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Combination of Spinal Anesthesia and Obturator Nerve Block in Transurethral Resection of Bladder Tumor, Comparison between Nerve Stimulator and Ultrasonography

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Abstract

Background: Genitourinary system mostly develops cancers with bladder origin which can be treated in several ways. One of the most prevalent these ways are through the urethra (TURP). For anesthesia, general anesthesia or neuraxial methods can be used but the most common procedure is spinal anesthesia. The level of sensory block should reach to T10. Obturator nerves which are part of lumbar plexus innervate adductor muscles. The nerve in its route passes close to the ladder wall. Sometimes during cauterization of the tumor this nerve is stimulated, causing reflex adductor (Jump organs) despite the spinal anesthesia. Intraoperative complications of TURP include bleeding (sometimes too much). In some cases, adductor reflex can cause rupture of the bladder due to the movement of the patient. One of the useful measures to prevent this incident is to block the Obturator nerve separately.

Methods: 124 eligible subjects were assigned to two groups randomly. Ultrasound-guided Obturator nerve blocks in one group and the other with nerve locator, both received 10 cc of Lidocaine 1.5% with Epinephrine 1/200000. After spinal block with Bupivacaine 3 cc of 0.5% to obtain sensory level to 10, surgery is done. Presence or absence of adductor reflexes were recorded by the surgeon. Bladder perforation and bleeding during and after surgery were also recorded. The presence or absence of sensory or motor block residual was recorded in the next day.

Results: The incidence of adductor reflex (Jerking limbs during cauterization of the tumor) was significantly low in the ultrasound group than nerve location. The amount of bleeding and ruptured bladder in ultrasound group was significantly lower than in nerve locator. Any remaining blocks in any group after 24 hours were not present.

Conclusion: Based on the current study results, ultrasound-guided nerve block is more suitable than nerve locator for obturator block.

Keywords: Transurethral resection of bladder tumor (TURBT); Obturator nerve; Reflexes adductor

Introduction

Peripheral nerve blocks are still a well-accepted procedure in comprehensive anesthetic care. Benefits of peripheral nerve block are better analgesia, less need for opioids and other pain medications administration, decreased recovery room duration and/or hospital stay, improved mobility and functional recovery post operation, and increased patient satisfaction [1]. Obturator Nerve Block (ONB) is usually performed to avoid sudden and harmful thigh adduction during TURBT [2,3].

Labat et al., [4] first described selective ONB in 1922. Since then, several ONB techniques using surface landmarks to localize the nerve have been reported by different studies [5-7]. Obturator nerve (ON) passes through proximal to the inferolateral bladder wall, bladder neck, and prostatic urethra. Hence, TURBT on the lateral side of the bladder under spinal anesthesia may arouse an obturator reflex, adductor muscle activation and so leg to jerk [8].

TURBT is usually done under spinal anesthesia, but it does not prevent the obturator jerk reflex leading to some problems for surgeons and many complications such as bladder perforation, bleeding or incompletely resection of tumor which could be prevented by ONB in TURBT [8-11]. Many recent findings in different studies suggest that ONB can make it possible to eradicate tumors located on the lateral wall of the bladder by immobilizing the surgical field.

Objectives

The degree of success of blocking the obturator nerve is between 65 to 90 percent when we do the block blindly without use of sonographic approach. While the selective blockage of this nerve is partly safe, there is a risk of neurological or other neighboring parts damage [12]. So ultrasonography guide is a hopeful option. In this research, we compared using ultrasonography or nerve stimulator for obturator nerve block in TURBT [13].

Materials and Methods

Patients with TURBT were enrolled in the current randomized clinical trial after signing the informed consent form.

Inclusion and exclusion criteria

Inclusion criteria: No addiction, no sensory or motor disorder, ASA Class I/II, no diabetes mellitus, no coagulopathy, no infection on injection site, no hyper/hypotension, consent in spinal anesthesia and no electrolyte imbalance.

Exclusion criteria: Surgery duration above 2 hours, need for general anesthesia, and electrolyte imbalance.

Spinal anesthesia was done by 3 ml of 0.5% Bupivacaine after blocking the obtoratur nerve in either ways. In both group after standard fluid therapy and monitoring, the sedation was achieved by Midazolam 0.02 mg/kg (Table 1).

130 patients						
Sonography (65 persons)				Nervelocator (65 persons)		
1 persons	1 persons	1 persons	62 persons	1 persons	2 persons	62 persons
Open surgery	Surgery Prolongation	Failed Spinal	Participation in the study	Surgery Prolongation	Failed Spinal	Participation in the study

Table 1: The result of the reviews of 130 patients.

After aseptic techniques were done, 85 mm (Visicon) needle for performing block and ultrasonography (for guidance were used. Nerve stimulator guided block was done selectively for the obtoratur nerves at the inguinal level and little more distal. The adductor longus tendon and the femoral artery is marked. to identify tendon, achievement of extreme leg abduction is required (Figure 1). Pubis tubercle as the surface anatomic guide is important.

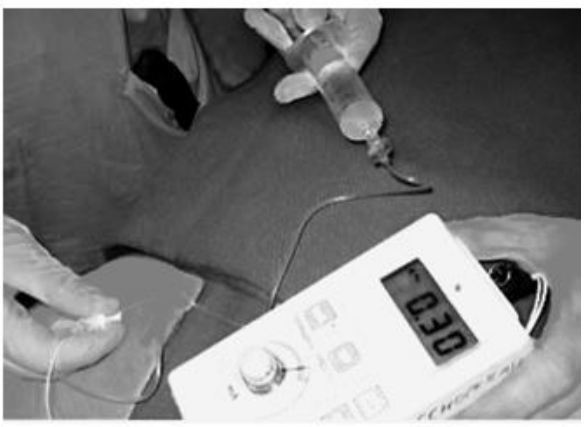


Figure 1: Nervelocator.

The needle was inserted one inch lateral and one inch inferior from the pubis tubercle. Then, the needle was inserted deeper (2 cm) over the short adductor muscle laterally until responding the major adductor muscle and when receiving to the posterior-medial side of the thigh. Nerve stimulation by 2-3 mA decreased to 0.5 mA before local anesthesia. After needle insertion, 5 ml of local anesthetic was infiltrated.

In the sonography-guided group, sonography confirmed injection site. The proposition of LA was done slowly (10 ml/minute). Presence of obturator reflex was reported by surgeon. In order to estimate hemorrhage accurately, the bladder should be evacuated completely before the procedure and the volume of the used liquid was accurately calculated. The amount of bleeding was evaluated low, very low (less than MABL), Moderate (To the extent MABL: Without the need for blood prescription and compensation by Serum) and Severe (to the extent MABL and more and need for blood prescription).

$$MABL\ (Measured\ Allowable\ Blood\ Loss) = \frac{Weight\ (Desired\ Hct - Patient\ Hct)}{\frac{(Desired + Pat)\ Hct}{2}}$$

During the operation, the patient was monitored for bladder perforation symptoms and at the end of the surgery, the surgeon evaluated bladder for perforation. Eventually, the presence or absence of sensory and motor symptoms was recorded on the day after surgery. Study variables were age, gender, lower extremity jerking, bladder hemorrhage, perforation, etc.

124 patients' information including 62 persons under selective obturator nerve block with nerve stimulator as well as 62 control subjects selected based on ultrasonographic guide was analyzed with SPSS version 21.0. Chi-Square and Exact-Fisher tests were used ($p<0.05$).

Results

130 patients were evaluated (65 in each group) and 6 patients (3 in each) were excluded from study (3 because of not achieving the considered level, 2 because of surgery duration more than 2 hours and 1 because of change of surgical plan to open surgery). The mean age of patients in with/without ultrasonographic-guide groups were 62.11 ± 9.59 and 63.21 ± 9.71 years respectively ($p>0.05$) and 12 (19.4%) and 16 (25.8%) subjects were female in each group, respectively ($p>0.05$). both groups had the same operation time ($p>0.05$, 88.6+19.4 *versus* 92.1+20.3 minutes).

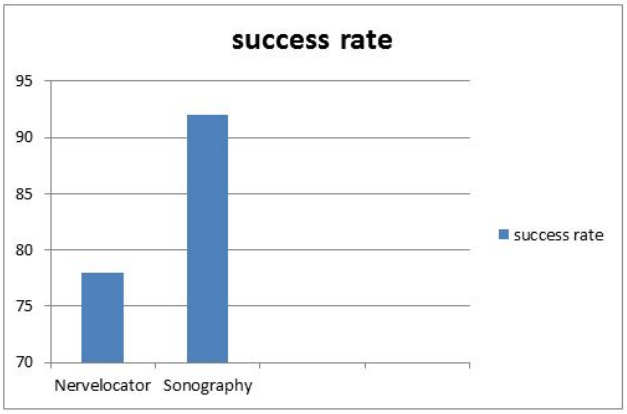
Based on Table 2, however no significant difference was reported between the without guide the guided groups in the onset time (6.2+2.3 min *vs.* 5.8+2.2 min), while, the time needed for blocking nerve (4.5+1.2 min *versus* 1.6+0.9 min) was shorter significantly ($p=0.001$) in sonographic-guided group.

	A	**B**	**p-value**
N	**62**	**62**	
Gender			
Female	16 (25.8%)	12 (19.4%)	0.39
Male	46 (74.2%)	50 (80.6%)	
Age	63.21 ± 9.71	62.11 ± 9.59	0.528
Bleeding			

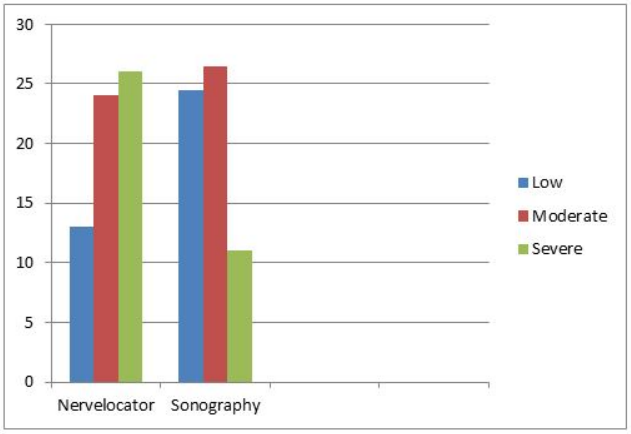
Low	13 (21.0%)	24 (38.7%)	0.003
Moderate	23 (37.1%)	27 (43.5%)	
Severe	26 (41.9%)	11 (17.7%)	
Jerk	14 (22.6%)	5 (8.1%)	0.025
Perforation	8 (12.9%)	1 (1.6%)	0.032
Residual effects of block	0(0%)	0 (0%)	Non-significant
Duration of operation	92.1+20.3	88.6+19.4	<0.05
Onset time	6.2+2.3 min	5.8+2.2 min	0.001

Table 2: The result of the reviews.

Based on Graph 1, the success rate in block was relatively more in patients underwent ultrasonography (92% *versus* 78%, p-value: 0.05).



Graph 1: Comparison of success rate in two groups.



Graph 2: Comparison of bleeding rate in two groups.

Bleeding was mild, moderate and sever in 21%, 37.1% and 41.9% in group without sonographic guidance and 38.7%, 43.5% and 17.7% in sonographic guide nerve block group respectively (p-value: 0.003 and Graph 2).

Jerking was seen in 22.6% and 8.1% of two groups respectively (p-value: 0.025) and perforation was seen in 8 (12.9%) in first group and only 1 (1.6%) in second group (p-value: 0.032). Residual effect of nerve block was seen in none of the patients in two groups.

Discussion

TURBT is a surgical technique extensively used to diagnose and treat bladder cancer which often performed under spinal anesthesia. Peripheral nerve blocks are inexpensive anesthetic methods used to induce anesthesia while avoiding induction of general anesthesia and its complications or even neuroaxial 23 anesthesia. So, now-a-days demand for regional methods is growing increasingly because of patients satisfaction, its cost-effectiveness, its usefulness and better postoperative recovery in different experiences [5,8,11,14].

Obturator nerve block combined with spinal anesthesia is a suitable method in TURBT. There are different modalities described in literature to block obturator nerve. One of them is nerve stimulation technique which was reported by Prentiss et al., [15] and then Parks and Kennedy [16] with a success rate of 83.8% to 85.7%.

Min et al., and Bolat et al., [17,18] in their study using nerve stimulator to do ONB reported an overall success rate of 95.4% and 88.6% respectively. Recent studies reported more success rate of 97.2% for nerve stimulation in combination with sonography [19,20]. In our study success rate in group ONB+ nerve locator was about 78% and in group ONB+ ultrasonography was about 92%.

In a study by Augspurger and Donohue [21] obturator jerk was abolished 83.8% with blind anatomic approach which is lower to nerve stimulation and sonographic-guided techniques described previously. As the effectiveness rise from 89.4% to 100% in Gasparich et al., and Kobayashi et al., [22,23] studies. In our study obturator jerk was seen in 8.1% using ultrasound in compare with 22.6% in nerve stimulation without sonographic guide.

Dick et al., [24] in a study evaluated the occurrence of hemorrhage was 13% while Collado et al., [25] have reported 3.4% of patients needed blood transfusion. Malik et al., [26] reported 25% of patients in their study required transfusion after TURBT. In our study sever bleeding was seen in 17.7% of ultrasound-guided ONB in compare with 41.9% in control group.

Literature search revealed bladder perforation incidence between 0.9% to 5%, while in this study it was 1.6% and 12.9% in sonography-guided ONB and control group respectively [27]. Yamauchi et al., [28] evaluated the effect of peri articular infiltration analgesia (PIA) and sciatic nerve block (SNB) for posterior knee pain. They reported lower score of VAS in PIA group than in SNB group 12-24 hours, most of patients didn't experience posterior knee pain. So they included that post-TKA application of FNB plus PIA is suitable periarticular infiltration method and could be used instead of SNB providing sufficient analgesia.

Helayel et al., [29] surveyed a new ultrasound-guided technique to localize the obturator nerve. In 91% of cases, this nerve is properly identified on the first attempt within 30 ± 23 seconds. Adductor strength decreased in all patients and they had various sensory territories, although 32% of them had no cutaneous distribution. 14% of the patients received low-dose opioid and no one received general anesthesia to complete the surgery.

In Manassero et al., [30] study 50 patients who were candidate for spinal anesthesia randomly divided into two groups of 5 ml 2% Lidocaine, ultrasound-guided injection into the interfascial plane between adductor longus and adductor brevis as well as adductor brevis and magnus muscles (US group), and of 5 ml of 2% Lidocaine accompanied by nerve stimulation after identification of the divisions of the obturator nerve (USENS group). The blocking nerve was found by ultrasound-guided obturator after division of the nerve, induction of local anesthetic between the planes of the adductor muscles as the nerve stimulation analogue.

Based on the findings of a study, risk of intraneural injection and neurological postoperative complications can be reduced by ultrasound guidance. An observational study was conducted on 257 patients underwent a pre-operative neurological examination before arthroscopy with sedation and ultrasound-guided interscalene or supraclavicular block. The ultrasound video of the block offline was also displayed for two anesthesiologists who were blind to the study. 42 patients received Intraneural injection. No patient had postoperative neurological complications at follow-up [31].

Conclusion

Based on our current study results, ultrasound-guided nerve block is more suitable than nerve locator and has less morbidity for Obturator block. But in my opinion every procedure needs practice and one can be very skillful than others in a special method that is not known as 'choise'.

Ethical Considerations

The objectives and procedure of the study was explained to all the selected subjects and they were asked to sign the written informed consent form. In addition the study protocol was approved by the Ethics Committee of the local university.

The therapist undertook to avoid any disruption to the patient's treatment process and to maintain ethical issues throughout and after the operation. Eventually none of the patients experienced complications from anesthetic procedures.

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