ORIGINAL ARTICLE

Comparison of Ultrasound-Guided Femoral Nerve Block (FNB) with Adductor Canal Block (ACB) for Analgesia After Total Knee Arthroplasty

SYED AFTAB HAIDER¹, MUHAMMAD USMAN MOHSIN², MUHAMMAD ADNAN³, ZEESHAN KHAN⁴, MUHAMMAD KALEEM SATTAR⁵, ALI AMMAR⁶

¹Associate Professor of Anesthesia, Intensive Care Unit and Pain Management. Nishtar Medical University/Hospital Multan.

²Associate professor, Nishtar Medical University/Hospital Multan.

³Assistant professor, Children Hospital Complex.

⁴Assistant professor, Sheikh Zayed Hospital Rahim Yar Khan.

⁵Assistant Professor, Nishtar Medical University/Hospital Multan.

⁶Assistant Professor, Nishtar Medical University/Hospital Multan.

Correspondence to: Dr. Syed Aftab Haider, Email ID: draftab.nishtar@gmail.com, Cell No: 0300-9634061.

ABSTRACT

Objectives: To compare the femoral nerve block (FNB) with adductor canal block (ACB) in patients undergoing total knee arthroplasty (TKA) in-terms of post-operative pain and quadriceps muscle strength.

Methods: The randomized controlled trial was conducted in department of anesthesiology, Nishtar Hospital Multan. We included 50 patients of age >20 years, who were planned for unilateral TKA. All procedures were done under spinal anesthesia. For induction of block the catheter was inserted into the block site after completion of surgery. Functional mobility was assessed after 24 hours of surgery using the timed up and go (TUG) test.

Results: Mean age was 62.5±7.4 years in ACB group versus 63.2±6.9 in FNB group. There were 17 (68%) female patients in ACB group versus 18 (72%) in FNB group. Mean VAS score after 6 hours was 1.9±0.8 in FNB group versus 2.8±0.7 in ACB group (p-value <0.001). VAS score after 12 hours was 2.0±0.9 in FNB group versus 3.1±1.2 in ACB group (p-value <0.001). After 24 hours, the VAS score was 1.3±0.57 in FNB group versus 2.7±1.0 in ACB group (p-value <0.001). The mean TUG score was 37±7 seconds in ACB group versus 41±8 seconds in FNB group (p-value 0.06).

Conclusion: The ultrasound guided FNB significantly controls post-operative pain after TKA in comparison to ACB without affecting the quadriceps muscle strength.

Keywords: Total knee arthroplasty, post-operative pain.

INTRODUCTION

Total knee arthroplasty (TKA) is now a commonly performed procedure especially in elderly patients. The common indications of TKA are rheumatoid arthritis or endstage osteoarthritis.¹ TKA is associated with a very intense pain in early post-operative rehabilitation time, therefore the major concern of post-op management is the optimal control of pain.² Currently, the use of continuous regional anesthesia by using peripheral catheters is the main stay for the management of pain after TKA.3 The goal of regional anesthesia is to block sensory senses. While to spare motor responses to prevent weakness.⁴ Use of femoral nerve block (FNB) has remained the preferred management strategy deliver analgesia. However, some recent studies have reported that the use of FNB can cause weakness of the quadriceps muscles and therefore increases the risk of falling during mobilization.5,6

Recently the use of adductor canal block (ACB) has merged as a new technique for pain control after TKA and is it did not have any weakening of quadriceps muscle strength. The benefit of using ACB us that it blocks the castus medialis nerve and saphenous nerve distal to the quadriceps motor branches therefore did not cause weakness of quadriceps muscles and prevent the risk of fall.⁷

Studies comparing the FNB with ACB have reported mixed results regarding their effects on pain management.^{8,} ⁹ Therefore, the present study is designed to compare the

FNB with ACB in patients undergoing TKA in-terms of postoperative pain.

METHODS

The randomized controlled trial was conducted in department of anesthesiology, Nishtar Hospital Multan. We included 50 patients of age >20 years, who were planned for unilateral TKA. Patients planned for bilateral TKA, revised procedure and those taking chronic opioids for pain control or drug addicts were excluded. Patients were included after taking written consent from them. Approval from ERC of hospital was obtained.

Patients were randomly divided into two groups using computer generated numbers by using a block size of patients at one time to divide them into either FNB or ACB groups.

All procedures were done under spinal anesthesia. For induction of block the catheter was inserted into the block site after completion of surgery. The catheter was inserted using aseptic technique under USG guidance. The catheter with opening only at the end was used. The area was first hydro-dissected using 0.2% of 15 ml of ropivacaine before insertion of catheter. The 2 cm of catheter area was inserted into dissected space and was secured for continuous analgesia.

All the catheters were connected to a portable infusion pump and infusion of 8 ml/hour of plain 0.2% ropivacaine was started immediately after shifting the patient to ICU. Post-op pain score was noted at 6, 12, 24,

36 and 48 hours after surgery. Pain was measured using VAS (1-10) points scale.

Functional mobility was assessed after 24 hours of surgery using the timed up and go (TUG) test using the principles described by Yeung et al. The patients were instructed to stand up from chair, walk for 3 meters and then come and then sit of chair. The time lapsed to perform all this activity was noted. The whole test was performed with assistance of walker with the patient.¹⁰

Data was entered and aanalyzed usingsSPSS v25 software. Post-operative pain score was compared using independent sample t-test between the groups. P-value ≤ 0.05 was taken as significant association.

RESULTS

Baseline characteristics were not statistically significantly different between the groups as presented in table 1. Mean age was 62.5±7.4 years in ACB group versus 63.2±6.9 in FNB group. There were 17 (68%) female patients in ACB group versus 18 (72%) in FNB group. Mean BMI was 26.7±4.3 Kg/m² in ACB group versus 27.1±4.2 Kg/m² in FNB group. ASA status was I-II in 23 (92%) patients in ACB group versus in 21 (84%) patients in FNB group (p-value 0.38).

Mean VAS score was significantly lower in FNB group after first 24 hours of surgery. After 24 hours there was significant difference in VAS score between the groups. Mean VAS score after 6 hours was 1.9 ± 0.8 in FNB group versus 2.8 ± 0.7 in ACB group (p-value <0.001). VAS score after 12 hours was 2.0 ± 0.9 in FNB group versus 3.1 ± 1.2 in ACB group (p-value <0.001). After 24 hours, the VAS score was 1.3 ± 0.57 in FNB group versus 2.7 ± 1.0 in ACB group (p-value <0.001). VAS score after 36 hours of surgery was 1.2 ± 0.4 in FNB group versus 1.3 ± 0.5 in ACB group (pvalue 0.43). The mean TUG score was 37 ± 7 seconds in ACB group versus 41 ± 8 seconds in FNB group (p-value 0.06) [Table 2].

	ACB	FNB	P-Value
	(N=25)	(N=25)	
Age	62.5±7.4	63.2±6.9	0.73
Gender			
Male	8 (32%)	7 (28%)	0.75
Female	17 (68%)	18 (72%)	
BMI (Kg/m ²)	26.7±4.3	27.1±4.2	0.74
ASA Status			
1-11	23 (92%)	21 (84%)	0.38
	2 (8%)	4 (16%)	

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Table 2. Comparison of Study Outcomes.

	FNB	ACB	P-Value		
	(N=25)	(N=25)			
Post-operative Pain					
6 hours	1.9±0.8	2.8±0.7	<0.001		
12 hours	2.0±0.9	3.1±1.2	<0.001		
24 hours	1.3±0.57	2.7±1.0	<0.001		
36 hours	1.2±0.4	1.3±0.5	0.43		
48 hours	1.0±0.2	1.1±0.3	0.17		
TUG Score (seconds)	41±8	37±7	0.06		

DISCUSSION

The applicability of regional anesthesia to provide pain relief after TKA has gained much popularity using the

catheters for continuous sedation.^{11, 12} In present study we compared ACB with FNB for analgesia after TKA. We found that FNB is superior to ACB in-terms of lower post-op VAS score within 24 hours of surgery, while it did not disturb the functional mobility of the patients.

These results favors the study results of Song et al., these authors also compared FNB with ACB for analgesia after TKA and reported lower median pain score during first 24 hours of recovery period. However, they did not report statistically significant difference in total morphine usage as rescue analgesia between the groups. The mean TUG score was also statistically insignificant with mean value of 69.1 seconds in FNB group versus 66.2 seconds in ACB group.¹³

A study by Sztain et al. on comparison of ACB with FNB for TKA, reported that FNB is superior to ACB as it significantly reduces the morphine requirements after surgery.⁸

While some studies have reported that there is no difference in outcomes of ACB and FNB. A study by Chuan et al. did not reported any significant difference in TUG score at 24 hours and 48 hours after surgery. They also did not found any difference in mean VAS score and opioids consumption and differences in functional activities of patients in ACB and FNB groups.¹⁴

Another study by Lim et al. also did not reported any significant difference using both techniques regarding VAS scores at 24 hours on rest and movement, quadriceps strength at baseline and 48 hours of surgery, total hospital stay and functional activity between the groups.¹⁵ Meier et al. also reported similar outcomes.¹⁶

A recent meta-analysis comprising 9 studies of 609 patients, reported that ACB is superior to FNB regarding quadriceps strength and functional mobility. While they did not report any difference in VAS score during movement, use of rescue morphine, patient satisfaction and hospital stay. The meta-analysis recommended to use ACB as an alternative regional block to FNB for management of post-op pain after TKA.¹⁷

Still there is an ongoing debate regarding the ideal technique of post-op pain management after TKA and existing literature has insufficient evidence to declare which technique should be adopted as first-line investigation. Therefore, there is a need to conduct more studies on larger scale to determine the effectiveness of ACB for management of post-op pain in patients after TKA.

CONCLUSION

The ultrasound guided FNB significantly controls postoperative pain after TKA in comparison to ACB without affecting the quadriceps muscle strength.

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