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COMPARATIVE EVALUATION OF USG GUIDED SUPRA-INGUINAL FASCIA ILIACA COMPARTMENT BLOCK WITH PERICAPSULAR NERVE GROUP BLOCK FOR REDUCING PAIN ASSOCIATED WITH POSITIONING FOR SUBARACHNOID BLOCK IN PATIENTS OF HIP FRACTURE.

Anaesthesiology

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ABSTRACT

Introduction: Positioning patients with a fractured hip for spinal anaesthesia is challenging since minimal movement of the overriding fracture ends can cause extreme pain. Nerve blocks are reported to be more effective for perioperative pain management than other analgesic techniques. In the present study, we compared the analgesic efficacy of USG guided pericapsular nerve group (PENG) block with USG guided supra-inguinal fascia iliaca compartment block (FICB-S) using 0.2% ropivacaine in patients with fracture hip in reducing pain associated with positioning (sitting) for subarachnoid block.

Methods and Material: Sixty patients of fracture hip, having pain of intensity of numerical rating score (NRS) >4 were divided into two groups Patients of Group A received FICB-S and those of group B received PENG block. Pain scores were assessed by NRS at every 5 mins for thirty minutes after block placement in the two groups. Subsequently patient was positioned for spinal anesthesia. Ease of positioning and patient satisfaction score were also recorded.

Results: We observed that in both group there was significant ($P < 0.05$) pain reduction at the time of positioning for spinal anesthesia. When NRS was compared at different time interval, it was found that Group A (FICB-S) was better and significant ($P< 0.05$) at time point 10min,15min and 20 min in comparison to Group B (PENG). Ease of positioning was comparable in both the groups ($P > 0.05$). Patient satisfaction score was better and significant ($P< 0.05$) in Group A (FICB-S) in comparison to Group B.

Conclusions: PENG and FICB-S are equally effective in achieving pain free patient positioning for spinal anaesthesia in patient listed for hip surgery.

KEYWORDS

Suprainguinal Fascia Iliaca Compartment Block, pericapsular nerve group block, ultrasound.

INTRODUCTION

Globally 1.6 million patients suffer from hip fracture every year, and there is a reported increase of 25% every decade. Hip fracture has been associated with adverse effects in the elderly patients and this is in marked contrast with the relatively simple surgical procedures needed for treatment.

Neuraxial block such as spinal anaesthesia, combined spinal-epidural anaesthesia, epidural anaesthesia are the preferred anaesthesia modalities.[1] Regional anaesthesia has been observed to be associated with lesser morbidity and mortality compared to general anesthesia.[2-5] Positioning patients with a fractured hip for spinal anaesthesia is challenging since minimal movement of the overriding fracture ends can cause extreme pain.

Fractures of the hip are a particularly painful bone injury because the periosteum has the lowest pain threshold of the deep somatic structures. Failure to effectively control the pain before the procedure increases neurohormonal stress responses leading to potential risks of cardiovascular events during surgery in hip fracture patients. These group of patients are generally elderly with multiple comorbidities and have potential risks of unwanted effects of opioids including respiratory depression, confusion, and other side effects.

Current modalities used for analgesia are systematic nonsteroidal anti-inflammatory drugs and opioids, or peripheral nerve block, such as fascia iliac compartment nerve block (FICB), Femoral nerve block, 3 in 1 block.[6-9] Optimal perioperative pain management of hip surgery improves the long-term quality of life. Nerve blocks are reported to be more effective for perioperative pain management than other analgesic techniques. Ultrasound guidance (USG) improves visualization of anatomical structures, success rate, quality of sensory block, and onset time and decreases dose of local anaesthetics and complications compared to nerve stimulator or landmark techniques.

USG-guided FICB by the supra-inguinal approach, with local anaesthetic injection superficial to the iliacus muscle, superior to the inguinal ligament, will block both the femoral (FN) and the lateral femoral nerve (LFN) completely. This is because FN and the LFN are not branched off and have a more consistent course at this location.[10-12]

Pericapsular nerve group (PENG) block has been recently recommended by Giron-Arango et al. for use as postoperative analgesia in hip surgeries [13]. It is a new regional anaesthesia method based on blocking the articular branches of FN and accessory obturator nerve (AON) in the region between the anterior inferior iliac spine (AIIS) and iliopubic eminence (IPE).

In the present study, we compared the analgesic efficacy of USG guided PENG with USG guided FICB- S using 0.2% ropivacaine in patients with fracture hip in reducing pain associated with positioning (sitting) for subarachnoid block.

MATERIAL AND METHODS

Approval for the study was obtained from the Institutional Ethics Committee (IEC code-2020-42-IP-114). Sixty patients of American Society of Anesthesiologists (ASA) status I and II, of either sex, of age 18 years and above, diagnosed with fracture hip, having pain of intensity of numerical rating score (NRS) >4 and listed for elective surgery under spinal anaesthesia were randomly divided into two groups (Group A and Group B) by computer generated slips.

Patients with cognitive impairment, dementia, delirium, coagulopathy, polytrauma, hemodynamic instability, allergic to local anesthetic, alcohol abuse, any prior opioid administration for acute pain were excluded from the study.

USG (Sonosite® Edge II®) guided blocks were performed using B Braun® Stimuplex® Ultra 360®20 Ga × 4 inch 100 mm echogenic needle under complete aseptic precautions in the two groups. 30 ml of 0.2 % Ropivacaine was used in both the groups.

Patients of Group A received FICB-S and those of group B received PENG block.

Pain scores were assessed by NRS at every 5 mins for thirty minutes

after block placement in the two groups. Subsequently patient was positioned for spinal anesthesia. NRS score <4 after 30 minutes of block placement was considered as a successful block. If any patient in either group reported pain scores ≥4 during positioning, IV fentanyl 0.5 μg/kg was given every 5 min until the pain score decreased to <4 or maximum dose of 3 μg/kg was given (whichever was first). Patients in whom pain score < 4 could not be achieved were excluded from study.

Injection paracetamol 1 gm i.v 8 hourly was administered as a part of multimodal analgesia. Patient demographics, type of hip fracture, patient satisfaction and any adverse effects were recorded. All blocks were performed by investigators involved in the study. Pain assessment was performed by a different investigator blinded to the nature of study and not involved in the placement of block.

Ease of positioning for spinal anesthesia was graded as-
Very difficult-4; Difficult-3; Easy-2; Very easy- 1
Patient satisfaction Score was graded as-
Very satisfied-5; Satisfied-4; Somewhat satisfied-3; Not satisfied-2; Very unsatisfied-1

Any adverse effects such as hypotension, bradycardia, and sedation were recorded.

STATISTICALANALYSIS

At minimum two-sided 95% confidence interval and 80% power of the study, minimum required sample size for each of the two groups was 28. Finally, in this study we included 30 patients in either group [Total 60 patients]. Sample size was estimated using software G Power version - 3.1.9.2 (Düsseldorf university, Germany).

Normality of the continuous variables was assessed. As data were normally distributed, continuous variables are presented in mean ± standard deviation while categorical variables are presented in frequency and percentage. Independent samples t test was used to compare the NRS pain scores between FICB -S and PENG groups at different time points.

Paired t test was used to compare NRS pain scores at 0 min and 30 min within each group. Mann whitney U test was used to compare ordinal data like ease of positioning and patient satisfaction scores. Fischer exact test was used to compare the incidence of complications. P value < 0.05 was considered as statistically significant. Statistical package for social sciences, Version 23 (SPSS 23, IBM, Chicago, USA) and Med Calc software was used for data analysis.

RESULT

In our study, the demographic characteristics in terms of age, gender, BMI, duration of surgery and diagnosis of all the patients were comparable in both the groups [Table 1] ($p > 0.05$). We studied 30 patients in Group A and 30 patients in Group B having hip fracture. We observed that in Group A (mean±SD) NRS before FICB-S was 7.63±1.19 which reduced to 0.87±0.63 at positioning for spinal anesthesia, which is statistically significant ($P< 0.05$). Whereas in Group B (mean±SD) NRS before PENG block was 7.83±1.34 which reduced to 0.93±0.629 at the time of positioning for spinal anesthesia, which is statistically significant ($P < 0.05$) [Table 2].

When NRS was compared at different time interval, it was found that Group A(FICB-S) was better and significant ($P< 0.05$) at time point 10min,15min and 20 min in comparison to Group B (PENG). Ease of positioning was comparable in both the groups [Table 2] ($P > 0.05$). Patient satisfaction score was better and significant ($P< 0.05$) in Group A (FICB-S) in comparison to Group B (PENG).Complication in form of bradycardia and hypotension in 4 patients in A(FICB-S) and 3 patients in Group B (PENG) was observed , which was managed .

Table -1. Distribution of the Demographic and other variables among the patients

Variable´s	Group A (n=30)	Group B (n=30)	P Value
Age (mean±SD)	52.80±2.21	51.87±2.27	0.77
Sex (M/F)	14/16	16 /14	0.79
BMI (mean±SD)	26.09±4.54	26.12±3.55	0.98
Duration of Anaesthesia (mins) (mean±SD)	91.17±27.06	92.57±28.97	0.84
Diagnosis (n)			0.95
1-Fracture neck of femur	13	15	
2-Intertrochanteric fracture	12	11	
3-Subtrochanteric fracture	4	3	
4-Acetabular fracture	1	1	

Table -2 Comparison of pain score, ease of positioning and satisfaction levels between 2 groups.

Variable´s	Group A (n=30)	Group B (n=30)	P Value
1-NRS Score (mean±SD)			
0 min	7.63±1.19	7.83±1.34	0.543
5 min	4.90±1.86	5.00±1.151	0.820
10 min	2.50±.90	3.07±1.08	0.031
15 min	1.47±.73	1.93±.868	0.028
20 min	1.17±.70	1.57±.68	0.028
25 min	1.13±.57	1.43±.68	0.069
30 min	0.87±.63	.93±.629	0.697
2- Ease of positioning (mean±SD)	1.13±.35	1.07±.25	0.398
3-Satisfaction level (mean±SD)	4.13±.73	3.37±.85	0.001
4-Complications (n)	4	3	1.00

DISCUSSION

Spinal anaesthesia is routinely employed for reduction of fracture in patients with fracture hip. Positioning of these patients for neuraxial anaesthesia can be extremely challenging as any overriding of the fracture ends is extremely painful. Systemic analgesics like opioids, NSAIDS and peripheral nerve blocks are some of the options available to mitigate the pain associated with patient positioning.

Sandby et al in their nation wide survey observed that nerve blocks are being used infrequently to aid with positioning and no sedation or analgesia was given for positioning in 15.1% of patients.[14] A 2012 survey of three Toronto, Ontario–area hospitals found that regional nerve blocks for hip fractures were performed by only 33% of attending emergency physicians and only 6% performed them often or almost always.[15] A 2009 survey in the United Kingdom found that 55% of emergency departments regularly use regional anaesthesia techniques for hip and femur fractures.[16]

A 2002 Cochrane systemic review of nerve blocks for hip fractures undertaken shortly after admission to hospital concluded that nerve blocks resulted in statistically significant reductions in reported pain levels and in the quantity of parenteral or oral analgesia administered to control pain from the fracture or during surgery.[17] Assessment of peripheral nerve blocks to achieve optimum patient positioning for neuraxial anaesthesia requires assessment of onset of block, adequacy of blockade of involved nerves and patient satisfaction.

A recent anatomical study by Short et al confirmed the innervation of the anterior hip by these 3 main nerves, but also found that the AON and FN play a greater role in the anterior hip innervation than previously reported. [10] This study also identified the relevant landmarks for those articular branches. The high articular branches from FN and AON are consistently found between the anterior inferior iliac spine (AIIS) and the iliopubic eminence (IPE), whereas the ON is located close to the inferomedial acetabulum.

Majority of studies which evaluated FICB for on positioning for spinal anesthesia in fracture hip joint patients, were done using infrainguinal approach employing landmark based double pop technique or were USG guided. This approach did not result in reliable blockade of LFCN and ON.[11]

Vermeylen K et al in their two studies demonstrated that USG guided suprainguinal approach of FICB using a volume of 40 ml can extend cranially to reliably block FN, LFCN, ON. Therefore, this approach has also been referred to as anterior lumbar plexus block and was found to provide anaesthesia to anterior, medial and lateral aspect of thigh. [11,12]

Current evidence of using PENG block for hip surgery or hip pain is limited to case reports and case series only. Benefits of the PENG block are patient positioning for the procedure, no significant motor weakness, potential motor sparing effect, and analgesic efficacy.

Giron-Arango et al demonstrated that high hip articular branches of

femoral nerve and accessory obturator nerve can be consistently found between anterior superior iliac spine and ilio-pubic eminence and demonstrated that 20 ml of 0.25 % bupivacaine injected at ilio-pubic eminence can reliably block these two nerves providing adequate motor sparing analgesia in patients of hip fracture. [13]

Rocha Romero et al in their 5 patients case series administered PENG block in patients of hip fracture in emergency department and observed that block onset time varied between 15-20 minutes. They further noted that PENG block is a motor and opioid-sparing technique and offers long-lasting analgesia and requires less volume than other blocks. [18]

Bhattacharya et al in their study on 50 patients of fracture neck of femur patients compared USG guided PENG block with infra-inguinal approach of FICB by administering 20 ml of 0.25% levobupivacaine in either group and observed that PENG group had a significantly quicker onset of action (signified by a reduction of pain score by 5) compared to the fascia iliaca group (average of 13.6 minutes and 22 minutes, respectively). the average duration of action was almost similar between the two groups (9.9 hours in PENG and 10.32 hours in fascia iliaca group).[19]

Bhattacharya et al and Rocha Romero et al defined reduction in NRS scores by 5 points as time to onset of block, we observed that both groups demonstrated onset of block at 10 mins of observation, however, FICB-S showed better NRS score at 10, 15, 20 minutes ($p < 0.05$) showing earlier blockade of nerve distribution with this FICB-S.

PENG and FICB-S were found to be equally efficacious in achieving pain free patient positioning at 30 mins (0.87 vs 0.93) although patients in FICB-S group were more comfortable and reported better satisfaction score (4.13 vs 3.37) during block placement as PENG requires a much deeper placement of needle.

CONCLUSION

Integrating nerve blocks for regional anesthesia in comprehensive clinical care pathway for elderly patients with hip fracture can result in marked improvement in patient outcome. PENG and FICB-S are equally effective in achieving pain free patient positioning for spinal anaesthesia in patient listed for hip surgery.

REFERENCES

1. Neuman MD, Silber JH, Elkassabany NM, et al. Comparative effectiveness of regional versus general anesthesia for hip fracture surgery in adults. Anesthesiology 2012;117:72–92.
2. Zywiel MG, Prabhu A, Perruccio AV, Gandhi R. The influence of anesthesia and pain management on cognitive dysfunction after joint arthroplasty. Clin Orthop Relat Res 2014;472:1453-66.
3. Mason SE, Noel-Storr A, Ritchie CW. The impact of general and regional anesthesia on the incidence of post-operative cognitive dysfunction and post-operative delirium: a systematic review with meta-analysis. J Alzheimers Dis 2010;22(Suppl. 3):67-79.
4. Neuman MD, Silber JH, Elkassabany NM, Ludwig JM, Fleisher LA. Comparative effectiveness of regional versus general anesthesia for hip fracture surgery in adults. Anesthesiology 2012;117:72-92.
5. Garstin WIH, Brown JG, Taylor TC, Howe JP. Spinal anaesthesia for surgical correction of fracture of the proximal femur. Ulster Med J 1987;56(1):39-44.
6. Diakomi M, Papaioannou M, Mela A, et al. Preoperative fascia iliaca compartment block for positioning patients with hip fractures for central nervous blockade: A randomized trial. Reg Anesth Pain Med 2014;39:394–8.
7. Madabushi R, Rajappa GC, Thammanna PP, et al. Fascia iliaca block vs intravenous fentanyl as an analgesic technique before positioning for spinal anesthesia in patients undergoing surgery for femur fractures—a randomized trial. J Clin Anesth 2016;35:398–403.
8. Mosaffa F, Esmaelijah A, Khoshnevis H. Analgesia before performing a spinal block in the lateral decubitus position in patients with femoral neck fracture: a comparison between fascia iliaca block and IV fentanyl. Reg Anesth Pain Med 2005;30:61–161.
9. YunM, HanM, ParkS, etal.Analgesia prior tospinal block in the lateral position in elderly patients with a femoral neck fracture: A comparison of fascia iliaca compartment block and intravenous alfentanil. Eur J Anaesthesiol 2009;26:111.
10. Short AJ, Barnett JJG, Gofeld M, et al. Anatomic study of innervation of the anterior hip capsule: implication for image-guided intervention. Reg Anesth Pain Med. 2018;43:186.
11. Vermeylen K, Soetens F, Leunen I et al. The effect of the volume of supra-inguinal injected solution on the spread of the injectate under the fascia iliaca: a preliminary study. J Anesth 2018; 32: 908e13
12. Vermeylen K, et al. Supra-inguinal injection for fascia iliaca compartment block results in more consistent spread towards the lumbar plexus than an infra-inguinal injection: a volunteer study. Reg Anesth Pain Med 2019;0:1–9. doi:10.1136/rapm-2018-100092.
13. Giron-Arango L, Peng PWH, Chin KJ, et al. Pericapsular Nerve Group (PENG) block for hip fracture. Reg Anesth Pain Med 2018;43:1–63.
14. 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.
15. Haslam L, Lansdown A, Lee J, van der Vyver M. Survey of current practices: Peripheral nerve block utilization by ED physicians for treatment of pain in the hip fracture patient population. Can Geriatr J 2013;16:16‒ 21.
16. Mittal R, Vermani E. Femoral nerve blocks in fractures of femur: Variation in the current UK practice and a review of the literature. Emerg Med J 2014;31:143‒ 7.
17. Parker MJ, Griffiths R, Appadu BN. Nerve blocks (subcostal, lateral cutaneous, femoral, triple, psoas) for hip fractures. Cochrane Database Syst Rev 2002;1:CD001159.
18. Rocha-Romero et al. Pericapsular nerve group (PENG) block for hip fracture in the emergency department: a case series. Anaesthesia Reports 2021, 9, 97–100.
19. Bhattacharya A, Bhatti T, Haldar M.ESRA19-0539 Pericapsular nerve group block – is it better than the rest for pain relief in fracture neck of femur?.Regional Anesthesia & Pain Medicine 2019;44:A116.