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PENG (Pericapsular Nerve Group) block versus intravenous fentanyl as an analgesic technique in cardiac patients for positioning ofhip fracture: Prospective, Randomized study

Mohamed AbdEl Gawad Abd ElHalim[1], Abdelwahab Abdelsattar Saleh[1], Mohammed Hamdy Alqassas[1]

[1]Department of Anesthesiology and Intensive Care, Faculty of Medicine, Al Azhar University, Cairo,Egypt.

Corresponding author: Mohamed AbdElgawadAbdElhalim, M D.

Email: abosoad.mohamed2017@gmail.com

Mobile:0201091945931

Abstract

Background: The "Pericapsular Nerve Group (PENG) Block" is an alternate regional anesthetic approach for the treatment of acute pain following hip fractures. The musculofascial plane between the psoas muscle and the superior pubic ramus is blocked with local anesthesia using (PENG) block technique.

Aim of work: The purpose of this study was to assess the effectiveness of (PENG) Block against intravenous fentanyl as an analgesic method for hip fracture in cardiac patients.**Patients and Methods:** After getting ethical committee approval and signed informed agreement from patients, the study enrolled sixty cardiac patients with ASA (II-III) ranging in age from 21 to 60 years old. They were split into two groups: group I received intravenous fentanyl (IVF) at a dose of 0.5 µg/kg body weight, while group II received a PENG block with 20 mL bupivacaine(0.125%).

Results: VAS during positioning in PENG group was lower than intravenous fentanyl. Patient position for spinal anesthetic was better in the PENG group than in the intravenous fentanyl group. patient satisfaction was lowerin the IVF group than PENG group.PENG users need fewer extra analgesics than IVF users.

Conclusion:PENG block provides greater analgesia to intravenous fentanyl during position and post operation. PENG block gives superior analgesia, patient satisfaction, and patient position during spinal anesthesia of hip fracture than intravenous fentanyl.

Key wards: PENG block,Cardiac patients, HIP fracture, Intravenous fentanyl.

Introduction

Multimodal analgesia with nerve block has been recommended in the preoperative period of lower limb joint arthroplasty to reduce the challenges and adverse effects of spinal anesthesia and intravenous opioid analgesia.Two nerve block commonly used for anesthesia and analgesia in hip replacement are the 3-in-1 femoral nerve block and the fascia iliac compartment block [1].In patients with heart disease, both acute and chronic pain are typical comorbid issues [2].

pericapsular nerve group (PENG) block is a technique that involves deposition of local anesthetic in the musculofascial plane between the psoas muscle and the superior pubic ramus [3]. this block has been recently described as an effective option for hip analgesia.The "Pericapsular Nerve Group (PENG) block" has been described and initially developed in 2018 by Giron-Arango et al., for the blockade of the femoral, obturator and accessory obturator nerve provide sensory innervation to the anterior hip capsule[4].It has been developed as an alternative regional anesthesia technique for the management of acute pain after hip fractures, but its applications are expanding[5]. This diffusion block could provide complete postoperative analgesia with the advantage of sparing the motor function of quadriceps.

Aim of work:to compare the efficacy of "Pericapsular Nerve Group (PENG) Block" versus intravenous fentanyl as an analgesic technique in cardiac patients for positioning of hip fracture.

Patients and Methods: This was randomized single blinded study was undertaken in the university hospitals of El-Hussein and Bab-Alshaeria at Al-Azhar University from 1/8/2020 to 1/8/2021. The study was approved by the hospital ethical committee approval at Al-Azhar University, as well as informed consent permissionhaving hip fracture. A total of 60 cardiac patients ranged in age from 21 to 60 years old, with ASA physical status II–III were assigned to two equal groups using the closed envelope method, they were divided into two groups: group I received intravenous fentanyl at 0.5 µg/kg body weightwhile group II received PENG blockusing 20ml of bupivacaine(0.125%).

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Inclusion criteria: Cardiac patients (ex: hypertension, previous angina or myocardial infraction)in age from 21 to 60 years old, with ASA physical status (II–III)having hip fracture.

Patient refusal, severe dementia and allergies to local anesthetics, were all used as exclusion criteria. All patients had preoperative preparation, which included a medical history, examinations and tests.

The primary outcomes: Support required while positioning upright and Support required after positioning.

The secondary outcomes: Patient satisfaction, postoperative opioid consumptionand the occurrence of adverse effects.

PENG block technique: After proper skin cleaning, the PENG block is conducted under ultrasound supervision. The patient is put in a supine posture, which allows the ultrasound transducer and needle to be placed comfortably [6]. In most situations, a curvilinear low-frequency ultrasound probe (2-5 MHz) is first put in a transverse plane above the antero inferior iliac spine (AIIS) and then rotated 30-45 degrees to align with the pubic ramus [7] (Figure1, 2).Other authors preferred to use a transverse scan to identify the hip joint, then move the probe cranially until the IPE and AIIS were visible, before rotating the probe to align with the pubic ramus. There have also been reports of thin or young patients being treated with a linear high-frequency probe (8-13MHz)[8].

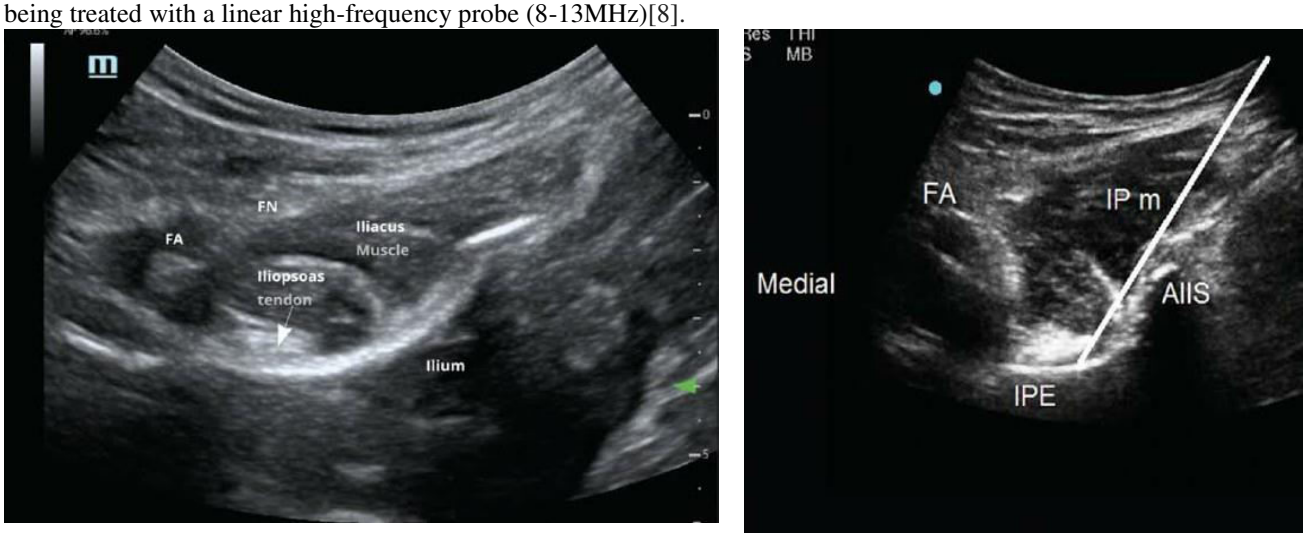

Figure1, 2: Local anesthetic spread after PENG block (F.A.: femoral artery; AIIS: antero inferior iliac spine).

Calculation of Sample Size: The sample size was calculated using the "Med Calc® version 12.3.0 programmed Ostend, Belgium" statistical calculator, which used a 95 percent confidence interval and an 80 percent power of the study with a 5 percent error rate.A previous study doneof 42 patients: 21 patients (Femoral nerve block group) and 21 patients PENG block in clinical practice.

SPSS (Statistical Package for Social Sciences) for Windows 17.0 was used for statistical analysis. All of the data was expressed using means, standard deviations, and frequencies.The two groups were compared using an independent t-test. To test the differences between groups, the Fishers Exact Test and the chi-square examination were utilized. It was considered significant if the P-value was less than 0.05; else, it was classified as non significant.

Results

Demographic data of study: There were statistically non-significant variations in age, weight, sex,ASA and operation duration between the groups (Table 1).

Table 1.Demographic data of study population.

Groups / Parameters	Group I Mean ± SD	Group II Mean ± SD	P-value
Age (year)	50.5±5.3	51.2±4.9	0.596
Weight (kg)	74.4±6.1	73.0±6.1	0.400
Sex (M:F)	17:13	18:12	0.51
ASA II III	17(65.7%) 13(43.3%)	21(70.0%) 9(30.0%)	0.422

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Duration(min.)	64.4±11.3	64.9±12.0	0.869

Table 2.Support required while positioning upright and Support required after positioning

Variable	Group I (n = 30)	Group II (n = 30)	P-value
Support required while positioning upright	4	15	<0.001*
Support required after positioning	2	12	<0.001*

Patient position for spinal anesthetic was better in the PENG group than in the intravenous fentanyl group.

Visual Analogue Scale: Preprocedural VAS scores were similar in both groups. There was significant significant difference between both groups Post procedural. Postoperative VAS was found to be higher in group I than group II ($p<0.05$). There was significant non-significant difference between VAS scores of both groups Preprocedural (Table 3).

Table 3.postoperative Visual Analogue Scale scores of the groups.

Variable	Group I (n = 30)	Group II (n = 30)	P-value
2hr	1(0–1)	0(0–1)	<0.001*
4hr	1(1–2)	1(0–1)	<0.001*
6hr	2(1–2)	1(1–1)	<0.001*
8hr	2(2–3)	1(1–2)	<0.001*
12hr	3(2–4)	2(1–3)	<0.001*

Opioid consumption: There was significant significant difference between both groups (Table. 4).

Table (4): Comparison between the two studied groups according to number of morphine boluses after operation.

Variable	Group I (n = 30)	Group II (n = 30)	p-value
0	9(30.0%)	19(63.3%)	0.038*
1	6(20.0%)	6(20.0%)	
2	7(23.3%)	4(13.3%)	
3	6(20.0%)	1(3.3%)	
4	2(6.7%)	0(0.0%)	

Patient satisfaction: There was significant difference between both groups (Table:5).

Table (5): Patient satisfaction score.

Variable	Group I (n = 30)	Group II (n = 30)	p-value
Excellent	9(30.0%)	18(60.0%)	0.039*
Good	8(26.7%)	10(33.3%)	
Poor	11(36.7%)	4(13.3%)	

Side effects of groups: There was statistically significant difference in the incidence of side effects between groups (Table: 6) ($p <0.05$).

Table 6.Incidence of side effects between groups.

Variable	group I (n=30)	group II (n=30)	P- value
Nausea	8	2	<0.05
Vomiting	5	1	<0.05
Purities	4	0	<0.05
Hematoma	0	0	0.00

Discussion

The present study was comparesthe effectiveness of (PENG) Block and intravenous fentanyl as an analgesic method for hip fracture in cardiac patients. The current study was carried on 60 patients

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divided into 2 equal groups: group I received intravenous fentanyl at 0.5 μg/kg body weightwhile group II received PENG blockusing 20ml of bupivacaine(0.125%).

PENG block has developed as an alternative regional anesthesia technique for the management of acute pain after hip fractures.Patient position for spinal anesthetic was better in the PENG group than in the intravenous fentanyl group.

PENG block provides effective analgesia in the current study which Postoperative VAS was found to be higher in group I than group II similar to EnesAydin et al., study [9].

Our study, the used volume was 20 ml but the volume ranges from 8 to 30 ml in Delbuono et al., study [10].

In our study, Patient position for spinal anesthetic was better in the PENG group than in the intravenous fentanyl group.

Regarding the complications, no major events such as hematoma/bleeding or needle-related organ injury in our study butDelbuono et al., study [10]. There have been reported three cases of blood aspiration through a catheter during its placement for continuous PENG block.

Acharya U and Lamsal R[11] study report as Pericapsular Nerve Group Block: An Excellent Option for Analgesia for Positional Pain in Hip Fractures. The current study concluded that nerve bock better than intravenous opioid which agreement with Flávia, et al., [12]study that the use of femoral nerve block seems to be more effectivethan intravenous fentanyl.

Conclusion:PENG block provides greater analgesia to intravenous fentanyl during position and post operation. PENG block gives superior analgesia, patient satisfaction, and patient position during spinal anesthesia of hip fracture than intravenous fentanyl.

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Conflicts of interest: There are no conflicts of interest.

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