

The pericapsular nerve group block, a highly selective blockage for intracapsular hip fractures: A case series

ABSTRACT

Hip fracture is a very frequent clinical situation in the elderly and frail patient. The Pericapsular Nerve Group (PENG) has emerged as a highly selective block for the intracapsular hip fractures. We describe 44 patients with intracapsular hip fractures who underwent a PENG block in addition to spinal anaesthesia with. The main objective was to assess post-surgical pain control at the recovery room and after 24 h. Also, we considered the need for first of second analgesic rescue during the first 24 h after surgery. Only 10 patients presented mild pain at the recovery room. Up to 30 of them had pain after 24 h. However, 25 of these patients reported having mild pain. Only 9 patients required analgesic rescue for postoperative pain control. In conclusion, PENG block is a locoregional technique that allows good postoperative pain control and low opioid consumption during the postoperative period of intracapsular hip fractures.

Key words: Anaesthetics, analgesics, hip fractures, local, opioids, pain, postoperative

Introduction

Hip fractures are a very common clinical situation in elderly patients and are associated with significant morbidity and mortality. In addition, they have a great social and economic impact that in most cases requires definitive surgical treatment. This may consist of fixation, surgical reduction, or hip arthroplasty.^[1]

Although proximal femur surgery is a very common procedure, there is great variability regarding anaesthetic procedures and their subsequent management.^[2] Subarachnoid anaesthesia is the most used for this type of surgery. Some examples of locoregional techniques are the fascia iliaca compartment

block (FICB), the 3-in-1 block or the femoral nerve block, which allow a lower consumption of opioids and reduce some adverse effects such as postoperative delirium. However, many of the comparative studies between the different techniques do not differentiate between the type of femur fracture and the surgical approach. Therefore, when comparing the different anaesthetic alternatives, none is shown to be superior to the other.

Hip fractures are classified as intracapsular and extracapsular according to their location in front of the femoral insertion of the joint capsule.^[1] This distinction is essential since the innervation of the affected area is different. Therefore, our anaesthetic strategy should be adjusted to the location of the fracture.

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If we focus on the intracapsular fractures, the anterior hip capsule contains the largest number of sensory and mechanoreceptor fibres and is innervated by the femoral nerve, obturator nerve and obturator accessory nerve.^[3] Recently, a new sensory block called Pericapsular Nerve Group (PENG) has been identified. Its target is precisely the previously mentioned nerves.^[3] Its high selectivity makes it a probably more effective technique using lower volumes of local anaesthetic for intracapsular femoral fractures compared and avoids motor block associated with other locoregional techniques.^[4] Therefore, our objective is to demonstrate that the PENG block is a highly effective technique specifically in intracapsular femoral fractures for the control of post-surgical pain.

Case Report

We present a series of 44 patients who underwent intracapsular femur fracture repair surgery. PENG block was performed in the preanaesthesia room in supine position using the technique described by Girón-Arango *et al.*^[3] using a low-frequency convex probe (2 – 5 MHz; SonoSite SII; SonoSite INC., Madrid, Spain) and a 22-gauge 100 mm echogenic needle (Echoplex+; Vygon; Paterna; Spain). A total of 15 mL of 0.2% ropivacaine was injected with a previous negative aspiration technique [Figure 1]. All patients underwent spinal anaesthesia at the L3 - L4 level with 8 – 10 mg of bupivacaine 0.5% and 10 µg of fentanyl. During surgery, they received intravenous (iv) conventional analgesia (1 g of paracetamol and 2 g of metamizole).

Pain scores with the Numerical Rate Scale (NRS) and the need for first analgesic rescue with iv tramadol 1 mg/kg or second rescue with 2 mg iv morphine during their stay in the recovery room and the first 24 h after surgery. Demographic and

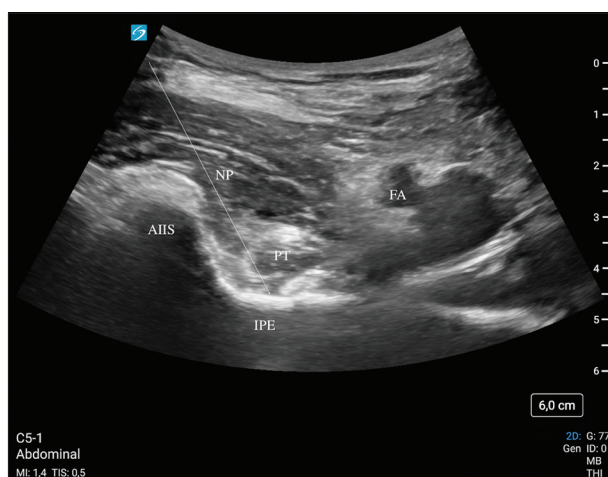


Figure 1: Ultrasound image of the Pericapsular Nerve Group block: NP, needle path; IPE, iliopubic eminence; FA, femoral artery; PT, psoas tendon; AIIS, anterior inferior iliac spine

operation characteristics of the patients are detailed in Table 1. Postoperative pain scores, opioid consumption, demographic characteristics of the patients presenting pain at the recovery room and after 24 h of surgery are detailed in Tables 2 and 3.

Table 1: Demographic and fracture details of the participants

	n (%)
Number of patients	44
Demographics	
Sex	
Male	16 (36.4%)
Female	28 (63.6%)
Mean age in years (IC)	81.2 (47–94)
> 85 years	19 (43.2%)
65–84 years	21 (47.7%)
< 65 years	4 (9.1%)
ASA Physical Status Classification	
ASA 1–2	14 (31.8%)
ASA 3–4	30 (68.2%)
Type of fracture	
Subcapital	34 (77.3%)
Basicervical	7 (15.9%)
Transcervical	3 (6.8%)
Surgical side	
Right side	19 (43.2%)
Left side	25 (56.8%)
Type of surgery	
Hemiprosthesis	23 (52.3%)
DHS system	11 (25%)
Total hip replacement	7 (15.9%)
Gamma nail	3 (6.8%)

The results are expressed as the total number of participants (n) and as the percentage of the total population. CI, confidence intervals

Table 2: Demographic and fracture details of the 10 patients with pain in the recovery room

	n (%)	IC 95% (%)	P [‡]
	10 (22.7)	(12.0–38.2)	
Surgical side			0,474
Right	3 (15.8)		
Left	7 (28.0)		
Type of surgery			1
Hemiprosthesis + total hip replacement	3 (21.4)		
Others*	7 (23.3)		
Type of fracture			0,411
Subcapital	1 (10.0)		
Others [†]	9 (26.5)		
ASA			0,701
1-2	4 (28.6)		
3-4	6 (20.0)		
Sex			0,724
Female	7 (25,0)		
Male	3 (18.7)		

The results are expressed as the total number of participants (n) and as the percentage of the total population. NRS, Numeric Pain Rating Scale. CI, confidence intervals. ASA, American Society of Anesthesiologists. *Others=DHS system + Gamma nail. [†]Others=Basicervical + Transcervical. [‡]P was calculated with Fisher test

Table 3: Demographic and fracture details of the patients with pain 24 h after surgery

	NRS at 24 h						P [‡]	Need of Analgesia rescue		
	NRS=0		NRS=1-3		NRS=4-6			n (%)	IC (%)	P [‡]
	n (%)	IC95% (%)	n (%)	IC95% (%)	n (%)	IC (%)				
Total number of patients	14 (31.8)	(19.1-47.7)	25 (56.8)	(41.1-71.3)	5 (11.4)	(4.3-25.4)		9 (20.5)	(10-3-35.8)	
Surgical side							0.459			0.260
Right	8 (42.1)		9 (47.4)		2 (10.5)			2 (10.5)		
Left	6 (24.0)		16 (64.0)		3 (12.0)			7 (28.0)		
Type of surgery							0.460			1
Hemiprosthesis + total hip replacement	6 (42.9)		6 (42.9)		2 (14.3)			3 (21.4)		
Others*	8 (26.7)		19 (63.3)		3 (10.0)			6 (20.0)		
Type of fracture							0.763			0.659
Subcapital	2 (20.0)		7 (70.0)		1 (10.0)			1 (10.0)		
Others†	12 (35.3)		18 (52.9)		4 (11.8)			8 (23.5)		
ASA							0.084			0.695
1-2	6 (42.9)		5 (35.7)		3 (21.4)			2 (14.3)		
3-4	8 (26.7)		20 (66.7)		2 (6.7)			7 (23.3)		
Sex							0.902			0.702
Female	9 (32.1)		15 (53.6)		4 (14.3)			5 (17.9)		
Male	5 (31.3)		10 (62.5)		1 (6.3)			4 (25.0)		

The results are expressed as the total number of participants (n) and as the percentage of the total population. NRS, Numeric Pain Rating Scale. CI, confidence intervals. ASA, American Society of Anesthesiologists. *Others=DHS system + Gamma nail. †Others=Basicervical + Transcervical. ‡P was calculated with Fisher test

The majority of patients did not show pain according to the NRS pain scale in the recovery room. Although 24 h after the surgery most patients reported having pain, most of them had mild pain according to NRS scale. Even more significant is that none of the participants required opioid rescue during their stay in the recovery room and just a minority of them during the 24 hours after surgery avoiding all possible associated side effects.

Discussion

These results would support our theory that PENG block is a highly selective and useful technique for intracapsular fractures. If we analyse the femoral capsule, much of the innervation comes from the femoral nerve, the obturator nerve, and the obturator accessory nerve fibres. Although during the last few years multiple locoregional techniques have appeared with the aim of improving analgesic quality, opioid consumption, or other undesirable effects such as postoperative delirium,^[5] the PENG block is the only one that precisely blocks these nerve endings. For all these reasons, this locoregional technique is possibly much more specific when compared to others such as the FICB. Moreover, it has also been shown to be a useful technique to facilitate sitting position for neuraxial anaesthesia in patients with acetabular fractures.^[6]

Although there are some studies that show a superiority of PENG block over FICB in intracapsular femur fractures,^[7,8] other authors have not observed significant differences between them.^[9] However, many of these studies have limitations. Some of these reports do not discriminate the type of fracture of the patients. This factor is essential in

order to decide which locoregional technique is the most appropriate and gives even more importance to our results. It should also be considered that the population sample in these studies tends to be quite small.^[10] This could be affecting the results obtained.

Postoperative pain, lower opioid consumption and early bed mobility are variables that are associated with shorter hospital stays and early discharge. These factors are of paramount importance in an elderly and frail population where any factor can lead to an increase in mortality and morbidity. PENG block is a highly selective technique for the analgesic control of intracapsular femoral fractures. We found an effective postoperative pain control at the recovery room, at 24 h as well as a low need for rescue analgesia has been demonstrated. However, to confirm the superiority of PENG blockade over other locoregional procedures, a greater number of comparative studies are needed in the future.

Conclusions

PENG block is a new locoregional technique indicated for hip surgery. We demonstrated that its high nerve selectivity makes it an excellent technique for the control of postoperative pain in intracapsular femoral fracture. Further studies should be carried out with the aim of demonstrating its superiority over other blocks in this subtype of hip fracture.

Declaration of patient consent

The authors declare that they have obtained consent from patients. Patients have given their consent for their images

and other clinical information to be reported in the journal. Patients understand that their names will not be published and due efforts will be made to conceal their identity but anonymity cannot be guaranteed.

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Conflicts of interest
There are no conflicts of interest.

References

- Miyamoto RG, Kaplan KM, Levine BR, Egol KA, Zuckerman JD. Surgical management of hip fractures: An evidence-based review of the literature. I: femoral neck fractures. *J Am Acad Orthop Surg* 2008;16:596-607.
- Al Harbi M, Alshaghrouh S, Aljahdali M, Ghorab F, Baba F, Al Dosary R, *et al.* Regional anesthesia for geriatric population. *Saudi J Anaesth* 2023;17:523-32.
- Giron-Arango L, Peng P, Chin K, Brull R, Perlas A. Pericapsular nerve group (PENG) block for hip fracture. *Reg Anesth Pain Med* 2018;43:859-63.
- Abrahamsen C, Nørgaard B. Elderly patients' perspectives on treatment, care and rehabilitation after hip fracture: A qualitative systematic review. *Int J Orthop Trauma Nurs* 2021;41:100811. doi: 10.1016/j.ijotn.2020.100811.
- Desmet M, Vermeulen K, Van Herreweghe I, Carlier L, Soetens F, Lambrecht S, *et al.* A longitudinal supra-inguinal fascia iliaca compartment block reduces morphine consumption after total hip arthroplasty. *Reg Anesth Pain Med* 2017;42:327-33.
- Mistry T, Sonawane K, Raghuvanshi A, Balavenkatasubramanian J, Gurumoorthi P. Preemptive pericapsular nerve group block to facilitate sitting position for neuraxial anesthesia in patients with acetabular fractures: A case series. *Saudi J Anaesth* 2022;16:221-5.
- Hua H, Xu Y, Jiang M, Dai X. Evaluation of pericapsular nerve group (PENG) block for analgesic effect in elderly patients with femoral neck fracture undergoing hip arthroplasty. *J Healthc Eng* 2022;2022:7452716. doi: 10.1155/2022/7452716.
- Natrajan P, Bhat RR, Remadevi R, Joseph IR, Vijayalakshmi S, Paulose TD. Comparative study to evaluate the effect of ultrasound-guided pericapsular nerve group block versus fascia iliaca compartment block on the postoperative analgesic effect in patients undergoing surgeries for hip fracture under spinal anesthesia. *Anesth Essays Res* 2021;15:285-9.
- Senthil KS, Kumar P, Ramakrishnan L. Comparison of pericapsular nerve group block versus fascia iliaca compartment block as postoperative pain management in hip fracture surgeries. *Anesth Essays Res* 2021;15:352-6.
- Sahoo RK, Jadon A, Sharma SK, Peng PW. Peri-capsular nerve group block provides excellent analgesia in hip fractures and positioning for spinal anaesthesia: A prospective cohort study. *Indian J Anaesth* 2020;64:898-900.