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Analgesic efficacy of Femoral Nerve Block (FNB) in arthroscopic ACL tears repair surgeries

Dr. Amey Dixit [1], Dr. Subhash Kumar Agrawal [2], Dr.Avtar Singh Yadav [3] Dr. Sudhakar Dwivedi[4]
[1] Postgraduate student, [2]Associate Professor, [3, 4] Professor,
Department of Anaesthesiology, Shyam Shah Medical College, Rewa, MP

Corresponding Author
Dr. Subhash Kumar Agrawal
Associate Professor Department of Anaesthesiology, Shyam Shah Medical College, Rewa, MP

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ABSTRACT

Background and aims: Femoral nerve block (FNB) provides effective analgesia after arthroscopic ACL tear repair surgeries. The aim of the study was to compare FNB with control regarding its analgesic efficacy in patients following arthroscopic ACL tear repair surgeries.

Materials and Methods: Sixty patients of ASA status I or II undergoing arthroscopic ACL tear repair surgeries under subarachnoid block were divided into 2 groups to receive FNB (Group 1) and Control (Group 2). Each patient was assessed for VAS score, tramadol consumption postoperatively in the PACU.

Results: There was significant difference between the Group FNB and Control group regarding the postoperative analgesia, total rescue analgesia consumption in 24 h postoperative. The mean VAS score at 2, 4, 6,8 h and total rescue analgesia consumption in 24 h were higher in control group which was statistically significant (p value<0.05).

Conclusion: Femoral nerve block provides better postoperative analgesia after arthroscopic ACL tear repair surgeries when compare to control.

Keywords: Femoral nerve block, Postoperative analgesia

INTRODUCTION

Arthroscopic ACL tear repair is a common surgery to improve mobility and quality of life. Postoperative pain is universal phenomenon, which is aggravated by associated muscle spasm and visceral distension. Most of the patients after knee arthroscopic surgeries with end-stage osteoarthritis, ACL (anterior cruciate ligament) injuries and other knee diseases suffered severe pain, which has affected the quality of sleep, appetite, and functional exercise.[1-4]

Current multimodal postoperative analgesia uses opioid, acetaminophen, NSAIDS, alpha2 agonist, NMDA antagonists, dexamethasone and gabapentinoids.[5] Although opioids are considered analgesic of choice to treat moderate to severe pain but they carry the risk of respiratory depression, pruritus and hyperalgesia. NSAIDS improve pain after surgery but does not eliminate use of opioids.[6] Epidural analgesia is the commonly used regional technique to alleviate pain during surgeries but it has its own limitations and complications.[7]

Peripheral nerve blocks are easily performed with the help of Ultrasound which increases success rate, shortens the block performance time, reduces the number of needles pricks and shortens onset time.[8]

FNB is a common method of analgesia in which anesthetic is injected more proximally around the femoral nerve in the inguinal canal. Motor branches of femoral nerve which innervate the quadriceps

muscle group can also be blocked to decrease quadriceps muscle strength.[9] Reduced quadriceps muscle strength could increase patient's risk for falling when initially ambulating post-operatively.[10]

MATERIAL METHOD

The randomized controlled trial was conducted after obtaining institutional ethics committee approval. 60 adult patients with ASA grade I and II, posted for arthroscopic ACL tear repair surgeries under subarachnoid block, were selected for the study. Patients who refused to give consent, Patients with psychological disorders like language difficulty, mental illness, and dementia, Patients with significant systemic diseases like asthma, diabetes, hypertension, cardiovascular diseases were excluded from the study.

Patients fulfilling the selection criteria were randomized using computer-based randomization software, in two groups of 30 patients each.

Group 1(FNB) received femoral nerve block with Inj. Ropivacaine 0.25% 15ml and Inj. Dexmedetomidine 0.5 µg/kg body weight, at the end of the surgery.

Group 2 (Control group) received only standard analgesic regimen.

A detailed history of all selected patients was taken. A thorough pre-anaesthetic evaluation including the airway, back of the patient and site of block assessment were performed. The patients were explained about the entire procedure, informed consent was taken, in a language of their understanding. They were also educated about the visual analogue scale (VAS) and patient's satisfaction scale. With all standard Monitoring baseline parameters viz heart rate, systolic and diastolic blood pressure, mean arterial pressure, SpO_2, ECG tracings were recorded. Subarachnoid block with Inj. Bupivacaine (0.5%) heavy was given to all patients. Standard hemodynamic monitoring was done. The **femoral nerve block** was performed under real time USG guidance with high frequency ultrasound probe (Mindray DC 30)), at the end of the surgery in Group 1. We have given Inj. Diclofenac 75mg i/v and Inj. Paracetamol 1gm i/v infusion to all the patients.

In patients belonging to group 1, the skin over the femoral crease was disinfected and the transducer was positioned to identify the femoral artery and nerve. If the nerve isn't immediately apparent lateral to the artery, tilting the transducer proximally or distally often helps to image and highlight the nerve from the iliacus muscle and the more superficial adipose tissue. In doing so, an effort should be made to identify the iliacus muscle and its fascia, as well as the fascia lata, because injection underneath a wrong fascial sheath may result in block failure. When the femoral nerve is identified, the needle was inserted in plane during a lateral to medial orientation and advanced toward the femoral nerve. Once the needle tip is adjacent (either above, below, or lateral) to the nerve and after careful aspiration, drug was injected with necessary needle repositions.

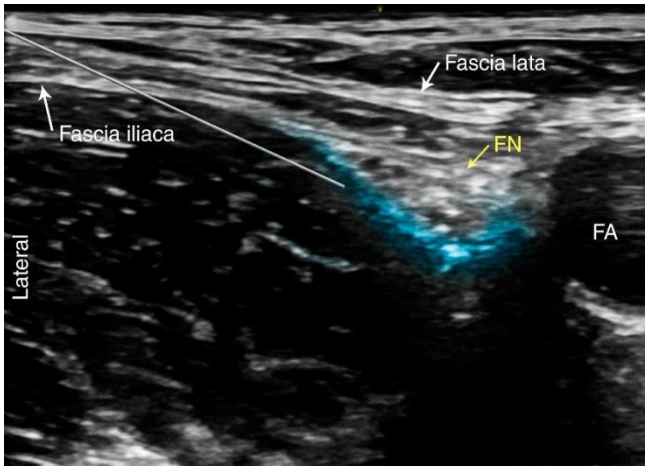

FIGURE 1: USG anatomy and local anaesthetic distribution in femoral nerve block at the level of femoral crease. (FN, femoral nerve: FA, femoral artery)

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After completion of the surgical procedure and block, patients were transferred to the post anaesthesia care unit (PACU). Pain severity was assessed employing a Visual Analogue Scale. VAS score was recorded at 0, 2, 4, 6, 8, 12, 18 and 24 hrs after block. When VAS score became more than 4 or the patient first demand for analgesia that time was noted. Inj. Tramadol 100 mg IV was given as rescue analgesic. At the end of 24 h, duration of analgesia and total Tramadol consumption was noted.

Any signs of adverse effects of the technique like local site infection, hematoma formation, local anaesthetic toxicity due to intravascular injection of anaesthetic agents (like dizziness, tinnitus, perioral numbness and tingling, lethargy, seizures, signs of cardiac toxicity like conduction block, arrhythmias, myocardial depression) were noted and managed accordingly. Neurological assessment was performed in all the patients before hospital discharge. The study ended 24 hours after block placement.

All recorded data were tabulated and statistically analyzed by appropriate statistical test (ANOVA, post hoc tukey's HSD test and chi-square test).

OBSERVATION AND DISCUSSION

The data collected was analyzed, continuous variables were presented as mean with standard deviation (SD) and categorical variables were presented as frequency and percentages. Student's t-test was used for testing the significance of mean in both the groups. Qualitative data was analyzed using Chi- square test. All the statistical results were considered significant at p value < 0.05

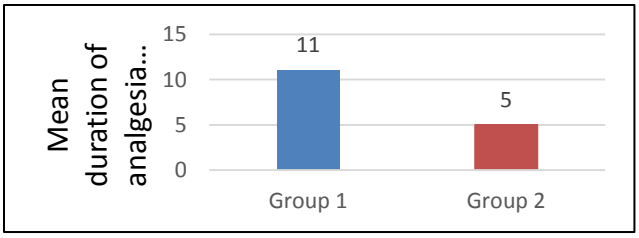
TABLE 1: DEMOGRAPHIC PROFILE

Parameters	Group 1	Group 2	P value
Age in years (Mean ± SD)	39±10	38±12	0.707
Height in cm (Mean ± SD)	160±8	162±7	0.373

The demographic parameters like age (years), height (cm) were comparable between the groups.

TABLE-2 DURATION OF ANALGESIA

	Group 1	Group 2	P value
Duration of analgesia(hrs) **Mean ± SD**	11 ± 3	5 ± 1	<0.0001



Graph showing mean duration of analgesia(hrs) of FNB and control group

The duration of analgesia was (11 ± 3) hrs in group 1 and (5 ± 1) hrs in Group 2. Duration of analgesia was longer in group 1 as compare to Group 2 and difference was statistically significant. (p-value<0.05) (Table-2).

Similar to our study **Mai K Abdallah et al**.[11] (2018)The first time to introduce morphine was significant increase in Group 1 i.e. FNB [(11.22±2.28) hours in comparison with Group I i.e. control (0) (*p*-value <0.001).

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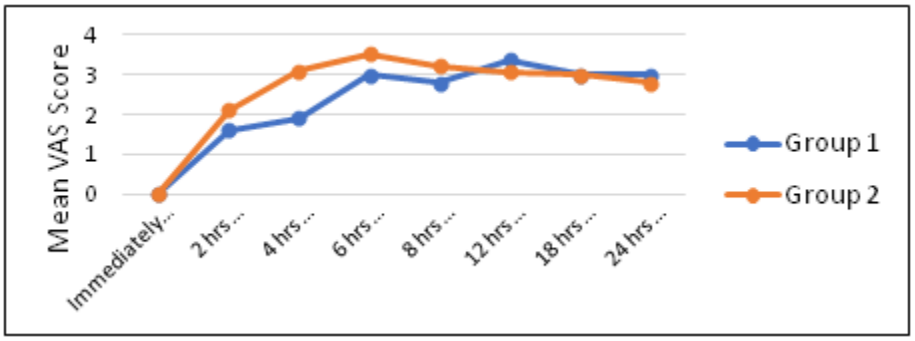
TABLE-3 VAS SCORE AT DIFFERENT TIME INTERVAL

VAS Score Mean ±SD	Group 1	Group 2	P value
Immediately after the surgery	0	0	-
2 hrs postoperatively	1.6±0.7	2.1±1	0.03
4 hrs postoperatively	1.9 ±0.6	3.1 ±1.1	<0.0001
6 hrs postoperatively	3.00±0.95	3.53±0.90	0.0338
8 hrs postoperatively	2.8 ±0.9	3.23 ±0.7	0.04
12 hrs postoperatively	3.37 ±1.1	3.07 ±0.91	0.253
18 hrs postoperatively	3 ±0.9	3 ±1	0.786
24 hrs postoperatively	3 ±0.9	2.8 ±0.71	0.348



Graph showing mean VAS Score of FNB and control group

The objective for our study was to render patients' pain-free, with otherwise minimal effect on muscle strength. We found that the average of mean VAS score in first 24 hrs was 2.61±0.91 in group 1 and 2.94±1.03 in Group 2. (Table-3)

In our study we found statistically significant difference in VAS scores among patients undergoing FN block and control. At 0 ,2 ,4,6 and 8 h VAS score was higher in control group compare to FNB group and difference was statistically significant p value<0.05 after 8 hr difference become statistically comparable.

TABLE-4 TOTAL TRAMADOL REQUIREMENT (In first 24 hours)

	Group 1	Group 2	P value
Total Tramadol Requirement (mg) **Mean ±SD**	160 ± 67.5	223 ±63	<0.0001

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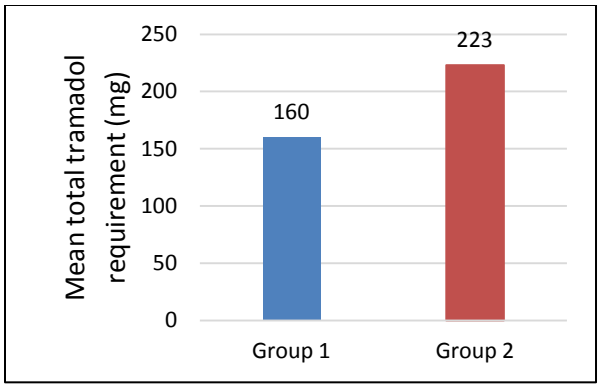


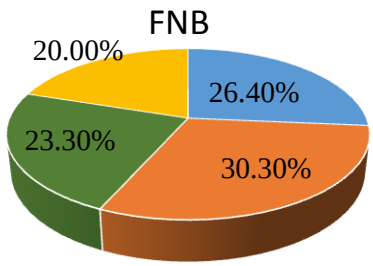
Graph showing mean Tramadol Requirement (mg) of FNB and control group

In our study, the total Tramadol requirement in first 24 hrs post operatively was (160 ± 67.5) mg in group 1 and (223 ±63) mg in Group 2. Tramadol requirement was higher in group 2 as compare to group 1 which was statistically significant. (p value<0.05). (Table-4).

Similar results were also observed by **Mai K Abdallah et al**.[11] (2018) noted that the total morphine consumption showed statistically significant difference between group 1i.e. FNB (1.37±3.87) mg and group 2 i.e. control (14.11±4.63) mg, there was significant higher analgesic requirement in group 2i.e. control group in comparison to group 1 (*p*-value <0.001).

TABLE 5: PATIENT SATISFACTION SCORE

Patient satisfaction scale score	Group 1		Group 2		**p-values**
	N	%	N	%	
Highly Satisfied	8	26.4%	0	0	
Satisfied	9	30.3%	6	20.0%	
Neither Satisfied nor Dissatisfied	7	23.3%	6	20.0%	
Dissatisfied	6	20.0%	14	46.7%	<0.0001
Highly Dissatisfied	0	0	4	13.3%	
TOTAL	30	100%	30	100%	



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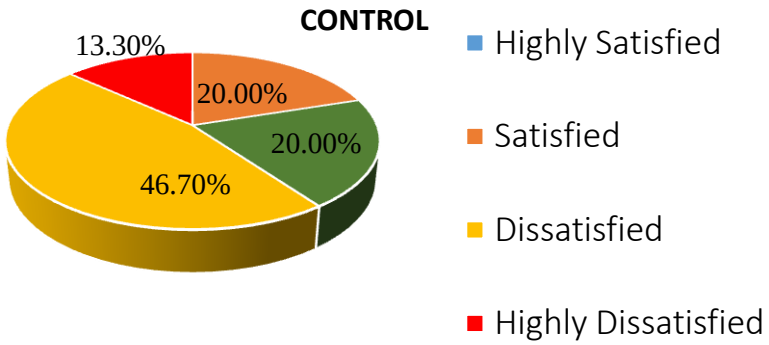

Graph showing Patient mean satisfaction scale score of FNB and control group

We assessed Patient's Satisfaction Score at 24 hrs after surgery, using a 5-Point Patient's Satisfaction Score to evaluate the level of postoperative analgesic satisfaction (Table-5). Our assessment revealed that the no. of highly satisfied patients in group FNB and Control group was 08 and nil respectively. Similarly, the no. of highly dissatisfied patients was nil in group FNB and 04 in Control group.The difference in the patient Satisfaction Score between groups was statistically significant. (P<0.0001).

There were no significant adverse effects or complications in both the groups.

CONCLUSION

Femoral nerve block provide better postoperative analgesia in terms of long duration of analgesia, lesser requirement of analgesics and better patient satisfaction after arthroscopic ACL tear repair surgeries when compare to control without any adverse effects.

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