

Transurethral Surgery and the Adductor Spasm

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Abstract

Introduction: Transurethral surgery has become the dominant treatment for bladder and prostatic tumours. Regional anaesthesia is the favoured anaesthetic technique but adductor spasm leading to bladder wall perforation and increased morbidity is not uncommon. This review seeks to outline the cause, risk factors predisposing to this complication and the various techniques that have been adopted to eradicate it. **Methods:** Literature search was performed from PubMed (1965 onwards). All studies related to obturator nerve stimulation or adductor spasm in transurethral surgery were short-listed. **Results:** Various methods have been attempted. These ranged from local blockade of the obturator nerve, periprostatic and subvesical lignocaine infiltration, changing the site of the inactive electrode, reduction of the electrocoagulation voltage and general anaesthesia with muscle relaxants. **Conclusions:** Hitherto, local blockade of the obturator nerve, either by the direct method or "3-in-1" method is the most effective in preventing this complication. With the aid of a nerve stimulator, greater accuracy and use of smaller volumes of local anaesthetic will improve the safety of this block.

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Introduction

Bladder tumours frequently arise from the posterolateral wall of the bladder¹ over the course of the obturator nerve. It is during transurethral resection of these tumours that direct electrical stimulation of the obturator nerve occurs. This may lead to violent adductor contraction when a regional anaesthetic or general anaesthetic without muscle relaxants is administered.

Regional anaesthetic techniques like spinal anaesthesia have always been a popular anaesthetic technique for transurethral surgery. In addition to offering good operating conditions, having an awake patient allows early detection of complications like intravenous absorption of irrigation fluid causing neurological changes and bladder perforation if the level of regional blockade is limited to T10.

Spinal anaesthesia for urological surgery is associated with benefits like reduced blood loss, good postoperative analgesia, prevention of postoperative bladder spasm and an atonic, large capacity which facilitates surgical resection. General anaesthesia is undesirable in transurethral surgeries,² especially when a large proportion of such patients are elderly.

Complications of postoperative hypoxaemia,^{3,4}

deterioration of mental function,⁵ hypothermia,^{6,7} paralytic ileus,⁸ and deep vein thrombosis⁹ are said to be increased after a general anaesthetic in the elderly.

In spite of these benefits, during transurethral surgical procedures, obturator nerve stimulation occurs and it has been suggested that this is the result of low frequency voltage brought about by gas pockets at the surface of the cutting electrode stimulating the obturator nerve as it passes close to the bladder wall.¹⁰ This can result in bladder perforation^{11,12} as a result of adductor muscle contraction during transurethral resection. Surgeons have expressed concern that limited surgical resection to avoid stimulation of the obturator nerve may result in incomplete resection and subsequent recurrence of tumour. Bladder perforation leads to an increased risk of infection, haemorrhage¹³ and fears of tumour dissemination. It often necessitates administration of general anaesthesia for repair of the perforation.

Anatomy

The obturator nerve is derived from the lumbar plexus (L2-4) and descends through the pelvis along the medial border of the psoas muscle. As it passes through the pelvis, it passes in the close proximity to the inferolateral bladder

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wall, bladder neck and lateral prostatic urethra. The obturator nerve passes through the superior mid-aspect of the obturator canal to enter the thigh. Thereafter, it divides into an anterior and posterior division. The former innervates the adductor brevis, adductor longus and gracilis muscles, and the posterior division innervates the adductor magnus and obturator externus muscles (Fig. 1).

Risk Factors

Although the incidence of adductor spasm quoted varies between 10%¹⁴ and 20%,¹⁰ several risk factors have been cited to increase the frequency of this complication.

Distension of the bladder by irrigating fluid has been shown in autopsy studies to reduce the distance between the bladder and the obturator nerve at its entrance into the obturator foramen¹⁴ and in cystographic studies, 300 mL of saline caused the bladder contour to bulge so as to cover the cranial part of the obturator foramen.¹⁴

There is also an increased likelihood of adductor spasm during electroresection of lesions in the posterolateral bladder neck, trigone and posterior urethra due to the proximity to the obturator nerve at these sites.¹⁵

Hradec et al¹⁵ mapped out the corresponding areas within a distended bladder from which obturator nerve stimulation occurred and these were localised to the lateral aspects of the bladder wall (Fig. 2).

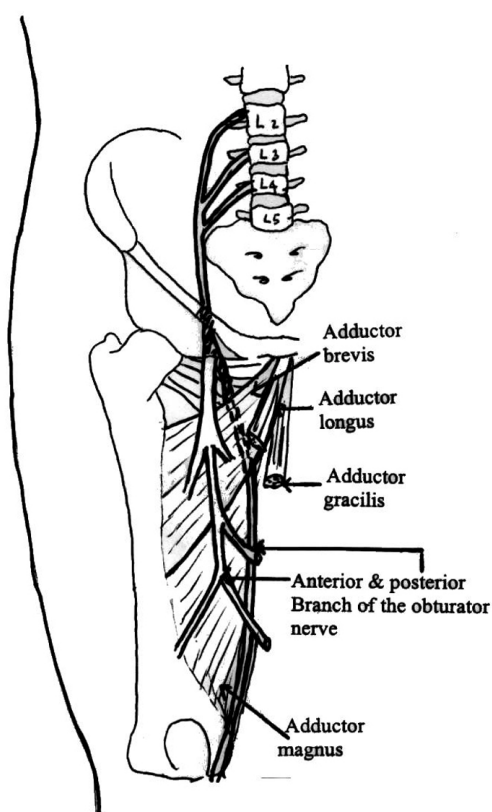


Fig. 1. Anatomy of the obturator nerve.

Although it has been found that about 10% of the population have an accessory obturator nerve, this does not increase the risk of adductor spasm and therefore does not require anaesthetic blockade as it is located beyond stimulation during transurethral surgery.¹⁶

Techniques to Prevent Adductor Spasm

Various methods have been used to prevent this potentially dangerous problem. The use of local anaesthesia to block the obturator nerve has proven to be practical and reliable.^{10,17} To perform this, the patient is placed supine with the leg abducted. The tip of the pubic tubercle is identified and the injection site is located 1 to 2 cm lateral and caudad to the pubic tubercle (Fig. 3). A 7- to 8-cm needle is inserted perpendicular to the skin until the horizontal ramus of the

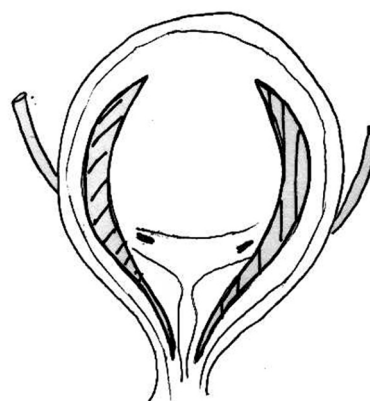


Fig. 2. Area where the obturator nerve is stimulated.

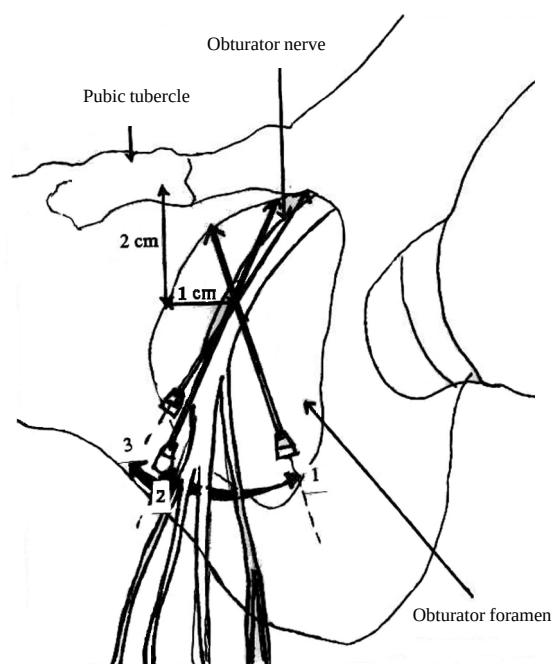


Fig. 3. Direct obturator block.

pelvis is felt and then the needle withdrawn and redirected laterally about 45° in the cephalad direction, 2 to 3 cm deeper than the pelvic ramus until it passes into the obturator canal. After careful aspiration, 10 to 15 mL of local anaesthetic is injected in a fan-like fashion to block the obturator nerve.¹⁸ Complications that may arise include intravascular injection or needle insertion into the surrounding structures,¹⁹ but with careful aspiration prior to injection, attention to bony landmarks and use of the nerve stimulator, this technique is considered safe and accurate.²⁰ Gasparich and coauthors²⁰ advocate the use of a nerve stimulator in localising the obturator nerve, which has the added advantage of verification of blockade before surgical manipulation and using a lower volume of local anaesthetics. During a 2-year interval when more than 275 transurethral resections were performed, not one had a single adductor contraction. In addition, there were no complications related to the nerve block or use of the nerve stimulator.

Concerns regarding potential risk of systemic toxicity of local anaesthetics because a fairly large dose of drug is used have arisen.¹¹ This is complicated by elderly patients undergoing transurethral resection who may have altered pharmacokinetics²¹ superimposed with the effects of spinal anaesthesia. With the aid of a nerve stimulator, a low volume of 10 mL 2% lignocaine has been effective and safe for bilateral obturator nerve block in elderly patients undergoing transurethral resection procedures under spinal anaesthesia.²² In the study, Fujita et al²² demonstrated no adductor spasm in 12 subjects. Peak plasma lignocaine concentration was less than 7 µg/mL and clinically there were no symptoms of systemic toxicity. It has been recommended that extradural anaesthesia should not be combined with bilateral obturator nerve block as extradural anaesthesia also requires a large dose of local anaesthetics, which may then lead to the toxic effects from local anaesthetic drugs.²²

Winnie et al²³ described the “3-in-1” block to block the lumbar plexus from which the obturator nerve is derived. The “3-in-1” paravascular block is hypothesised to work by cephalad spread of the local anaesthetic to block the femoral nerve while medial and lateral extension of the anaesthetic block the obturator and lateral femoral cutaneous nerves.²³ The patient is positioned supine with the leg abducted and a 3- to 4-cm 22-gauge block needle is inserted 1 cm lateral to the femoral artery, immediately below the inguinal ligament. The needle is directed cephalad and advanced until femoral nerve paraesthesia is elicited or contraction of the quadriceps muscle is observed when a nerve stimulator is used. Thereafter 30 to 40 mL of local anaesthetic is injected after careful aspiration. Although some studies have shown this block to be clinically effective in preventing contractions of the thigh adductor muscle^{24,25}

during transurethral surgery, Atanassoff et al²⁶ demonstrated by electromyographic recordings that the obturator nerve was not blocked as effectively during the 3-in-1 technique as compared with direct obturator nerve blockade. In fact, Lang et al²⁷ had a success rate of only 4% in blocking the obturator nerve using the 3-in-1 block. Perhaps the main advantage in this block lies in the slower absorption of lignocaine when compared with a direct obturator nerve block, although none of the latter patients studied demonstrated clinical signs of toxicity.²⁸ Possible complications arising from this block include intravascular injection, inadvertent puncture of the femoral artery leading to haematoma formation and nerve injury.¹⁹

A variety of other methods have been attempted to overcome obturator nerve stimulation with unpredictable results. These include keeping the bladder partially filled to increase the distance from the resecting loop, reversal in polarity of the power supply to the electrosurgical unit,¹² reduction of the electrocoagulation voltage and resection of smaller chips.²⁹ Periprostatic and subvesical infiltration with lignocaine has also been suggested.¹² This involves passing the needle beneath the trigone and adjacent lateral vesical wall and infiltrating the periprostatic and perivesical tissue with local anaesthetics. Transurethral or transvesical anaesthetic infiltration of the bladder tumour is not advised as the obturator nerve trunk itself is not blocked and risks dissemination of tumour cells.¹²

Kihl et al¹⁴ studied the efficacy of changing the site of the inactive electrode from the buttocks to the thigh in patients undergoing transurethral surgery with spinal or general anaesthesia. In the 17 out of 160 patients studied where thigh adductor spasm was seen, the inactive electrode was then reattached to the lateral aspect of one of the thighs and surgery resumed. Of these, the contractions were abolished in 13 of these patients possibly by changing the distribution of the currents in such a way as to prevent further contraction. It has been advocated by Kihl et al that this measure be tried first when adductor contraction occurs.

The most common and arguably convenient method of managing obturator nerve stimulation is the administration of general anaesthesia with a neuromuscular blocker.^{30,31} However, this requires endotracheal intubation and the benefits of regional anaesthesia are lost.

Conclusion

To conclude, one should recognise that adductor muscle spasm is not an uncommon phenomenon. By far, local blockade of the obturator nerve is the most efficacious method in interrupting this reflex arc. Should general anaesthesia be planned for in patients assessed to be at risk of obturator spasm, endotracheal intubation and muscle

paralysis are suggested. If one should choose to perform spontaneous respiration-general anaesthesia, a supplementary block should be given.

With regards to patients who are not in optimal condition for general anaesthesia, spinal anaesthesia with accompanying obturator nerve block or “3-in-1” block is a suitable option. The final decision lies in the collaboration between the surgeon and the anaesthetist, fitness level of the patient, anaesthetic set-up and anaesthetist’s practice.

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