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RESEARCH ARTICLE

A study to compare ultrasound guided pericapsular nerve group block versus intravenous fentanyl, for positioning during spinal anaesthesia in patient undergoing proximal femur fracture surgeries

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Abstract

Background: Spinal anesthesia is the preferred method for fixing a femur fracture, but severe pain can hinder optimal patient positioning for this procedure. Both intravenous (IV) fentanyl and pericapsular nerve group (PENG) block are frequently employed to alleviate pain during positioning. However, studies have shown inconsistent findings regarding whether PENG block is more effective than IV fentanyl. In this study, we compared the analgesic effects of IV fentanyl and PENG block before placing the patients for central neuraxial block for femur fracture surgery.

Methods: 60 patients scheduled for femur fracture surgery under spinal anesthesia were enrolled. Patients were randomized into two groups using a computer-generated random numbers, the PENG block and the IV fentanyl (FENT) groups. In the PENG block group, patients received a 20ml injection of 0.5% bupivacaine. In the FENT group, patients received IV fentanyl 1 µg/kg, administered 5 minutes before positioning for surgery. Pain scores were assessed both before and during the positioning phase and were recorded for comparison between the two groups. Continuous variables were analyzed with the unpaired t test. Categorical variables were analyzed with the Chi-Square Test and Fisher Exact Test. Statistical significance was taken as $P < 0.05$. The data was analyzed using SPSS version 29

Results: VAS score during positioning between PENG group versus FENT group(P=0.0029), Quality of patient positioning between PENG group and FENT group (P=0.0024), patient satisfaction status between PENG group (yes=96.67%, no=3.33%) and FENT group (yes=76.67%, no=23.33%)(P=0.0284), time to perform subarachnoid block between PENG group and FENT group(P=<0.0001), time of first postoperative analgesic need between PENG group and FENT group (P=<0.0001)

Conclusion: The peri-capsular nerve group block provides superior pain compared to intravenous fentanyl for subarachnoid block in patients undergoing surgery for femur fractures.

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Introduction:-

Proximal femur fractures, a common type of hip fracture, are extremely painful and typically require surgical repair, especially among elderly individuals [1]. Given the higher prevalence of multiple health issues in geriatric patients, regional anaesthesia is preferred over general anaesthesia [2]. Research indicates that regional anaesthesia reduces mortality and pulmonary complications compared to general anaesthesia in hip fracture patients [3]. However, positioning patients for spinal anaesthesia can be challenging due to the intense pain at the fracture site, necessitating additional opioids and sedation, which can lead to more side effects in older patients [4].

Effective pain management should begin immediately after injury to facilitate examination, transportation, and diagnostic procedures [5], and should continue into the postoperative period to promote early mobility and physiotherapy [6]. Traditionally, opioids have been the primary method for managing orthopedic pain, but their use in elderly patients is associated with numerous adverse effects, such as delirium, hypotension, and respiratory depression, as well as potential long-term issues like addiction or dependence [7].

Regional nerve blocks offer a promising alternative to opioids by providing rapid, targeted pain relief that is more effective than standard systemic analgesia, thereby minimizing systemic side effects [8]. These blocks can be initiated in the emergency department to facilitate initial management and subsequent procedures [9]. Various techniques, such as intravenous fentanyl, femoral nerve block, 3-in-1 block, fascia iliaca block, intraarticular injections, and local anesthetic infiltration, are used to provide analgesia for hip fractures while the patient is in a supine position [10].

In this study, we aim to compare the efficacy of PENG block with Intravenous fentanyl in providing effective preoperative analgesia for patients undergoing hip surgery under spinal anaesthesia

Materials and Methods:-

This prospective comparative study was conducted at a tertiary care teaching hospital. The sample size was calculated by formula

$$n = \left(\frac{z_{\alpha/2} \cdot \sigma}{E}\right)^2$$

Where n = Sample size, σ = Population standard deviation, e = Margin of error, Z = The value for the given confidence interval. The study used a 95% confidence level, a standard deviation of 3.09, a Z-value of 1.96, and a margin of error of +/-0.80. Assuming that 80 percent as power of the study, minimum sample size required for the study was calculated to be 58. The study population consist of 60 ASA I & ASA II patients in the age group of 18 years to 80 years admitted to undergo elective proximal femur fracture surgeries at Basaveshwar Teaching and General Hospital, Kalaburagi. The study duration was from 1st September 2022 to 1st March 2024 (18 Months). Patients grouped randomly by simple random sampling technique into 2 groups, Group A patients- PENG block and Group B- intravenous fentanyl (Figure 1). Written and informed consent was obtained for participation in the study and use of the patient data for research and educational purposes. Patient with local skin infections or disease, coagulopathies, chronic use of opioids or corticosteroids were excluded from the study.

Half an hour prior to the planned procedure, patients shifted inside the pre-op room. Baseline vitals such as pulse rate, non-invasive blood pressure, saturation on room air, respiratory rate, ECG pattern were recorded. Intravenous access obtained with 18G IV cannula. Local anaesthetic test dose was given the previous night using 0.1 ml of Inj. Lignocaine 2%. All patients were pre-medicated with Inj. ondansetron 0.1mg/kg intravenously

In group A, USG guided PENG block, the patient was in supine position and skin over inguinal crease disinfected. Curvilinear USG probe placed on the anterior superior iliac spine, is rotated slightly (about 45 degrees) to align with the inguinal crease. By sliding the probe the anterior inferior iliac spine (AIIS), ilio-pubic-eminence (IPE), and the psoas tendon located. Using a thin needle, inserted it in the same plane as the psoas tendon. 20ml of a local anaesthetic 0.5% Bupivacaine deposited between poas tendon and pubic ramus (Figure 2). While group B patients received intravenous fentanyl 1mcg/kg 5 mins before positioning for spinal anaesthesia.

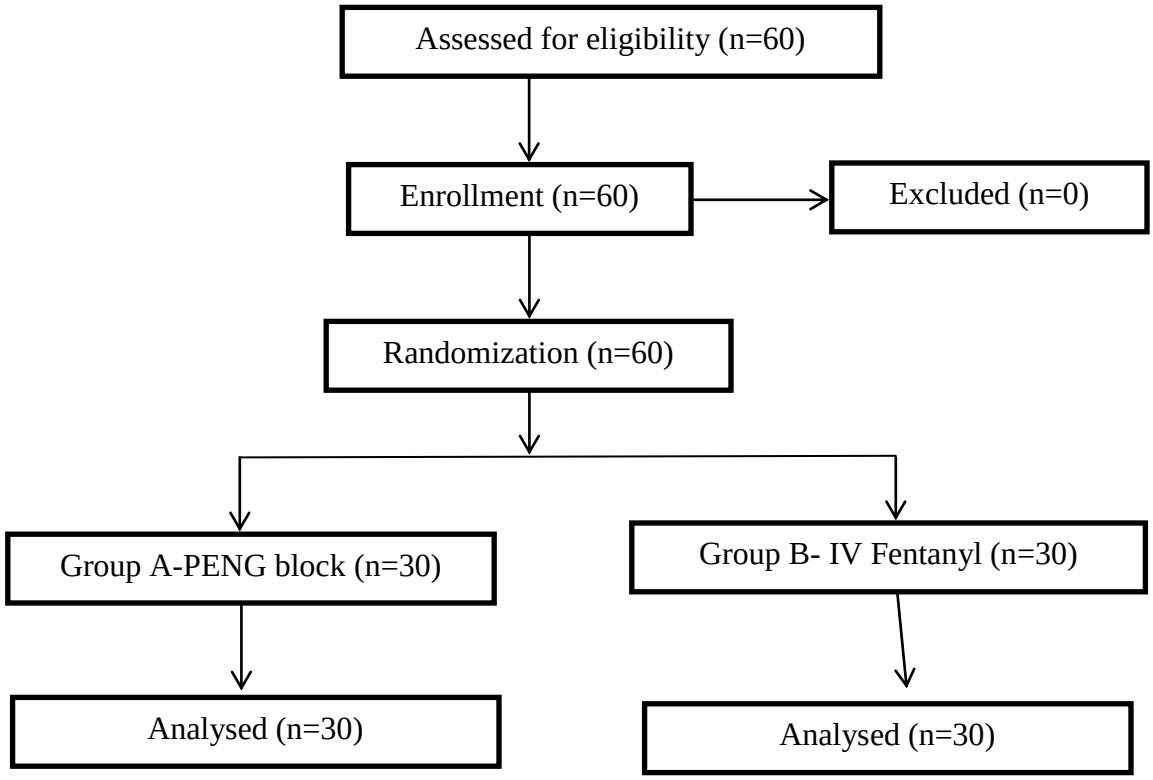


Figure 1: Consort study

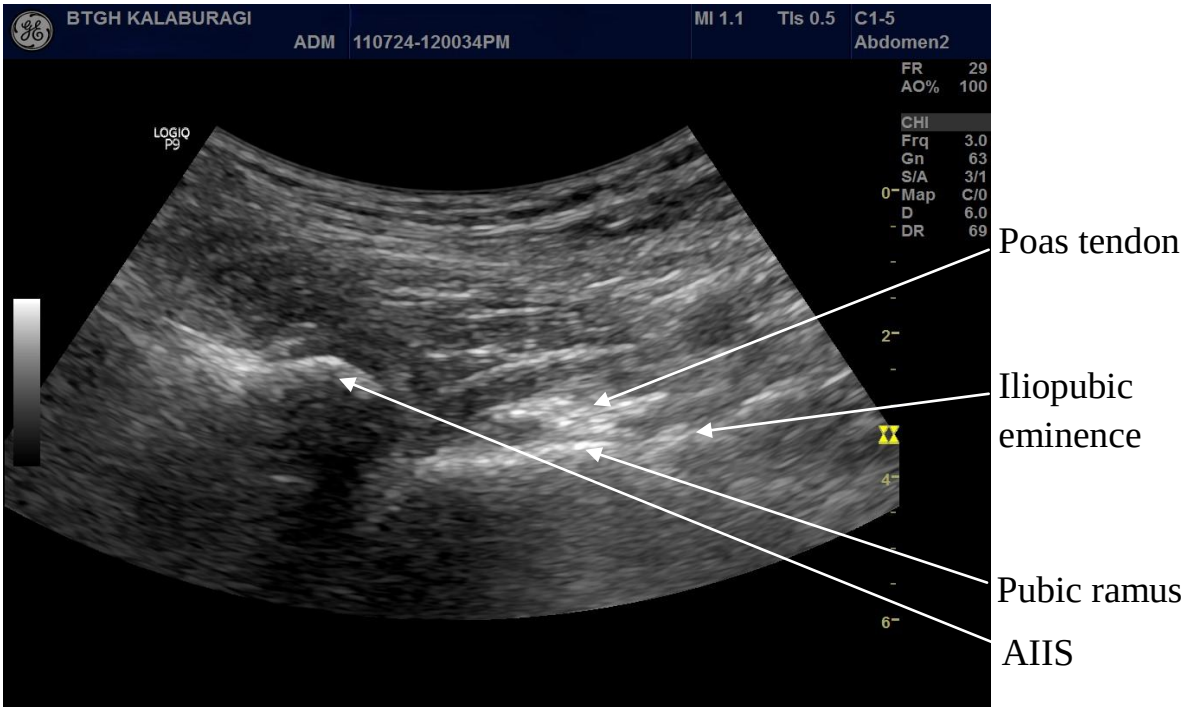


Figure 2: Ultrasonoanatomy of Peri-capsular nerve group block

Visual analogue score was used to assess pain during the positioning for spinal anesthesia. Quality of patient positioning (Not satisfactory-0, Satisfactory-1, Good-2, Optimal-3), Patient satisfaction (satisfactory/ not satisfactory) and time to perform spinal anaesthesia was noted. Vital parameters like heart rate (HR), mean arterial pressure (MAP) by non invasive blood pressure and SpO2 were monitored.

Descriptive statistics was done for all data and are reported in terms of mean values and percentages. Suitable statistical tests of comparison were done. Continuous variables analysed with the unpaired t test. Categorical variables analysed with the Chi-Square Test and Fisher Exact Test. Statistical significance was taken as $P < 0.05$. The data was analysed using SPSS version 26 and Microsoft Excel 2007.

Results:-

The demographic information and initial values for heart rates (HRs), mean arterial pressures (MAPs), and types of surgeries were similar between both groups. MAP during positioning and the SpO2 values were similar in both groups.

The mean heart rate was significantly lower in FENT group compared to PENG group by a mean difference of 6 bpm. This difference is significant with a lowest p-value of 0.0022 as per unpaired t-test.

There was a statistically significant difference in relation to VAS score during positioning between PENG group (mean=1.13, SD=1.25) and FENT group (mean=2.27, SD=1.55) with a p value of 0.0029 as per unpaired t test.

There was a statistically significant difference in relation to quality of patient positioning between PENG group (mean=2.43, SD=0.63) and FENT group (mean=1.87, SD=0.78) with a p value of <0.05 as per unpaired t test.

The positive patient satisfaction status was significantly higher in PENG group compared to FENT group by a percentage difference of 20.00 (21% higher). This difference is significant with a p-value of 0.0284 as per Fisher's exact test.

The mean time to perform subarachnoid block was significantly shorter in PENG group compared to FENT group by a mean difference of 58 seconds (16% shorter). This difference is significant with a p-value of <0.0001 as per unpaired t-test.

The mean time of first postoperative analgesic need was significantly delayed in PENG group compared to FENT group by a mean difference of 4 hours and 15 minutes (72% more delayed). This difference is significant with a p-value of <0.0001 as per unpaired t-test.

Table 1- Data of Demography

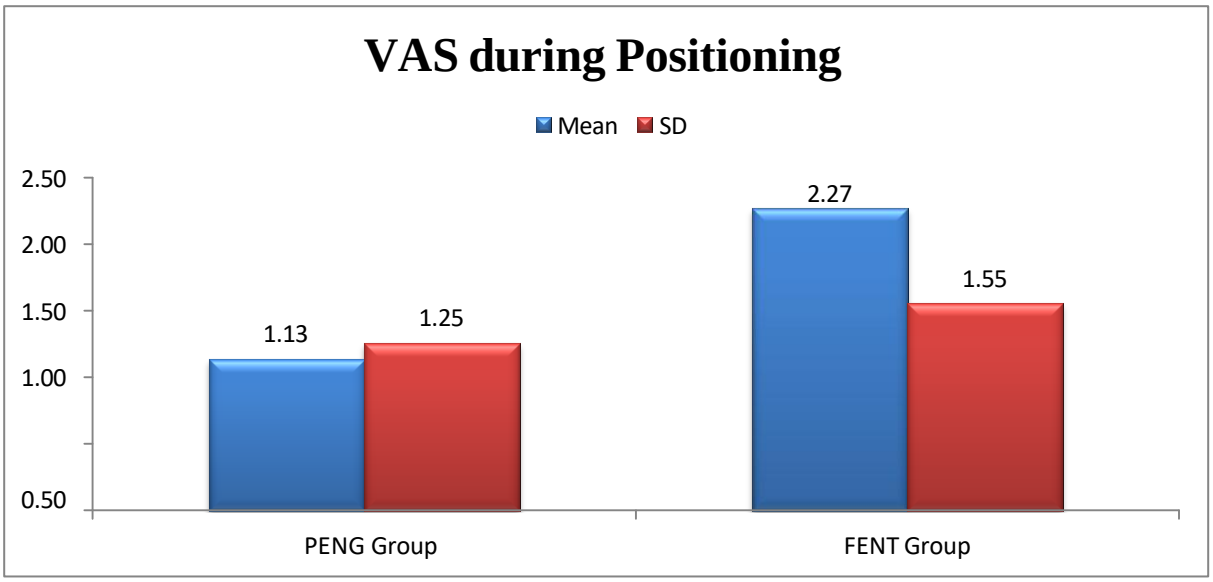
Parameters	Group-A(n=30) PENG	Group-B(n=30) FENT	P Value
Age(years)	64.62 ± 12.13	64.95 ± 8.72	0.881
Sex(male/female)	19/11	21/9	0.74
Weight(kgs)	62.77	63.20	0.7520

Table 2- Hemodynamic parameters

Vital parameters	Group-A(n=30) PENG	Group-B(n=30) FENT	P Value
MAP mm Hg baseline	100.17	101.87	0.3548
MAP mm Hg during position	97.73	98.17	0.7649
HR per min at baseline	86.93	88.70	0.4065
HR per min during position	86.13	79.67	0.0022
SpO2% at baseline	98.03	98.10	0.7359
SpO2% during position	99.27	98.94	0.1118
MAP – Mean arterial pressure; HR – Heart rate; PENG block- Peri-capsular nerve group block; SpO2 – Oxygen saturation; FENT – Fentanyl			

Table 3- VAS, Patient position, patient and anaesthetist satisfactory, first rescue analgesia

	Group-A(n=30) PENG(mean)	Group-B(n=30) FENT(mean)	P Value
VAS score during positioning	1.13	2.27	0.0029
Quality of position (0-3)	2.43	1.87	0.0024
Patient's acceptance (yes/no)	29/01	23/07	0.0284
Time to Perform SAB(min)	4.90	5.86	<0.0001
First Rescue Analgesic Postoperative(hours)	5.90	1.65	<0.0001



Graph 1: Visual Analog Scale during Positioning

Discussion:-

Spinal anaesthesia is widely acknowledged and favored as the preferred method of anaesthesia for surgeries involving femoral fractures [11]. This approach offers numerous benefits compared to general anaesthesia, such as enabling early mobility and reducing the risks of deep vein thrombosis and mortality [12, 13].

Sandby-Thomas et al. [1] found that the commonly employed agents for assisting in patient positioning for spinal blocks included midazolam, ketamine, and propofol. Less commonly used alternatives were fentanyl, remifentanil, morphine, nitrous oxide, and sevoflurane, while nerve blocks were seldom utilized for this purpose. In a study by AlrefaeyKandeelAlreafey et al [14] Preoperative PENG block reduces the amount of time needed for spinal block, improves the anesthesiologist and patient experience, and is an excellent way to manage pain related to positioning during spinal anaesthesia.

In our study, visual analogue scale scores during the positioning of patient for spinal anaesthesia in Peri-capsular nerve group block were significantly lower than intravenous fentanyl. Many other studies also reported significantly low pain scores with PENG block compare to fentanyl. In a similar study by Mohamed AbdElgawadAbdElhalim, M D [15], 60 patients were divided into 2 groups. Group 1 with 30 patients received PENG block with 20 mL bupivacaine (0.125%). Group 2 with 30 patients received intravenous fentanyl (IVF) at a dose of 0.5 μg/kg body weight. They concluded that PENG block offers superior pain relief compared to intravenous fentanyl both during positioning and after the operation.

In our study, we found that better quality of position of patient for spinal anaesthesia, higher patient satisfaction and lower time for SAB. PENG block provided better post op analgesia compared to IV fentanyl. According to a study by Acharya U and Lamsal R [15], pericapsular nerve group block is a great choice for treating positional pain in hip fracture patients.

Conclusion:-

The peri-capsular nerve group block provides superior pain relief, improved hemodynamic stability, higher patient satisfaction, better positioning for subarachnoid block, shorter anaesthesia induction time, and delayed onset of first postoperative pain compared to intravenous fentanyl in patients undergoing surgery for femur fractures.

References:-

1. Parker M and Johansen A. Hip fracture. Bmj. 2006;333(7557):27-30.

2. Kowark A, Rossaint R and Coburn M. General versus spinal anesthesia for the elderly hip fractured patient. Current Opinion in Anesthesiology. 2019;32(1):116-9.

3. Neuman MD, Silber JH, Elkassabany NM, Ludwig JM and Fleisher LA. Comparative effectiveness of regional versus general anesthesia for hip fracture surgery in adults. Anesthesiology: The Journal of the American Society of Anesthesiologists. 2012;117(1):72-92.

4. Yun M, Kim Y, Han M-K, Kim J, Hwang J-W and Do S. Analgesia before a spinal block for femoral neck fracture: fascia iliaca compartment block. Acta Anaesthesiologica Scandinavica. 2009;53(10):1282-7.

5. Morrison RS, Magaziner J, McLaughlin MA, Orosz G, Silberzweig SB, Koval KJ, et al. The impact of post-operative pain on outcomes following hip fracture. Pain. 2003;103(3):303-11

6. Morrison RS, Dickman E, Hwang U, Akhtar S, Ferguson T, Huang J, et al. Regional nerve blocks improve pain and functional outcomes in hip fracture: a randomized controlled trial. Journal of the American Geriatrics Society. 2016;64(12):2433-9.

7. Helmerhorst GT, Vranceanu A-M, Vrahas M, Smith M and Ring D. Risk factors for continued opioid use one to two months after surgery for musculoskeletal trauma. JBJS. 2014;96(6):495-9.

8. Scurrah A, Shiner C, Stevens J and Faux S. Regional nerve blockade for early analgesic management of elderly patients with hip fracture–a narrative review. Anaesthesia. 2018;73(6):769-83.

9. Curatolo M. Regional anesthesia in pain management. Current Opinion in Anesthesiology. 2016;29(5):614-9.

10. Shin JJ, McCrum CL, Mauro CS and Vyas D. Pain management after hip arthroscopy: systematic review of randomized controlled trials and cohort studies. The American journal of sports medicine. 2018;46(13):3288-98.

11. Sandby Thomas M, Sullivan G, Hall JE. A national survey into the peri operative anaesthetic management of patients presenting for surgical correction of a fractured neck of femur. Anaesthesia 2008;63:250 8.

12. Parker MJ, Handoll HH, Griffiths R. Anaesthesia for hip fracture surgery in adults. Cochrane Database Syst Rev 2004;CD000521.

13. Urwin SC, Parker MJ, Griffiths R. General versus regional anaesthesia for hip fracture surgery: A meta analysis of randomized trials. Br J Anaesth 2000;84:450 5

14. AlrefaeyKandeelAlreafey et al,Pericapsular nerve group block for analgesia of positioning pain during spinal anesthesia in hip fracture patients, a randomized controlled study October 2020, Egyptian Journal of Anaesthesia 36(1):234-239

15. Utsav Acharya, RiteshLamsal, "Pericapsular Nerve Group Block: An Excellent Option for Analgesia for Positional Pain in Hip Fractures", Case Reports in Anesthesiology, vol. 2020, Article ID 1830136, 3 pages, 2020