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Effect of Ultrasound-guided Obturator Nerve Block on Complications in Transurethral Resection for Bladder Cancer

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What's known on the subject? and What does the study add?

The higher incidence of bladder cancer in older ages increase sthe risk of complications that may develop due to anesthesia and surgery. Transurethral resection (TUR) of lateral bladder cancers with obturator reflex is an undesirable event for surgeons as the risk of complications may increase. It is thought that obturator nerve block application added to the anesthesia technique will provide safe surgery. In our study, we aimed to show the protective effect of obturator block on complications that may develop in TUR operation and to make a positive contribution to similar studies.

Abstract

Objective: This study explored the efficiency of obturator nerve block (ONB) along with spinal anesthesia on obturator reflex and related complications during transurethral resections (TUR-B) of bladder tumors on the lateral and inferolateral bladder walls.

Materials and Methods: We retrospectively reviewed the medical history of 248 patients having undergone TUR-B operations in our hospital between March 2017 and March 2019. Among them, we recruited the data of only 115 patients with bladder tumors on the lateral and inferolateral walls, according to the pre-operation ultrasound reports. Ultimately, 44 patients who received only spinal anesthesia (group A) and 37 patients who underwent spinal anesthesia combined with ONB (group B) were compared concerning postoperative bleeding, adductor muscle contraction, bladder perforation, reoperation, mortality - morbidity rates, length of hospital stay and conversion rates to general anesthesia.

Results: There was no significant difference between the groups in terms of age, gender, American Society of Anesthesiologists, length of hospital stay, postoperative bleeding and mortality ($p>0.05$). Yet, the incidence of obturator reflex in the group A was found to be significantly higher than in the group B ($p<0.001$), and major complications such as bladder perforation were not encountered in any of the patients.

Conclusion: ONB combined with spinal anesthesia in the operations for lateral and inferolateral bladder wall tumors is an effective method to prevent possible obturator reflex and related complications.

Keywords: Cystoscopic surgery complications, obturator nerve block, urinary bladder neoplasms

Introduction

Bladder cancers are highly prevalent diseases, and transurethral resection of a bladder tumor (TUR-B) still represents the most appropriate and effective treatment for carcinoma of the bladder and provides essential histopathologic information necessary for definitive diagnosis, staging and primary treatment (1). The obturator nerve, originating from the lumbar plexus, is responsible for the motor innervation of the thigh muscles and the sensory innervation of a small region. The anatomical course of the obturator nerve close to the lateral and inferolateral walls of the bladder is critical during TUR-B

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since the adductor muscle may contract due to involuntary stimulation of the obturator nerve. However, the electrical stimulation directly adjacent to the lateral wall of the bladder may induce the obturator nerve reflex and sudden adductor muscle contraction, which may cause incomplete tumor resection, bladder perforation, extravesical dissemination of the cancer cells and even injury to the obturator artery (2). An adductor muscle spasm is also called obturator reflex (1). Due to the involuntary obturator reflex; bladder perforation, regional hematoma, the spread of tumor cells outside the bladder, or inadequate resection of the tumor may cause adverse outcomes that elevate mortality and morbidity (1,3). It has been reported that the incidences of sudden thigh movement and bladder perforation during surgical procedures in the absence of ONB were 49% and 16% respectively (4). Accordingly, curarization is often recommended to relax muscles, which contributes to eliminating such undesirable effects.

Old age and many comorbidities of patients with bladder tumors and common postoperative pulmonary complications among such patients have often led to general anesthesia and curarization to be avoided, increasing the tendency to regional anesthesia. ONB was first introduced by Labat (5) in 1928, and Prentiss et al. (6) showed that it could be used to prevent the obturator muscle spasm in 1965. Now, frequent use of ultrasonography (US) in peripheral nerve block practices enables operators to see the obturator nerve between adductor muscles, which brings a higher rate of successful blocks with less drug use (3,6,7).

In this study, we retrospectively explored the effectiveness of US-guided ONB performed under spinal anesthesia in preventing undesirable surgical and anesthetic complications in TUR-B operations.

Materials and Methods

Study Design

Following the ethics committee approval from Hitit University School of Medicine, we retrospectively reviewed anesthesia

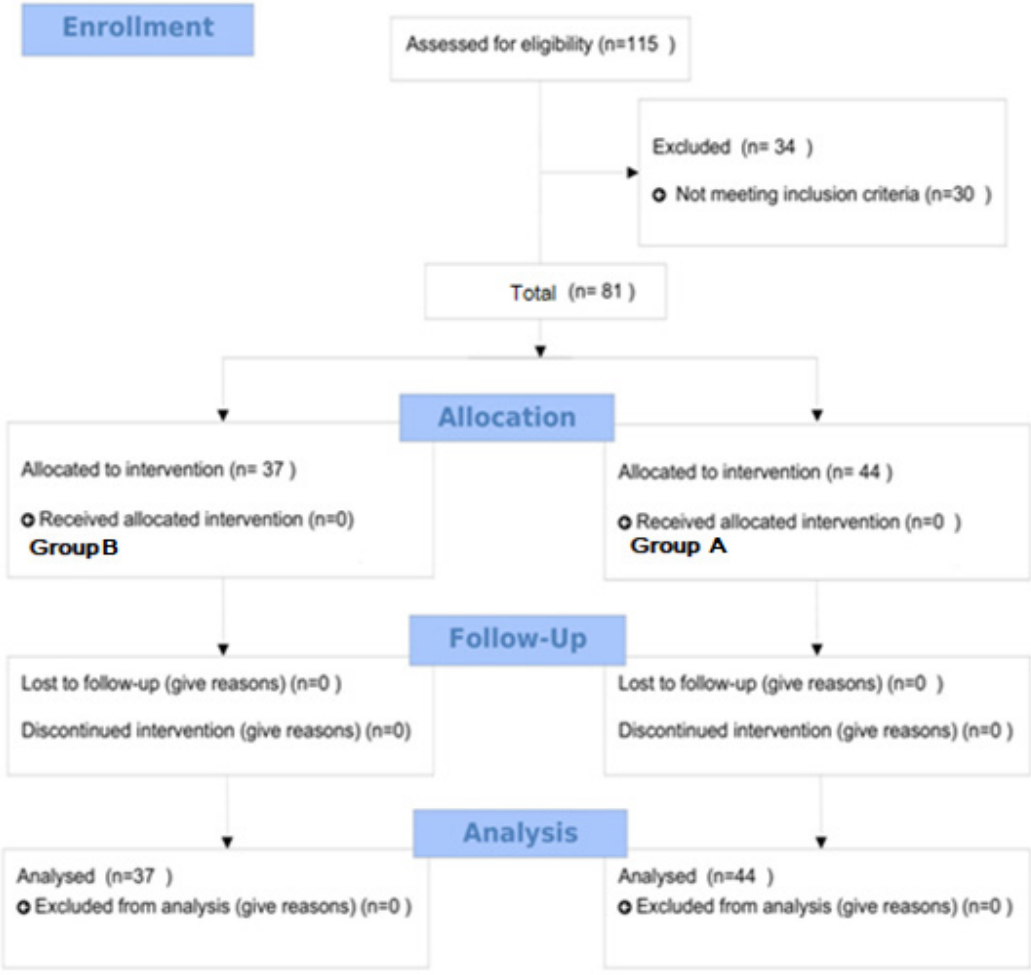

Figure 1. Consort follow chart

records of those having undergone TUR-B operations at Erol Olçok Training and Research Hospital between March 2017 and March 2019. The study was approved by the local ethics committee (Hitit University Faculty of Medicine Erol Olçok Training and Research Hospital Clinical Ethical Board No: 2019-158) and registered with clinicaltrials.gov (NCT04995445).

We determined that 115 patients underwent bipolar TUR-B operations because of lateral-inferolateral wall-located bladder tumors in a two-year period. While 30 patients were administered general anesthesia for various reasons, and the remaining ones received spinal anesthesia. We excluded 4 patients from the study since they had additional operations other than TUR-B and conducted the study with 81 patients (Figure 1). We divided 81 patients into two groups as those with and without obturator block. In the retrospective file review, it was determined that spinal anesthesia was applied to all patients. Patients who underwent obturator block after spinal anesthesia were grouped as group B, and patients who did not applied were grouped as group A. In our clinic, peripheral blocks have been routinely implemented under US guidance since 2017. The obturator block application in our clinic with ultrasound; the patients are in the supine position, the leg is slightly abducted, the pubic tubercle area is scanned with a superficial US probe and the obturator nerve is seen. The anterior branch of the obturator nerve, located between the adductor longus and the brevis, is reached by advancing a 21 gauge, 100 mm stimulating isolated needle from the lateral to the medial under US guidance. After negative aspiration, 5 mL of local anesthetic solution is injected. Then, the needle is withdrawn. A peripheral block needle is guided into the posterior branch of the obturator nerve, between the adductor brevis and the magnus, and an additional 5 mL of local anesthetic mixture is injected while the spread of the local anesthetic solution is monitored under real-time visualization (Figures 2, 3). In our clinic, 10 mL of local anesthetic mixture containing 40 mg 0.5% bupivacaine and 40 mg 2% lidocaine is used for obturator block.

While 44 patients were operated on after without ONB (group A), 37 were operated on after ONB (group B). We compared the demographic information of these patients, the presence of obturator reflex, obturator reflex-related complications, mortality (30 days) and morbidity rates during the hospital stay.

Statistical Analyses

Statistical analyses in this study were performed using the SPSS (version 22.0, SPSS Inc., Chicago, IL, USA) package program. Descriptive statistics were presented as mean ± standard deviation for normally distributed continuous data, as median (minimum-maximum) for non-normally distributed continuous and ordinal data, and as numbers and percentages (%) for categorical data. We checked whether the data showed a normal distribution using the Shapiro-Wilk test. The Mann-Whitney U test was used for non-normally distributed data in the mean comparisons of two independent samples. The chi-square test or Fisher's exact test was used for comparisons of nominal variables. We accepted $p<0.05$ as statistically significant in all statistical analyses.

Results

The files of 81 patients were reviewed retrospectively. We did not find any significant differences between the groups in terms of age, gender, American Society of Anesthesiologists (ASA), length of hospital stay, postoperative bleeding and mortality for 30 days ($p>0.05$) (Table 1). Although the mean age of the patients was 69.49 years (±11), there were 75 (92.6%) male patients. The tumor sizes of 32 (39.5%) patients were found to be smaller than 3 cm, whereas they were larger than 3 cm in 49 (60.5%) patients. Most patients (70.4%) had a smoking habit. Generally, 28.4% of the patients had lung diseases (COPD,

Figure 2. Obturator nerve with US

US: Ultrasonography

Figure 3. Obturator block with US

AL: Adductor longus muscle, AB: Adductor brevis muscle, AM: Adductor magnus muscle, US: Ultrasonography

asthma, etc.), 51.9% had cardiac diseases (CAD, HT, etc.), 21% had endocrinological diseases (DM, etc.), and 2% had central nervous system diseases (CVD, etc.). The mean age of in group B was 68.57, while it was 70.27 in the group A.

While there was no adductor contraction in the group B, we discovered that 13 (29.5%) patients in the group A experienced it. These 13 patients were switched to general anesthesia by administering neuromuscular blocking agents. Despite neuromuscular blockade in 2 patients, it was noted in the files of the patients that the operation was terminated due to the continuation of adductor muscle spasms.

Accordingly, adductor contraction rates were statistically significant (p<0.001) between the groups. Although the need for reoperation due to adductor contractions was not statistically significant, it was required for 2 patients in group A. Moreover, there was no significant difference between the groups in terms of age, gender, ASA, length of hospital stay, postoperative bleeding and mortality. No major surgical complications were observed in any patient (Table 2).

Discussion

TUR-B is a widespread urological operation to remove bladder tumors, predominantly diagnosed in the older adult population (1,3). In our study, the mean age was 69.49 years, which indicates that the participants were already in the risk group for bladder tumors. The frequent occurrence of comorbidities in this age group poses additional risks of severe complications arising from both anesthesia and operation. Accordingly, one of the critical surgical complications of TUR-B operations is the possibility of bladder perforation because of obturator reflex and adductor muscle contraction due to obturator nerve stimulation. The possibility of tumor cells spreading out of the bladder following perforation may lead surgeons to act hesitantly during resection, which may hinder adequate tumor

Table 1. Demographic information of the patients (mean ± standard deviation)

	Group A		Group B		
	Mean	Frequency	Mean	Frequency	p-value
Age	70.27 (±1.7)		68.57 (±1.9)		
Male		41		34	
Female		3		3	
Tumor size <3 cm		14		18	
Tumor size >3 cm		30		19	
ASA					
I		3		4	
II		19		13	
III		22		10	
Smoking					
(+)		16		8	
(-)		28		29	
Discharge (days)	3.86	4	3.22	3	0.833

Table 2. Complications ratios

	Group A		Group B		p-value
	YES	NO	YES	NO	
Obturator reflex	13 (29.5%)	31 (70.5%)	0	37 (100%)	**>0.001**
Postoperative bleeding	5 (11.4%)	39 (88.6%)	4 (10.8%)	33 (89.2%)	1.000
Reoperation	2 (4.5%)	42 (95.5%)	0	37 (100%)	0.498
General anesthesia ratio	13 (%29.5)	31 (70.5%)	0	37 (100%)	**>0.001**
Mortality (30 days)	1 (2.3%)	43 (97.7%)	4 (10.8%)	33 (89.2%)	0.173

chi-square test , p<0,005

resection (2). Although general anesthesia with neuromuscular blockade is recommended to prevent adductor muscle spasms, it was previously reported that the obturator reflex might be encountered even under general anesthesia in which muscle relaxants are used (8). In our study, obturator reflex persisted despite neuromuscular blockade in two patients. Among surgical measures, it is recommended to reduce the cautery flow, use bipolar cautery, and empty the bladder to reduce the possibility of obturator reflex. While under anesthesia, the other hand, it is recommended to use a neuromuscular blockade or ONB to be able to prevent the obturator reflex. So far, various methods, such as using laser resectors, using saline as an irrigation solution, reversing the polarity of electric current, and applying periprostatic infiltration, have also tried thanks to advances in medicine, which have brought success at varying rates (4,7,9-11).

Considering the advanced age and comorbid conditions, patients are likely to have an increased risk of mortality and morbidity, particularly in terms of postoperative pulmonary complications (1,3). Therefore, anesthesiologists tend to perform operations under regional anesthesia. ONB along with regional anesthesia is shown as a good option in those with advanced age comorbidity (9,12). ONB has been performed since 1965 to prevent the obturator reflex (7,13). The introduction of US to regional anesthesia practices for ONB has led to the emergence of relevant techniques in which ONB is performed under US (14,15). In our clinic, we apply the interadductor approach, defined by Wassef (16) used anatomical points in 1993, for the anterior and posterior branches of the obturator nerve under the guidance of US. While Manassero et al. (17) advocated the importance of blocking the posterior branch in practice, Marhofer et al. (7) considered blocking the anterior branch adequate. In their study, Han et al. (18) reported that blocking the anterior branch or posterior branch did not create a significant difference in terms of effectiveness and complications. Aksu et al. (19) concluded similar findings with the previous research when they blocked the anterior branch in their study. In our clinic, we performed the blockade of the anterior branch using the US-guided in-plane technique, and the results were similar to those in other studies. The relevant literature reports the success rates of ONB to be between 93%-97.2%, owing to the increase in the use of US (17,20). All the blocks administered in our clinic were successful, and we did not encounter any complications, which overlapped what was previously found in the literature. In most studies, ONB is presented as a safe method, as in our study.

Although the previous research reported different severities of obturator spasms, a study reported that the severity of spasms reached 100% in some patients and that bladder perforation developed in 8% of them (21). In our study, obturator reflex was observed in 29.5% of patients who underwent spinal anesthesia only, and reoperation was required in 4.5% of these patients. These high rates may indicate that US-guided ONB should be performed along with spinal anesthesia to prevent complications that may occur due to the obturator reflex formation.

Patel and Patel (21) reported that the complication most affecting the mortality and morbidity of patients was bladder perforation. In our study, the absence of a significant difference between the discharge day and mortality may be attributed to successful operations without bladder perforation. But, reoperation was required in 2 (4.5%) patients.

The most clear weakness of our study might be the small number of patients. Therefore, future studies should attempt to recruit a higher number of patients. Additionally, in our study, surgical teams especially favored obturator block in the operations because of obturator reflex findings in the previous operation history of the patients, which may explain the higher frequency of complications in the group A.

Regional anesthesia has been the recommended anesthesia method to protect both the patient and staff in pandemics affecting the respiratory system such as COVID-19. Due to the advanced age of the TUR-B patients in our study and the presence of pulmonary comorbidities, regional anesthesia supplemented with peripheral blocks is recommended be the first choice if there are no contraindications (22-25). In a meta-analysis study involving 448 patients, Krishan et al. (25) stated that the addition of an obturator block to spinal anesthesia is important and necessary for the safety of both patients and staff in TUR-B operations during the COVID-19 outbreak. Regional anesthesia methods are recommended to prevent pulmonary complications of general anesthesia and microbial contamination during intubation in respiratory system diseases such as pandemics (22-25).

Study Limitation

The limitation of this study is that it is single-centered and retrospective. It is recommended to increase the number of patients and to conduct randomized controlled studies.

Conclusion

Spinal anesthesia with ONB in TUR-B operations of lateral-inferolateral wall-located bladder tumors is an effective and safe method to prevent possible obturator reflex and related complications. Although there is no statistical self-mark in terms of discharge time and mortality, powerful data can be obtained by extending the follow-up periods and increasing the number of patients in line with numerical values.

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Ethics

Ethics Committee Approval: The study was approved by the local ethics committee (Hitit University Faculty of Medicine Erol Olçok Training and Research Hospital Clinical Ethical Board No: 2019-158) and registered with clinicaltrials.gov (NCT04995445).

Informed Consent: Retrospective study.

Peer-review: Externally and internally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: C.A., A.B.Ş., Concept: H.T., C.A., Design: H.T., Data Collection or Processing: H.T., Ö.Y., Analysis or Interpretation: H.T., Literature Search: H.T., Ö.Y., Writing: H.T.

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