

## ORIGINAL RESEARCH

# Comparative evaluation of ultrasound guided nerve stimulator technique versus landmark guided nerve stimulator technique for obturator nerve block in transurethral resection of bladder tumor done under subarachnoid block: A prospective study

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### ABSTRACT

**Background:** Bladder cancer is the ninth most common cancer diagnosed globally. Recent literature data reported ultrasound-guided obturator nerve block techniques to be safe for transurethral resection surgery with success rates of up to 100%. **Aim:** The present study aimed to comparatively assess the ultrasound-guided nerve stimulator technique versus landmark-guided nerve stimulator technique for obturator nerve block in transurethral resection of bladder tumor done under subarachnoid block. **Methods:** The study assessed 50 subjects from both genders and age range of 30-80 years undergoing transurethral resection of bladder wall tumors randomly divided into two groups of 25 subjects each where Group I subjects were given ultrasound guided nerve stimulator group and Group II subjects landmark guided nerve stimulator group. All subjects were assessed for success rate of obturator nerve block, time taken for block, conversion to general anesthesia, and complications related to surgery bladder injury and block vascular injury. **Results:** It was seen that the success of group I which was ultrasound guided nerve stimulator technique was 96 % and group II which was the landmark guided nerve stimulator technique was 92% with no statistically significant difference among the groups with p-value= 0.600. The mean time taken to perform the block in group I was 6.4±.69 min and in group II was 4.0±.50 min and the difference was statistically significant (p-value <0.000). In groups I and II, 1 and 2 cases respectively were converted to general anesthesia to avoid complications and for patient safety. No complications were seen with block or surgery. **Conclusion:** The present study concludes that the rate of successful obturator nerve block is comparable between ultrasound guided nerve stimulator technique and landmark-guided nerve stimulator technique with the slightly longer time to perform the block in the ultrasound nerve stimulator technique.

**Keywords:** Bladder cancer, landmark-guided nerve stimulator technique, obturator nerve block, transurethral surgery, ultrasound-guided obturator nerve block

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### INTRODUCTION

The ninth most commonly diagnosed carcinoma globally is contributed by bladder cancer which is gold-standard managed and diagnosed by transurethral resection making it a vital procedure in cases of bladder cancer. Nearly 50% of all tumors of

the bladder are seen and situated on the lateral wall of the bladder.<sup>1</sup>

Origination of the obturator nerve is attributed to the lumbar plexus of L2 to L4 which is comprised of both sensory and motor nerve fibers. In the pelvic cavity, the obturator nerve lies in close relation to the prostatic urethra, inferolateral bladder wall, and

bladder neck. Owing to the anatomic location of the obturator nerve, resection of transurethral bladder tumor from the lateral bladder wall under spinal anesthesia can lead to provocation of leg jerking, adductor contraction, and obturator reflex.<sup>2</sup>

After distension of the bladder using the irrigation fluid, the obturator nerve is seen nearby on the lateral wall of the bladder. During the transurethral resection of the bladder tumor using electrocautery can lead to the stimulation of the obturator nerve present adjacent to the tumor which can lead to leg jerking and contraction of the adductor muscle.<sup>3</sup> This is an involuntary action of the legs secondary to the spasm of the adductor muscle which can further lead to complications including vascular injuries, extravascular cancer cell dissemination, bladder perforation, and incomplete resection of the tumor.<sup>4</sup>

Contraction of adductor muscle can be eliminated with the use of general anesthesia with the use of neuromuscular relaxant. However, the majority of the subjects undergoing transurethral resection belong to the elderly age group and have preexisting comorbidities. Hence, spinal anesthesia is chosen over general anesthesia in these subjects. Spinal anesthesia is generally used for transurethral tumor resection, however, the obturator jerk reflex is not blocked using the spinal anesthesia.<sup>5</sup>

Other methods that can be employed to prevent the jerk of the obturator nerve are by reduction of the electro-coagulation voltage, resection of smaller chips, or incomplete bladder filling which has low efficacy, and can lead to incomplete bladder tumor resection.<sup>6</sup>

Labat in 1922 was the first to describe the selective obturator block, whereas, the regional block of the obturator nerve was first used in 1965 by Prentiss. Previous literature data has depicted that using the blind anatomical approach, the efficacy of obturator jerk reflex inhibition was found to be nearly 83% to 94%. However, the efficacy of the nerve stimulator technique was reported to be 96% to 100%. The rate of complications using the nerve stimulator and blind block in transurethral bladder resection was seen in the range of 0.9% to 5%.<sup>7</sup>

In the last decade, high popularity has been seen with the use of ultrasound-guided obturator nerve block techniques owing to its efficacy of 93% to 97% and its high safety during transurethral resection surgery. In combination with the nerve stimulators, the efficacy of the block is increased to 100%.<sup>8</sup> Hence, the present study was done to compare the two different techniques namely ultrasound guided nerve stimulator technique and landmark guided nerve stimulator technique to determine the best possible method which could reduce complications and improve the success rates during transurethral resection of bladder tumor surgery under subarachnoid block.

## MATERIALS AND METHODS

The present prospective comparative observational study was aimed to compare the two different techniques namely ultrasound guided nerve stimulator technique and landmark guided nerve stimulator technique to determine the best possible method which could reduce complications and improve the success rates during transurethral resection of bladder tumor surgery under subarachnoid block. The study was done at Meenakshi Mission Hospital and Research Centre, Madurai, Tamilnadu from January 2018 to October 2018.

The study included 50 subjects from both genders and in the age range of 30-80 years in the ASA grades 1, 2, and 3 that had to undergo transurethral resection of bladder tumor. The sample size was calculated using the OPEN-EPI software version-3 from Nida Farooq et al<sup>9</sup> and Deniz Balot et al.<sup>10</sup> According to the calculation the sample size calculated was 50, 25 Patients in each group with equation (n=sample size).

$$n = \frac{(z_{\alpha} + z_{\beta})^2 (p_1 q_1 + p_2 q_2)}{(p_2 - p_1)^2}$$

The inclusion criteria for the study were subjects with tumors on the lateral wall of the bladder undergoing resection bladder tumor, subjects with ASA grades 1, 2, and 3, subjects from both genders, and subjects in the age range of 30-80 years. The exclusion criteria for the study were subjects who underwent surgery of the pubic region and lumbar spine in the past, subjects with known allergy to the study drugs, subjects with nerve injury and neuropathy of any etiology in the surgical extremity, subjects with coagulopathy, and subjects having local infection at the block site.

After final inclusion, 50 subjects were randomly divided into two groups using a computer-generated random numbers table using the Epi open random program where Group I subjects were Ultrasound-guided nerve stimulator group block and Group II received landmark guided nerve stimulator group.

Before the procedure, all subjects were comprehensively assessed along with a recording of the demographics including age, name, gender, weight, height, and hospital number along with a recording of the history. The investigations done in all subjects were ECG, viral markers, coagulation profile, serum creatinine, blood urea, blood sugar, and complete hemogram. All the attendees/subjects were explained about the procedure and the expected complications. They were informed about the present study and their eligibility for participating in the study. Only patients who were willing to participate were included and informed consent was obtained. This was followed by connecting the NIBP, SPO2, and ECG devices. All subjects were assessed for peripheral oxygen saturation, NIBP (non-invasive arterial blood pressure), and heart rate. All the procedures were carried out under the personnel expert in the field with 25 years of anesthesia field experience. After giving subarachnoid block at L3-L4

or L4 –L5 in the right lateral position with 0.5% hyperbaric bupivacaine.

For the obturator nerve block using ultrasound guidance with a nerve stimulator, a 21-gauge needle was faced towards the anterior division of the obturator nerve. After turning on the nerve stimulator, 1-2 mA current (2 Hz) was delivered to initiate muscle contraction with a gradual reduction to 0.5 mA. If muscle contraction on the medial thigh was still seen, 7.5 ml of 0.5% bupivacaine was injected. The current was then reduced to zero and the needle was turned to posterior division and a stimulation current was applied. If muscle contraction on the posterior thigh was still seen, 7.5 ml of 0.5% bupivacaine was injected again.

Fir landmark guided nerve stimulator technique, a nerve locator was used to insert the needle and 2 mA current was given 1.5 cm perpendicular and lateral to the pubic tubercle, and after hitting the ramus, the needle was redirected medially and caudally to enter the obturator foramen in obturator canal. On the medial aspect of the thigh, muscle contractions were seen on 0.5 mA current followed by an injection of 15 ml of 0.5% bupivacaine.

The rate of successful obturator nerve block was assessed on the following grade where Grades 0, 1, and 2 were allotted to failed block showing the presence of adductor jerk, partial block with reduced adductor jerk to 50%, and successful blockade with the absence of adductor jerk. The time taken to perform the block was taken as time from probe placement to drug deposition ended in minutes for the ultrasound-guided technique and landmark technique from landmark identification to drug deposition.

All the cases of grades 0 and 1 were considered as failed block and were taken as failed blocks and were taken as general anesthesia for the safety of the subjects. Complications related to block were nerve

injury, hematoma, and vascular puncture, and related to surgery were incidence of any bladder injury assessed as score 0, 1, and 2 depicting no bladder injury, sub-serosal injury, and complete bladder perforation.

The data gathered were analyzed statistically using SPSS (Statistical Package for Social Sciences) software version 20.0 (SPSS Inc., Chicago, IL). The data were expressed in percentages and frequencies. For quantitative variables, chi-square and t-test were used, and p-values were calculated. The data were also expressed as mean and standard deviation. Fisher's chi-square test was also used. The significance level was taken at  $p < 0.05$ .

## RESULTS

In the present study, fifty patients aged between 30-80 years belonging to ASA grades 1, 2, and 3, were posted for elective transurethral resection of bladder tumor surgery. The study was conducted to compare the efficacy of an ultrasound-guided nerve stimulator versus a landmark-guided nerve stimulator approach of obturator nerve block in transurethral resection of bladder tumor surgery done under subarachnoid block.

The demographic data of the study participants are listed in Table 1. The mean age of the study participants was  $61.2 \pm 9.6$  years in Group I using the independent t-test and in Group II was  $60.3 \pm 15.9$  years which was the statistically non-significant difference with  $p = 0.814$ . For gender, there were 84% ( $n = 21$ ) males and 16% ( $n = 4$ ) females in Group I of the study, whereas, in Group II, there were 76% ( $n = 19$ ) males and 24% ( $n = 6$ ) females. The gender difference between the two groups was statistically non-significant with  $p = 0.480$  assessed using the chi-square test as shown in Table 1.

**Table 1: Demographic data of the study participants**

S. No	Variable	Groups		P-Value
		Group I n (%)	Group II n (%)	
1.	Age (in years)	61.2±9.6	60.3±15.9	0.814 NS
2.	Gender			
a)	Males	21 (84)	19 (76)	0.480
b)	Females	4 (16)	6 (24)	

Concerning the rate of successful obturator nerve blockade in the two groups of study subjects using the chi-square test, it was seen that successful blockade was seen in 96% ( $n = 24$ ) subjects from Group I and in 92% ( $n = 23$ ) subjects from Group II. Partial block was seen in 4% ( $n = 1$ ) subjects from both Groups I and

Group II and failed block was seen in no subject from Group I and 4% ( $n = 1$ ) subjects from Group II. The difference in success of nerve block in the two groups was statistically non-significant with  $p = 0.600$  as depicted in table 2.

**Table 2: Rate of successful obturator nerve blockade in the two groups of study subjects**

S. No	Variable	Group		P-Value	
		Group I	Group II		
1.	Grade of obturator nerve blockade	Successful Blockade	24	23	0.600 NS
			96.0%	92.0%	
2.		Partial Block	1	1	
			4.0%	4.0%	

3.	Failed Block	0	1
		0.0%	4.0%

For the time taken to perform the block in the two groups of study subjects, it was seen that in Group I, the mean time taken to perform the block was  $6.4 \pm 0.69$  minutes in ultrasound guided nerve stimulator group

block, whereas, for landmark guided nerve stimulator group block, the mean time taken to perform the block was  $4.0 \pm 0.50$ . The results were statistically significant with  $p=0.000$  as shown in Table 3.

**Table 3: Time taken to perform the blocks in the two groups of study subjects in minutes**

Variable	Groups		P-Value
	Group I	Group II	
Time in(minutes)	$6.4 \pm 0.69$	$4.0 \pm 0.50$	<b>0.000 SIG</b>

The study results showed that concerning the conversion of subjects to general anesthesia in two study groups, it was seen that in Group I, ultrasound-guided nerve stimulator group block, 4% (n=1) subject was converted to general anesthesia, whereas,

in Group II, landmark guided nerve stimulator group block, 8% (n=2) subjects converted to general anesthesia. The difference between the two study groups was statistically non-significant with  $p=0.551$  (Table 4).

**Table 4: Conversion of subjects to general anesthesia in two study groups**

S. No	Group	Conversion to General anesthesia			
		Yes		No	
		Number (n)	%	Number (n)	%
1.	Group I	1	4	24	96
2.	Group II	2	8	22	92
3.	'p' value	0.551 (not significant)			

It was seen that in block variables, no nerve injury was seen in any group. Also, hematoma and vascular injury were not seen in any subject of either group. The significance and p-value could not be calculated.

In surgery-related complications, no bladder injury was seen in all 25 subjects from both groups. Sub-serosal injury and complete bladder perforation were not seen in any subject from the group (Table 5).

**Table 5: Complications related to the block and surgery in the study subjects**

Block variables	Group1		Group 2	
	Yes	No	Yes	No
Nerve injury	0	25	0	25
Hematoma	0	25	0	25
Vascular injury	0	25	0	25
P value	cannot be calculated			
No bladder injury	25	0	25	0
Sub-serosal	0	0	0	0
complete bladder perforation	0	0	0	0
P value	cannot be calculated			

## DISCUSSION

The study was conducted to compare the efficacy of an ultrasound-guided nerve stimulator versus a landmark-guided nerve stimulator approach of obturator nerve block in transurethral resection of bladder tumor surgery done under subarachnoid block.

The rate of successful obturator nerve blockade in the two groups of study subjects using the chi-square test, it was seen that successful blockade was seen in 96% (n=24) subjects from Group I and in 92% (n=23) subjects from Group II. Partial block was seen in 4% (n=1) subjects from both Groups I and Group II and failed block was seen in no subject from Group I and 4% (n=1) subjects from Group II. The difference in success of nerve block in the two groups was statistically non-significant with  $p=0.600$ . These

results were consistent with the studies of Javanmard B et al<sup>11</sup> where authors reported significantly higher in the group with ultrasonographic guide 100% versus 92% without ultrasound and with Thallaj A et al<sup>12</sup> where authors reported a block success rate of 97% which was almost comparable with our study where obturator nerve block success rate was 96%.

Concerning the time taken to perform the block in the two groups of study subjects, it was seen that in Group I, the mean time taken to perform the block was  $6.4 \pm 0.69$  minutes in the ultrasound-guided nerve stimulator group block, whereas, for the landmark-guided nerve stimulator group block, the mean time taken to perform the block was  $4.0 \pm 0.50$ . The results were statistically significant with  $p=0.0$ . These results were in agreement with the studies of Shah NF et al<sup>13</sup> where the authors suggested block performance time

with an ultrasound-guided nerve stimulator was  $4.47 \pm 0.73$  min which was almost comparable with our study  $6.4 \pm 0.69$  min and Varshney S et al<sup>14</sup> where the block performance time with nerve stimulator was  $4.08 \pm 3.60$  in min which was almost comparable with our study where block performance time for nerve stimulator was  $4.0 \pm 0.50$  min.

The study results showed that concerning the conversion of subjects to general anesthesia in two study groups, it was seen that in Group I, ultrasound-guided nerve stimulator group block, 4% (n=1) subject was converted to general anesthesia, whereas, in Group II, landmark guided nerve stimulator group block, 8% (n=2) subjects converted to general anesthesia. The difference between the two study groups was statistically non-significant with  $p=0.551$ . These results were comparable to the studies of V Nagmothe et al<sup>15</sup> where authors reported that out of 30 patients, only one patient had (3.33%) failed block in nerve stimulator technique using 10 ml of 0.75 % Ropivacaine, and was converted to general anesthesia were as in our study out of 25 patients two failed block (8%) was there in nerve stimulator technique, converted to general anesthesia higher failure rate in our study due to use of low concentration of local anesthetic drug (0.5% bupivacaine). Also, Shah NF et al<sup>13</sup> reported that out of 30 patients, only one failed block in group ultrasound-guided nerve stimulator using 10 ml of bupivacaine 0.5%, which was comparable with our study which also had only one failed block in ultrasound-guided nerve stimulator group, which was converted to general anesthesia.

It was seen that in block variables, no nerve injury was seen in any group. Also, hematoma and vascular injury were not seen in any subject of either group. The significance and p-value could not be calculated. In surgery-related complications, no bladder injury was seen in all 25 subjects from both groups. Sub-serosal injury and complete bladder perforation were not seen in any subject from the group. These findings correlated with the studies by Dick et al<sup>16</sup> where 373 patients posted for turbt in the year between 1931-1979 they reported about 5% of patients had complete bladder perforation and Collado A et al<sup>17</sup> where a study done on 2821 patients underwent turbt in the year 1979-1996, 36 patients had bladder perforation (1.3%). However, in the present study, there was no such complication because we converted all failed blocks to GA to avoid adductor jerk.

## CONCLUSION

Considering its limitations, the present study concludes that the rate of successful obturator nerve block is comparable between ultrasound guided nerve stimulator technique and landmark-guided nerve stimulator technique with the slightly longer time to perform the block in ultrasound guided nerve stimulator technique.

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