Obturator Nerve Block Using Levobupivacaine for the Prevention of Adductor Spasm in Transurethral Bladder Tumor Resection

Transüretral Mesane Tümörü Rezeksiyonunda Addüktör Spazmını Önlemek İçin Levobupivakain ile Obturator Blok Uygulaması

Kamil DARÇIN,[a]
Züleyha KAZAK BENGİSUN,[b]
Perihan EKMEKÇİ,[b]
Ahmet Hakan HALİLOĞLU,[c]
Arif Hikmet SÜER[b]

[a]Clinic of Anesthesiology and Reanimation, Kayseri Develi State Hospital, Kayseri
Departments of [b]Anesthesiology and Reanimation, [c]Urology, Ufuk University Faculty of Medicine, Ankara

Geliş Tarihi/*Received:* 16.01.2012
Kabul Tarihi/*Accepted:* 27.06.2012

Yazışma Adresi/*Correspondence:*
Kamil DARÇIN
Kayseri Develi State Hospital, Clinic of Anesthesiology and Reanimation, Kayseri, TÜRKİYE/TURKEY
drdarcink@gmail.com

ABSTRACT Objective: Adductor spasm can occur during transurethral resection of bladder tumour (TUR-BT) due to the stimulation of obturator nerve and can cause involuntary movement of legs, incomplete resection, bladder perforation and secondary extravesical dissemination of neoplastic cells. In this study we aimed to prevent adductor spasm and associated complications by obturator block with levobupivacain in patients with spinal anesthesia during TUR-BT for lateral wall tumors of the bladder. **Material and Methods:** Sixty 18-80 year-old patients, graded as ASA (American Society of Anestesiologists) I-III and scheduled for transuretral resection for lateral wall tumor of the bladder, were recruited for this study. Thirty patients, randomized as group S, received only spinal anesthesia and 30 patients randomized as group SOB, received spinal anesthesia and obturator block. Using a 22 G 50 mm insulated needle, 2 Hz, 0.5 mA electrical stimulation, with a pulse duration of 0.1 ms was applied, until the adductor muscle contractions were evoked. The local anesthetic solution 5 mL 7.5% levobupivacaine (37.5 mg) plus 5 mL 0.9% NaCl (Levobupivacaine 3.75%) was injected. Surgery was allowed after the spinal sensory block reached the T10 dermatome for all patients. Any adductor spasm occurring during surgery was recorded. Occurence of adductor muscle spasm and patient and surgeon satsifaction was evaluated. **Results:** Surgeon satisfaction was significantly higher in Group OBS ($p<0.001$) compared to Group S. Adductor spasm incidence was higher in Group S [25/30 (83%)] patients than in Group OBS [2/30 (6.7%)] patients ($p<0.001$). **Conclusion:** Obturator nerve block using levobupivacaine is effective in preventing adductor spasm in transurethral resection of lateral wall bladder tumours.

Key Words: Obturator nerve; levobupivacaine; anesthesia, spinal

ÖZET Amaç: Mesane tümörünün transüretral rezeksiyonu (TUR-MT) sırasında obturator sinirin stimülasyonu nedeniyle ortaya çıkabilen addüktör kas spazmı, bacakların istemsiz hareketi, inkomplet rezeksiyon, mesane perforasyonu ve buna bağlı olarak kanser hücrelerinin ekstravezikal disseminasyonu gibi istenmeyen sonuçların ortaya çıkmasına neden olabilir. Bu çalışmada, mesane yan duvarı tümörü olan ve TUR-MT uygulanacak hastalara spinal anestezi altında levobupivakain kullanılarak obturator blok uygulanmış ve bu şekilde addüktör spazmının ve komplikasyonlarının önlenmesi amaçlanmıştır. **Gereç ve Yöntemler:** Bu çalışmaya, lateral duvar mesane tümörü için transüretral rezeksiyon planlanan, 18-80 yaşları arasında ASA (American Society of Anestesiologists) I-III düzeyinde 60 hasta alındı. Hastalar spinal anestezi (S) veya spinal anestezi+obturator blok (SOB) gruplarında otuzar hasta olacak şekilde randomize edildi. Kasta seyirme yanıtı, 22 G 50 mm'lik yalıtılmış iğne kullanılarak, 2 Hz'de 0,1 ms, 0,5 mA akım ile elde edildi. Daha sonra 5 mL %7,5 levobupivakain (37,5 mg) ve 5 mL %0,9 NaCl ile hazırlanmış lokal anestezik solüsyonu (%3,75'lik levobupivakain) enjekte edildi. Her iki gruptaki hastalarda spinal duyu blok düzeyi torakal 10 seviyesine ulaşana kadar beklendikten sonra cerrahi girişim başlatıldı. Cerrahi sırasında hastada addüktör spazm olup olmadığı kaydedildi. Adduktor kas spazmının görülmesi ve cerrah ve hasta memnuniyeti değerlendirildi. **Bulgular:** Cerrah memnuniyeti Grup OBS'de anlamlı olarak daha yüksek bulundu ($p<0,001$). Adduktor spazmı insidansının Grup S'de [25/30 (%83)], Grup OBS'dekine [2/30 (%6,7) göre anlamlı ölçüde daha yüksek olduğu saptandı ($p<0,001$). **Sonuç:** Lateral duvar mesane tümörünün transüretral rezeksiyonu sırasında görülen adduktor spazmının önlenmesinde levobupivakain kullanılarak yapılan obturator blok uygulaması etkin bir yöntemdir.

Anahtar Kelimeler: Obturator sinir; levobupivakain; anestezi, spinal

doi: 10.5336/medsci.2012-28161

Turkiye Klinikleri J Med Sci 2013;33(1):49-53

Bladder cancer is the second most common genitourinary neoplasm in males.[1] The obturator nerve lies close to the bladder neck and the inferolateral wall of the bladder in pelvis. Obturator nerve block, together with femoral and lateral femoral cutaneous nerve, is used for superficial surgeries of the thigh, knee surgery, treatment of tourniquet pain, treatment of hip adductor spasm, and treatment of persistant hip pain due to osteoarthritis.[2,3] Adductor spasm can occur during transurethral resection of bladder tumour (TUR-BT) due to the stimulation of the obturator nerve and can cause involuntary movement of legs, incomplete resection, bladder perforation and secondary extravesical dissemination of neoplastic cells.[4] Resection under general anesthesia, partial filling of the bladder during resection, using low powered electrocautery or changing the polarity of the electric current have been tried to prevent the adductor spasm. However none of these techniques have been efficient in preventing the spasm, which has an incidence of 20%.[5-7] The aim of this study was to investigate the effectiveness of obturator block using levobupivacaine in preventing adductor spasm in TUR-BT for lateral wall bladder tumors.

MATERIAL AND METHODS

After obtaining local ethics committee approval and written consent, 60 ASA (American Society of Anestesiologists) I-III patients between 18-80 years scheduled for transurethral resection of lateral bladder wall tumors were enrolled in the study. Patients were selected according to tumors which were known to be localised on the lateral bladder wall established in previous cystoscopies. Exclusion criteria were advanced cardiac disease, allergy to local anesthetics, coagulopathy, pregnancy and neurological diseases affecting the central nervous system. In this randomised, controlled double-blind study, the patients were allocated to spinal anesthesia (Group S) and spinal anesthesia plus obturator block (Group OBS) groups using the closed envelope method. Obturator nerve block was carried out in the block room, thus the anesthetist doing the follow up of the patient and the surgeon resecting the tumour was blinded to the procedure. Upon arrival to the operating room, the patients were premedicated using midazolam 0.05 $mg.kg^{-1}$. Adductor muscle strength was evaluated using the method described by Lang et al.[8]

In order to evaluate the block success in group OBS, the patients were required to squeeze a sphygmomanometer which was inflated to 40 mmHg between their knees in extension. The maximum force applied by the patient was noted as basal adductor muscle force. Following this, 2 cc 2% prilocaine was applied to the site of entry. The obturator nerve block was carried out using the following technique. While the patient was lying supine and legs in abduction position, a 50-mm insulated needle (22-gauge Stimuplex™; B/Braun, Melsungen, Germany) was inserted. The insertion point was located 2 cm caudally and 2 cm laterally of the pubic tubercle. The needle was advanced until it contacted the inferior border of the superior pubic ramus. Then the needle was redirected posteriorly and was advanced along the inferior margin of the superior pubic ramus. The current was slowly lowered until the adductor muscle motor response was obtained at 0.5 mA of 0.1 ms at 2 Hz. After the confirmation of the needle position, 10 ml 3.75% levobupivacaine was injected. After the block, the patients were asked to squeeze the sphygmomanometer between their knees at one minute intervals for the next 30 minutes. A decrease in the maximum power applied by the patient was considered successful block. Following this, 10 mg levobupivacaine was given intrathecally from the L3-4 or L4-5 intervertebral space using a 25 G spinal needle for spinal anesthesia. Surgery was initiated after the block reached the T10 level. Any adductor spasm reported by the surgeon during surgery was recorded.

Patient satisfactiıon was evaluated at the end of procedure using a 4-point Likert scale (4:Very painful, 1: Comfortable). Suregon satisfaction was also evaluated using a 4-point Likert scale at the end of surgery (4: Very dissatisfied, 1:Perfect).

SPSS for Windows Version 15.0 (SPSS Inc., Chicago, IL, USA) was used for atatistical analysis.

Categorical variables were expressed as frequencies and percents. Quantitative variables were expressed as mean±standart deviation or median [minimum-maximum] as appropriate. Difference in quantitative variables was evaluated with the Mann Whitney U test or t test depending on whether the variables showed normal distribution. Chi square test was used to analyze the difference in categorical variables. Repeated measures of ANOVA was used to analyze the changes in blood pressure, heart rate and saturation. Significance value was set at $p<0.05$. Group sample sizes of 30 in group S and 30 in group OBS achieved 100% power to detect a difference between the groups for adductor spasm proportions of 0.7660.

RESULTS

There was no statistically significant difference in demographic data between groups (Table 1). Similarly, there was no difference in heart rate, sistolic and diastolic blood pressures and saturation between groups. Difference in blood pressure at first and 60th second of the anesthetic process was significant in both groups ($p<0.001$) (Table 2). Adductor spasm incidence was higher in Group S patients than in Group OBS [25/30 (83%) and 2/30 (6.7%) respectively, $p<0.001$) (Figure 1). All patients reported they were comfortable. Surgeon satisfaction was significantly higher in Group OBS than in Group S ($p<0.001$) (Table 3). In Group S, 1 surgeon reported perfect and 1 surgeon reported "satisfactory" operating conditions while in Group OBS, 27 surgeons reported perfect and 1 surgeon reported "satisfactory" operating conditions. There were no complications associated with obturator nerve block such as bleeding or hematoma.

DISCUSSION

The primary endpoint of this study was to investigate the efficiency of obturator block in prevent-

TABLE 1: Demographic data.

	Group Spinal (n=30)	Group Spinal+Obturator (n=30)	p
Gender (F/M)	6/24	5/25	1.000
Age (Years)	61.1±3.8	60.9±3.5	0.833
Height (cm)	166.2±6.2	164.4±6.2	0.293
Weight (kg)	76.5±7.1	78.0±5.6	0.367

F: female; M: male.

TABLE 2: Repeated measures ANOVA of blood pressure, heart rate and saturation in groups.

	Blood pressure		Heart rate		Saturation	
	Group spinal	Group spinal+obturator	Group spinal	Group spinal+obturator	Group spinal	Group spinal+obturator
Time (second)	(n=30)	(n=30)	(n=30)	(n=30)	(n=30)	(n=30)
1	67.4±2.3	67.5±2.2	70.6±7.6	68.3±3.9	98.0±1.2	98.2±0.8
5	65.1±1.9	64.9±1.7	69.0±8.6	67.7±6.4	98.2±0.8	98.2±0.9
10	65.2±1.7	65.5±1.5	68.8±7.8	71.8±5.9	98.5±0.7	98.2±0.8
15	65.5±1.4	65.3±1.6	68.4±7.0	66.6±4.1	98.5±0.6	98.3±0.8
20	65.0±1.2	65.1±1.3	67.8±6.8	66.8±3.3	98.2±0.7	98.1±0.8
25	64.7±1.8	65.1±1.8	67.4±6.7	67.2±3.2	98.4±0.6	97.9±1.0
30	64.9±1.8	65.5±1.8	67.0±5.6	69.7±8.3	98.3±0.7	98.0±0.9
35	65.1±1.7	65.3±1.6	67.8±5.9	70.0±5.2	98.4±0.7	98.2±0.7
40	65.3±1.3	65.7±1.5	66.8±6.7	69.6±4.6	98.6±0.6	98.1±1.0
45	65.1±1.4	65.0±1.6	67.8±6.6	69.9±5.0	98.3±0.8	98.3±0.8
50	65.2±1.3	65.0±1.8	68.7±6.3	69.3±5.2	98.4±0.7	98.1±1.0
55	65.0±1.6	64.7±1.6	69.2±5.8	68.1±3.2	98.5±0.8	98.1±0.9
60	65.9±1.5	65.7±1.4	67.5±5.9	68.4±4.1	98.3±0.9	98.1±0.9
Difference in time	<0.001		0.041		0.753	
Difference in groups	0.644		0.636		0.062	
Interaction between groups and time	0.878		0.015		0.416	

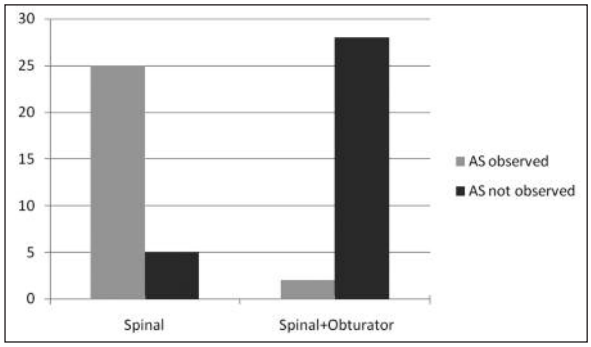

FIGURE 1: Incidence of adductor spasm among groups.
AS: Adductor Spasm

TABLE 3: Surgeon satisfaction.

	Group Spinal (n=30)	Group Spinal+Obturator (n=30)	p
Surgeon satisfaction	3 [1-4]	2 [1-4]	<0.001

ing the adductor spasm and the secondary endpoint was to investigate surgeon and patient satisfaction. Adductor muscle spasm is associated with anesthetic and surgical technique employed, location and spread of the tumour and the electric current used and thus it is hard to foresee the incidence. Patel et al. reported bladder perforation due to adductor spasm in 2 TUR-BT patients under spinal anesthesia and one patient needed emergency laparotomy.[9] Although the methodology of this study and the study conducted by Patel et al. have similarities, using a lower dose of local anesthetic and using levobupivacaine is a novel approach to this technique. In a case report, So et al. reported that in an 80 years old female patient undergoing TUR-BT under spinal anesthesia, adductor spasm was so strong that the surgeon had to stop the resection.[10] The spasm persisted despite general anesthesia and the surgery had to be postponed for one week due to increased risk of bladder perforation. After this, obturator block was applied and the resection was carried out uneventfully.[10]

Approaches like resection under general anesthesia, partial filling of the bladder during resection, using low powered electrocautery or changing the polarity of the electrical current have been tried with no efficiency in preventing the stimulation of the obturator nerve.[6] Prentiss et al. have reported the incidence of strong adductor spasm as 20% during the transurethral resection of large intraurethral adenomas and lateral bladder wall tumors.[5] Advanced age of the majority of patients undergoing TUR-BT, concurrent systemic diseases, the advantage of preventing intraoperative and postoperative complications have caused spinal anesthesia to be preferred over general anesthesia.[11,12] However, spinal anesthesia is also ineffective in preventing the adductor spasm.[11]

Obturator nerve block can be performed using multiple techniques. Many authors have performed the block using landmarks near the pubic tubercle described by Labat. However, Wassef et al. have stated that patient satisfaction is low and discomfort is high when using Labat's technique.[13] In this study, obturator nerve block was carried out using the technique described by Labat under sedation and patient satisfaction was normal. Accessory obturator nerve (AON), which is formed by the fusion of anterior branches of the L3 and L4 roots is found in 10-30% of the population.[14,15] Failure to block the AON results in insufficient obturator nerve block.[16,17] Patel et al. have divided patients scheduled for TUR-BT into two groups; one group received spinal anesthesia only while the other group received spinal anesthesia together with obturator nerve block and adductor spasm developed in 25 patients who did not receive obturator nerve block.[9] Bladder perforation occured in 2 of those patients and one had to undergo emergency laparotomy. One patient in the spinal and block group had 80% decrease in adductor spasm and this was attributed to the existence of the AON.[9] In this study, adductor spasm developed in 25 out of 30 patients who did not receive obturator nerve block ($p<0.001$). No complications occured due to the spasm; the obturator reflex was blocked in 28 out of 30 patients in Group OBS but adductor response developed in 2 patients. This was attributed to the existence of AON.

Choosing the local anesthetic and determining the dose is as important as the technique preferred in obturator block. In a case report by Akata et al.,

8 mg mepivacaine was used for obturator block in a patient scheduled for TUR-BT under spinal anesthesia.[17] During the deep resection of the tumour, bleeding developed in the bladder wall and the perforation was repaired under general anesthesia using laparotomy.[17] The authors have stated that the presence of adductor spasm despite the obturator block could have been caused by insufficient dose of local anesthetic. In this study levobupivacaine was chosen because of its equivalent effect to bupivacaine with a better safety profile in cardiovascular and central nervous system toxicity.[18,19]

In conclusion, the results of this study suggested that obturator block performed using 10 ml 3.75% levobupivacaine was effective in preventing adductor spasm in patients scheduled for TUR-BT under spinal anesthesia for the resection of lateral bladder wall tumours and resulted with better surgeon satisfaction and better surgical conditions.

REFERENCES

1. Jemal A, Siegel R, Ward E, Murray T, Xu J, Smigal C, et al. Cancer statistics, 2006. CA Cancer J Clin 2006;56(2):106-30.
2. Embey-Isztin D. The role of neurolytic obturator nerve block to relieve pain due to cancer and osteoarthritis. Ideggyogy Sz 2009;62(7-8):262-4.
3. Sinha SK, Abrams JH, Houle TT, Weller RS. Ultrasound-guided obturator nerve block: an interfascial injection approach without nerve stimulation. Reg Anesth Pain Med 2009; 34(3):261-4.
4. Walsh CP. Surgical treatment of bladder cancer. In: Retik BA, Vaughan DE, Wein AJ, eds. Campbell's Urology. 9th ed. Philadelphia: W.B. Saunders; 2007. p.2819-23.
5. Prentiss RJ, Harvey GW, Bethard WF, Boatwright DE. Massive adductor muscle contraction in transurethral surgery, cause and prevention; in development of new electrical circuitry. J Urol 1965;93:263-71.
6. Ong EL, Chan ST. Transurethral surgery and the adductor spasm. Ann Acad Med Singapore 2000;29(2):259-62.
7. Augspurger RR, Donohue RE. Prevention of obturator nerve stimulation during transurethral surgery. J Urol 1980;123(2): 170-2.
8. Lang SA, Yip RW, Chang PC, Gerard MA. The femoral 3-in-1 block revisited. J Clin Anesth 1993;5(4):292-6.
9. Patel D, Shah B, Patel BM. Obturator nerve block for bladder tumours. Indian J Anaesth 2004;48(1):47-9.
10. So PC. Two case reports of obturator nerve block for transurethral resection of bladder tumour. Hong Kong Med J 2004;10(1):57-9.
11. Lynch CF, Cohen MB. Urinary system. Cancer 1995;75(1 Suppl):316-29.
12. Salonia A, Suardi N, Crescenti A, Colombo R, Rigatti P, Montorsi F. General versus spinal anesthesia with different forms of sedation in patients undergoing radical retropubic prostatectomy: results of a prospective, randomized study. Int J Urol 2006;13(9):1185-90.
13. Wassef MR. Interadductor approach to obturator nerve blockade for spastic conditions of adductor thigh muscles. Reg Anesth 1993;18(1):13-7.
14. Akkaya T, Comert A, Kendir S, Acar HI, Gumus H, Tekdemir I, et al. Detailed anatomy of accessory obturator nerve blockade. Minerva Anestesiol 2008;74(4):119-22.
15. Di Benedetto P, Pinto G, Arcioni R, De Blasi RA, Sorrentino L, Rossifragola I, et al. Anatomy and imaging of lumbar plexus. Minerva Anestesiol 2005;71(9):549-54.
16. Vloka JD, Hadzic A. Obturator and genitofemoral nerve blocks. Tech Reg Anesth Pain Manag 1999;3(1):28-32.
17. Akata T, Murakami J, Yoshinaga A. Life-threatening haemorrhage following obturator artery injury during transurethral bladder surgery: a sequel of an unsuccessful obturator nerve block. Acta Anaesthesiol Scand 1999; 43(7):784-8.
18. Özkardeşler S, Akan M, Karcı A, Alaygut E, Özzeybek D, Öztekin S, et al. Comparison of two different spinal anesthesia techniques using levobupivacaine in perianal surgery. Turkiye Klinikleri J Med Sci 2011;31(1): 93-9.
19. Kazak Z, Mortimer MN, Şekerci S. Spinal anaesthesia with hyperbaric solutions of ropivacaine, levobupivacaine or bupivacaine in major orthopedic surgery. Turkiye Klinikleri J Med Sci 2010;30(2):731-7.