



Twitching of the Pectineus Muscle Under Ultrasound-Guided Complete Obturator Nerve Block at the Inguinal Crease: A Case Report

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Abstract

Introduction: This report showed that clinically significant adductor muscle contraction can be possible even when the anterior and posterior branches of the obturator nerve are completely blocked.

Case Presentation: A 66-year-old male patient visited Gil Medical Center, Gachon University College of Medicine, Incheon, South Korea during the year 2016. He underwent transurethral resection of the bladder (TURB) of a bladder tumor under spinal anesthesia and obturator nerve block (ONB). ONB was performed at the right-side inguinal crease by an ultrasound-guided block of the anterior and posterior branches. At the beginning of surgery, he exhibited grade IV obturator reflex; therefore, general anesthesia was applied and the surgery completed. After the effect of neuromuscular blockade had been completely reversed, we confirmed twitching of the pectineus muscle by ultrasound using a nerve stimulator (stimulation current 0.3 mA). Main branches of the right obturator nerve were still completely blocked when we rechecked the previously blocked-site (stimulation current 2 mA).

Conclusions: The described case cautions that investigators must be aware more than two branches may pass adjacent to interfascial layers at the inguinal crease level and that a missed obturator nerve branch might result in severe adductor muscle contraction. We report this observation and suggest the possibility of an anatomical variant that requires the need for nerve stimulation and ultrasound for obturator nerve block verification.

Keywords: Muscle Contraction, Neoplasms, Neuromuscular Blockade, Obturator Nerve Block, Pectineus Muscle, Perforation, Reflex, Transurethral Resection of the Bladder, Urinary Bladder

1. Introduction

The obturator nerve (ON) is considered to divide into two branches after exiting their respective obturator canals. Anterior branch is located in fascial planes among adductor longus, adductor brevis, and pectineus muscles, whereas posterior branch is located between the adductor brevis and adductor magnus muscles at the inguinal crease (1, 2). Therefore, the obturator nerve block (ONB) is performed using anterior and posterior (main) branch blocks at the inguinal crease level (1, 2). However, we experienced Grade IV obturator reflex even after complete main branch block of the right ON, and confirmed additional twitching of the pectineus muscle using ultrasound and a nerve stimulator. Therefore, we report this case with regard to various branching patterns of the ON at the inguinal crease (3-5). This report challenges the notion

that anterior and posterior branch blocks are sufficient for complete ONB at the inguinal crease.

2. Case Presentation

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A 66-year-old man (height 170 cm, weight 79 kg) was admitted to undergo transurethral resection of the bladder (TURB) for bladder tumor of the right lateral wall at the Gil Medical Center (1600-bed tertiary referral hospital), Gachon University College of Medicine, Incheon, South Korea during the year 2016. He had well-controlled hypertension. Preoperative electrocardiography (ECG), chest X-ray, and blood chemistry were normal. ECG, pulse oxygen saturation, and noninvasive blood pressure were measured on arrival at the operating room. He

was administered 0.5% bupivacaine 13 mg intrathecally at the L4-5 level for spinal anesthesia and left in the supine position. Ten minutes later, his anesthetic level reached T8.

After achieving spinal anesthesia, we performed the obturator nerve block. The right leg was slightly abducted and rotated externally without knee flexion, and the inguinal region was prepared with a povidoneiodine solution. A 10 MHz linear transducer (Zonare Medical Systems, California, USA) equipped with a sterile plastic cover and gel and set at an image depth of 4 - 5 cm was then positioned parallel to the inguinal crease at 90° to skin. The inguinal region was examined laterally from the femoral vein until the pectineus muscle was identified with the adductor longus, adductor brevis, and adductor magnus medially at the inguinal crease. A 22-gauge, 120-mm stimulating needle (Stimuplex insulated needle; D Plus B. Braun, Melsungen, Germany) attached to a nerve stimulator (Stimuplex HNS12; B. Braun, Melsungen, Germany) was then advanced from lateral to medial using an ultrasound in-plane approach. We found the twitching spot at a stimulation current 0.3 mA on the lower part of 'Y-shaped fascia lying on its side', which was considered the anterior branch of the right ON (*; Figure 1A). After negative aspiration, 10 mL of local anesthetics (LA; 1.5% lidocaine + epi 1:200,000) were slowly injected within the muscle interface. The needle was positioned on the most hyperechoic spot of fascia between the adductor brevis and adductor magnus (**; Figure 1A), at which twitching (0.3 mA) was also observed, and posterior branch block was achieved by injecting 10 mL of LA.

After performing ONB, patient was positioned in the lithotomy position. Endoscopic resection of the neoplasm was started using a bipolar resectoscope (electrical current: 280 W) and endovesical irrigation with normal saline, but as soon as the surgery began, Grade IV obturator reflex occurred (6). After discussing the situation with the surgeon, we administered propofol 100 mg and rocuronium 55 mg, and inserted a 7.5-mm endotracheal tube. General anesthesia was maintained with an air-O₂ mixture (FIO₂ 0.5) and end-tidal desflurane at 6 vol%, and surgery was continued. After 30 minutes of surgery, we injected 0.6 mg of glycopyrrolate and 1.5 mg of neostigmine IV, confirmed spontaneous breathing, and removed the endotracheal tube.

After the patient had arrived in the recovery room, we checked at the inguinal crease again using ultrasound. When the transducer was moved medially from the block site, we found a hyperechoic spot at the center of the pectineus muscle (*; Figure 1B). We considered the need to confirm residual twitching and explained the situation to the patient who agreed to our rechecking ONB state.

When we re-inserted the stimulating needle to the hyperechoic spot (0.3 mA), severe adductor muscle contraction was elicited, which we considered the cause of incomplete ONB. The main branches remained a completely blocked state (2 mA). No vascular puncture or blood aspiration occurred during the procedure. The patient was discharged on POD 3, and follow-up urology chart reviews on POD 13 revealed no neurologic or vascular complication.

3. Discussion

Generally, if adductor muscle contraction is observed after ONB during surgery, the block is considered to have failed. However, in this case, we confirmed LA deposition in the appropriate sites on ultrasound images at a sufficiently low current level (i.e. 0.3 mA), and thus, it is unlikely that our block resulted in failure due to incomplete main branches block. Thus, we consider an unidentified ON branch passing through the pectineus muscle affected adductor muscle contraction.

Akata et al. (7) described a case of life-threatening haemorrhage following obturator artery injury due to incomplete ONB, and supposed the concentration or volume of the LA used may have been inadequate (1% mepivacaine, 8 mL). Notably, no consensus has been reached regarding the volume or concentration of LA required to prevent adductor muscle contraction (7). However, based on considerations of lidocaine peak plasma levels following ONB (8), we believe 20 mL of 1.5% lidocaine is sufficient for complete ONB.

We suppose that in the described case a non-blocked sub-branch remained on innervated pectineus muscle but question whether grade IV reflex is possible when main branches are completely blocked. In one study, several subdivisions of main ON branches were visualized by sonography just below the inguinal ligament (4), but we do not know to what extent these subdivisions affect adductor muscle strengths, that is, whether no block of subdivisions can cause severe muscle contraction or whether leaving some in a non-block state is acceptable. Furthermore, it has been shown that even successful ONB does not guarantee complete adductor motor block because innervations from the femoral and sacral plexus also contribute to adductor muscle motor strength (1).

Another possibility, which is probably the most plausible, is that we blocked a sub-branch within interfascial layers and not the main branch passing through the pectineus muscle. Recently, many ON branching patterns and high anatomic variability at the inguinal crease were reported in a cadaveric study, in which the authors suggested that nerve stimulating response may be due to a

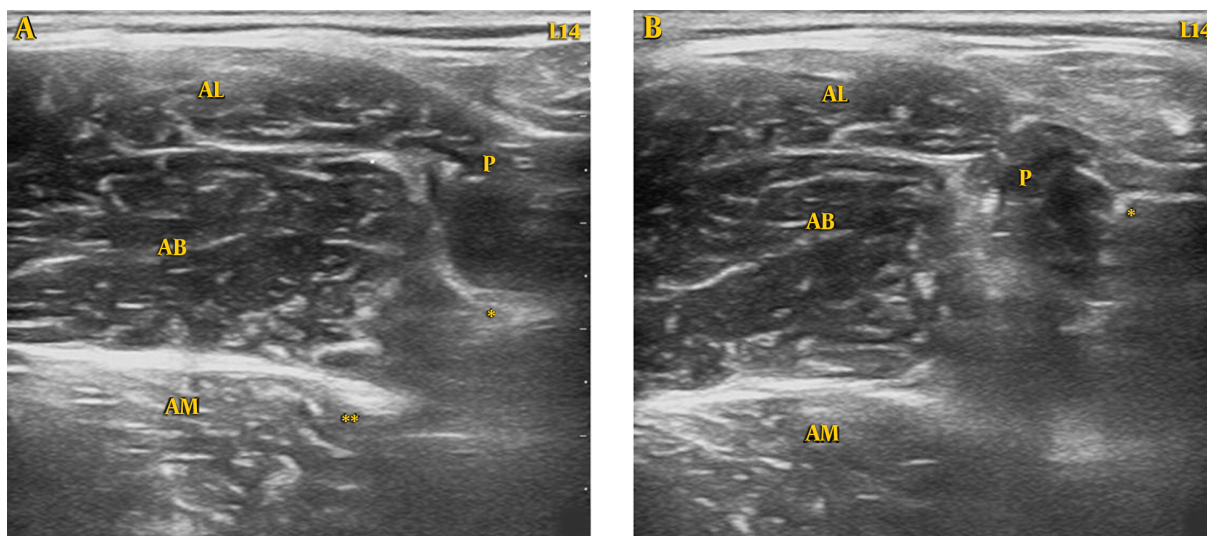


Figure 1. Obturator nerve block (ONB) and recheck of the additional twitching spot in pectineus muscle at the inguinal crease. A, When ONB was performed, fascial planes of adductor pectineus muscles were identified. (* indicates anterior branch block and ** posterior branch block). B, When the stimulating needle was reinserted, an additional twitching spot (*) was found in pectineus muscle. AL, adductor longus muscle; AB, adductor brevis muscle; AM, adductor magnus muscle; P, pectineus muscle.

subdivision and not the main branch (3). When performing ONB we focused on interfascial layers, and thus, did not locate the hyperechoic spot within pectineus muscle.

Studies have reported that complete ONB is possible by interfascial injection at a known anatomical location without nerve stimulation (1, 2). However, based on the experience of the described case, we are of the opinion that LA injection at a specific site at which main branches are expected to pass cannot guarantee complete ONB. Ishiyama et al. (5) mentioned that multiple injections at fascial sites between adductor muscles might be necessary for complete ONB.

Incomplete ONB can result in serious bladder perforation. Although further research is required to evaluate the efficacy of multiple injections, we propose that ONB should be performed by ultrasound using a nerve stimulator (9, 10). Finally, the described case cautions that investigators must be aware more than two branches may pass within muscles adjacent to interfascial layers at the inguinal crease level and that a missed obturator nerve branch might result in severe adductor muscle contraction.

Footnotes

Authors' Contribution: Hee Yeon Park: Drafting of the manuscript. Wol Seon Jung, Dong Chul Lee and Jong Cheol Park: English editing. Young Jin Chang: Interpretation of the ultrasound images and drafting of the manuscript. Mi

Geum Lee: Performing the obturator nerve block and drafting of the manuscript

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