ORJİNAL ÇALIŞMA

FEMORAL BLOK UYGULANMIŞ KALÇA KIRIKLI OLGULARDA BLOĞUN SPİNAL ANESTEZİNİN FARKLI POZİSYONLARI ÜZERİNE ETKİNLİĞİNİN DEĞERLENDİRİLMESİ

Evaluation of the Effectiveness of the Block on Different Positions of Spinal Anesthesia in Patients with Hip Fractures Treated with Femoral Block

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ÖZET

Amaç: Tek doz femoral sinir blokajının (FNB) kalça kırığı cerrahisinde ultrasonografik kılavuzluk altında sedyeden ameliyat masasına transfer sırasında, lateral dekübit veya spinal anesteziden önce oturma pozisyonlarında etkinliğini değerlendirmeyi amaçladık

Yöntem ve Gereçler: Sedye üzerinde ultrasonografik rehberlik altında tek doz FNB uyguladık. Görsel Analog Skala (VAS) skorları sedyeden ameliyat masasına transfer sırasında ve spinal anestezi öncesi lateral dekübit pozisyonunda (grup I) veya oturma pozisyonunda (grup II) değerlendirildi

Bulgular: Grup I'de 2.96 ± 0.55 transfer sırasındaki VAS skorları ve lateral dekubit pozisyonda 3.33 ± 0.54, başlangıç 7.47 ± 0.68, P <0.001 VAS skorlarından anlamlı olarak düşüktü. Ancak, transfer sonrası hastalar lateral dekübit pozisyonuna geçtiklerinde VAS skorlarında anlamlı bir artış vardı

II. Grupta 3.06 ± 0.52 transfer sırasındaki VAS skorları ve 2.96 ± 0.49 oturma pozisyonunda başlangıç 7.56 ± 0.62, V <0.001 VAS skorlarından anlamlı olarak düşüktü. Hastaların transfer sonrası oturma pozisyonuna geçerken VAS skorlarında anlamlı bir artış olmadı P <0.001

Tartışma ve Sonuç: Kalça kırıklı hastalarda ağrı yönetimi için FNB yapılması, hasta transferi sırasında ve spinal anestezi öncesi hem oturma hem de lateral dekübit pozisyonlarında etkiliydi. Bununla birlikte, lateral dekübit pozisyona kıyasla VAS skorlarının oturma pozisyonunda daha az yükselmesi oturma pozisyonunun daha az ağrılı olduğunu göstermiştir.

Anahtar Kelimeler: *Femoral sinir bloğu; Spinal anestezi; Femur kırığı*

ABSTRACT

Introduction: We aimed to evaluate the efficacy of single-dose femoral nerve blockade (FNB) under ultrasonographic guidance in hip fracture surgery during transfer from the stretcher to the operating table, in lateral decubitis or sitting positions before the spinal anesthesia

Methods: We performed single-dose FNB under ultrasonographic guidance on the stretcher. Visual Analogue Scale (VAS) scores were calculated during transfer from the stretcher to the operating table and in lateral decubitus position (group I) or in sitting position (group II) before spinal anesthesia

Results: In group I, VAS scores during transfer 2.96±0.55 and in lateral decubitis position 3.33±0.54 were significantly lower than the VAS scores at the beginning 7.47±0.68, P<0.001. However, there was a significant increase in VAS scores when the patients moved to lateral decubitis position after transfer.

In group II, VAS scores during transfer 3.06±0.52 and in the sitting position 2.96±0.49 were significantly lower than the VAS scores at the beginning 7.56±0.62, P<0.001. There was no significant increase in VAS scores when the patients moved to sitting position after transfer P<0.001

Conclusion: Performing FNB for pain management in hip fracture patients was effective during patient transfer and in both sitting and lateral decubitis positions before spinal anesthesia. However, the lesser elevation of VAS scores in sitting position when compared to lateral decubitis position indicated that sitting position was less painful

Keywords: *Femoral nerve block; Spinal anesthesia; Femur fracture*

INTRODUCTION

Preoperative analgesia is necessary in patients with femoral fractures for the management of problems related to reduction and traction (1). Patients may experience severe pain during positioning for transfer or a spinal blockade, and therefore effective pain relief with an effective analgesic procedure will prevent sudden hemodynamic changes and increase patient cooperation (2). It is known that a peripheral nerve blockade under ultrasound guidance can provide rapid, safe and effective acute pain relief, and so can contribute to existing pain management protocols (3,4). An ultrasonography (USG) allows the anatomical structures to be identified, to image the tip of the needle and even observe the local anesthetic (LA) spread. USG has increased the success rate of regional anesthesia and has reduced the complications related to peripheral nerve blockades (5).

Peripheral nerve blockades are seeing increasing use for the provision of adequate pain relief in patients with femoral fractures (6,7). Providing effective analgesia by way of a femoral nerve block (FNB) may further reduce the side effects of such systemic analgesics as nonsteroidal anti-inflammatory drugs and opioids by reducing their usage. FNB lacks the side effects associated with systemic analgesics, such as vomiting, urinary retention, pruritus, epigastric pain, nausea, headache, dizziness and rash (3,8). In FNB, the injected substance is spread in the lateral and cranial directions. The infiltration of the femoral sheath causes the femoral nerve, obturator nerve, lower cords of the lumbar plexus and lateral cutaneous nerve to be blocked (9).

In our clinic, all lower extremity fractures are usually managed under spinal anesthesia. For this reason, we decided to carry out this study of patients with femoral fractures to evaluate the efficacy to of FNB by using single dose of lidocaine and bupivacaine, administered in the lateral decubitus/sitting position during transfer and prior to spinal anesthesia on VAS score.

MATERIAL AND METHODS

Of 127 patients who were operated on for radiologically confirmed hip fractures (femur neck, intertrochanteric or pericapsular) in the orthopedic clinic of our hospital between 2016 and 2018, data of a total of 60 patients who were performed femoral nerve blockade (FNB) and subsequent spinal anesthesia in sitting or lateral positions n=30 and n=30, respectively were reviewed. The study protocol was approved by the local ethical board (Approval date / ID : March 13rd, 2018 / 18-68).

Patient selection

Patients in the ASA IV and above risk groups, patients who have undergone previous vascular surgery on the same side of the fracture and patients with femoral vascular grafts, an infection at the injection site, hemorrhagic diathesis, known allergies to local anesthetics and multiple organ injuries were excluded.

Femoral nerve blockade procedures

In our clinical practice, the patient with hip fracture is monitorized on the stretcher in the operating room in terms of hemodynamic parameters, oxygen saturation, electrocardiogram, respiratory rate, pulse rate and blood pressure. A crystalloid solution is started intravenously (IV) in the rate of 2 ml/kg/hour. For sedation, 1–2 mg IV of midazolam is given prior to the procedure. After regional clean-up, FNB is performed in the supine position under ultrasonic guidance (8–14MHz linear probe, EDGE® ultrasound device, Sonosite inc. Bothell, Washington, USA) using the short conical non-traumatic 22-gauge stimulated needle (Unipex Nanoline TM pajunk, Geisingen, Germany).

The femoral vein and artery are centered on the screen to provide optimal imaging and the femoral nerve which is hyperechoic on USG is then anatomically identified. After injecting local anesthetic (LA) agent subcutaneously, the needle is entered with an angle of 45 degree to the skin under direct visualization by USG and the LA solution (1 mg/kg of 0.5% bupivacain, <150 mg totally and 1-2 mg/kg of 2% lidocaine; total volume of the solution: 20 ml) is injected at a constant rate through the nerve sheath. After the success of blockade is controlled by a pinprick test, the patients are taken to the operating table and are given sitting or lateral decubitus positions. Then, spinal anesthesia is performed at the L4–L5 level using 3 ml (5 mg/1ml) of heavy marcaine.

The records of the patients including gender, age, American Society of Anesthesiologists (ASA) score, Visual Analogue Scale (VAS) scores determined on the stretcher prior to the blockade, during transphere to the operating table after the blockade and in sitting and lateral decubitus positions prior to spinal anesthesia, post-operative requirement of opioid analgesics during the first 24 hours were reviewed.

VAS score of four points or less is considered acceptable pain. Patients are routinely started IV analgesic treatment (1000 mg of paracetamol three times daily) postoperatively.

Statistical Analysis

The data analysis was carried out using the IBM SPSS Statistics version 21 (IBM SPSS Inc, Chicago, IL) package program. Descriptive statistics were expressed as mean±standard deviation for continuous variables, and as the number of cases and percentage (%) for the nominal variables. Continuous data with a normal distribution, such as age and BMI, were analyzed using a Student's t test, while categorical data such as sex, ASA were evaluated by a Chi-Square test. The comparison of the repeated measures of VAS scores (Within-Subjects effects [Time]) between the sitting and lateral decubitus position groups (Between-Subjects Effect [lateral decubitus position and sitting group]) was assessed with a Mixed type ANOVA. Normal distributions of data were evaluated using a Kolmogorov-Smirnov test, and variance homogeneity was evaluated by a Levene's test, and all met these assumptions. Since the sphericity assumption was met, repeated ANOVA values were given without correction at the level of independence. Neither multivariate tests nor degrees of freedom were used. Multiple comparisons were evaluated using the Bonferroni adjustment for the main effect of time, and a simple effect analysis with a Bonferroni adjustment was used to resolve any significant interaction terms. Clinical significance was assessed with a partial-etasquare ($\eta 2$) for ANOVA, and with a correlation coefficient (r) for multiple comparisons. Clinical significance was determined according to Cohen's (1969) limit values. The results were considered statistically significant at a p value = <0.05.

RESULTS

Of the 60 patients, 29 were female and 31 were male, and the difference between two groups in terms of mean age, body mass index (BMI), ASA score was not statistically significant (Table 1).

Table 1: Demographic data patient

	Grup Lateral decubitus	Grup sitting	Number of patients	Test Statistics and p Value
Gender Male	n=15 48.4%	n=16 51.6%	n=31 51.6%	p=0.458 (p>0,05)
Gender Female	n=14 48.3%	n=15 51.7%	n=29 48.4%	p=0.458 (p>0,05)
Age Mean±SD	78.40±7.35	77.56±6.57	77.98±6.93	t=0.463 p=0.645 (p>0,05)
BMI Mean±SD	27.47±3.15	26.27±2.78	26.87±3.00	t=1.567 p=0.123 (p>0,05)
ASA 2	n=14 46.7%	n=17 56.7%	n=31	p=0.438 (p>0,05)
ASA 3	n=16 53.3%	n=13 43.3%	n=29	p=0.438 (p>0,05)

The mixed ANOVA results showed that Group (s) significantly interacted with time, F (2.116) = 3.230, P =0.043, η2=0.053 (Table 2). The mean VAS scores measured at three different times were significantly different between Groups 1 and 2. Since the interaction effect is significant, there is no statistical interpretation of this effect on the groups, or its effect on time. The results for the main effects of group and time are shown in Table 2.

The VAS scores of the patients in groups 1 and 2, measured at three different times, were compared with each other. The mean VAS scores measured during the transfer and in the lateral decubitus position were found to be significantly lower than the mean baseline scores (P<0.001). Furthermore, the mean VAS scores measured in the lateral decubitus position were significantly higher than those measured during the transfer (P<0.001). For the patient group in sitting position, it can be said that the mean VAS scores measured during transfer and sitting position were significantly lower than the baseline scores (P<0.001) (Table 2)

In addition to Table 2, the results are presented visually in figure 1, from which it can be seen that the decrease in VAS scores in the two groups occurred in parallel until the measurements in the lateral decubitus and sitting positions. In the first group, the mean VAS score in the lateral decubitus position decreased slightly in the sitting position when compared to the mean VAS score measured during transfer, although not to a statistically significant degree.
The mean VAS score was 1.5±0.5 points in the first 24 hours, postoperatively.
Clinical significance: First, the interaction effect was evaluated, and in addition to statistical significance (p=0.043), the effect size of the study was calculated as medium (0.0099< η2 =0.053< 0.0588) according to Cohen's limit values (0.0099 small, 0.0588 medium and 0.1379 large effect) (10,11) .

Table-2 VAS Score Values According to Positions

VAS Scores (n=60)	Lateral Decubit mean± SD (n=30)	Sitting mean± SD (n=30)	VAS Scores Mean± SD	Main Effect		Interraction Effect	Source of Difference for Time***
				Time	Group		
Begining(1)	7.47±0.68	7.56±0.62	**7.51±0.65**	F=1166.657*	F=0.443	F=3.230*	**1-2 (P<0.001)**
Trans(2)	2.96±0.55	3.06±0.52	**3.01±0.53**	P<0.001**	P=0.508	P=0.043**	
Lateral-Sitting(3)	3.33±0.54	2.96±0.49	**3.15±0.54**	η2=0.953	η2=0.008	η2=0.053	**1-3 (P<0.001)**
TOTAL	**4.58±2.13**	**4.53±2.22**					
Source of Difference for Interraction (Group x Time)							
	Pairwise Comparison** (Time)**		**p**		**Pairwise Comparison**** (Time)**		**p**
Lateral Decubit	**1-2 1-3 2-3**		**p<0.001**	**Sitting**	**1-2 1-3**		**p<0.001**
Mauchly's Sphericity Test Statistic W=0.960, χ2 =2.346, p=0.309, df=2, The assumption of Sphericity was met							

*: F test statisticsvalue. **: The mean difference is significant at the 0.05 level. (p<0.05)
***: Multiple comparison were assessed by using Bonferroni adjustment.
****: Simple effects analysiswith Bonferroni adjustment were used

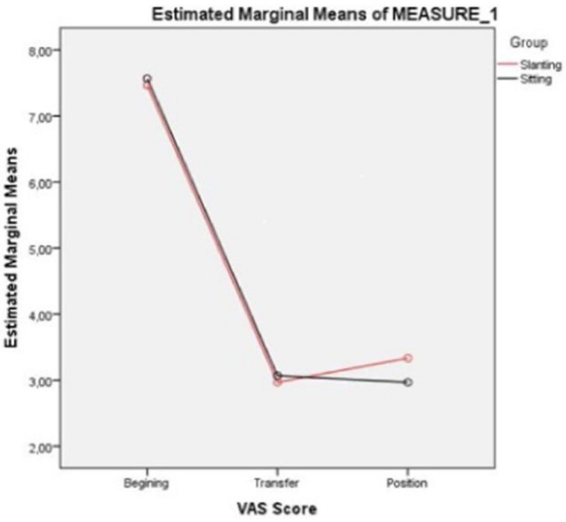

Figure: VAS Scores

DISCUSSION

Hip fracture is a cause of severe pain which requires intensive management. Femoral block can easily be performed with USG guidance and is a safe and effective procedure providing comfort for both patient and practitioner in cases with hip fracture. Patient's position is important in regional anesthesia. Optimal positioning increases the comfort of practitioner and patient's compliance can affect the success of the process.

There have been only a small number of studies evaluating FNB to facilitate patient positioning during spinal anesthesia. No studies were available in literature when an answer to the question "Is the analgesic efficacy of FNB different in sitting or lateral decubitus positions when performing spinal anesthesia in patients with hip fracture? " was sought.

The mean postoperative VAS scores of the patients in the first 24 postoperative hours were found to be 1.5 points, and no narcotics were administered in addition to routine analgesics. In accordance with reports in the literature that FNB reduces the need for opioids (12,13), we came up with similar results.

In their study with patients who were operated on for femoral shaft fractures, Sia et al. (14) performed FNB using 15 mL of 1.5% lidocaine and administered fentanyl 3 µg/kg intravenously before the spinal blockade in the first and the second groups, respectively. In both groups, they evaluated the VAS scores, patient's compliance with positioning and patient's satisfaction during spinal anesthesia in the sitting position. When compared to the fentanyl group, VAS scores and duration of spinal anesthesia were significantly lower, and patient's compliance with positioning and patient's satisfaction were significantly higher in FNB group. They concluded that FNB was more advantageous than administration of intravenous fentanyl in facilitating the sitting position for spinal anesthesia. They reported significantly lower VAS scores in the sitting position in the FNB group than in the IV fentanyl group, and concluded that FNB was more effective than IV fentanyl when facilitating the positioning for spinal anesthesia in patients with a femoral fracture.

Gosavi and colleagues (15) performed FNB by injecting 10 ml of 2% lidocaine + 1 ml of sodium bicarbonate + 4 ml of saline in 40 patients with femur fracture. After 10 minutes, VAS scores were detected to be 2.7 in the sitting position and 2.1 in the supine position. Most patients rated the analgesia as excellent. They also reported that FNB was effective in providing comfort during the positional change required for regional anesthesia.

Lamarron et al.(16) seperated 60 patients with femoral fractures who were operated on under spinal anesthesia into two groups. Patients in FNB group was performed a single dose of 20 mL of 0.5% bupivacaine and 10 mL of saline and in fentanyl group was performed 0.5 µg fentanyl intravenously in every 5 minutes until VAS score <4 points was obtained. They reported no difference between FNB and intravenous fentanyl groups in terms of analgesic benefit in patient's positioning prior to spinal blockade. They also stated that FNB was effective in postoperative pain management and that analgesic dose of fentanyl should be titrated carefully according to the pain scores due to its severe side effects.

We believe that FNB could be considered more effective and safer in decreasing VAS scores, based on the fact that the use of narcotics should be avoided in patients of advanced age or those with additional comorbidities. For FNB, we used lidocaine for the early onset effect, and bupivacaine for the long-lasting postoperative effect. Accordingly, we did not have to wait for 20–30 minutes for the effect of bupivacaine (17,18), having obtained enough pain-relieving effect in around 6–8 minutes. There have been many studies in literature (19,20) reporting reductions in pain scores and analgesic requirements after peripheral nerve blockades, and the results of the present study are consistent with literature in this regard. Parker et al. (21) reported that nerve blockades reduce pain scores and analgesic requirements; while Schiferer et al. (20) showed that FNB provides analgesia after a femoral fracture that is sufficient for transfer. In addition, there have been other studies reporting positive outcomes of FNB in the provision of analgesia in the emergency room (9,22).

We observed no side effects or complications in our study, while femoral nerve blockades have a low risk of complications, including vascular hematomas, nerve damage, infection. LA toxicity is rare (23,24), and in a previous study, FNBs were found to be associated with a low risk of compartment syndrome (25). Carrying out the procedure under the guidance of USG may offer significant advantages to the prevention of this complication.

Limitations

The FNB procedure could not be performed when the patients were first admitted to the emergency room, due to our hospital's operational rules and the technical requirements.

CONCLUSION

Positioning in spinal anesthesia is commonly based on the anesthesiologist's choice and experience. In our study, FNB had an analgesic effect in both positions; although the lesser elevation of VAS scores in sitting position indicated that this position was less painful. We believe that FNB stands as a safe and effective analgesia in patients with and hip fractures in the operating room, and that this effect can contribute to reducing the need for narcotics in the postoperative period.

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