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Research Article

Pericapsular Nerve Group (PENG) Block Is a Novel Technique in the Hip Surgery

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ABSTRACT

Background: Peritrochantric fracture is common especially in elderly patients. Very often we are faced with elderly and fragile patients with several comorbidities. In these cases a careful anesthetic technique is crucial to reduce comorbidity and mortality. Currently the pericapsular nerve group (PENG) block are introduced as an analgesic technique. We used PENG block for purpose of hip surgical Anesthesia.

Methods: In this single-centre, case series, patients undergoing gama nailing for peritrochanteric fractures. The PENG block was performed with the patient in the supine position using ultrasound guidance. Pain scores were measured by numeric rating score (NRS) at rest and with a straight leg raise of the affected limb to 15 degrees before and 30 minutes after block performance.

Results: Totally, 10 patients of ASA Grades II, III and were included who came with peritrochantric hip fracture and were scheduled for gamma nailing. The mean age of the study participants was 77 years. Significantly, pain scores reduced as compared with baseline. No such adverse events were recorded for any of the patients.

Conclusion: In this article the PENG block has been determined to be safe and effective as an anesthetic technique in gamma nailing of peritrochantric fractures but more research in larger-sized studies are needed to better assess the PENG block.

The first description of pericapsular nerve group (PENG) block as a novel ultrasound-guided approach performed by giron-arango et al. for the goal of postoperative analgesia in orthopedic surgery [1]. The group of articular branches are involved in this block such as the femoral (FN), obturator (ON) and accessory obturator (AON) nerves. Definitely, these articular branches innervate the sensory part of anterior hip capsule [1].

PENG block technique is a regional anesthesia modality for acute pain control and it can be expanded to surgical anesthesia [2-6].

Currently, almost all articles introduce the PENG block for controlling and reducing pain in hip-related procedures [1,2,7-20]. Amazing role of this block in surgical anesthesia was not evaluated clearly.

On reports base, the hip arthroplasty and hip arthroscopy were done by PENG block [1,21].

Also, it was used in sickle cell disease (vaso-occlusive crisis) as an analgesic technique [22].

The usability of PENG block for non-hip related surgeries have been reported by Enes Aydin et al., such as leg vein ligation and stripping, medial thigh surgery [23-24]

The Gamma Nail is The latest advance in the treatment of peritrochanteric fractures is the gamma nail and it is based on intramedullary nailing principles during closed procedures [25].

The goal of this article is to give further extended application of the PENG block for orthopedic surgery.

The authors declare no conflicts of interest.

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Methods

All the patients who were candidates for peritrochanteric fractures surgery was signed the informed consent. Procedure was done under standard monitoring such as non-invasive blood pressure ,3 leads continuous electrocardiogram , and pulse oximeter.

After preb and drep, a high frequency curvilinear ultrasound probe (2-5 MHz, HONDA electronic, HS-2100) was placed parallel to the inguinal crease, at the level of ASIS. After gradual caudad movement of the probe, the anterior inferior iliac spine (AIIS) was visible then probe was roteted approximately 45 degrees medialy

Until the hyperechoic bone posterior shadow of superior pubic ramus was visible (Figure 1). Femoral artery, iliopubic eminence, and psoas muscle appeared. The target point was the plane between tendon of psoas muscle and pubic ramus.. By ultrasound-guided in- plane technique, a standard 22G Quincke needle was introduced and after negative aspiration, 30 mL 0.5% bupivacaine was administered. The spread of local anesthetic beneath the psoas tendon was attented (Figure 2) After 30 minutes, sensory testing of the femoral, obturator, accessory obturator, and genitofemoral nerve dermatomes determined a sufficient level of anesthesia. Pain scores were measured by numeric rating score (NRS) (0-no pain and 10-very severe pain) at rest and with a straight leg raise of the affected limb to 15 degrees before and 30 minutes after block performance.

After performing the block, Patient was transfered on the traction table (Figure 3) for perfect reduction. After insertion of nail from the top of the greater trochanter, the femoral canal was reamed. Then neck screw must be stayed in the middle of the femoral neck (Figure 4).

The sedation was done during surgery by administration of 1 mg midazolam and 50 µg fentanyl.

Figure 1- Relevant sonoanatomy for PENG block (F.A. = femoral artery; F.V. = femoral vein; AIIS = antero inferior iliac spine).

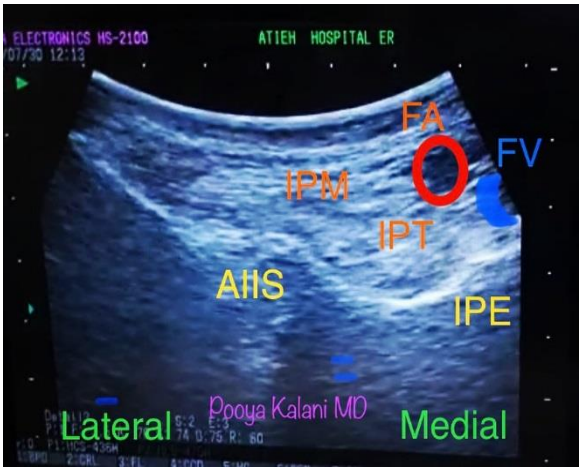
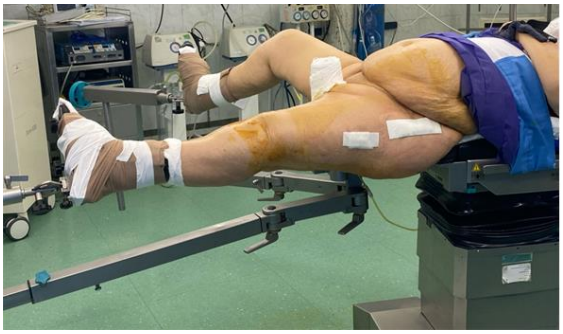


Figure 2- Local anesthetic spread after PENG block (L.A. = local anesthetic; F.A. = femoral artery; AIIS = antero inferior iliac spine).

Figure 3- Fracture after nailing that is well controlled by the Gamma nail and correct position of femoral neck screw

Figure 4- Patient position on orthopaedic traction unit



Results

10 patients (4 male and 6 females, between 73 and 82 years old were candidates for treatment of closed trochanteric fractures (Table 1).

Table 1- Peri and Post-operative pain scores (numeric rating score NRS) of gamma nailing for peritrochanteric fracture

Gender	Age	ASA	Surgical Side	Rest	Dynamic	30 mins	6 hrs
F	76	3	L	5	9	0	0
F	79	3	L	5	10	0	0
M	75	3	L	8	10	0	0
F	82	3	L	3	10	0	3
M	80	3	R	5	10	0	2
M	76	2	L	5	10	0	0
F	78	3	R	6	10	0	0
F	74	3	L	4	10	0	0
F	77	3	L	5	10	0	0
M	73	2	L	7	10	0	0

Discussion

The gamma nail (peritrochanteric nail) is an osteosynthetic implant designed to treat proximal femoral fractures in the trochanter area with a closed intramedullary fixation method.

It can be performed with the patient under general or regional anesthesia. Nowadays, the ultrasound has opened up in clinical anesthesia practice and facial plane blocks are a gate which have started to replace neuroaxial anesthesia techniques in many surgical fields [26-28].

Necessarily, the combination of more than 1 block is required for closed trochanteric fractures. So PENG block ability limits the use of nerouaxial blocks or peripheral nerve blocks.

The group of nerves are blocked with a single injection such as the femoral nerve and accessory obturator nerve [1-2].

We demonstrate the efficacy of PENG block for closed peritrochanteric fractures.

Thirty minutes after block placement, we evaluated all patients by asking them to flex at the hip and to perform a straight leg raise of the affected limb to 15 degrees. All patients were able to comply and reported significantly reduced pain scores compared with baseline.

All steps of nailing and screwing was in both the FN and ON dermatome and osteotome innervations, so all patients were pain free during surgery.

During surgery, no additional opioid was required. Duration of the surgery was 45 minutes, and patients beared the surgery and anesthesia well. The patient was discharged without any event.

Lower-extremity peripheral nerve block requires a thorough understanding of the neuroanatomy of the lumbosacral plexus.

The femoral, lateral femoral cutaneous, and obturator nerves are most important for lower- extremity surgery.

Neuroanatomicaly, The gama nail insertion site is covered by femoral,obturator and lateral cutaneuoes.

Dermatomes, myotomes and osteotomes of the lumbosacral plexus are coincide with surgical site innervations [29].

Considering the dermatomal area of these patients' lesions included both the femoral nerve and obturator nerve regions, High volume (30 ml) and single injection technique as a PENG block was selected.

A high volume local anesthetic was accompanied by anesthesia level dose range with out local anesthetic toxic side effect. In spite of all that a PENG block will act similar to a lumbar plexus block [24,30].

Single injection point of this method is one of its advantages and prevents separate injection of each nerve involved in the surgical area.

Lateral femoral cutaneous, genitofemoral, obturator, and femoral nerve dermatomes were blocked effectively in all patients.

Due to the block of several nerves from one injection site, the proverb applies to kill two birds with one stone.

Simplicity in technique makes PENG block superior to lumbar plexus block so anesthesiologists doubt to perform because of the difficulty and high complication rate.

PENG block preferences over neuroaxial anesthesia are the prevention of adverse effects such as motor block, gross autonomic system effect (hemodynamic instability, nausea and vomiting) and it is targeted approach because of a nonsurgical extremity is spared Coincidentally.

However, PENG block limitations should be considered and there are limitations such as the impact of the surgical incision following the dermatomes and

myotomas and osteotomes involved in the type of surgery.

It should be noted that PENG block cannot be offered as the sole anesthesia for hip surgery due to the innervation of the posteromedial hip capsule deriving from branch of the sciatic nerve [31].

Conclusion

In conclusion, PENG block provides effective surgical anesthesia for gamma nail insertion technique. However, more large sized clinical studies are required to determine the effectiveness of the PENG block.

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