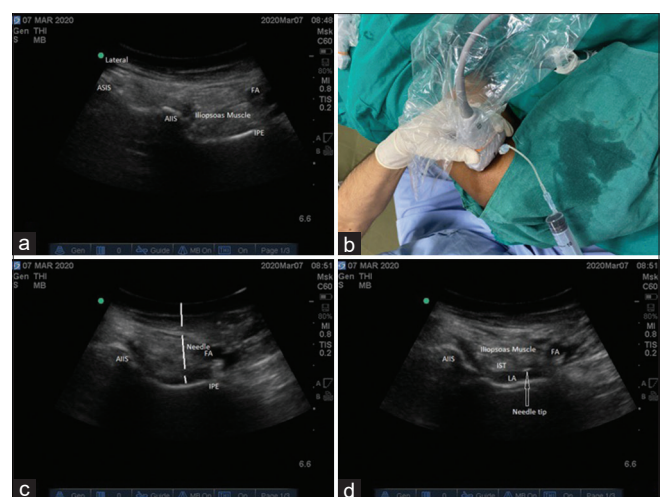
The primary aim of the study was to assess the successful placement of needle at the target point based on surface landmarks. To assess clinical effect of the block with standard drug doses which are being used during USG PENG block. To observe the procedural difficulty and block related complications.

**MATERIAL AND METHODS**

After obtaining ethical committee clearance and informed consent, 10 patients (6 male and 4 females, between 55 and 72 years and body mass index of 25 and 29) were selected and were scheduled for hip surgery (either with fracture neck of femur or sub trochanteric fracture) under spinal anaesthesia [Table 1]. Standard hospital protocol regarding medical optimisation, intravenous line placement, premedication, and antibiotic prophylaxis was followed. In operation room, monitors for non-invasive blood pressure (NIBP), 3 leads continuous electrocardiogram (ECG), and pulse oximeter (SPO2) were attached. Pain during rest and pain on 15° passive limb elevation was assessed by numeric rating score (NRS) (0-no pain and 10-very severe pain). Taking all aseptic precautions and sterile measures, in first four patients (two males and two

females), a low frequency curvilinear ultrasound probe (2-5 MHz, SonoSite M-Turbo) was placed over the line joining anterior superior iliac spine (ASIS) and pubic tubercle (PT) keeping lateral margin at ASIS and adjusted the probe to get a sonoanatomic view for PENG block [Figure 1a]. The needle entry point was selected on the skin in such a manner that perpendicular needle entry will guide needle near target point (IPE). The needle entry point was anaesthetised with 2 ml 1% lidocaine and 23G spinal needle was inserted “out-of- plane” [Figure 1b] to reach the bony rim near IPE avoiding injury to femoral nerve (visible just lateral to femoral artery) [Figure 1c]. On bony contact, 20 ml 0.25% bupivacaine and 8 mg dexamethasone was injected slowly with repeated aspiration to avoid intravascular injection. The correct needle position was confirmed by drug spread under ilio-psoas muscle [Figure 1d]. The entry point at skin was marked and its distance from ASIS was measured and recorded [Table 1]. In other six patients (2 males and 4 females), patients were positioned supine, ASIS and PT were identified by palpation and marked. A line was drawn to join these two landmarks, a mark 5 cm medial to ASIS was marked and femoral artery was also palpated and marked. After marking the landmarks and with aseptic preparation, selected needle entry point (5 cm medial to ASIS on the line joining ASIS and PT) was anaesthetised with 2 ml 1% lidocaine and 100 mm long, 22G insulated needle (Stimuplex, BBraun) connected to nerve stimulator (Stimuplex HNS-12, B. Braun, Melsungen AG) (starting current at

Table 1: Demographic profile, Numeric Rating Scale (NRS), Distance between ASIS and AIIS, Ease of Spinal Positioning (EOSP) and complication	
Characteristics	Value
Gender (M:F)	M = 4, F = 6
Fracture Side (R/L)	5/5
Mean Age (range)	63.6 yrs. (55-72)
Distance Between ASIS and AIIS in cm Median (Range)	4.25 (4-5)
	<b>Before PENG block</b> <b>After PENG block</b>
Median NRS at rest (range)	6 (6-9)      2 (0-2)
Median NRS at 15° Passive leg raising (range)	8 (8-10)      3 (2-4)
Median EOSP (range)	3 (2-3)
Complication	Nil



**Figure 1:** (a) Sonoanatomy view for PENG block, (b) Needle entry under ultrasound guided Out-of-plane (OOP) approach for PENG block, (c) Out-of-plane needle entry toward bony rim near IPE (d) spread of local anaesthetic below the ilio-psoas muscle. ASIS-anterior superior iliac spine, AIIS-anterior inferior iliac spine, FA-femoral artery, IPE-iliopectineal eminence, IST-Ilio-psoas tendon

1 mA at 2 HZ frequency) was inserted perpendicular to skin keeping two fingers of other hand on the femoral artery [Figure 2a and b]. Excessive medial angulation was avoided to prevent injury to femoral artery. When bony contact was made (about 3–5 cm deep), 20 ml 0.25% bupivacaine and 8 mg dexamethasone was injected with repeated aspiration. If quadriceps contraction noticed during needle insertion, needle was reinserted one cm laterally. Any side effects like vascular puncture, local hematoma formation and signs of local anesthetic toxicity were recorded. After 30 min, pain was reassessed at rest and on 15° limb elevation. The comfort during sitting for spinal anaesthesia was also assessed by ease of spinal position (EOSP) score.

## RESULTS

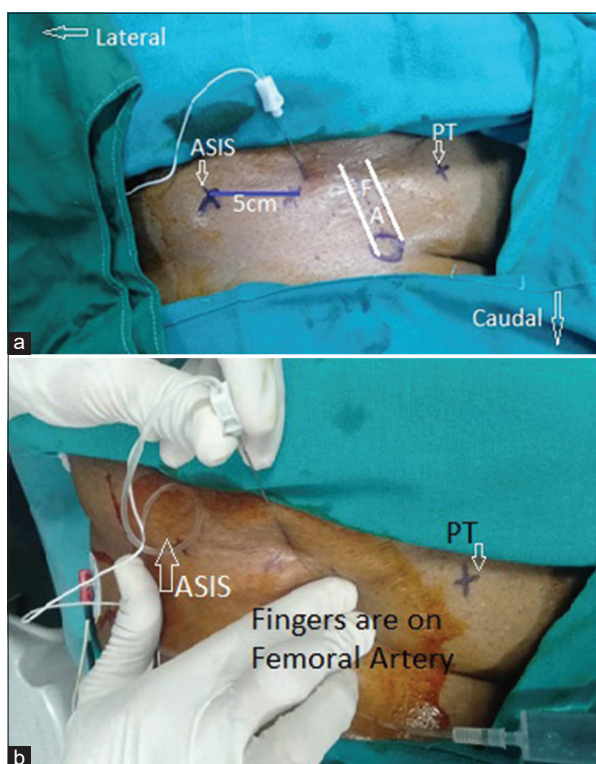
Successful needle placement was achieved in all patients (one patient in land mark group required needle redirection due to quadriceps contraction). All patients showed >50% of pain relief in rest pain as well as on 15° limb elevation [Table 1]. All the patients showed comfortable positioning during spinal block as assessed by EOSP (Ease of spinal

positioning) score (0-unable to sit and 3- patient position without pain) [Table 1]. No patient had block related complication.

## DISCUSSION

Ultrasound-guided PENG block has been used for many clinical indications and, with increasing anatomical understanding by clinical and cadaveric studies, many more indications might be added in future. However, ultrasound availability remains a challenge that undermines the usefulness of this versatile block. We postulated that addition of new approach (based on skin landmarks) might increase the dexterity and utility of the procedure. As there is no vital structure in the trajectory of needle except femoral nerve, which can be avoided by use of nerve stimulator and redirected needle appropriately away from femoral nerve, block needle can be introduced easily and safely. Correct placement of needle can further be confirmed by bony endpoint. In present study all 10 patients had successful PENG block and there was no procedural difficulty or block related complication. The first four patients (where ultrasound was used) helped us simultaneously to validate an out-of-plane (OOP) approach (In plane approach is conventionally used for PENG block) while we were trying the shortest and easiest way to put the block needle at target point using landmarks [Figure 1a and d]. During USG we also noticed that AIIS is about 3–4 cm medial to ASIS [Table 1]. This information helped us to decide skin entry point during landmark guided block. We introduced the block needle at 5 cm medial to ASIS in six patients where landmark-based block was used [Figure 2a]. In the present study we have used landmark-based PENG block successfully in six patients, however it is difficult to generalise the findings. Therefore, a clinical study with more numbers of patients is required before common clinical acceptance. Combination of Quadratus lumborum block (QLB) and erector spinae plane block (ESPB) has been recently used for managing a patient with fractured hip.<sup>[12]</sup> Although ESPB can be given with fluoroscopic guidance,<sup>[13]</sup> ultrasound will be necessary, because, it will be difficult to position the patient with painful fractured limb for block under fluoroscopy.

Although, it is debatable, whether PENG block (Pericapsular nerve block) is pure pericapsular block<sup>[14]</sup> or not,<sup>[15]</sup> still, there is a scope for newer indications for PENG block.<sup>[5-9]</sup> Therefore, it is prudent to explore other approaches that can affect its efficacy,



**Figure 2:** (a) Landmark-guided block; ASIS, PT, Femoral artery and skin entry point marked over skin. Blunt tip insulated needle attached with Nerve stimulator is entering after local infiltration of skin. (b) Needle entry point 5 cm medial to ASIS while two fingers are on femoral artery. ASIS-anterior superior iliac spine, FA-femoral artery

safety, and usefulness. With our results we can conclude that landmark-based technique is a feasible option to give PENG block when ultrasound is not available. Nerve stimulator guidance is essential to avoid inadvertent femoral nerve injury.

#### Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

#### Financial support and sponsorship

Nil.

#### Conflicts of interest

There are no conflicts of interest.

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