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# Interadductor approach to obturator nerve block for transurethral resection procedure: comparison with traditional approach

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**Abstract**
*Purpose.* We compared the interadductor approach of obturator nerve block with the traditional approach in terms of the insertion-adductor contraction interval (ICI), success rate, completion of the block, and plasma lidocaine concentration.
*Methods.* An obturator nerve block by the interadductor approach was performed by needle insertion 1 cm behind the adductor longus tendon and 2 cm lateral to the pubic arch in 12 patients, and by the traditional approach in 12 patients.
*Results.* The ICI with the interadductor approach was significantly shorter than that with the traditional approach. The success rate, completion of the block, and plasma lidocaine concentrations were similar with both approaches.
*Conclusion.* The interadductor approach can provide faster identification of the obturator nerve than the traditional approach.

**Key words** Obturator nerve block · Interadductor approach · Traditional approach · Insertion-adductor contraction interval (ICI)

## Introduction

Obturator nerve block combined with regional anesthesia has become essential in transurethral resection (TUR) of tumors located on the lateral and inferolateral bladder wall, in order to avoid the danger of bladder perforation by contractions of the thigh adductor musculature by electrical stimulation of the obturator nerve [1,2]. With the traditional approach to the obturator nerve, even the most expert hands could fail to identify the nerve because of anatomical difficulties. In 1993, Wassef [3] described the interadductor approach as a new method for obturator nerve blockade, in which a needle is inserted behind the upper end of the adductor longus muscle. In that report, a new approach to the management of adductor muscle spasm in patients with neuromuscular disorders was demonstrated to be successful, reproducible, and without complications. To our knowledge, however, there have been no controlled studies on the efficacy of the interadductor approach to obturator nerve block compared with the traditional approach in TUR procedures. The aim of this study was to assess the efficacy of the interadductor approach for obturator nerve block in TUR.

## Methods

After institutional approval had been secured, informed consent was obtained from 24 patients of ASA physical status I or II, 45–83 years of age, who were scheduled to undergo TUR with spinal anesthesia and bilateral obturator nerve block. The patients were premedicated with intramuscular atropine sulfate 0.01 mg·kg$^{-1}$ body weight (maximum, 0.5 mg) 30 min prior to spinal anesthesia, and they were monitored intraoperatively with continuous electrocardiography, heart rate determination, noninvasive blood pressure measurement, and pulse oximetry. Spinal anesthesia was then administered with the patient in the lateral decubitus position. After local anesthesia with 0.5% bupivacaine to the skin, plain hyperbaric dibucaine 0.24% (2.0–2.5 ml) was injected at the third or fourth lumbar interspace through a 25-gauge Whitacre needle. The patient was immediately returned to the spinal horizontal position. Following confirmation of an adequate anesthesia level for the TUR procedure, the obturator nerve block was performed by the teaching-staff anesthesiologists.

To identify the obturator nerve, a Teflon-insulated, 22-gauge, 8-cm needle was connected with an extension

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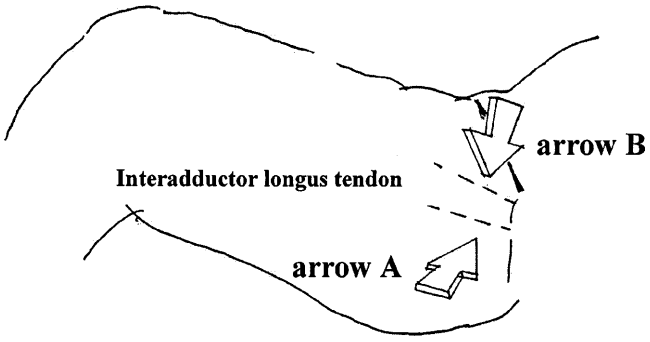


**Fig. 1.** Illustration of the interadductor approach and the traditional approach for obturator nerve blockade. In the interadductor approach (*arrow A*), the inserted point of a needle is 1 cm behind the adductor longus tendon and 2 cm lateral from to the pubic arch. **B** In the traditional approach (*arrow B*), the inserted point of a needle is 3 cm lateral and 3 cm inferior to the pubic tubercle

tube to a 20-ml syringe filled with 1% lidocaine solution. The negative-pole cathode from the nerve stimulator was connected to the needle, and the anode was connected to a skin surface electrode placed on the abdominal wall.

*Interadductor approach* (Fig. 1)

With the patient in the lithotomy position, two lines on the skin were drawn at the adductor longus tendon and the pubic arch. An 8-cm, 22-gauge insulated needle was inserted 1 cm behind the adductor longus tendon and 2 cm lateral to the pubic arch. The inserted needle was advanced with a slight lateral and posterior inclination, while a nerve stimulator using continuous 1 Hz, 3 mA was simultaneously employed. Once muscle twitch in the thigh adductor was visible and palpable, the amperage was lowered and the needle was advanced and/or redirected until stimulation recurred. This procedure was repeated until 1 mA. A successful encounter with the obturator nerve resulted in contractions of the adductor muscles by 1 mA of electrical stimulation.

*Traditional approach* (Fig. 1)

With the patient in the lithotomy position, the same type of needle as described above was inserted perpendicularly to the skin 3 cm lateral and 3 cm inferior to the pubic tubercle. The needle was advanced until contact was made with the inferior ramus of the pubis. The needle was withdrawn short of the tip and redirected in a lateral and slightly anterior direction, parallel to the superior ramus of the pubis. The needle was slowly advanced until a response to a nerve simulator was elicited, as described above. If the identification of the obturator nerve in an approach failed within 5 min after the first insertion of the needle, the method of approach was changed.

*Injection of local anesthetic*

The stimulating needle was advanced until visual confirmation of contractions of thigh adductor muscles was obtained. Inadvertent intravascular needle placement was excluded by frequent aspiration. Then, 1% lidocaine solution was infused until the visual contractions weakened significantly. The needle was then withdrawn short of the tip and was reinserted in several directions to determine whether there were other contractions of adductor muscles. The needle was removed after it was confirmed that contractions of adductor muscles by electrical stimulation could not be visualized.

Evaluation consisted of two main categories. The first was evaluation of two approaches to the blockade of the obturator nerve. This evaluation included the insertion-adductor contraction interval (ICI), success rate, and completion of the nerve block. The second category was evaluation of the infusion volume of 1% lidocaine solution for the nerve block and the plasma lidocaine concentration 20 min after the injection. Blood was taken via the right radial artery 20 min after the completion of the obturator nerve block. The blood sample was immediately centrifuged, and plasma lidocaine concentration was measured by high-performance liquid chromatography in our laboratory.

Demographic data, ICI, volume of 1% lidocaine solution, and plasma concentration of lidocaine were analyzed by the unpaired *t*-test. The success rate of the obturator nerve block was analysed by Fisher's exact probability test. $P < 0.05$ was considered to indicate a statistically significant difference.

## Results

The subjects of the two groups were comparable with respect to age, sex ratio, body weight, and duration of surgery (Table 1). Although the obturator nerve could not be identified by the traditional approach in only one patient, it was identified without difficulty by the interadductor approach in this patient. Thus, the success rate was 91.7% (11/12) with the traditional approach and 100% (12/12) with the interadductor approach (Table 2).

Evaluation of the interadductor approach in comparison with the traditional approach revealed a significant decrease in ICI. With respect to total injected volume of 1% lidocaine solution and plasma concentration of lidocaine 20 min after the block, there were no significant differences between groups (Table 2). Two patients showed clinical signs of local anesthetic toxicity.

**Table 1.** Demographic data

| Group | Interadductor approach ($n = 12$) | Traditional approach ($n = 12$) |
|---|---|---|
| Sex (M/F) | 11/1 | 11/1 |
| Age (yr) | 69.4 ± 18.3 | 64.6 ± 10.6 |
| Weight (kg) | 58.9 ± 11.9 | 60.3 ± 11.7 |

Plus-minus values are means ± SD

**Table 2.** Success rate, insertion-adductor contraction interval (ICI), volume of lidocaine, and plasma levels of lidocaine with two approaches to obturator nerve block[a]

| Group | Interadductor approach | Traditional approach |
|---|---|---|
| Success rate | 100% | 91.7% |
| ICI (s) | | |
| Right | 16.1 ± 7.0* | 31.5 ± 12.4 |
| Left | 14.2 ± 7.1* | 38.8 ± 16.2 |
| Volume of lidocaine ($mg \cdot kg^{-1}$) | 1.8 ± 1.0 | 1.9 ± 1.1 |
| Plasma level of lidocaine ($\mu g \cdot ml^{-1}$) | 5.9 ± 3.6 | 5.0 ± 2.7 |

[a] Plus-minus values are means ± SD
* $P < 0.05$ compared with traditional approach

One patient in the group receiving the traditional approach complained of feelings of chest compression about 15 min after the block, and another patient in the group receiving the interadductor approach had numbness of the lips and tongue. In the former patient, 5 mg of diazepam was administered intravenously after the diagnosis of high spinal anesthesia and ischemic heart disease had been excluded. The plasma lidocaine concentration of this patient was $10.3\,\mu g \cdot ml^{-1}$. This patient did not need any medications.

No contractions of the adductor muscle were observed during the TUR procedure, and the urologist expressed overall satisfaction.

## Discussion

The present study showed that the ICI was significantly shorter with the interadductor approach than with the traditional approach, although the success rate, completion of the block, and plasma lidocaine concentrations were similar with both approaches. Because of some anatomical difficulties, the obturator nerve can be missed in blockade by the traditional approach even in the most expert hands. Although the teaching—staff anesthesiologists who took part in this study were accustomed to the traditional approach, they could identify the obturator nerve faster by the interadductor approach than by the traditional approach. This fact, therefore, shows that the interadductor approach can provide faster identification of the obturator nerve than the traditional approach.

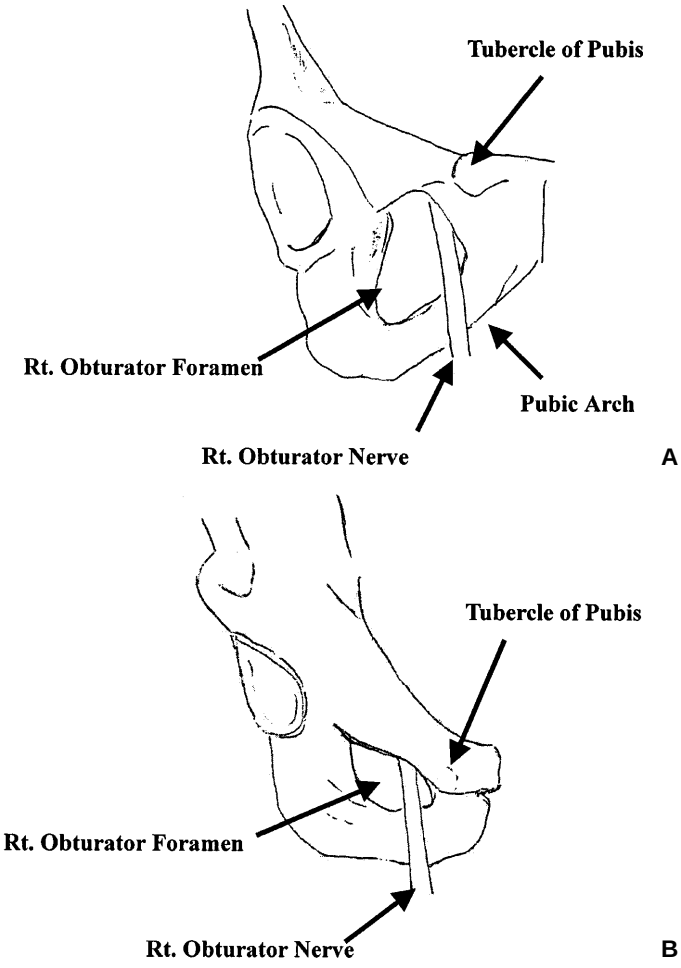


**Fig. 2.** Illustration showing the obturator canal viewed from the perspective of the (**A**) interadductor approach and (**B**) traditional approach

The high success rate of the interadductor approach described by Wassef [3] in 1993 was thought to be due to the ease and accuracy with which the needle tip can be positioned in the vicinity of the obturator nerve trunk within the obturator canal. The direction of the needle from its point of insertion, 1 cm behind the adductor longus tendon and 2 cm lateral to the pubic arch, is mainly slightly lateral with a posterior inclination. This direction is aligned with that of the obturator canal. According to Wassef [3], difficulty in the traditional approach can be attributed to the following factors. First, the general direction of needle insertion from the anterior aspect of the thigh, which makes needle alignment with the obturator canal unattainable, is different from that of the obturator canal (Fig. 2A and B). Second, because the bony part of the obturator canal is directed downward and backward, the obturator nerve

trunk is shielded as viewed from the perspective of this approach. Considering these factors, it is understandable why in the present study more time was required to position the tip of needle in the vicinity of the obturator canal with the traditional approach than with the interadductor approach.

Because no contraction of the adductor muscle was observed during TUR in either group, no differences between these techniques in the completion of the obturator nerve blockade were found in the present study. Although the only failure in identifying the obturator nerve was seen in the group receiving the traditional approach, there was also no statistically significant difference in the success rate between these techniques.

Fujita et al. [4] demonstrated that the peak plasma concentration of lidocaine was $3.75 \pm 0.79\,\mu g \cdot ml^{-1}$ 20 min after the injection of 15 ml of 2% lidocaine for the blilateral obturator nerve block. Additionally, a prospective study [5] showed that a peak of $3.63 \pm 2.07\,\mu g \cdot ml^{-1}$ (range, 0.75–7.21 $\mu g \cdot ml^{-1}$) occurred 15 min after injection of 30 ml of 1.5% lidocaine for the bilateral obturator nerve block. Our results demonstrated that the plasma concentrations of lidocaine 20 min after the block were $5.94 \pm 3.62\,\mu g \cdot ml^{-1}$ (maximum, $10.8\,\mu g \cdot ml^{-1}$) and $4.99 \pm 2.68\,\mu g \cdot ml^{-1}$ (maximum, $10.3\,\mu g \cdot ml^{-1}$) with the interadductor approach and the traditional approach, respectively. We did not know the exact reason why the plasma concentrations of lidocaine 20 min after the bilateral block in our study were much higher than in other reports [4,5]. However, it could be speculated that the higher intensity of the stimulus by the nerve stimulator in the present study as compared with that used in those previous reports might have resulted in the administration of a large volume of local anesthetic [4,5]. Therefore, the intensity of the electrical stimulus may have to be reduced in obturator nerve blockade. The main determinants for plasma levels of lidocaine are the total volume of administered lidocaine and the rapidity of absorption at the site of lidocaine injection. Therefore, administering a smaller quantity of lidocaine is one of the most effective means to control plasma levels. Furthermore, the addition of epinephrine to lidocaine, which can reduce the absorption speed of lidocaine from the injected site, is also effective for suppressing the plasma concentration of lidocaine. For bilateral obturator nerve block, we should adopt methods in which the plasma concentration of lidocaine would be kept within normal range.

In conclusion, the interadductor approach to obturator nerve block seems to be an easier technique that offers certain anatomical advantages in comparison with the traditional approach, although both approaches can provide a high success rate and the completion of the block in TUR procedures.

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