

Over 500 obturator nerve blocks in the lithotomy position during transurethral resection of bladder tumor

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KEY WORDS

transurethral electroresection ► obturator nerve block ► lithotomy position ► bladder tumor

ABSTRACT

Introduction and aim of the study. Spinal anesthesia for transurethral resection of bladder tumor (TURB) does not prevent unintended stimulation of the obturator nerve when electroresection is performed on the lateral wall of the bladder. It results in muscle contraction of the adductor muscles of the thigh, which may lead to perforation of bladder wall with the resectoscope loop. The aim of the study was to assess the efficacy and safety of obturator nerve block (ONB).

Methods. This prospective study was conducted between 01/01/1999 and 12/31/2010 in the Department of General, Oncologic and Functional Urology, Medical University of Warsaw. In 431 patients undergoing TURB adductor spasms were observed. In these cases nerve stimulation and ONB with 2% lidocaine using thigh interadductor approach in the lithotomy position were performed.

Results. The efficacy of 542 ONB was 94%. In 31 cases general anesthesia was necessary. There were two cases of urinary bladder perforation, but only one resulted from an insufficient nerve block. Both were managed conservatively. Neither hematomas nor neurological adverse events were observed.

Conclusion. The described method offers a high rate of efficacy and ensures optimal and safe conditions for the resection of a tumor located on the inferolateral wall of the urinary bladder. The risk of complication is low.

fascia, which covers the outer part of the internal obturator muscle. It innervates the muscles responsible for adducting the thigh and the skin on the surface of the paramedian segment of the thigh. During TURB, when the bladder has been filled with irrigation fluid, the ON is directly adjacent to the lateral wall of the bladder. Any unintentional stimulation during electroresection results in the adductors' contraction and resultant sudden leg movement, which may in turn lead to extraperitoneal perforation of the bladder wall with the resectoscope loop. However, intraperitoneal perforations or obturator artery ruptures necessitating immediate conversion to laparotomy were reported. The frequency of tumor cell dissemination can reach 4% in the case of perforation [1].

Methods of preventing the stimulation of the ON include: reduction of the diathermy power, bipolar resection, general anesthesia, or obturator nerve block (ONB) following spinal anesthesia. Preventing muscle contractions by means of regional anesthesia (different approaches to ON [2, 3]) has been proposed since 1928. The modification of the interadductor approach (described by Wassef) discussed herein does not involve the necessity to change the patient's lithotomy position (Fig. 1).

The aim of the study was to assess the efficacy and safety of ONB performed with nerve stimulator using the interadductor approach in the lithotomy position.

METHODS

After obtaining an approval from the bioethical committee at Medical University of Warsaw, a prospective study was conducted from 01/01/1999 to 12/31/2010 to assess the efficacy of ONB performed using interadductor approach during TURB under spinal anesthesia. All patients gave their written informed consent for the procedure.

Before the procedure an oral premedication was given. After admission to the operating room, intravenous access was estab-

INTRODUCTION

Bladder cancer is the fourth most common cancer in men in the world; the incidence in women is three times lower. The basic methods for diagnosis and management are endoscopic procedures (cystoscopy, transurethral resection of bladder tumor TURB). In the case of superficial tumors (limited to mucosa and submucosa, pTa and pT1), which account for approximately 75% of cases, these neoplasms often recur. The age of most patients is above 65 years, which increases the risk of complications during anesthesia [1].

In the Department of General, Oncologic and Functional Urology, Medical University of Warsaw approximately 500 TURB procedures are performed every year; 7% of them necessitate the prevention of obturator nerve (ON) stimulation and that cannot be provided by spinal anesthesia. This sensorimotor nerve arises from the lumbar plexus at L2-L4 and in the lesser pelvis it is adjacent to the obturator



Fig. 1. Obturator nerve block.



Ryc. 2 A–C. Anatomical landmarks for needle placement. 2a. Long adductor tendon localization. 2b. Crevice palpation. 2c. Point of needle insertion.

lished and the patient received a drip infusion of 500 ml 0.9% NaCl with an antibiotic (2nd generation cephalosporin). Constant monitoring was ensured of ECG, heart rate, and arterial blood saturation (pulse oxymetry). Non-invasive blood pressure measurements were taken every five minutes. To maintain patients' blood oxygenation, oxygen was delivered with the use of a facemask. Spinal anesthesia was performed with patients in the sitting position, most frequently in the L3/L4 space (in the case of technical difficulties – L2/L3 or L4/L5) using 8–15 mg 0.5% hyperbaric bupivacaine depending on the patient's anthropometric parameters. The needles used were 25–27G pencil point. After drug administration, the patient was placed in the supine position.

Upon reaching the appropriate anesthesia level (Th10), which blocks conduction in the sensory nerve fibers of the bladder, the patient was placed in the lithotomy position. In the case of tumors located on the lateral wall of the bladder, the safety of TURB was ensured using a neurotest performed with a nerve stimulator built into the resectoscope [4]. Current flow settings were progressively marked relative to a 1–5 scale (Neurotester FB2, ERBE). The extremity movement above the first level lead to the decision to block the ON. ONB was not performed when no or slight movement on the first level of the neurotest was observed. We also excluded patients who really did not need ONB procedures.

An anesthesiologist performed the ONB. Due to prior spinal anesthesia the patient was not exposed to discomfort. The patient's position was not changed when the long adductor tendon was localized. A needle with a nerve stimulator (Stimuplex DIG, Braun) was inserted approximately 2 cm to the side of the tendon attachment to the pubic bone in the palpable crevice below the muscle (Fig. 2 A, B, C). The needle was directed towards the head, at a

slight angle, so that after inserting the needle 2–4 cm deep, its end could be below the long adductor muscle [5] (Fig. 3). Initially the stimulator current flow was set at 5 mA; when a patient presented a response from the ON (manifested as limb movement) the current was reduced down to 0.5 mA. If limb movement sustained after reducing current, a block was performed with the use of an immobile needle technique. The anesthesiologist fixed the needle and a nurse provided 10 ml of lidocaine 2% after an aspiration test. When it was necessary to perform a bilateral block, adrenalin in 1:200 000 dilution was added to the local anesthetic so that lidocaine dose could be increased without the risk of toxic signs linked with drug overdose. In the case of unilateral blocks, the adrenalin addition was not administered to avoid unnecessary constriction of the obturator vein and artery, which are in close vicinity of the nerve.

After approximately fifteen minutes, the surgeon repeated the neurotest. When lack of reflexes from the ON was confirmed with current flow settings above the first level, the procedure could be continued. If limb movement continued, general anesthesia was performed.

RESULTS

The analysis covered 542 ONB in 431 patients, including 65 bilateral cases. Fifty-three patients underwent multiple procedures (2, 3, 4). The decision whether to perform ONB was made by the urologist. All patients received spinal anesthesia and additional ONB performed in the lithotomy position using the interadductor approach. The procedures were performed in a single endoscopic operating theatre.

In the studied population, in only as few as 15.77% cases, the bladder tumor was the only pathological condition as the rest of the patients had coexisting diseases. The patients' ages varied from 18 to 92, but almost 2/3 of them were over 65 years of age (Table 1).

The efficacy of the block was 94.28% and only 31 cases required general anesthesia. In one case it was not possible to analyze the efficacy of ONB performed prior to the procedure. The cystoscope proved too short and TURB could not be performed. In another case due to skin lesions in the inguinal region the block could not be performed.

Bilateral block was performed in cases of bilateral inferior wall bladder tumors. The neurotest proved its necessity in bilateral cases and when crossed adductor reflex occurred (0.92% cases). Despite the ONB on the side of the tumor a sudden adduction of the limb on the contralateral side was sometimes observed – a bilateral block was usually sufficient. In one case, however, it was necessary to convert to general anesthesia because adductor contractions continued in both thighs.

In two cases of unilateral blocks, adverse effects were observed when lidocaine was discontinued. In the first case, the patient

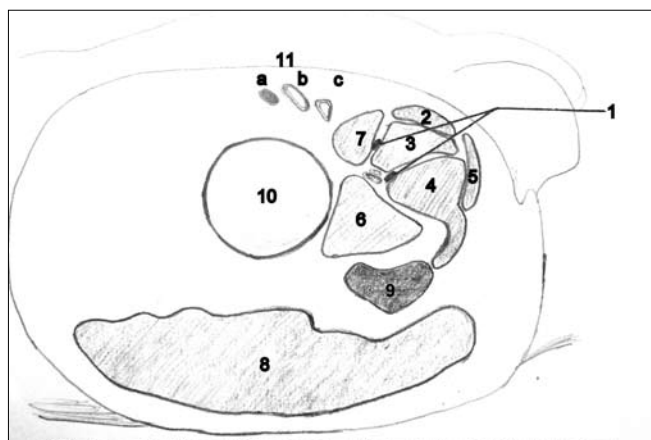


Fig. 3. Diagram illustrating obturator nerve.

1. Obturator nerve 2. M. add. longus 3. M. add. brevis 4. M. add. magnus
5. M. gracilis 6. M. obturator externus 7. M. pectineus 8. M. gluteus maximus
9. Tub. Ischlad 10. Acetabulum 11. Femoral: a. nerve b. artery c. vein

Table 1. The demographics of the study population

	Total	%	F	%	M	%
Patients	431		122	28.30%	309	71.69%
65-75 yrs	135	31.32%	34	27.86%	101	32.68%
>75 yrs	118	27.37%	47	38.52%	71	22.97%
Average age	66.63		69.75		65.30	
SD	13.98		14.003		13.95	
Min.	18		18		19	
Max.	92		92		91	
BMI	26.10		23.61		26.75	
SD	10.45		11.31		14.05	
Min.	15.61		15.61		16.84	
Max.	36.71		31.62		36.71	

reported disturbed vision. In the second case, the patient was briefly agitated and then developed consciousness disturbances, which lasted approximately two minutes. At that time both ECG record, arterial pressure and saturation values were within the normal value ranges. Both complications were most probably due to the intravascular application of the drug, despite a negative aspiration test. None of the observed symptoms of lidocaine overdose were life-threatening.

There were two incidents of urinary bladder perforation: one of them a consequence of insufficient ONB and the other because the electroresection was too deep. The procedure was immediately stopped and cystography was performed to assess the perforation localization and extension. Both perforations were extraperitoneal and only required conservative management.

Neither neurological incidents nor hematomas in the drug application site were observed after anesthesia (Table 2).

It usually takes less than three minutes to perform the ONB and the resection can be safely performed approximately 10 minutes after drug administration. The blockades were performed by specialists and training anesthesiologists supervised by a specialist. With the use of Student-t test no statistically significant correlation in block efficacy was found between the groups. Also in terms of correlation between the efficacy and sex, age, height and weight values – the results are not statistically significant.

DISCUSSION

The results we present concern the largest patient population and ONB number described in literature. The analysis proved the efficacy of ONB in over 94%, which corresponds with the efficacy rates published by other authors – Naseem 94% (50 blocks) [6]. Paresthesia does not occur following a central block, but even a blind approach results in high efficacy: 93% reported by Tatlisin in 63 blocks [7]. However, because nerve stimulators are widely available and their contribution to reducing the risk of nerve damage is proven, the latter procedure does not seem advisable.

The interadductor approach for ONB is easy, which is further confirmed by the lack of a statistically significant correlation between anesthesiologist experience. Patient's sex, age, and BMI do not affect the efficacy, which enables successful application of the block in every patient group. In comparison to ONB, general anesthesia does not shorten the procedure and patient's stay in the operating room. Although the induction is usually quick, the

time needed to awake the elderly patient after the TURB is often longer.

Non-specific stimulation of the ON during electroresection of bladder tumor on the inferolateral wall may be the cause of bladder perforation. Spinal anesthesia, does not provide protection against this complication. Urologic literature recommended general anesthesia as a fail-safe method in such cases. But in 2002 the 100% efficacy of general anesthesia in preventing the obturator nerve stimulation with an electroresectoscope was questioned. Despite the use of neuromuscular-blocking drugs, adductors contracted during TURB [8].

An alternative to general anesthesia is ONB in the peripheral segment following spinal anesthesia. Different approaches were proposed by Labat and by Wassef. The former, described in 1928, is based upon inserting a needle approximately 2 cm down and 2 cm to the side of the palpable pubic bone tubercle. The patient is positioned in the supine position, with the limb adducted and slightly bent knees [2]. In the Wassef approach the needle is inserted in the rear of the attachment of the long adductor tendon, which is why it is called the interadductor approach [3].

Based on the findings reported in reference materials, the interadductor approach is assessed as a quicker and easier method for nerve identification [9]. One advantage of the modification to the Wassef approach described by the authors is eliminating the necessity to change the patient's lithotomy position to perform the block. It can be performed at any stage of the procedure without the need to repeat the preparations of the operating field [10].

Khorrami also describes a transvesical ONB in 30 patients, but in 20% of them the lidocaine was applied blindly because the nerve could not be detected with stimulator. In one case the adductor contraction sustained despite the ONB [11].

A method that has lately been one of the most significant developments in regional anesthesia is localizing nerves with ultrasound guidance. What is more, first publications were issued on the use of the method in ONB. However, the ON is difficult to visualize ultrasonographically; usually only the application of the local anesthetic and its spreading between muscle layers can be observed. The efficacy of US-guided block was comparable with the stimulator method (93%), but local anesthetic doses were not reduced [12, 13]. Recent reports suggest that ultrasound guidance may reduce, but not eliminate the most common complications of regional anesthesia, such as blood vessel puncture or inadvertent intraneural or intravascular injections [14]. The use of nerve stimulator and aspiration before drug administration can also ensure a low rate of adverse events. In light of these findings, and taking costs as well as technique availability into consideration, the

Table 2. Adverse events

	Number of incidents	%
Total number of blocks	542	
Adverse effects that signified lidocaine overdose	2	0.36%
Opposite nerve response during the neurotest	5	
Bilateral block	4	
Necessary GA	1	
Bladder perforation during electroresection	2	0.36%
Total	9	1.66%

peripheral nerve stimulator remains the fundamental tool facilitating safe nerve localization in ONB.

Some contraindications for the block overlap with those of spinal anesthesia, such as clotting disorders. Limited mobility at joints does not affect the eligibility for the block unless it prevents positioning the patient in the lithotomy position. Over 12 years of observation, only one patient was not eligible to ONB due to advanced skin lesions in the inguinal regions.

Use of various local anesthetics was reported in literature. For this study lidocaine was chosen because its effects are prompt and the time of effects is shorter than it is in the case with bupivacaine used in spinal anesthesia. Moreover, it is a cost-effective and easily available agent. Low concentrations were not used because they might only enable sensory block.

The ON is a mixed nerve. The diameters of neurons responsible for pain and temperature perception are significantly smaller than those of thick motor neurons. It is stated that in order to obtain an effective motor block, the lidocaine concentration for the obturator nerve block should be over 1% [15, 16].

A complication rate below 2% serves for considering this method as safe. We observed no case of paralysis, nerve damage, or hematomas at the injection site. Cesur reports one case of difficulty localizing the nerve and one hematoma [17]. The only serious complication after ineffective ONB reported is damage of obturator artery in a bladder perforation incident and subsequent necessity of converting to laparotomy [18].

CONCLUSIONS

The described method offers high efficacy rate of 94.28%. The risk of complications related to the applied modification is low and the procedure is easy to perform. The interadductor ONB in the lithotomy position combined with spinal anesthesia ensures optimal and safe conditions for the resection of a tumor located on the inferolateral wall of the urinary bladder.

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