Obturator nerve block for transurethral resection of bladder tumour: A comparative study on transvesical approach and nerve stimulator guided classic approach

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Abstract

Background: Transurethral resection of the bladder tumour located in the lateral wall, postero-lateral wall and lateral aspect of bladder neck under spinal anaesthesia is often hampered by obturator jerk, which may cause serious complications like bladder perforation. Using obturator nerve block along with spinal anaesthesia can overcome this problem. There are various techniques of obturator nerve block. Classic approach is most commonly used technique for obturator nerve block. It effectiveness can be increased by using a nerve stimulator to locate the nerve precisely. Also a transvesical approach using a cystoscope is reported to be effective.

Objective: To compare the effectiveness of obturator nerve block between classic approach using a nerve stimulator and transvesical approach in terms of elimination of obturator jerk.

Materials and Methods: This study was conducted in the Department of Urology, Bangabandhu Sheikh Mujib Medical University, Shahbag, Dhaka from May 2018 to August 2019. Total 81 patients underwent transurethral resection of bladder tumour (TURBT) under spinal anesthesia for bladder tumour located at the lateral wall, postero-lateral wall and lateral aspect of bladder neck. They were divided into two groups by randomization. 42 patients in group I received obturator nerve block (ONB) by classic approach using a nerve stimulator and 39 patients in group II received ONB by transvesical approach. The effectiveness of both techniques were observed in terms of the elimination of obturator jerk, ability of the surgeon to completely resect the tumour, and presence of detrusor muscle in the histopathological specimen.

Results: Complete elimination of obturator jerk was significantly higher in group I (100% vs. 79.5%; P = 0.002). In terms of ability to completely resect the visible tumour, effectiveness of both techniques were similar (100% vs. 97.4%; P = 0.481). The presence of detrusor muscle in the histopathological specimen was significantly higher in group I (90.5% vs. 64.1 %; P = 0.007). Bleeding requiring transfusion was low and similar in both groups (7.1% vs. 10.3%; P = 0.707). No bladder perforation occurred or systemic effect of lignocaine injection was observed.

Conclusion: Compared to transvesical approach, the classic approach with a nerve stimulator was more effective for obturator nerve block and presence of detrusor muscle in the histopathological specimen. In terms of surgeon's ability to completely resect the visible tumour, effectiveness of both techniques were similar.

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INTRODUCTION

Bladder cancer is the second most common cancer of the genito-urinary tract[1] (Badrinath et al, 2008). Transurethral resection of bladder tumour (TURBT) under spinal anesthesia is the standard initial treatment option for visible lesion. The goal is to remove all visible tumours completely and provide specimen for histopathological examination. TURBT under Spinal anaesthesia has several advantages such as technical ease of performing the procedure, reduced risk of bleeding and early recognition of bladder perforation. But the limitation of spinal anaesthesia is that, it cannot block the obturator nerve, which may be stimulated by electricity during tumour resection and cause adductor contraction. This may cause inadvertent bladder injury, even bladder perforation during TURBT[2] (Collado et al, 2000).

The obturator nerve arises from 3rd and 4th lumbar nerves and descends on psoas muscle and pass along the obturator vessels in the pelvis to enter the obturator canal, where it comes close to postero-lateral wall of urinary bladder, bladder neck and prostatic urethra[3] (Berberoglu et al, 2001).So, during TURBT of tumours located at the lateral wall, postero-lateral wall and neck of urinary bladder, obturator nerve may be stimulated. To avoid this, local anaesthetic blockade of the obturator nerve as it passes through the obturator canal can be done[4] (Kobayashi et al, 1991).

There are also some different ways to minimize obturator jerk. Such as minimizing the distention of bladder to minimum needed for resection, use of bipolar cautery or use of general anaesthesia with muscle relaxant. But, inadequate bladder distension may hamper complete resection as tumour may be missed due to mucosal folding. Bipolar and laser systems are expensive and not available at many centers. Most patients with bladder tumour are heavy smokers[5] (Burger et al, 2013) and the median age at diagnosis for patients (men and women) is 73 years, so cardiopulmonary conditions are serious limitations for general anesthesia in these patients[6] (Prout et al, 2005). So obturator nerve block with spinal anesthesia can be an effective modality for TURBT that can easily be accomplished.

Various techniques with variable effectiveness have been used to block obturator nerve. The classic method was explained in 1967 and is the commonly used approach for ONB[7] (Jo et al, 2011). In this method, a needle is inserted at a point 1.5 cm lateral and 1.5 cm inferior to the pubic tubercle and then guided into the obturator canal where the nerve is blocked. The accuracy of this blind anatomic technique can be increased by using a nerve stimulator to locate the obturator nerve in the obturator canal before anesthetic injection[8] (Gasparich et al, 1984).

It has also been shown that local blockade of obturator nerve via a transvesical approach during cystoscopy is an effective method for controlling obturator jerk[9,10] (Khorrami et al, 2010; Rahman et al, 2010). Transvesical obturator block is easy to perform and do not require help of an anesthetist. Possible complications of obturator block include injury to obturator vessels and systemic complication if lignocaine enters into bloodstream.

Materials and Methods:

This study was conducted in the Department of Urology, Bangabandhu Sheikh Mujib Medical University, Shahbag, Dhaka from May 2018 to August 2019. Patients with bladder tumour located at the lateral wall, postero-lateral wall and lateral aspect of bladder neck were included in the study. Patients with cardiac arrhythmia or heart block, hepatic functional impairment, known hypersensitivity to Lignocaine or Coagulopathies were excluded. Ethical clearance for the study was taken from the Institutional Review Board (I.R.B) of BSMMU prior to the commencement of this study. The aims and objectives of the study along with its procedure, risks and benefits of this study was explained to the study subjects in an easily understandable local language. A written informed consent was taken from all the study subjects without exploiting any of their weakness. Total 81 patients were enrolled in the study and underwent transurethral resection of bladder tumour (TURBT) under spinal anesthesia.

Participants were allocated into two groups by randomization. Randomization was done by lottery. Group I received ONB through classic approach using a peripheral nerve stimulator (Stimuplex® HNS 12, B Braun, Germany) and group II received ONB through transvesical approach using an endoscopic needle, after spinal anaesthesia.

In this study, 10 ml of 2% Lignocaine was used as local anesthetic agent for nerve block. Side of the ONB was decided by location of tumour seen by preoperative ultrasonography of urinary bladder. Fifteen minutes waiting period was allowed in both groups for the full effect of the nerve block.

Classic approach for obturator nerve block technique:

Originally described as a paresthesia method, the advent of nerve stimulation has increased the effectiveness and reduced patient discomfort, complications, and number of needle insertions.

The patient lies supine, with the limb to be blocked at 30 degrees abduction. The pubic tubercle is identified by palpation, and a 1.5-cm long line is drawn laterally and caudally; the injection insertion site is labeled at the tip of the end of the caudal line (Figure 01).
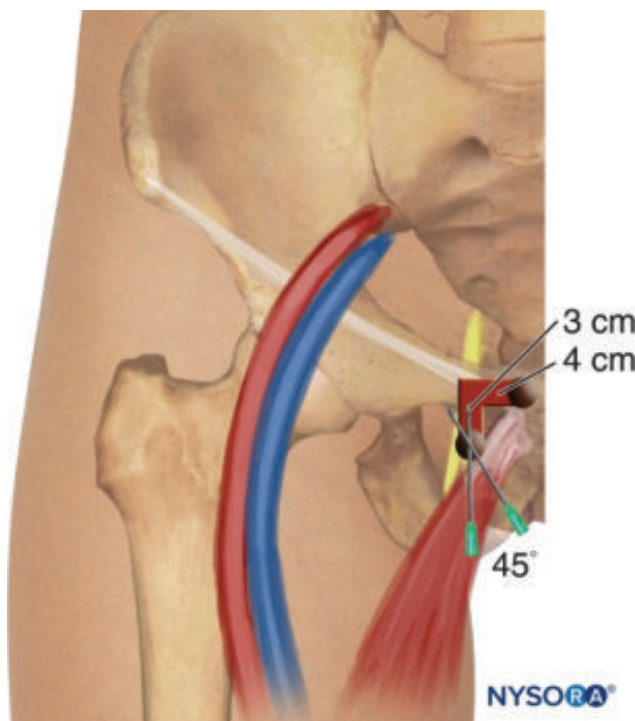

Figure 1: *Obturator nerve block: Needle position for classic technique (Anon, 2018).*

With a 22-gauge, 8-cm long needle, the skin is penetrated perpendicularly and the needle is advanced until it makes contact with the inferior border of the superior pubic branch at a depth of 2–4 cm. then the needle is slightly withdrawn and redirected (cephalad and laterally) at an angle of 45 degrees for another 2–3 cm until contractions of the thigh adductor muscles are observed (NYSORA, 2019). Nerve stimulation is begun using a current intensity of 2–3 mA (2 Hz, 0.1–0.3 msec) and reduced to 0.3–0.5 mA before injection of local anesthetic (Figure 02).

In this study we used 'Stimuplex® HNS 12' nerve stimulator by B Braun, Germany and 'Stimuplex® A' needle was used with for the block.

Figure 2: *Needle in position for ONB in classical approach*

Transvesical approach for obturator nerve block technique:

At first cystoscopy is done and survey of bladder interior is done. Then, an endoscopic needle is introduced through the working channel of the cystoscope. After that, the needle is inserted into the postero-lateral bladder wall between the ureteral orifice and the bladder neck. After aspiration test, anesthetic agent is injected. Patient is kept in 30º Trendelenburg's position along with lateral tilt to the injection side, so that the drug does not wash out (Figure 3).

Figure 3: *Transvesical ONB by endoscopic needle*

During resection of the tumour, monopolar cautery was used and setting was 100-120 Watt for cutting and 80-100 Watt for coagulation. Mode of cutting was pure cut and coagulation mode was spray.

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During surgery (TURBT), data on the degree of elimination of obturator jerk and ability of complete resection was recorded. After histopathological examination, presence of detrusor muscle in the TURBT specimen was also recorded.

RESULTS

In group I, the mean age of patients was 59.38 (±12.01) years which ranged from 30-80 years. In group II, the mean age of patients was 62.28 (±12.68) months which ranged from 35-90 years. In group I, 34 (81.0%) patients were male while in group II, 34 (79.5%) patients were male (Table 1).

Table 1: *Demographic characteristics of patients in two groups:*

Variables	Group I (n=42)	Group II (n=39)	P value
Age(in years)	59.38±12.01	62.28±12.68	0.259
Gender			
Male	34 (81.0%)	31 (79.5%)	1.000
Female	8 (19.0%)	8 (20.5%)	

In group I, the mean tumour size was 2.95 (±0.73) cm. In group II, the mean tumour size was 3.02 (±0.78) cm. There was no significant difference between two groups regarding tumour size as the p = 0.663 (obtained by Student t test). Regarding the location of tumour, 36 (85.7%) patients had tumour on the lateral wall and 4 (9.5%) patients had tumour on the posterior wall while in group II, 33 (84.6%) patients had tumour on the lateral wall and 4 (10.3%) patients had tumour on the posterior wall. Fisher's Exact test showed that there was no statistical differences between the groups regarding location of tumour as the p >0.05 (Table 2).

Table II: *Tumour characteristics in two groups (N=81)*

Variables	Group I (n=42)	Group II (n=39)	P value
Tumour size (in cm)	2.95 ±0.73	3.02 ±0.78	0.663
Location of tumour			
Lateral wall	36 (85.7 %)	33 (84.6 %)	0.943
Postero-lateral wall	4 (9.5 %)	4 (10.3 %)	
Lateral aspect of bladder neck	2 (4.8 %)	2 (5.1 %)	

In group I, all patients had complete elimination of obturator jerk while in group II, 31 (79.5%) patients had complete elimination of obturator jerk. Fisher's Exact test showed that there was significant statistical differences between the groups regarding degree of elimination of obturator jerk as the p=0.002 (Table 3).

Table III: *Degree of elimination of obturator jerk after ONB in two groups (N=81):*

Degree of elimination of obturator jerk	Group I (n=42) No. (%)	Group II (n=39) No. (%)	P value
Complete	42 (100.0)	31 (79.5)	0.002
Partial	0 (0.0)	8 (20.5)	0.002

In group I, all patients had complete visible resection while in group II, 38 (97.4%) patients had complete visible resection. Fisher's Exact test showed that there was no significant statistical differences between the groups regarding visible complete resection (Table IV).

Table IV: *Complete resection of tumour in two groups (N=81):*

Complete resection	Group I (n=42) No. (%)	Group II (n=39) No. (%)	P value
Yes	42 (100.0)	38 (97.4)	0.481
No	0 (0.0)	1 (2.6)	0.846

In group I, 38 (90.5%) patients had dertrusor muscle in the histopathological specimen while in group II, 25 (64.1%) patients had dertrusor muscle in the histopathological specimen. Pearson's Chi-square test showed that there was significant statistical differences between the groups regarding dertrusor muscle in the histopathological specimen (Table V).

Table V: *Presence of detrusor muscle in the TURBT specimen in both groups (N=81):*

Detrusor muscle in TURBT specimen	Group I (n=42) No. (%)	Group II (n=39) No. (%)	P value
Present	38 (90.5)	25 (64.1)	0.007
Absent	4 (9.5)	14 (35.9)	0.003

In group I, 3 (7.1%) patients required blood transfusion due to bleeding while in group II, 4 (10.3%) patients required blood transfusion due to bleeding. Fisher's Exact test showed that there was no significant statistical differences between the groups regarding perioperative complication as the p=0.707 (Table VI).

Table VI: *Occurrence of perioperative complication (N=81):*

Perioperative complication	Group I (n=42) No. (%)	Group II (n=39) No. (%)	P value
• Bleeding requiring transfusion	3 (7.1)	4 (10.3)	0.707
• Perforation of urinary bladder	0 (0.0)	0 (0.0)	
• Systemic toxic effects of lignocaine	0 (0.0)	0 (0.0)	

Discussion

This study had been designed compare the effectiveness of obturator nerve block between classic approach and transvesical approach along with spinal anaesthesia for transurethral resection of bladder tumour in terms of elimination of obturator jerk, ability to completely resect the tumour, presence of detrusor muscle in the TURBT specimen and complications.

Most of the patients with urinary bladder mass were elderly. In the study by Sharma et al. (2017)[11] mean age of the patients in two groups were 66.4 ± 11.2 years and 63.6 ± 10.7 years. Similarly Jo et al. (2011)[7] enrolled patients with mean age of 64.05 ± 10.2 and 62.4 ± 11.8 years. In our study, mean age of the patients was 59.28 ± 12.01 years in group I and 62.28 ± 12.68 in group II, which is similar to other studies. Majority of the patients were male. In our study 81% patients in group I and 79.5 % patients in group II were male. In the study by Jo et al. (2011), 84 % patient in one group and 86% patients in the other group were male. About 95% patients in both groups were male in the study of Sharma et al. (2017)[11].

Mean tumour size (in centimeters) in our study was 2.95 ± 0.73 and 3.02 ± 0.78 in group I and II respectively. This difference was not statistically significant. 85.7 % patients in group I had lateral wall tumours, whereas 84.6 % patients in group II had lateral wall tumours. In study by Rahman et al (2010), percentage of patients having lateral wall tumours were 82.2 % and 77.7 % in two groups, which is similar to ours.

Patel et al. (2004)[12] and Khan et al. (2017)[13] conducted studies on obturator nerve block in classic approach without using a nerve stimulator. They reported success rate of ONB to be 84.6 %, 96% and 94.54 % respectively. Patel et al. (2004)[12] used 1% lignocaine and in other two studies 2% lignocaine was used as anaesthetic agent. In our study we also used 2% lignocaine for nerve block.

The use of nerve stimulator in classic approach obturator nerve block showed higher success rates.

Gasparich et al. (1984)[8] used classic approach using a nerve stimulator in 275 patients and reported 100% success rate defined by absence of obturator jerk during transurethral resection of bladder tumour. Also Nagmothe et al. (2017)[14] and Sharma et al. (2017)[11] repoted success rate of classic approach ONB as 96.66% and 95 % respectively with the use of a nerve stimulator. In our study we had similar high success rate in classic approach for ONB. We performed obturator nerve block in classic approach using a nerve stimulator in 42 patients with 100% success rate. As obturator nerve is accurately located by nerve stimulator before injection of anaesthetic agent, such high success rate is expected.

Khorrami et al. (2010)[9] used nerve stimulator for transvesical approach ONB and reported high success rate (97%). Rahman et al. (2010)[10] also reported a success rate of 93.3% in transvesical approach of ONB although they did not use nerve stimulator.

Sharma et al. (2017)[11] reported 75% success rate in transvesical approach for obturator nerve block. They also did not use nerve stimulator for this technique. In our study we found similar success rate in transvesical approach (79.5%). We did not use nerve stimulator, because we did not have a long suitable insulated needle that can be used through a cystoscope. In Contrast, Hizli et al. (2016)[15] reported only 60% success rate in transvesical approach for obturator nerve block.

Erbay et al. (2017)[16] conducted a study on 96 patients where one group of patients received obturator nerve block via inguinal approach and other group did not receive obturator nerve block. They compared the ability of complete resection of lateral wall bladder tumour in two groups. They reported that, complete resection of the tumour was possible in 91.48 % patients who received obturator nerve block. On the other hand, in patients who did not receive obturator nerve block, complete resection was possible in only 63.26 % patients.

Sharma et al. (2017)[11] reported complete resection was possible in 100% patients who had obturator nerve

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block in classic approach and in 90 % patients who had obturator nerve block in transvesical approach. In the study ny Rahman et al (2010)[10], 93.3% patient had complete resection of tumour without any obturator jerk after ONB via transvesical approach. In our study, visible complete resection was possible in 100 % patients in group I (classical approach) and in 97.4 % patients in group II (Transvesical approach). Statistically there was no significant difference. In only one patient (2.6%) in group II, complete resection was not possible due to obturator jerk. Resection was completed later under general anaesthesia with muscle relaxant.

Erbay et al. (2017)[16] showed that detrusor muscle was present in the TURBT specimen of 95.74 % patients who had obturator nerve block during resection of lateral wall bladder tumour. In our study, we found that detrusor muscle was present in TURBT specimen of 90.5% patients who had obturator nerve block in classic approach. In contrast, detrusor muscle was present in specimen of 64.1 % patients in whom obturator nerve block was given by transvesical approach. Presence of some degree of obturator jerk in some patients this group may be a cause for this. Patients with absent detrusor muscle in the TURBT specimen underwent repeat transurethral resection at later date. Those data was not included in the study.

Nagmothe and Vali (2017)[14] reported that 6.66% patient who had obturator nerve block by classic approach needed perioperative transfusion of blood products. In our study, 7.1 % patients in group I (Classic approach) and 10.3% patients in group II (transvesical approach) required perioperative blood transfusion due to peroperative haemorrage. This is similar to their findings and the difference between two groups were statistically insignificant.

No patient in our study had bladder perforation or systemic effect of lignocaine injection. Erbay et al (2017)[16] and Nagmothe and Vali (2017)[14] also reported no incidence of bladder perforation in the patients who received ONB. Although Sharma et al (2017)[11] reported, 1 (5%) to have bladder perforation eve after getting ONB via transvesical approach.

Rahman et al (2010)[10] reported mild systemic effect of lignocaine injection in the form of severe anxiety in 6.6 % patients. But no such incidence happened in our study. Also Jo et al (2011)[7] reported that, there was no ONB related complications in their study.

Conclusion

Obturator nerve block in both classic approach and transvesical approach is safe. The classic approach with a nerve stimulator is more effective than transvesical approach for obturator nerve block, but the effectiveness of both techniques for complete resection of tumour is similar.

Limitations of The Study

1. Small sample size.
2. Nerve stimulator was not used in transvesical approach.
3. Multiple surgeons performed the surgery.
4. Oncological principle may be breached in transvesical approach.

Recommendation:

Considering the findings of this study it can be said that, classic approach with nerve stimulator should be used for obturator nerve block for transurethral resection of bladder tumours located in the lateral wall, postero-lateral wall and lateral aspect of bladder neck. If experienced anaesthetist or nerve stimulator is not available, then transvesical approach can also be used safely.

A study on transvesical approach for obturator nerve block using a nerve stimulator is necessary to comment about the exact effectiveness of this approach.

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