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Comparison of Ultrasound-Guided Nerve Block with Ultrasound-Guided Nerve Stimulation Technique for Obturator Nerve Block in Transurethral Resection of Bladder Tumour

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ABSTRACT

***Objective*:** To compare the ultrasound-guided nerve block with ultrasound-guided nerve stimulation technique for obturator nerve block (ONB) in patients undergoing transurethral resection of bladder tumour (TURBT).

***Study Design*:** Prospective comparative study.

***Place and Duration of Study*:** Department of Anesthesiology, Nishtar Medical University/Hospital Multan from Jan to Jul 2019.

***Methodology*:** A total of 80 patients were divided into two groups. In Group-I, an ultrasound-guided nerve block was applied, while in Group-II, an ultrasound-guided nerve stimulation technique was applied for the block. Time of onset/ success of motor block and ease of approach were the primary study endpoints. At the same time, the surgeon and patient satisfaction were secondary endpoints.

***Results*:** Motor block onset time was 6.58±2.16 minutes in Group-II versus 12.41±2.39 minutes in Group-I (*p*-value <0.001). Block performance time was 4.34±0.78 minutes in Group-II versus 2.09±0.46 minutes in Group-I (*p*-value <0.001). The block success rate was also higher in Group-II, with 36(90%) patients, compared to 31(77.5%) in Group-I, with an insignificant *p*-value of 0.12. Surgeons were satisfied by the quality of the obturator nerve block in 37(92.5%) cases in Group -II and only 30 (75%) cases in Group-I (*p*-value 0.03).

***Conclusion*:** The ultrasound-guided nerve stimulator is superior to the Ultrasound-guided nerve block for Obturator nerve block (ONB) and is associated with higher patient and surgeon satisfaction.

Keywords: Nerve stimulation, Obturator nerve block, Ultrasound.

How to Cite This Article: *Ahmad MS, Khan U, Haider SA, Sultan A, Khanum S, Saleemi MS. Comparison of Ultrasound Guided Nerve Block with Ultrasound-Guided Nerve Stimulation Technique for Obturator Nerve Block in Transurethral Resection of Bladder Tumour. Pak Armed Forces Med J 2023; 73(3): 695-698. DOI: https://doi.org/10.51253/pafmj.v73i3.5435*

INTRODUCTION

Transurethral resection of bladder tumour (TURBT) is a commonly performed surgery in urology theaters.[1] Mostly the procedure is done under spinal anaesthesia as it offers many advantages, such as ease of operation, minimal bleeding and helps in early recognition of bladder perforation, which is associated with recurrence rates.[2,3] The only major shortcoming of spinal anaesthesia is that it spares the obturator nerve, and stimulation of the obturator nerve can cause adductor muscle contractions during the procedure, which may cause bladder injury or rupture.[4]

Peripheral nerve blocks are now also in routine anaesthesia practice, which is used to provide surgical anaesthesia and control post-operative and non-operative pain. These are commonly used to avoid the adverse effects of anaesthetic and analgesic drugs.[5] In 1922, Labat first described the obturator nerve block (ONB); since then, many different techniques have been developed for obturator nerve block (ONB).[6,7] The availability and advancements in ultrasonography have made it possible to directly visualize the needle relative to nearby blood vessels and nerves during ONB. Ultrasound-guided blocks are more successful and have lower onset and reduced doses of local anesthetic.[8,9] The only drawback is that it requires a trained person for ONB.[10] The other commonly used technique for ONB is the nerve stimulation-guided technique; it is less expensive and does not require extensive induction training. The drawback of this technique is that it is a blind technique and can cause blunt trauma. The present study aimed to compare the ultrasound-guided nerve block with the ultrasound-guided nerve stimulation technique for ONB patients undergoing TURBT under spinal anaesthesia.

METHODOLOGY

The prospective comparative study was conducted at the Department of Anesthesiology, Nishtar Medical University/Hospital Multan from January to July 2019, after the Ethical Committee was approval. Informed consent was taken from each patient. The

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Received: 05 Oct 2020; revision received: 29 Oct 2021; accepted: 03 Nov 2021

sample size was calculated using a WHO calculator, keeping the success proportion in one Group as 100%, whereas, in the other Group as 80%.[11]

Inclusion Criteria: Patients planned for urinary bladder resection, aged 45-80 years, were included.

Exclusion Criteria: Patients having coagulation problems, active infections, or allergies to the drugs used in the study were excluded.

All procedures were done under spinal anaesthesia by inserting a 25-gauge Quincke needle at levels L3-L4. The local anaesthetic used was 10 ml of 0.5% hyperbaric bupivacaine. A total of 80 patients were included. The patients were divided into two equal groups using random number tables. Patients were allotted to Groups-I or II based on folded paper chosen by the doctor. In Group-I, a 22-gauge, 08cm long complex needle was advanced from lateral to medial side under US guidance to reach the anterior division of the obturator nerve (ON), and 5ml of 0.5% bupivacaine was injected. After that, the needle was redirected to the posterior division of ON, and 5ml bupivacaine was inserted again.

In Group-II, a nerve stimulator was used for ONB under ultrasonic guidance. We used a Microcontroller-based nerve stimulator (LCD-GEMI-Model: DSL-007). A 22-gauge 8 cm long needle was first directed to the anterior portion under US guidance. At the start, a 1-2 mA current was simulated at the beginning which was then gradually reduced to 0.5 mA. After that, 5 ml of 0.5% bupivacaine was given. The needle was then redirected to the posterior division of the ON, and the same procedure was repeated.

The operating surgeon was not allowed to enter the operating room during the procedure to keep the surgical team unaware of the study protocol. However, after 5 minutes of the block, the surgical team was called inside the OR to start the procedure and to monitor the motor blockage, which was graded as; 0; adductor spasm, 1; upto 50% reduction in adductor spasm, 2; no spasm at all. The thigh muscle strength was noted again at 10 and 15 minutes; a score of 2 was labelled a successful block. If the spasm persisted even after 15 minutes, it was labelled as a failed block.

The time of onset of the motor block, the success of the motor block and ease of approach was the primary study endpoints. At the same time, the surgeon and patient satisfaction were secondary endpoints. After the procedure, the patient and the surgeon were asked about their satisfaction level; the satisfaction level was purely based on verbal comments of the surgeon and the patient.

Statistical Package for Social Sciences (SPSS) version 23.0 was used for the data analysis. The independent sample t-test was used to compare quantitative variables. In addition, the chi-square test (or Fischer exact test) was used to compare quantitative variables such as surgeon satisfaction and patient satisfaction between the groups. The *p*-value of ≤0.05 was considered statistically significant.

RESULTS

Baseline demographic variables such as age, gender and weight were similar between the groups. The duration of surgery was 44.7±12.9 minutes in Group-I and 45.2±13.8 minutes in Group-II (Table-I). Motor block onset time was significantly lower in Group-II, 6.58±2.16 minutes versus 12.41±2.39 minutes in Group-I, with a *p*-value <0.001. Similarly, block performance time was 4.34±0.78 minutes in Group-II versus 2.09±0.46 minutes in Group-I (*p*-value <0.001). The block success rate was also higher in Group-II, with 36(90%) patients, compared to 31(77.5%) in Group-I. Easy access was achieved in 27(67.5%) patients in Group-I and only 23(57.5%) patients in Group-II (*p*-value 0.85). The total number of attempts was also similar between the groups (Table-II).

Table-I: Baseline Demographic and Operative Characteristics (n=80)

	Group-I (n=40)	Group-II (n=40)	*p*-value
Age (Years)	62.6±10.9	61.9±10.3	0.76
Gender			
Male Female	36(90%) 4(10%)	37(92.5%) 3(7.5%)	0.69
Weight (Kg)	74.2±7.1	76.7±6.8	0.11
Duration of Surgery (minutes)	44.7±12.9	45.2±13.8	0.86

Table-II: Comparison of Primary Study Endpoints (n=80)

	Group-I (n=40)	Group-II (n=40)	*p*-value
Onset time of Motor Block (min)	12.41±2.39	6.58±2.16	<0.001
Success rate of Block	31(77.5%)	36(90%)	0.12
Block performance time (min)	2.09±0.46	4.34±0.78	<0.001
Each of Access			
Easy (≤2 insertion attempts)	27(67.5%)	23(57.5%)	0.85
Difficult (>2 insertion attempts)	13(32.5%)	17(42.5%)	
Total Number of Attempts	2.36±1.11	2.49±1.14	0.60

The surgeon, as well as the patient satisfaction level, was higher in Group-II patients. Surgeons were satisfied by the quality of ONB in 37(92.5%) cases in Group-II and only 30(75%) cases in Group-I (*p*-value 0.03). On the other hand, there were 35 (87.5%) patients were satisfied with the quality of the block in Group-I and 39(97.5%) in Group-II (*p*-value 0.08) (Table-III).

Table-III: Comparison of Satisfaction Level (n=80)

	Group-I (n=40)	Group-II (n=40)	*p*-value
Patient Satisfaction	35(87.5%)	39(97.5%)	0.08
Surgeon Satisfaction	30(75%)	37(92.5%)	0.03

DISCUSSION

In the present study, we determined the ONB characteristics of nerve block performed under US guidance with that of performed using nerve stimulator under US guidance. The quality of the motor block in the present study was assessed at 5, 10 and 15 minutes to observe successful nerve stimulation. Successful nerve stimulation was achieved in 90% of patients in Group-II and 77.5% of patients in Group-I. A similar study by reported a success rate of 76.7% using US-guided ONB and 90% of patients using US-guided nerve stimulation.[12] Another study by reported similar results; in their study, the success rate of ONB was 88% using US-guided nerve stimulation and 70% in US-guided nerve block only.[13] Finally, another study reported a success rate of 100% in the US-guided nerve stimulation group and only 80.6% in the US-guided nerve block-only group.[14]

In the present study, the motor block onset was faster in Group-II than in Group-I. Similar results of motor block onset have been reported in the previous studies,[15,16] comparing US-guided nerve block with US-guided nerve stimulation bases ONB and found no significant difference in motor block onset time; 7.2 minutes in US-guided block and 6.2 minutes in nerve stimulation group. Another study reported a median block onset time of 4 minutes using US-guided ONB.[17]

We found no significant difference in the number of attempts to perform ONB in both groups. The mean number of attempts was 2.36±1.11 in Group I versus 2.49±1.14 in Group II. The mean number of attempts in the previous study. was similar compared to the present study. They reported a mean number of attempts of 2.37±1.12 in the US-guided block group & 2.47±1.13 in the US-guided nerve stimulation group.[18]

We also found higher patient and surgeon satisfaction levels in the US-guided nerve block group. In addition, other studies have also reported a higher satisfaction rate using US-guided nerve stimulation compared to US-guided block only.[18,19]

CONCLUSION

Obturator nerve block (ONB), along with spinal anaesthesia, is a valuable anaesthesia technique for patients undergoing transurethral resection of bladder tumours (TURBT). A US-guided nerve stimulator is superior to a US-guided nerve block for ONB and is associated with higher patient and surgeon satisfaction.

Conflict of Interest: None.

Authors Contribution

Following authors have made substantial contributions to the manuscript as under:

MSA & UK: Conception, drafting the manuscript, approval of the final version to be published.

SAH & AS: Data acquisition, data analysis, critical review, approval of the final version to be published.

SK & MSS: Study design, drafting the manuscript, data interpretation, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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