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Femoral Nerve Block in Patients with Femoral Shaft Fractures in Emergency Department

Ali Arhami Dolatabadi[1], Hamid Reza Hatamabadi[1,2], Ali Shahrami[1], Majid Shojaee[1], Sogol Matin[1]

[1]Emergency Medicine Department, Immam Hossein Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran
[2]Safety promotion and injury prevention research center, Shahid Beheshti university of medical sciences, Tehran, Iran

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ABSTRACT

Background: Femoral shaft fracture is a common problem in emergency departments. The aim of this study is comparing femoral nerve block (FNB) method with morphine administration for analgesia in patients with femoral shaft fractures.
Method: This randomized clinical trial was conducted in the emergency department of Imam Hossein Hospital in the year 2012 and in the patients with femoral shaft fractures and aged greater than 6 years. Patients were divided into two treatment groups: FNB and morphine groups. In FBN patients, femoral nerve block using 4mg/kg of 1% Lidocaine and 0.1mg/kg morphine administration were performed by an emergency medicine resident. Pain scores were evaluated using Visual Analog Scale (VAS) method before administration, 5 minutes, and 1, 2 and 3 hours after administration. The data was analyzed using SPSS Ver. 20. Multivariate analysis, T-test, and chi-square were used for comparison of the variables and the level of statistical significance was considered to be $p < 0.05$.
Results: There were 59 patients in each group. The mean and standard deviation of age of the patients were 35.2±17.8 years. The onset of the methods was significantly shorter in the FNB group comparing the morphine group (2.2±6.6 vs. 4.1±1.1 min) ($p<0.01$). Pain scores in treatment intervals were significantly lower in the FNB group than the morphine group. The lowest pain score was observed for the interval of 1 hour in the FNB group (5.6±0.9 min). Age, gender, social habits and underlying diseases had no significant impact on the efficacy of the methods.
Conclusion: The findings showed that FNB is a safe and efficacious method for pain management of femoral shaft fractures in emergency departments.
KEYWORDS: Femoral shaft fracture, Femoral nerve block, Pain management, Emergency department.

INTRODUCTION

Femoral shaft fractures are a common problem in emergency departments that is associated with a lot of pain for patients. Relief of the severe pains due to femoral shaft fractures can provide the patients with comfort and mitigate their discomforts (1-5). FNB has been reported as an effective method for analgesia in the event of femoral shaft fractures both in pre-hospital stage and in emergency departments (6, 7).

Since the use of systemic analgesic drugs may be limited due to unreliable neurological examination resulting from head injuries, adopting the methods with certain local effects is preferred to other analgesic agents such as opioids (20). Performing preoperative and postoperative peripheral nerve block in patients reduces the risks, complications associated with intraneural, and intrathecal administration. Peripheral nerve block reduces operating room time and hospital length of stay and patients can be discharged sooner (23).

Electrical stimulation for locating the brachial plexus was recorded for the first time by Perthes in 1912. However, the acceptance of this technique to aid in performance of peripheral nerve block was not realized until the 1960s. Greenblatt and Denson demonstrated that motor nerves can be stimulated without eliciting pain and that the current required to stimulate the nerve depends on the distance between the needle and the target nerve. Peripheral nerve stimulation techniques have largely replaced paresthesia techniques for most major conduction blocks, especially in lower extremity blockades and had a high success rate (23). Nerve stimulators help to position needle in closer proximity to the nerve without a required contact with the nerve (paresthesia) and with less discomfort for the patient (23).
Given the importance of pain relief in patients with femoral shaft fractures in the emergency departments and due to the lack of conducted studies in this regard in Iran, this study aimed to compare the efficacy of FNB technique and standard pain management in patients with femoral shaft fractures in Imam Hossein Hospital.

Corresponding Author: Dr. Sogol Matin, resident of emergency medicine. Immam Hossein hospital, Shahid Beheshti University of Medical science, Tehran, Iran. Email: sogolmatin84@gmail.com, Tel: +982173432380

METHOD

This randomized clinical trial was performed on the traumatic patients with femoral shaft fractures who were referred to trauma department, Imam Hossein Hospital. Inclusion criteria were femoral shaft fracture and age of greater than 6 years. All other patients with fracture in the same limb, multiple trauma, loss of consciousness, neurological and vascular disorders associated with trauma in the affected organ, and patients with unstable vital signs, allergies to local anesthetics, the patients who refused to be treated by the analgesic method and who had received analgesic medication pre-medically were excluded.

The data of the patients included: demographic information, taking medications or narcotic drugs, associated underlying conditions, associated trauma, the used method of analgesia, onset of action, duration, the pain scores before and after conducting analgesic method and the complications due to the method, all which were recorded in the checklists.

Patients with inclusion criteria were randomly divided into two groups, a group, which received intravenous morphine, and the other group that was treated using sonography-guided femoral nerve block. Analgesia in the first group was performed by intravenous administration of 0.1mg/kg morphine and in the second group nerve block was performed using 4 mg/kg of 1% Lidocaine, and then the affected limb was immobilized with a wire splint in both groups. FNB and morphine administration were performed by the resident researcher. Pain scores were measured using Visual Analog Scale (VAS) method before administration, 5 minutes, and 1, 2 and 3 hours after administration by a second-year resident who was unaware of analgesia method. Letter of Consent for participation in the study was signed by all patients or their companions.

SPSS Ver. 20 was used for data analysis. Description of the data was performed using mean, standard deviation, frequency and percentage. The multivariate test was used to compare the efficaciousness, and the level of statistical significance was considered to be $p < 0.05$.

RESULTS

Totally, 117 patients were included in the study, of whom 93 patients (79.5%) were males and 24 patients (20.5%) were females. The mean and standard deviation of age of the patients were 35.2±17.8 years. The youngest patient was 10 years old and the oldest one was 87 years old; 25 patients (21.4%) were less than 20 years old, 55 patients (47%) were between 20 and 40 years old, 24 patients (20.5%) between 40 and 60 years old and 13 patients (11.1%) were greater than 60 years old. Then, 58 patients were treated with morphine (the morphine group) and 59 patients received FNB treatment (the block group). The two groups were not significantly different in terms of age, and 97 patients (82.9%) had no disease, 1 patient (0.9%) suffered from diabetes mellitus, 4 patients (3.4%) had a history of underlying disease of HTN, 1 patient (0.9%) CRF, 8 patients (6.8%) CAD, 1 patient (0.9%) COPO and 5 patients (4.3%) had more than one underlying disease. Totally, 50 patients (42.7%) did not have any kind of social practice, 48 patients (41%) were smokers, 5 patients (4.3%) had a history of drug use and 14 patients (12%) had more than one of such habits.

Associated traumas in patients reported as follows: 1 case of assault (0.9%), 3 cases of (2.6%) contralateral fractures of toes (2.6%), 1 case of ipsilateral fractures of toes (0.9%), 1 case of contralateral fracture of fibula (0.9%), 1 case of contralateral metacarpal fracture (0.9%) and 1 case of ipsilateral metacarpal fracture (0.9%), 9 cases of chest fractures (7.7%), 7 cases of ipsilateral distal radius fracture (6.6%), 2 cases of contralateral distal radius fracture (1.7%), 1 case of ipsilateral fractures of fingers (0.9%), 2 cases of contralateral fracture of fingers (1.7%) and 4 cases of more than one trauma (3.4%). The types of trauma were as follows: 1 case of assault (0.9%), 4 cases of motorcycle accidents (3.4%), 12 cases of falling down (10.3%), 21 cases of CCA (17.9%), 53 cases of MCA (45.3%), 6 cases of MMA (5.1%), 7 cases of PCA (6%) and 2 cases of direct trauma (1.7%).

No complication was observed among the patients in the block group and 1 patient in the morphine group suffered from nausea and vomiting.

In the morphine group, the mean and standard deviation of pain scores was 10 minutes for the time before administration, 7.7±0.9 minutes for 5 minutes after administration, 6.9±0.8 minutes for 1 hour after administration, 8.8±1.3 minutes for 2 hours after administration and 9.8±0.4 minutes for 3 hours after administration. In the block group, the mean and standard deviation of pain scores was 5 minutes for the time before administration, 7±1.1 minutes for 5 minutes after administration, 5.6±0.9 minutes for 1 hour after administration, 6.4±1.1 minutes for 2 hours after administration and 8.9±1.2 minutes for 3 hours after administration.

The mean and standard deviation of onset of analgesia in the morphine group was 4.1±1.1 minutes and in the block group it was 2.2±0.6 minutes. Onset of analgesia in the block group was significantly shorter than that of the morphine group ($p < 0.001$). To test the efficaciousness of different treatments at different time intervals, repeated measures analysis of variance was performed. Descriptive results showed that the mean of the scores decreased until 1 hour after administration and then it slightly increased. Multivariable analysis showed that there was a significant difference between the mean of the scores of two groups ($P < 0.001$); also there was a significant

difference between the mean of the scores at different time intervals (P <0.001). The lowest mean of the scores was related to 1 hour after administration and equal to 6.28, while the highest mean of the scores was 10 and before treatment.

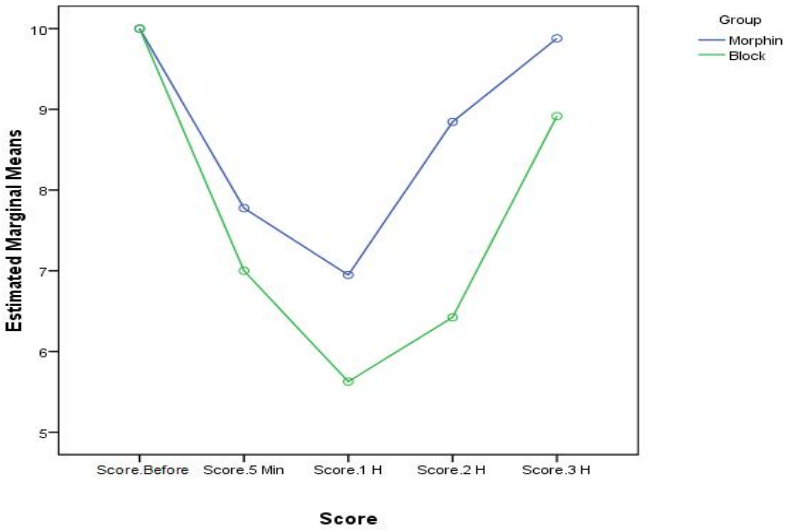

Figure 1: Changes in visual analog scores of the study groups over time.

The trend of changes was similar in both treatment groups (decreasing and then increasing), however the scores in the block group was significantly lower than that of the morphine group. (Figure 1). The mean and standard deviation of scores were 7.593±0.082, for the block group and 8.690±0.083 for the morphine group, respectively. No significant correlation was observed between pain scores at different time intervals related to underlying disease and social habits.

DISCUSSION

In this study, sonography-guided femoral nerve block technique was compared with standard pain management in patients with femoral shaft fractures who were referred to emergency department, Imam Hossein Hospital. The findings showed that femoral nerve block is an appropriate and efficient method for pain relief of femoral shaft fractures in the emergency department. Patients who underwent FNB experienced earlier onset of analgesia.

Femoral shaft fractures in patients are associated with severe pain, and if pain is not relieved in time, it will lead to discomfort and anxiety in patients. Pain management of such patients in emergency departments is one of the major goals of the treatment teams. FNB is one of the methods used for pain management used in emergency departments (17). By review of literature, we found several studies conducted for the use of this method. In the present study, FNB was performed using 4 mg/kg of 1% Lidocaine. In another study, 10 ml of 1% Lignocaine and 1:200000 Adrenaline (archmed), and yet in another previous study 20 ml of 0.5% Bupivacaine (12), and in another one 1% Lidocaine and 1:180000 Adrenaline (16) have been used, and analgesia was achieved in all cases. Review of literature also shows the use of 4.5mg/kg of Lignocaine (1-1.5%), or 7mg/kg of Mepivacaine (1-2%) or 2-3 mg/kg of Bupivacaine (0.25-0.37%) for FNB (11).

Choosing each of these anesthetic drugs is dependent on the patient and duration of anesthesia. For 2-4 hour blocks, Lignocaine and Mepivacaine may be used (19). Bupivacaine's effect lasts for 6 to 8 hours, and adding 5 mg/ml of Adrenaline increase the duration. In this study, pain scores were evaluated using Visual Analog Scale (VAS) method (scores from 0 to 10; from no pain to severe pain). The onset time in the FNB group was significantly shorter than that in the morphine group (2.2±0.6 to 4.1±1.1 min) (p <0.01).

The results showed the maximum reduction in pain scores occurred 1 hour after administration; and for the time intervals after 1 hour (i.e. 2 hours), pain scores had increased. Pain scores at 1 hour interval were significantly lower in the block group than the control group (5.6±0.9 vs. 6.9±0.8 min) (p <0.05). In similar studies, FNB had provided more pain relief than morphine administration (11) and 15 minutes after nerve block, the pain was significantly lower than morphine administration and analgesia lasted for 2 hours in the block group. The results of the current study indicate that FNB has caused more pain relief vs. injection of narcotic drugs and provide more comfort for patients. In Salvatore's study (2) in which FNB was performed using with 15 ml of 1.5% Lidocaine, the median pain score of 0.5 (0-1) was significantly lower than the same score in the

Fentanyl group during positioning (13) ($p < 0.001$). In addition, the average duration of spinal anesthesia in the block group was 3±1.1 minutes ($p < 0.01$). The results of the study concerning advantage of FNB for analgesia in fractures of the femoral shaft are consistent with the results of our study. In another study, the patients of the FNB group achieved the lowest pain score in shorter time (2.8 hours), compared to the control group (5.8 hours). Furthermore, the block group received significantly less morphine per hour than the control group (0.49 mg vs. 1.17 mg) (5). In another previous study where FNB was used, a significant difference was observed in pain relief at 15-minute (4.8 vs. 6.4) and 2-hour (3.7 vs. 5.9) intervals compared to the control group ($p < 0.05$). In addition, a significant reduction in the need for administration of narcotic drugs was observed in the block group compared to the control group ($p < 0.05$). This study's results regarding the efficaciousness of FNB technique in analgesia are similar to the present study. Statistical analysis to determine the efficacy of FNB vs. morphine administration based on gender, age, underlying conditions and social habits indicated that the performance of the methods in the two groups were not significantly different in terms of gender, age, underlying conditions and habits, and these results are consistent with previous findings (1).

In the present study, no complication was observed in the FNB group and in the morphine group, only one patient suffered from nausea and vomiting. Complications of FNB include: nerve damage, intravenous injection, hematoma, infection, systemic toxicity, muscle damage, allergy and overdose (1). By review of literature, we found no instance of complications due to FNB in emergency departments. Possible side effects are generally caused by poor technique, thus FNB nerve block should be performed by an experienced physician.

Limitations

The current study had some limitations, and most importantly was the sample size. Statistical population in this study was a small community and included the emergency department of a teaching hospital in Tehran. Multicentric retrospective and prospective studies are required for more comprehensive conclusion regarding the application of FNB.

Conclusion

This study compared the efficacy of FNB and standard pain management methods in patients with femoral shaft fractures in the emergency department of Imam Hossein Hospital. The results of this study showed that FNB method provided quicker analgesia than the standard method of morphine administration. In addition, FNB procedure did not cause any type of complication in patients; thus, FNB can be used as an efficient, safe and beneficial technique for pain relief caused by femoral shaft fractures in emergency departments. Further studies are required to generalize these results.

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The authors declare that they have no conflicts of interest in this research.

REFERENCES

1. Starr AJ, Bucholz RW. Fractures of the shaft of the femur. In: Bucholz RW, Heckman JD, eds. Rockwood and Green's fractures in adults. 5th ed. Philadelphia, PA: Lippincott Williams & Wilkins, 2001:1683–1730.
2. McGlone R, Sadhra K, Hamer DW, Pritty PE. Femoral nerve block in the initial management of femoral shaft fractures. Arch Emerg Med 1987;4:163–8.
3. Barriot P, Riou B, Ronchi L, Bellaiche S. Femoral nerve block in prehospital management of fractured shaft of femur. JEUR 1988; 1:21–4.
4. Capdevilla X, Biboulet P, Bouregba M, et al. Bilateral continuous 3-in-1 nerve blockade for postoperative relief after bilateral femoral shaft surgery. J Clin Anesth 1998;10:606–9.
5. Capdevilla X, Biboulet P, Bouregba M, et al. Comparison of the three-in-one and fascia iliaca compartment blocks in adults: clinical and radiographic analysis. Anesth Analg 1998; 86:1039–44 6.
6. Todd CJ, Freeman CJ, Camilleri-Ferrante C, et al. Differences in mortality after fracture of the hip: the East Anglian audit. BMJ. 1995;310:905-908.
7. Bonica JJ. Importance of effective pain control. Acta Anaesthesiol Scand. 1987;31(suppl 85):1-16.
8. Capdevilla X, Biboulet P, Bouregba M, et al. Comparison of the three-in-one and fascia iliaca compartment blocks in adults: clinical and radiographic analysis. Anesth Analg 1998;86:1039–44.
9. Lopez S, Gros T, Bernard N, et al. Fascia iliaca compartment block for femoral bone fractures in prehospital care. Reg Anesth Pain Med 2003;28:203–7.
10. Urbanek B, Duma A, Kimberger O, et al. Onset time, quality of blockade, and duration of three-in-one blocks with levobupivacaine and bupivacaine. Anesth Analg 2003;97:888–92.
11. CW Tam and TH Rainer. Femoral nerve block for pain management of femoral ractures in the emergency department: evidence based topic review. Hong Kong j. emerg. med. Vol. 12(3) Jul. 2005.

12. Fletcher AK, Rigby AS, Heyes FL. Three-in-one femoral nerve block as analgesia for fractured neck of femur in the emergency department: a randomized, controlled trial. Ann Emerg Med 2003;41(2):227-33.
13. Sia S, Pelusio F, Barbagli R, Rivituso C. Analgesia before performing a spinal block in the sitting position in patients with femoral shaft fracture: a comparison between femoral nerve block and intravenous fentanyl. Anesth Analg 2004;99(4):1221-4.
14. R McGlone, K Sadhra, D W Hamer, and P E Pritty. Femoral nerve block in the initial management of femoral shaft fractures. Arch Emerg Med. 1987 September; 4(3): 163–168.
15. Vloka JD, Hadzic A, Drobnik L, Ernest A, Reiss W, Thys DM: Anatomical landmarks for femoral nerve block: a comparison of four needle insertion sites. Anesth Analg 1999; 89:1467-70
16. Antappa Shantappa Tondare, Arvind Vithalrao Nadkarni. Femoral nerve block for fractured shaft of femur. May 1982, Volume 29, Issue 3, pp 270-271
17. 12. Parker MJ. Managing an elderly patient with a fractured femur. BMJ. 2000;320:102-103.
18. Berry FR. Analgesia in patients with fractured shaft of femur. Anaesthesia 1977;32(6):576-7.
19. Prithvi Raj P, editor. Textbook of regional anesthesia. Philadelphia, PA: Churchill Livingstone; 2002. p. 204,206, 364, 365.
20. Tintinalli. Emergency medicine A comprehensive study guide 7th edition 2010.
21. B.Naghvi M .etc.Burden of disease and risk factors and healthy life expectancy in Islamic Republic of Iran 2003, in national level and for 6 provinces. Ministry of Health and Medical Education .2006
22. Arissara Lamaroon; Femoral nerve block versus fentanyl: Analgesia for positioning patients with fracture of femur. Dove press journal: Local & Regional Anesthesia 2010 March 20; 3 21-26.
23. Peripheral nerve block. Edited by Jacques E Chelly, M.D., Ph.D., M.B.A. Second Edition 2004.