



Effectiveness of spinal anesthesia combined with obturator nerve blockade in preventing adductor muscle contraction during transurethral resection of bladder tumor

Transüretral mesane tümörü rezeksiyonunda addüktör kası kontraksiyonunu önlemede obtüratör sinir bloğuyla kombine spinal anestezinin etkinliği

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Cite this article as: Alavi CE, Asgari SA, Falahatkar S, Rimaz S, Naghipour M, Khoshrang H, et al. Effectiveness of spinal anesthesia combined with obturator nerve blockade in preventing adductor muscle contraction during trans-urethral resection of bladder tumor. Turk J Urol 2017; 43(4): 507-11.

ABSTRACT

Objective: To determine whether spinal anesthesia combined with obturator nerve blockade (SOB) is effective in preventing obturator nerve stimulation, jerking and bladder perforation during transurethral resection of bladder tumor (TURBT).

Material and methods: In this clinical trial, 30 patients were randomly divided into two groups: spinal anesthesia (SA) and SOB. In SA group, 2.5 cc of 0.5% bupivacaine was injected intrathecally using a 25-gauge spinal needle and in SOB after spinal anesthesia, a classic obturator nerve blockade was performed by using nerve stimulation technique.

Results: There was a statistically significant difference between jerking in both groups ($p=0.006$). During the TURBT, surgeon satisfaction was significantly higher in SOB group compared to SA group ($p=0.006$). There was no significant correlation between sex, patient age and location of bladder tumor between the groups ($p>0.05$).

Conclusion: Obturator nerve blockade by using 15 cc lidocaine 1% is effective in preventing adductor muscle spasms during TURBT.

Keywords: Adductor muscle Jerking; obturator nerve; spinal anesthesia; transurethral resection of bladder tumor; TURBT.

ÖZ

Amaç: Spinal anestezi ile kombine obtüratör sinir bloğunun (SOB) transüretral mesane tümörü rezeksiyonu (TURBT) sırasında obtüratör sinir uyarımı, seyirmeleri ve mesane perforasyonunu önlemede etkili olup olmadığını belirlemek.

Gereç ve yöntemler: Bu klinik çalışmada 30 hasta spinal anestezi (SA) veya spinal anestezi ile kombine obtüratör sinir bloğunun (SOB) uygulandığı iki ayrı gruba randomize edilmiştir. SA grubunda 25 no.lu spinal iğneyle intratekal olarak 2,5 cc %0,5 bupivakain enjeksiyonu yapılmış, SOB grubunda ise sinir uyarı tekniğiyle spinal anestezi sonrasında klasik obtüratör sinir bloğu uygulanmıştır.

Bulgular: Her iki grupta kas seyirmeleri arasında istatistiksel açıdan anlamlı bir fark mevcuttu ($p=0,006$). SA grubuna göre SOB grubunda cerrahın TURBT sırasında memnuniyet derecesi anlamlı derecede daha yüksekti ($p=0,006$). Gruplar arasında cinsiyet, hasta yaşı ve tümör lokalizasyonu yönünden anlamlı fark izlenmedi ($p<0,05$).

Sonuç: Yüzde birlik 15 cc lidokain kullanılarak gerçekleştirilen SOB, TURBT sırasında addüktör kas spazmlarını önlemede etkilidir.

Anahtar Kelimeler: Addüktör kas seyirmeleri; obtüratör sinir; spinal anestezi, transüretral mesane rezeksiyonu; TURBT

Introduction

Transurethral resection of bladder tumors (TURBT) encompasses risk of stimulation of

obturator nerve which is situated next to the lateral bladder wall. The obturator nerve arises from the second, third, and fourth lumbar plexus and it passes over fibers of the psoas

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Submitted:
28.12.2016

Accepted:
17.04.2017

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Available online at
www.turkishjournalofurology.com

major muscle which is adjacent to the obturator fascia and ultimately goes into the medial aspect of the thigh and innervates muscles responsible for adducting the thigh and also the skin on the paramedian part of the thigh.^[1] Incidental stimulation of the obturator nerve induces adductor spasms which are among significant concerns during numerous surgical operations, and particularly, during transurethral resection (TUR) procedures. Accidental adductor muscle spasm during these procedures will induce though infrequent but catastrophic complications such as excessive bleeding, bladder wall perforation, vessel laceration, vascular injury, hematomas and incomplete tumor resection.^[1-4]

Therefore various strategies have been implemented to preclude these intraoperative complications such as decreasing the intensity of the current of the resectoscope, application of general anesthesia with muscle relaxants, applying laser resectors, and obturator nerve blockade (ONB), etc.^[5,6] But applying spinal anesthesia for transurethral operations has been considered desirable.^[6] Although optimal anesthesia is provided by spinal anesthesia, preventing perineal laxity, pelvic floor relaxation and Jerking of obturator nerve motor is not possible by spinal anesthesia.^[7] So in urological surgeries for suppressing the obturator impulses and preventing incomplete resection of bladder, ONB has been prevalently applied as an alternative method.^[6,8] The common approach applied for ONB is the classic pubic approach, and ONB is technically challenging as the nerve is deeply positioned. The success rate varies between 60.5% and 100% when a nerve stimulator is used and it is categorized as a block with an intermediate level of difficulty.^[9] As Few studies adopted ONB to prevent adductor muscle contractions have confirmed effectiveness of this method.^[10,11] This double-blind, randomized study was undertaken to compare spinal anesthesia combined with obturator nerve blockade (SOB) with spinal anesthesia (SA) alone and also to validate the efficacy of combined SA in suppressing the obturator impulses during TURBT surgeries.

Material and methods

Between February 2014 and February 2015 we enrolled patients with lateral, posterior and posterolateral tumors of the bladder. After the approval of the Ethics Committee of Guilan University Medical Science (code of ethics:1910101709) and written informed consent obtained from 30 patients aged between 60-85 years, we performed our clinical prospective trial, and the patients were scheduled to undergo TURBT under SA and SOB. Pregnants, patients receiving anticoagulants or anti-platelet drugs or refuse to participate in the study, those with abnormal coagulation profiles and advanced cardiac disease, allergy to local anesthetics, neurological diseases affecting the central nervous system, pre-existing obturator neuropathy were excluded from the study. Fifteen patients were randomized to SA and the other

15 patients SOB using classic approach on one side or two sides depending on the laterality of the tumor. Allocation of patients receiving the type of block was made according to the random numbers generated by the computer using Microsoft Office Excel 2010 and the function "RANDBETWEEN" 1 and 2.

On arrival to the operating room, standard anesthetic monitors were applied and patients were pre-loaded with 500 mL of 0.9% normal saline intravenously. In the SA group a spinal block was done with a 25 G Quincke needle at the L3-4 or L4-5 inter-space in sitting position.

After confirming the presence of free-flow and clear cerebrospinal fluid in the cylinder of the syringe, 2.5cc of 0.5% Marcaine (bupivacaine) was administered. The patients were in the Trendelenburg position at an angle of 15° for 5 or 10 minutes. When the sensory level block reached above the level of T10, then, the patients were placed in lithotomy position and TURBT was carried out. In the SOB group, with the patient in the supine position, sensory blockade was checked with an alcohol swab and pin-prick test. When the sensory level block reached above T10, the initial insertion point for ONB was determined 1-2 cm caudally and 1-2 cm laterally to the pubic tubercle. ONB was performed using the classical approach with the patient in the supine position by an experienced anesthesiologist. A 22 G 10 cm long stimuplex needle was inserted vertically at a point 1.5 cm lateral and caudal to the pubic tubercle. When the tip of the needle touched the inferior border of the superior pubic ramus at a depth of 2-4 cm, the needle was advanced. Then the needle was withdrawn by 3 cm and was redirected further lateral and caudal, and 45° laterally to enter in the obturator foramen, in the obturator channel and the adductor muscle contraction was detected. If there was no contraction, the needle was withdrawn and redirected. Every time the needle was redirected it was counted as an attempt. For ONB, a peripheral nerve stimulator (B Braun STIMUPLEX® Dig RC Melsungen. AG, Germany) was applied. Initially, a current of 1 mA at a frequency of 1 Hz was set. When the needle was in contact with the obturator nerve and the first muscle contraction was stimulated, gradually the current was reduced, and resection of the bladder tumor started. We monitored NIBP, pulse, Spo₂, intraoperative ECG, and the patient was being observed specially for adductor spasm, and bladder perforation during TURBT in both groups, until the first contraction in the adductor muscles with electrical stimulation of 0.3-0.4 mA occurred. At this point, after aspiration (to confirm the needle is not in the vessel) 15 cc 1% lidocaine was injected as required for the approach and the patients were placed in the lithotomy position and transurethral resection was initiated. It should be mentioned that all the operations were done by applying Olympus bipolar device using U-shape cutting loop. Bipolar resections were performed under 260J cutting/120J coagulation setting. The median resection time for

both groups was 80 minutes. All the gathered information was entered into SPSS-16 and for comparing the two groups, and chi-square test and independent t-test were applied. A p value of <0.05 was considered to be statistically significant.

Results

Total number of patients was 30. Male to female ratio was 14:1 in the SA group and the median age of the patients was 67 years with a range of 50 to 79 years. Three (20%) patients were less than 60 years of age, 6 (40%) patients aged 61-70 years and 6 (40%) above 70 years of age. In the SOB male to female ratio was 12:3 and the median age of the patients was 69.2 years (range, 50- 80 years). Three (20%) patients were less than 60 years of age, 5 (33.3%) patients aged between 61 to 70 years and 7 (46.7%) were above 70 years of age. There was no significant correlation between sex ($p=0.598$), patient age group ($p=0.92$), Location of bladder tumor ($p=0.83$), ASA class ($p=1/0$) in the two groups of patients (Table 1).

In the SA group, two patients underwent ONB because of having severe adductor muscle jerking and severe cardiovascular disease. ONB was applied for these patients because general anesthesia (GA) was considered to be a significant risk factor. Two other patients in the SA group had severe adductor muscle jerking and had no underlying diseases so GA was applied for them. Fisher's Exact test demonstrated that there was no significant correlation between applying GA and ONB due to ineffectiveness of regional anesthesia in two groups ($p=0.1$). Three other patients in SA group suffered from a slight jerking

of obturator motor nerve but the problem was resolved by holding the leg and controlling its movement during cauterization. Out of the 15 patients of SA group, 7 caused dissatisfaction in surgeon. Fisher's Exact test showed that jerking and also the surgeons' satisfaction with patients' status in both groups was statistically significant ($p=0.006$) (Table 1).

Discussion

Transurethral resection of bladder tumors is regularly done for bladder tumors; however during the procedure, most urologists are anxious about obturator jerking and its consequences.^[12,13] Indeed irrigating the urinary bladder during TUR procedures reduces the distance between the obturator nerve and the urinary bladder wall. Consequently, the obturator nerve can be directly electrostimulated by the surgical resectoscope.^[14]

The frequency of severe adductor muscle spasms in patients undergoing transurethral surgery for laterally located bladder tumors or large intra-urethral prostatic adenomas was stated to be about 20%.^[15] This spasm may result in disastrous consequences such as bladder perforation, excessive bleeding, and sometimes discontinuation of operation and incomplete resection of tumors which are the serious complications of obturator nerve stimulation.^[16] Various strategies have been adopted to avoid these complications during surgery such as use of GA with succinylcholine or d-tubocurarine which is commonly advocated, the use of laser resectors, reducing the intensity of the current of the resectoscope, change in the site of inactive electrode, use of saline irrigation, ONB, ultrasound guided ONB, superficial resection with low current and cutting with bipolar resectoscope, blind ONB with or without nerve stimulator and periprostatic infiltrations have been applied with various success.^[1,13,16-21] However, a selective ONB still remains the safest and most effective alternative to this problem.^[22,23] It should be mentioned that SA with selective ONB is considered an appropriate option for aged patients undergoing such surgeries.^[21] Elderly patients are particularly sensitive and distinctively susceptible to hospitalization, surgery and anesthesia in ways that are only partially understood.^[24]

Obturator nerve blockade can be performed by using various methods and techniques such as classic pubic method by Labat and paravascular superficial inguinal approach.^[3] We blocked obturator nerve to prevent jerking by classical approach using a nerve stimulator because the proximal nerve would be blocked and blocking was more effective compared to the inguinal nerve blocking and at the same time, it is more easily to perform and less uncomfortable to patients. It should be declared that, the investigator in this study was experienced with classical approach. Results of our study were very encouraging with acceptable outcomes and no complication.

Table 1. Clinical characteristics of study subjects

Variables		Spinal anesthesia		p
		n (%)	SOB, n (%)	
Tumor location	Lateral	13 (86.7)	12 (80)	0.83
	Posterior	1 (6.7)	1 (6.7)	
	Postero lateral	1 (6.7)	2 (13.3)	
ASA class	I	1 (6.7)	1 (6.7)	1
	II	8 (53.3)	8 (53.3)	
	III	6 (30)	6 (40)	
Surgeon's satisfaction	Observed	8 (53.3)	15 (100)	0.006
	Not observed	7 (46.7)	0% (0)	
Movement during operation	Observed	7 (46.7)	0 (0)	0.006
	Not observed	8 (53.3)	15 (100)	
General anesthesia	Done	2 (13.3)	0 (0)	0.483
	Not done	13 (86.7)	15 (100)	

SOB: spinal anesthesia and obturator nerve block

In our study, we administered ONB with SA for patients in the SOB group and observed them for the development of adductor spasm. In the SOB group complete ablation of spasm was achieved in 15 patients. In SA group, out of 15 patients, in 8 patients complete ablation of spasm was achieved, and in 7 patients adductor spasm of varying degrees which were disturbing to the surgeon was observed. In a study which TURBT was performed on 50 patients, the patients were divided into two groups, the first group of 25 patients underwent SA, and the second group of 25 patients underwent SOB. In SA group, almost all the patients suffered from contraction of adductor muscles which disturbed the surgeon. But in the SOB group contraction of the adductor muscles did not occur in most patients. The results of the study demonstrated that ONB is an effective way to prevent adductor muscle spasms and its related complications in patients who underwent TURBT, which is comparable to our study.^[11]

In another study which bladder tumor resection was done in 60 patients aged 18-80 years old with ASA I - III, 30 patients were randomized into SA group and 30 patients into SOB group. The regional anesthesia was done using 5 cc of levobupivacaine and 5 cc of 0.5% NaCl. When the level of sensory block reached T10, adductor muscle spasms were recorded during the surgery. The frequency of adductor muscle spasms and the satisfaction of the surgeon were assessed. Surgeon satisfaction in SOB group compared to SA was significantly higher ($p < 0.001$). The frequency of adductor muscle spasms in the SA group (83%) compared to SOB group (6.7%) was higher ($p < 0.001$), and this result is comparable to our study.^[10]

Patel et al.^[11] had applied obturator nerve block in 13 patients, scheduled for TURBT. Out of them, 11 had resulted in complete ablation of adductor spasm and in 2 patients obturator spasm was reduced about 80%.^[11] Bleeding is a common complication and it is prevalent in TURBT. Dick et al.^[25] reported 13% incidence of hemorrhage; Six percent of the patients needed blood transfusion on the day of surgery, whereas 0.7% of them required blood transfusion during postoperative period. Collado et al.^[26] stated an incidence of 3.4% for requirement of blood transfusion but in our study, there was no need for blood transfusion which may be due to the normal hemoglobin level at the time of surgery in our patients.

In numerous studies, the incidence of perforation in TURBT ranges between 0.9, and 5%.^[10,25] Dick et al.^[25] stated that 5% incidence rate of intraperitoneal perforation but Collado et al.^[26] stated 1.3% incidence rate of bladder perforation, 83% out of these were extraperitoneal. Although the sample size in our study was small, there was no incidence of perforation in both groups. We suppose that perforation in four patients were precluded. Two patients in the SA group underwent ONB because of having severe adductor muscle jerking and severe

cardiovascular disease, and so general anesthesia (GA) for them was considered to be a significant risk factor and two patients in the SA group who had severe adductor muscle jerking without any underlying diseases received GA. It is assumed that selecting the proper type of anesthesia in our high risk patients was significant in preventing bladder perforation.

One of the limitations of our study was a relatively small sample size, caution needs to be applied concerning the generalizability of the research findings and further comprehensive work with larger sample size is suggested.

In conclusion, TURBT is the routinely performed technique for bladder tumors. ONB combined with spinal anesthesia is safely applied to preclude the obturator jerking, which usually happens during the surgeries of posterolateral bladder tumors. We conclude that, ONB can be an effective and safe method to preclude adductor spasms in TURBT, under spinal anesthesia.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Gulian University Medical Science (No: 1910101709).

Informed Consent: Written informed consent was obtained from patients who participated in this study.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept – C.E.A., S.A.A.; Design – C.E.A., S.A.A., S.R.; Supervision – C.E.A., S.A.A.; Materials – S.R., S.F., M.N.; Data Collection and/or Processing – M.N., H.K., M.J., N.H.; Analysis and/or Interpretation – S.F., M.N., M.J.; Literature Search – S.R., C.E.A., M.J., N.H.; Writing Manuscript – C.E.A., S.A.A., S.F., H.K.; Critical Review – H.K., M.N., S.A.A., S.R., C.E.A., M.J., S.F., N.H.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study has received no financial support.

Etik Komite Onayı: Bu çalışma için etik komite onayı Gulian Üniversitesi'nden (No: 1910101709) alınmıştır.

Hasta Onamı: Yazılı hasta onamı bu çalışmaya katılan hastalardan alınmıştır.

Hakem Değerlendirmesi: Dış bağımsız.

Yazar Katkıları: Fikir – C.E.A., S.A.A.; Tasarım – C.E.A., S.A.A., S.R.; Denetleme – C.E.A., S.A.A.; Malzemeler – S.R., S.F., M.N.; Veri Toplanması ve/veya İşlemesi – M.N., H.K., M.J., N.H.; Analiz ve/veya Yorum – S.F., M.N., M.J.; Literatür Taraması – S.R., C.E.A., M.J., N.H.; Yazıyı Yazan – C.E.A., S.A.A., S.F., H.K.; Eleştirel İnceleme – H.K., M.N., S.A.A., S.R., C.E.A., M.J., S.F., N.H.

Çıkar Çatışması: Yazarlar çıkar çatışması bildirmemişlerdir.

Finansal Destek: Yazarlar bu çalışma için finansal destek almadıklarını beyan etmişlerdir.

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