ORIGINAL ARTICLE e-ISSN: 2349-0659 p-ISSN; 2350-0964

Fascia Iliaca Compartment Block for Acute Pain Management for Hip Fracture Patient in the Emergency Department

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Abstract

Introduction: Pain is a common presentation to the emergency department (ED) representing 80% of cases. Hip fracture patients are in severe pain on arrival at ED and the provision of appropriate pain relief should be a priority, but proper pain management is still not being conducted in the busy ED. Although fascia iliaca compartment block (FICB) seems to be an ideal technique as it does not require expensive equipment and easy to perform in a patient with hip fracture, it is not being used in ED in our setting. This study is designed to assess the effect of anatomic landmark-guided FICB and compare pain score using a numeric rating scale (NRS) in patients with suspected hip fracture pre- and post-block periodically at the different time frames in a resource-poor setting. **Methodology**: Pain assessment was administered initially with a 10-point NRS that ranged from 0 ("no pain") to 10 (the worst pain imaginable). Patients having a pain score of more than 6 were given FICB. NRS was evaluated at presentation (−1), pre-block (0 min), and post-block at different time frames up to 6 h. Vital signs (blood pressure, respiratory rate, heart rate, pulse, and SpO_2) were recorded at a predetermined time. Thirty minutes after the block, patients were transferred to X-ray where NRS was assessed while positioning for an X-ray. **Results**: Out of 18 patients, eight were men and the remaining 10 were female, with a mean age of 69 (SD ± 6.9) years. The mean pain score at the triage (−1 min) was 8.1 (SD ± 0.7) and before the block was 7.6 (SD ± 0.7). Over the next 6 h, the patients reported a significantly lower mean pain score with the lowest score of 2.3 (SD ± 0.4) at 180 min. **Conclusion**: The FICB is effective, safe and can be easily performed by emergency doctors, especially in a resource-limited setting.

Keyword: Fascia illiaca, Compartment block, Pain, Management, Emergency

Asian Pac. J. Health Sci., (2020); DOI: 10.21276/apjhs.2020.7.4.5

Introduction

Pain is a common presentation to the emergency department (ED).[1,2] Hip fracture is a painful injury, commonly seen in the ED, especially in the elderly.[3-5] Studies examining analgesia in the ED have consistently shown that subtherapeutic pain relief remains a persistent problem.[6,7] It has been shown that patients with pain from hip fractures are under mediated while in the ED particularly in overcrowded facilities.[8]

Conventional pain treatment with NSAID, IV morphine may be inappropriate and has a delirious side effect, especially in the elderly, therefore, regional anesthesia technique has been advocated as an alternative treatment,[6,9] which includes peripheral nerve blockade.[5] There are different types of regional anesthesia used, femoral nerve block (FNB), 3 in 1 FNB, and fascia iliaca compartment block (FICB).[10] FNB can be conducted but usually requires additional skill and need for expensive equipment such as nerve stimulator or sonography. Therefore, in the resource-limited emergency department like ours in a developing country, FICB which was first described in 1989 by Dalens[11] would be ideal because it does not require expensive equipment and it is easy and safe to perform as been shown by studies.[12] There have been studies to show that FICB can be performed by junior doctors as well after brief training.[13] This study is designed to assess the effect of FICB and compare pain score using a numeric rating scale (NRS) in patients with suspected hip fracture pre- and post-block periodically at a different time frames.

Methodology

Study Design

This is a prospective study carried out in the ED of B.P. Koirala Institute of Health Sciences, Dharan, over a period of 3 months (January–March 2015).The sample size was 18, calculated from the mean difference in pain score from literature by Candal-Couto *et al*.[14]

After informed consent, 18 patients who met the inclusion criteria were enrolled. Eligible patients were patients with a clinical or radiological sign of hip fracture. Patients were excluded if they have a history of drug allergies to local anesthetics, a history of bleeding disorders, periphery neuropathy, psychiatric disorders, and infection at the site of injection. The study was approved by the institute ethics and research committee.

Pain assessments and severity were carried out initially at triage in patients with suspected hip fractures by triage nurse using subjective pain score a 10-point NRS that ranged from 0 ("no pain") at the fractured site to 10 (the worst pain imaginable). The patient was then initially evaluated by the fellow resident in emergency medicine, for clinical suspicion of hip fracture and was included in the study in the patient who had a pain score

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How to cite this article: Giri R, Bhandari R, Ghimire A, Poudel M, Ashok Y, Ajay Y. Fascia Iliaca Compartment Block for Acute Pain Management for Hip Fracture Patient in the Emergency Department. Asian Pac. J. Health Sci., 2020; 7(4):19-22

Source of support: Nil

Conflict of interest: None

Received: 26/05/2020 **Revised:** 15-07-2020 **Accepted:** 05/08/2020

>6. Patients with a radiologically proven hip fracture (done outside) were also included if they had pain score >6. The doctor performing the block explained the NRS to the patients before the procedure and recorded.

Pain score more than 6 were given FICB in the resuscitation area with an ECG and SpO_2 monitor. NRS was evaluated at the presentation at triage (−1), pre-block (0 min), and post-block at 15 min, 30 min, 1 h then after 3 h, and 6 h. Vital signs including blood pressure (BP), respiratory rate (RR), heart rate (HR), pulse, and SpO_2 were also recorded at a predetermined time. Thirty minutes after the block patients were transferred to the X-ray room and NRS was assessed when positioning for an X-ray. Patients having the same level of pain post-block or having NRS >6 when positioning for X-ray was assigned to give morphine (0.1 mg/kg) in the form of rescue analgesia and were excluded from the study. Block failure was noted if they have the same level of pain as before the block. To assess pain control, additional analgesia received pre or after the block was also recorded. Injection morphine 0.1 mg/kg would be given as rescue analgesia. Assuming our patients would be approximately 50 kg, the standardized would be 5 mg for most of the patients. Adverse events and procedural complications including site hematoma, systemic intoxication was recorded if any.

Procedure: After informed consent, the procedure was carried out by an emergency fellow resident who has received short training from the anesthesiologist to perform FICB. Drugs were prepared by mixing 15 ml of 0.5% of bupivacaine and 15 ml of normal saline, a total of 30 ml (75 mg) (1.5/kg). A 10-cc syringe needle was used to perform the block. The procedure and the technique of FICB were performed as described by Dalens *et al*.[11] The patient was taken to resuscitation area with a monitor where pulse, BP, SpO_2, and RR were monitored and then positioned supine for the block. A line was drawn from the pubic tubercle to the anterior superior iliac spine. The line was divided into three equal sections, the puncture site was marked 1 cm caudal to the point dividing the lateral third and medial two-thirds of the line. The femoral artery was identified to make sure that it was at least 2 cm medical to the intended puncture site. After skin disinfection, the skin was pierced with a needle perpendicular to the skin. Using the loss of resistance method, the needle was inserted until a loss of resistance was first felt as it passed the fascia lata and again when the fascia iliaca was pierced (often described as two "pops"). After negative aspiration, 30 ml of an equal volume mixture of 0.5% of bupivacaine and normal saline were injected slowly. Instructions were given to withholding strict avoidance of additional analgesia till 30 min of the block to minimize confounding bias. To assess pain control, the additional analgesic patient received pre- and post-block was also recorded. All data analyses were conducted with SPSS for Windows version 10. Test for significant pain difference was done with the Student's *t*-test.

Results

A convenience sample of eighteen patients was enrolled in this study. One patient who received a FICB on the clinical ground did not have a hip fracture but have a pelvic fracture so was excluded after X-ray and was not followed up. Hence, the extra patient was, therefore, included.

The patient's demographic and the fracture details are shown in Table 1.

Evaluation of the Block

The mean pain score at the triage (−1 min) was 8.1 (SD ± 0.7). Time 0 was recorded just before the administration of the nerve block, and the mean score at time 0 was 7.6 (SD ± 0.7). Over the next 6 h, the patients reported significantly lower mean pain scores as compared to time 0. Figure 1 displays the mean (NRS) pain score reported at each time point.

The lowest mean score of 2.3 (SD ± 0.4) was achieved at 180 min. All of the decreases in the pain scores were statically significant, with $P < 0.001$ from the time 0 versus each time point interval till 6 h.

Table 2 displays the patient's vital signs (mean arterial blood pressure, HR, and RR) including the NRS score evaluation at different points of time. During the 6-h observation period, there was a gradual trend toward normalization of vital signs as shown in the table.

A significant difference of pain relief was noted in the level of pain experienced by patients from 15 min to 6 h after the block. At 15 min, mean difference of pain was only 1.6 (SD ± 0.5) and at 30 min increased to 2.7 (SD±). Thereafter, patients reported significantly decreased pain score and the mean difference from time 0 to 1 h was 5.2 (SD ± 0.8), Figure 2.

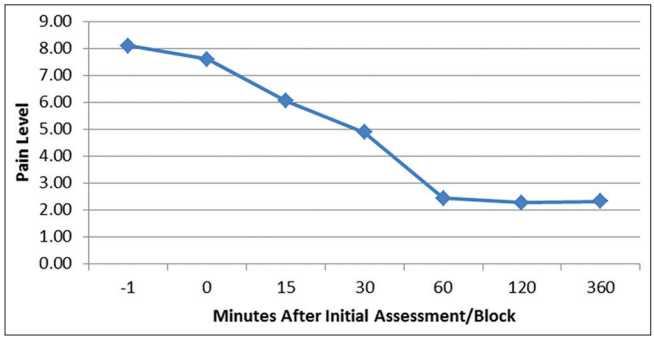

Figure 1: Mean numeric rating scale pain scores

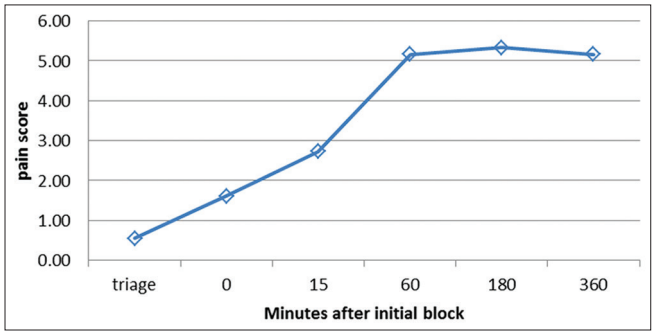

Figure 2: Mean difference in numeric rating scale pain score

Table 1: Demographic data of patients with hip fracture receiving FICB

Age (mean)	69±6.9
Sex	
M/F	8/10
Ratio	4:5
Wt	59±6.5
Fracture type	18
Intertrochanteric	10
Subtrochanteric	2
Neck of femur	6

FICB: Fascia iliaca compartment block

Table 2: Patients' vital signs, including pain score (NRS) evaluation

Time of block	*Triage*	*0 min*	*15 min*	*30 min*	*60 h*	*180 min*	*6 h*
NRS	8.1±0.7	7.6±0.7	6.06±0.7	4.8±0.57	2.4±0.5	2.3±0.4	2.3±0.5
P-value	-	-	<0.001	<0.001	<0.001	<0.001	<0.001
MAP	96.7±6.5	96±5.2	91.6±5.11	86.8±4.4	86±3.8	84.7±3.9	84.4±3.8
HR	95±10	96±9.7	90.4±7.5	85.9±9.3	82.8±7.1	83±7.0	80±5.7
RR	20±0.9	20±0.9	19±1	19±0.7	19±0.7	18±0.7	18±0.8

NRS: Numeric rating scale, MAP: Mean arterial blood pressure, HR: Heart rate, RR: Respiration rate

Although 80% of the patients already received analgesia in the form of diclofenac or tramadol before performing the block either outside the hospital or in hospital soon after the triage, the NRS was still high (mean at 0 min = 7.6). None of the patients requested additional analgesia over 6 h of time post-block.

There was no adverse toxicity of bupivacaine, such as seizures, arrhythmia, or cardiovascular collapse recorded. No local complication such as hematoma, infection, and persistent paresthesia was observed within the 24 h post-block.

Discussion

FICB has not been previously assessed as an acute analgesic procedure in hip fractures in our emergency department. This study shows that FICB using anatomical landmark technique provides significant pain relief in an emergency when performed by an emergency physician or resident with minimal training.

Although FICB had been advised for pain relief for the hip fracture,[13,15] this procedure was not done in our emergency. Pain management in hip fracture patients is often based on local tradition and ED staffing than the evidence.[15] A recent study done in our hospital showed that the majority of doctors preferred to give analgesia on "as required basis" or as "stat" doses (73%) rather than as a periodic regular prescription.[16] In that study, diclofenac injection was found to be the most common analgesic used.

The FICB was first described in 1989 by Dalens and performed earliest on children and later in adults.[11] It was mainly used for post-operative pain management (hip and femur fracture).[9,11] There are studied which has been performed in an emergency by junior registrars' doctors as well with success.[13] This technique has been also routinely used in the emergency department of many hospitals in recent years.[7] Golzan *et al*.[17] reported from his study that emergency medicine physicians trained in the technique can perform with a high success rate. They had performed FICB in 52 patients of femoral fracture with a success rate of 94%. Similar results were obtained in the study by Elkhodair[7] which shows effective block 77% when FICB performed by medical personnel staffing in the ED. Most of the studies done before were in a well emergency setting or operating room in a developed country using a blunt 21-gauge or a Tuohy needle but, in this study, a 10-cc intramuscular injection syringe needle was used successfully as those needles were seldomly available.

In this study, all the patients had already received analgesia in the form of either tramadol or diclofenac before receiving the block (either in or out of the hospital). Even with the conventional pain treatment with these drugs, there was no significant drop in mean pain score before the block from the triage time (mean difference was 0.6 ± 0.7) which shows that it is not an appropriate choice of analgesia for hip fracture.

There was a significant decrease in mean pain score over 6 h post-FICB, but the mean reduction of pain score at 15 min was not higher 6.06 (SD ± 0.7) when compared to other studies that show a higher reduction in the pain score at 15 min (2.9, 3.38).[5,18] However, at 30 min and thereafter, the mean reduction of pain was comparable with those studies. Although statistically significant $P < 00.1$ at 15 min, the ideal time for the X-ray would be after 30 min after the nerve block as shown by the study with a mean pain reduction of 4.8 (SD ± 0.57) at 30 min, as these patients' need to be transported and shifted from trolley to trolley to perform X-rays. The lowest mean score being 2.3 (SD±) at 180 min which is comparable with the other studies[5,18] which also showed the mean pain score 1.3 at 120 min.

None of the patients requested additional analgesia over 6 h of time post-block which is in contrast to other studies who required additional analgesia for pain relief.[5]

The FICB technique is performed with minimal risk to the patients as the anesthetic drugs are given at a safe distance from the neurovascular bundle.[7] Although transient femoral neuropathy has been reported after FICB, this appears to be a rare occurrence. Other side effects include site hematoma, intravascular injection, local anesthetic toxicity, and block failure site infection.[19,20] Close observation of the patients' vital signs increased the safety profile of the procedure by allowing the early detection of side effects, though we did not observe any side effects of the FICB which was similar to studies that also did not report any side effects.[15] However, some studies have reported fewer side effects (local hematoma).[18]

In our study, we achieved effective blocks in all patients. Our result is higher than other studies in which the block success was 67%[15] and 75–80%.[12] The higher success rate may be due to single residents performing the block most of the time and the sample was also small.

Limitation

This was a single hospital-based study with a limited number of sample size. Only subjective pain score was analyzed. A more objective pain assessment would have been a better measure to assess the efficacy of the block, although it would not be feasible to accomplish in a busy ED.

Conclusion

The FICB is effective, safe and can be easily performed by emergency physicians and residents in a recourse-poor emergency and it is an excellent method of pain control in the busy emergency department as this procedure does not require expensive equipment's. Easily available 10-cc needle can be used to perform FICB using two pop-up techniques as described by Dalens *et al*. It is hoped that through this change of practice, the amount of conventional pain treatment and their side effect can be reduced and patients get adequate pain relief.

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