

A nightmare during endoscopic bladder tumor resection; obturator reflex

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Abstract

Bladder Tumor is the most common cancer type among urologic cancers and causes high mortality-morbidity if it is not treated early and appropriately. Although there are lots of causes and risks of bladder tumor and it is known that tobacco smoking is the main contributor to bladder tumor, etiology of tumor is not clear. At diagnosis, it is generally seen as a superficial tumor. Transurethral resection of bladder cancer (TUR-B) is the primary surgical method for the diagnosis, staging and treatment of primary or recurrent non-muscle-invasive bladder cancer. In this procedure, different complications may occur, especially bleeding, and the most important complication is bladder perforation. Additional therapies are needed depending on location and size of perforation. An intraperitoneal perforation can lead to laparotomy, bladder repair and open drainage of the abdominal cavity. Sudden adductor muscle spasm can occur when the obturator nerve is directly stimulated by the electrical current transmitted by the resectoscope, especially when the surgeon is operating at the lateral wall of the bladder, where the obturator nerve runs in close proximity during its intrapelvic course. Therefore, the type of anesthesia is important in the lateral wall tumors of the bladder. Obturator nerve block is an effective method of preventing obturator nerve reflex. Combination of obturator nerve block and spinal anesthesia seems to be a safe method of anesthesia in transurethral surgery. We aimed to form a review to reduce difficult situations and to minimize the adverse consequences caused by this reflex that becomes a nightmare in many surgical cases.

Keywords: Bladder Tumor; Complication; Perforation; Obturator Reflex; Obturator Block.

The most common urological cancer type is bladder tumor, 75-80% of which is superficial and endoscopic tumor resection is the first choice of diagnosis and initial treatment (TUR-B) (1). During and after the resection, several complications may occur. Although bleeding is the most common complication, the most important complication is the bladder perforation, which is about 1-6 % (2). The risk of bladder perforation may be associated with several factors such as surgical experience, size and localization of tumor, surgical endoscopic instruments, image quality, and type and depth of anesthesia. Considering to localization of tumor, the risk of bladder perforation is more likely if tumor is located at lateral wall, anterior and dome of bladder (3). During Transurethral resection of Bladder Tumor (TUR-B), region of bladder perforation is clinically important. Perforation may be intraperitoneal and extraperitoneal. The patient may be treated 5-7 days with foley catheter if the perforation is small and extraperitoneal.

The perforation that occurs at the initial of operation is sometimes swollen by irrigation fluid, so drainage tube may be needed. In case of intra-abdominal injuries, abdomen

may be filled with free fluid and bloated. This case may be checked with ultrasound and contrast-enhanced and unenhanced abdominal computerized tomography (CT) according to kidney functions (Figure 1a-b).

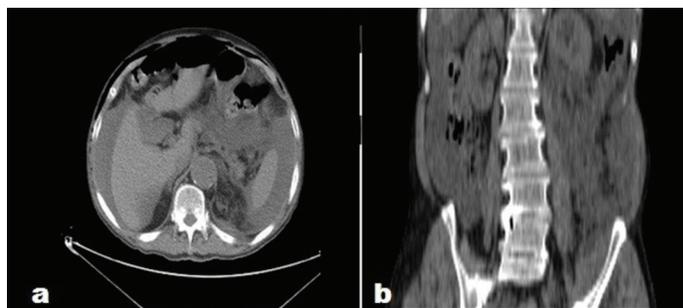


Figure 1a-b. Images of non-contrast CT show abdomen filled with irrigation fluid after the intraperitoneal perforation

Regardless of perforation size, open surgery is performed, free fluid is drained and performed bladder repair and abdomen is irrigated with distilled water (4). Although such complications required open surgery is seen more common in especially geriatric patients with huge

Received: 27.12.2016 **Accepted:** 15.02.2017

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tumor mass, operation history, thinning of bladder due to infravesical obstruction and diverticulum, bladder perforation is also more common in patients with side wall tumor due to obturator nerve stimulation causing sudden unintended movement of lower extremities. In this review, we aimed to review how to prevent bladder perforation due to obturator nerve stimulation.

Obturator Nerve Anatomy

The obturator nerve is formed by the anterior divisions of the second, third and fourth lumbar nerves and emerges from psoas major muscle near the brim of pelvis. It is disconnect from ovaries with thin periton layer in women. It runs laterally along the pelvic wall to the obturator foramen, and then enters the thigh through the obturator canal and splits into anterior and posterior divisions. Its fibers from both anterior and posterior branches are responsible for the motor innervation of abductor muscles, also they are responsible for the sensory innervation of the small skin area of the medial aspect of the thigh (5) (Figure 2).

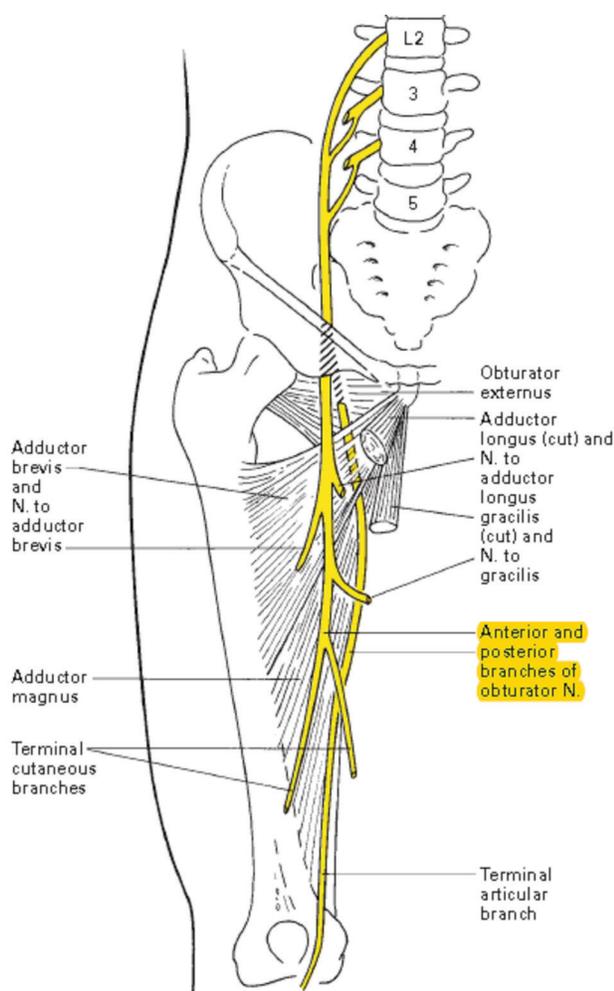


Figure 2. Anatomy of Obturator Nerve (8)

Even though it does not innervate bladder, its anatomic course is very close to inferolateral wall of bladder, bladder neck, and prostatic urethra. Therefore, during the transurethral resection of tumors located at inferolateral wall, and lateral wall, stimulation generated by electroresectoscope may cause adductor muscle spasm (obturator reflex). As

a consequence, complications may occur such as bladder perforation, external iliac vein injury, obturator artery injury, and tumor insemination (6,7).

Prevention of Obturator Reflexes

Although general anesthesia is recommended to prevent obturator reflexes, it may not be safe and appropriate method for elderly patients with comorbidities. Therefore, spinal anesthesia may be first choice of this operation. But, neuromuscular blockers are recommended to avoid obturator reflexes in general anesthesia for patients with lateral bladder tumors because of high risk of obturator reflex (9). According to Cesur et al. obturator reflexes were blocked in 56 patients by using succinylcholine as a neuromuscular blocker with the general anesthesia (10).

However, obturator reflexes were reported in some cases, even though general anesthesia and neuromuscular blockers were given to them. In Two case series reported by So P.C., spinal anesthesia was converted to general anesthesia because of obturator reflex and then neuromuscular blocker was given, but they could not avoid from obturator reflex. In another study, bilateral obturator nerve blockage was performed for a patient given general anesthesia before the operation, and it was noted that operation was free from complications (11). To avoid this complication, another recommendation is to add obturator nerve blockage to general or spinal/epidural anesthesia (12-14). Obturator nerve blockage was first used by Labat in 1928. Secondly, Nerve blockage was used by Prentiss et al. in 1965 and it was defined in detail by Parks in 1967 (15). And then, Wassef defined interadductor technique in 1963 (16). One of the indications of obturator nerve blockage is to avoid obturator reflex during the TUR-B operations (17). While the success rate of blind technique was reported to be 60-77%, Pladzyk et al. reported that the success rate of interadductor technique was 94% according to their studies including 542 patients. Thellaj and Rababh reported that the success rate of Ultrasound (USG) -guided nerve blockage was 97% (18,19). Aksu C. et al. performed 69 USG-guided blockage and found that only two patients suffered from obturator reflexes (20). In a group given both spinal anesthesia and nerve blockage, the rate of obturator reflex and the possibility of bladder perforation in patients with bladder tumor were found to be less than in a group given only spinal anesthesia (21). According to Tatlisin et al. they performed 116 transurethral resection. They observed 61 obturator reflexes (55%) and two of them were with bladder perforation. Obturator nerve blockage was performed for the others. 57 patients were operated successfully after the blockage, but 2 patients' operations were suspended because of persistent obturator reflexes (13). In a study, which compared plasmakinetic energy and monopolar energy to avoid obturator reflex and bladder perforation for 30 patients, bladder perforation occurred in 7 patients who monopolar energy was used and open surgery was used for only 1 patient. In an another group, any perforation was not reported (22).

In a comparative study, the reliability and effectiveness of monopolar, plasmakinetic and holmium laser energies

for bladder tumors were investigated. Totally 173 patients were divided into 3 groups. Plasmakinetic group and holmium laser group were free from complications, while 4 perforations were seen in monopolar group (23). Intravesical approach technique which needle is inserted throughout cystoscopy has been used recently. Khorrami et al. used both blind intravesical technique based on anatomical points and nerve stimulator-guided technique to determine obturator nerve. The rate of obturator reflex was 6.3 and 5.8%, respectively (Figure 3) (24). Hizli et al. performed a study which compared intravesical technique with inguinal technique based on anatomical points and USG-guided nerve stimulator. While bladder perforations were seen in 6 of 20 patients in the intravesical group, 2 perforations were seen in 21 patients in the inguinal group, and the success rates were 60% and 90.5%, respectively, which were found to be significant (25).

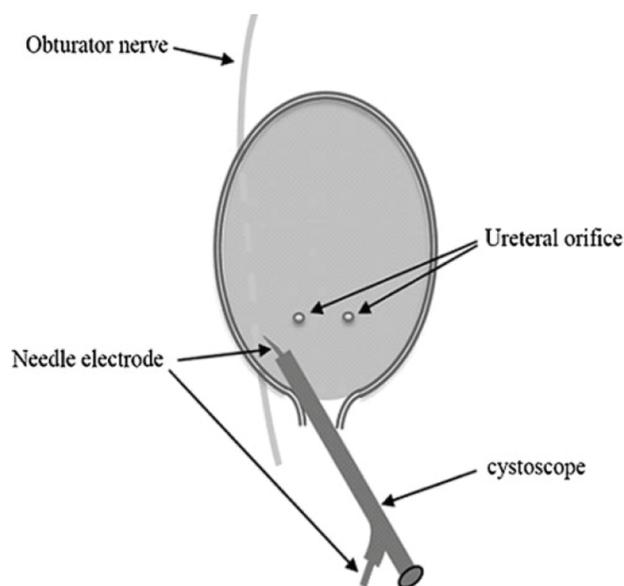


Figure 3. Nerve stimulation and Lidokain injection with needle throughout cystoscopy (24)

Obturator Nerve Blockage

Currently, obturator nerve blockage has been used with high success rate to prevent obturator reflex and developed by means of some additional methods to increase the effectiveness of blockage such as USG-guided and nerve stimulator techniques. Blockage can be performed by not only Classic Labat Technique, interabductor approach, interfacial approach, new inguinal approach but also only nerve stimulator or USG with nerve stimulator.

Heywang-Köbrunner et al. performed CT-guided obturator nerve blockage for 15 patients with hip pain and cited that this method might be used for diagnosis and treatment for patient with hip pain (26). House et al. performed CT-guided obturator blockage technique by using posterior approach for 51 patients. They cited that posterior approach was a good technique that was tolerable for patients and gave reliable and effective way to approach nerve (27).

Both clinic and anatomic approaches to obturator nerve

are used routinely, for USG is a minimal invasive and easily accessible procedure and is used widely for regional anesthesia. Akkaya et al. described USG-guided obturator nerve blockage in their regional anesthesia educational series (17).

In this technique, the patient lies in a supine position. Pubic tubercle (PT), Femoral artery (FA) and adductor longus muscle (ALM) where is adhere to Pubic bone are palpated and marked (Figure 4a). FA and ALM are seen by USG. And then, blockage needle are routed throughout lower level of ALM. At this time, pectineal muscles are viewed. Color Doppler is used to see Obturator Vein. Obturator Nerve is seen as hyperechoic just medially. Needle accompanied with nerve stimulator is forwarded with out of plane technique and viewed. Almost 10 ml. local anesthetic is injected (Figure 4b). Anterior branches of 3 and 4 Lumbar nerves may form accessory obturator nerve. That obturator reflex is seen in patients even if obturator blockage is performed may mean that the existence of accessory obturator nerve and this nerve may not be blocked with blockage. Katritsis et al. conducted a study with 500 cadavers, and found 13.2% accessory obturator nerve (28). Akkaya et al. found similar result which was 12.5% and compatible with Katritsis' results, but the rate of accessory obturator nerve is about 10-30% according to literature (5). As Akkaya et al. mentioned, possible accessory nerve blockage as well as blockage of obturator nerve may rise the success of blockage.

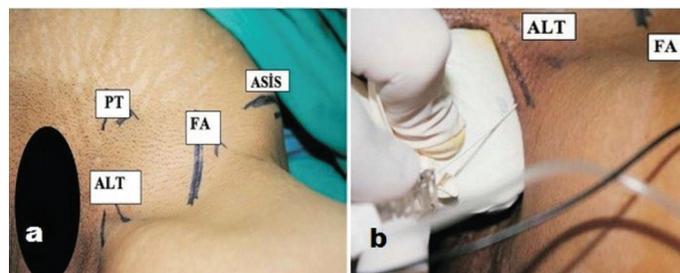


Figure 4a. Important superficial anatomic points before obturator nerve imaging with USG **Figure 4b.** The USG probe position and needle entry (17)

ALT: Adductor Longus' Tendon - ASIS: Anterior Superior Spina Iliaca
FA: Femoral artery - PT: Pubic tubercle

The important tips for Urologists

Currently, this type of procedures may cause some complications accompanied with the increase of endoscopic procedures with the advances of technology and possibilities, increased endoscopic surgery possibilities even in a small town hospital, and bladder tumor resection experiences given in a residency programs.

Especially, during the resection of lateral wall tumors of bladder, obturator reflex may get urologist into trouble, which may give rise to bad experiences in proportion to number of surgery performed by urologist along with their surgery life. As we are the surgeons who has experienced bad situation, we have tried to give proposal to take into consideration to avoid such complication. First thing we

have to do as a multidisciplinary approach is that we inform anesthesiologist about the case and warn them about potential and dangerous situations and choose the best anesthesia technique before the surgery. As mentioned before, most perforations due to obturator reflex are the result of resectoscope with monopolar energy. Therefore, if possible, we should choose bipolar (plasmakinetic) or holmium as energy source. In the light of experienced surgeons, to minimize the energy which provide enough resection will reduce the simulation of nerve. Also, it is recommended that bladder not be full of urine or fluid, bladder should be enough full to allow resection. In this position, it is thought that excitability of the nerve is decreased compared to patients with full bladder. But it should be noted that such precautions may only decrease the risk of perforation, may not affect the possibility of obturator reflex.

CONCLUSION

In addition to type of anesthesia which may prevent obturator reflex, it is important that the communication between surgeon and anesthesiologist should be sufficient. If the effectiveness of neuromuscular agent used in induction period is ended, obturator reflex may occur even under general anesthesia with neuromuscular agent. This may cause serious complications. Before and during the surgery, dialog with anesthesiologist is very important and it is mandatory to choose the best anesthesia technique for patients. After the losing of the effectiveness of neuromuscular agent, if necessary for surgical procedure, it can be asked anesthesiologist to give extra neuromuscular blocker. To add obturator nerve blockage to general anesthesia may be good choice to avoid from obturator reflex.

REFERENCES

- Collado A, Chechile GE, Salvador J, Vicente J. Early complications of endoscopic treatment for superficial bladder tumors. *J Urol* 2000;164(5):1529-32.
- Comploj E, Dechet CB, Mian M, Trenti E, Palermo S, Lodde M. et al. Perforation during TUR of bladder tumours influences the natural history of superficial bladder cancer. *World J Urol* 2014;32(5):1219-23.
- Balbay MD, Cimentepe E, Unsal A, Bayrak O, Koc A, Akbulut Z. The actual incidence of bladder perforation following transurethral bladder surgery. *J Urol* 2005;174(6):2260-2.
- Diñçel Ç. Üroonkoloji. İzmir, Meta yayınları, 2007; 392-3.
- Akkaya T, Comert A, Kendir S, Acar HI, Gumus H, Tekdemir I, Elhan A. Detailed anatomy of accessory obturator nerveblockade. *Minerva Anesthesiol* 2008;74(4):119-22.
- Zengin K, Başay S. TUR'a Bağlı Mesane Perforasyonu: Tedavi ve İzlem. *Üroonkoloji Bülteni* 2011;1:38-40.
- 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.
- Ellis H, Fieldman S, Harrop -Griffiths W. Anatomy for Anaesthetists 8th ED. page 187.
- Nieh P, Marshall FF. Transurethral resection of bladder tumors. *Campbell-Walsh Urology*. 9th ed. New York: Elsevier Inc, 2007, pp 2479-2505.
- Cesur M, Erdem AF, Alıcı HA, Yapanoğlu T, Yüksek MS, Aksoy Y. The Role of Succinilcholine in the Prevention of the Obturator Nerve Reflux During Transurethral Resection of Bladder Tumors. *Saudi Med J* 2008;29 (5):668-71.
- So PC, Two Case Reports of Obturator Nerve Block for Transurethral Resection of Bladder Tumour, *Hong Kong Med J* 2004;10(1):57-9.
- Yoshikawa K, Tomi K, Nosaka S, Obturator Nerve Block in Transurethral Resection. *Anaesthesia Jan* 1983;38(1):70
- Tatlisen A, Sofikerim M. Obturator nerve block and transurethral surgery for bladder cancer. *Minerva Urol Nefrol* 2007;59(2):137-41.
- Ong EL, Chan ST. Transurethral surgery and the adductor spasm. *Ann Acad Med Singapore* 2000;29(2):259-62.
- Parks CR, Kennedy WF Jr. Obturator nerve block: A simplified approach. *Anesthesiology* 1967;28:775-8.
- Wassef MR. Interadductor approach to obturator nerve blockade for spastic conditions of adductor thigh muscles. *Reg Anesth* 1993;18:13-7.
- Akkaya T, Cömert A, Ultrasonografi Eşliğinde Obturator Sinir Blokajı. *Rejyonel Anestezi Derneği Bülteni* 2010;(3):2-3.
- Pladzyk K, Jureczko L, Lazowski T. Over 500 obturator nerve blocks in the lithotomy position during transurethral resection of bladder tumor. *Cent European J Urol* 2012;65(2):67-70.
- Thallaj A, Rabah D. Efficacy of ultrasound-guided obturator nerve block in transurethral surgery. *Saudi J Anaesth* 2011;5(1):42-4.
- Aksu C, Gürkan Y, Kuş A.,Toker K, Solak M. Kocaeli Üniversitesi Hastanesi'nde Son Bir Yılda Uygulanan Ultrason Eşliğinde Obturator Blok Deneyimlerimiz, *Ağrı* 2016;28(1):39-41.
- Patel D, Shah B, Patel BM. Contribution of the obturator nerve block in the trans-urethral resection of bladder tumours. *Indian J Anaesth* 2004;48(1):47-9.
- Yıldırım I, Basal S, Irkilata HC. Ulas U.H., Zor M. Goktas S. Dayanc M. Safe resection of bladder tumors with plasma kinetic energy. *International Journal of Hematology and Oncology* 2009;19(4):232-6.
- Xishuang S, Deyong Y, Xiangyu C, Tao J,Quanlin L, Hongwei G, et al. Comparing the safety and efficiency of conventional monopolar, plasmakinetic, and holmium laser transurethral resection of primary non-muscle invasive bladder cancer. *J Endourol* 2010;24(1):69-73.
- Khorrani MH, Javid A, Saryazdi H, Javid M. Transvesical Blokade of the Obturator Nerve to Prevent Adductor Contraction in Transurethral Bladder Surgery. *J Endourol* 2010;24(10):1651-4.
- Hızlı F, Argun G, Güney I, Güven, Arık AI, Başay S Obturator Nerve Block Transurethral Surgery for Bladder Cancer: Comparison of Inguinal and Intravesical Approaches: Prospective Randomized Trial. *Ir J Med Sci* 2016;185(3):555-60.
- Heywang-Köbrunner SH, Amaya B, Okoniewski M, Pickuth D, Spielmann RP. CT-guided obturator nerve block for diagnosis and treatment of painful conditions of the hip. *Eur Radiol* 2001;11(6):1047-53.
- House CV, Ali KE, Bradshaw C, Connell DA. CT-guided obturator nerve block via the posterior approach. *Skeletal Radiol* 2006;35(4):227-32.
- Katristsis E, Anagnostopoulou S, Papadopoulos N. Anatomical observations on the accessory obturator nerve (based on 1000 specimens). *Anat Anz* 1980;148(5):440-5.