

Peripheral Nerve Stimulator for Obturator Nerve Block during Transurethral Resection of Bladder Tumor Following Spinal Anesthesia: Initial Experience

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Abstract

Context: Bladder injury and perforation is a major problem encountered during transurethral resection of bladder tumor (TURBT) under spinal anesthesia which can be overcome using obturator nerve block.

Aims: To evaluate obturator nerve block (ONB) using peripheral nerve stimulator during TURBT.

Subjects and Methods: Twenty adult male patients underwent TURBT under spinal anesthesia. ONB was performed with peripheral nerve stimulator. Data was assessed in terms of primary endpoints - the occurrence of obturator jerk, injury or perforation of bladder, and surgeon satisfaction in terms of ability to resect the tumor, number of surgical interruptions and number of blood transfusions required.

Results: In our study, there was reduction in obturator jerk but not complete abolition, during resection of bladder tumor. Bleeding was observed, however no bladder perforation occurred.

Conclusions: We conclude that ONB, when administered along with spinal anesthesia for TURBT, is feasible, simple and safe method of anesthesia to overcome adductor contraction. ONB with peripheral nerve stimulator is more precise and extremely efficient, although not absolute during TURBT.

Keywords: Obturator Nerve Block (ONB); Transurethral Resection of Bladder Tumor (TURBT); Peripheral Nerve Stimulator (PNS).

Introduction

Bladder cancer is the ninth most common malignancy worldwide. The predominant histological type (90%) consists of urothelial carcinoma¹ Bladder tumors require transurethral resection (TURBT) as an initial step for diagnosis and sometimes therapeutic as in Non muscle invasive bladder tumor (NMIBC). Although TURBT is commonly performed under spinal anesthesia

which offers many advantages such as technical ease of performing the procedure and avoiding the risks of general anesthesia; the major shortcoming with TURBT under spinal anesthesia is sparing of the obturator nerve with a potential complication of bladder injury or perforation secondary to obturator reflex i.e adductor muscle contraction from obturator nerve stimulation.²

The obturator nerve is mainly formed by the 3rd and 4th lumbar nerves with a minor contribution

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from L2. The nerve descends down on the psoas muscle and lies deep in the obturator canal. Exiting from here it divides into anterior and posterior branches. The anterior branch gives rise to an articular branch to hip and innervates adductor muscles, whereas the posterior branch innervates deep adductor muscles and the knee joint. The obturator nerve pass along with their corresponding vessels in pelvic cavity and exit through obturator canal to the thigh where it can be easily blocked.³

Various techniques of obturator nerve blocks (ONB) have been described such as using peripheral nerve stimulator, transvesical route and various ultrasound-guided ONB techniques (depending on the approach i.e distal or proximal.) We describe our initial experience of obturator block with peripheral nerve stimulation with key objective being - the ability to resect bladder tumor without occurrence of adductor jerk and hence avoiding bladder injuries or complications.

Material and Methods

Twenty patients with age range 59–73 years belonging to American Society of Anesthesiologists class III–IV underwent obturator block with peripheral nerve stimulation for transurethral resection of bladder tumor under spinal anesthesia. Exclusion criteria included patients with local site infection, coagulation disorders or surgery at lumbar spine and pubic region and patients with previous hypersensitivity to the local anesthetic agent. Preoperative assessment included ultrasonography and a CT of the KUB region to decide the side on which obturator nerve was to be blocked. Tumor number, location, size, shape, duration of surgery, blood loss, and postoperative complications, were all noted. The patients received 10 ml 2% preservative free lignocaine along with adrenaline for ONB.

Anesthetic Technique

Intravenous access was secured; patients were monitored routinely for pulse rate, noninvasive blood pressure, and oxygen saturation. Under strict aseptic precautions, in sitting position, all patients received subarachnoid block at lumbar space 3–4 or 4–5 with 2.5 ml of 0.5% heavy bupivacaine. After completion of spinal anesthesia, these patients were positioned supine with limb abducted to 30 degrees for obturator nerve block. After aseptic preparation of pubic area and upper thigh, an 10

cm long block needle attached to nerve locator set at 2.0 mA current intensity initially was inserted perpendicularly 1.5 cm lateral and inferior to pubic tubercle to hit pubic ramus and needle redirected caudally and medially to enter obturator foramen where obturator canal houses the nerve. (Fig 1) Needle tip is advanced until the tip is placed over the obturator foramen. When muscle contractions were visible on the medial aspect of the thigh at 0.5 mA current level, the local anesthetic was injected to block the obturator nerve. A waiting period of 20 min was allowed before initiating TURBT for the block to be in maximal effect. Monopolar cautery with the loop was used to resect the tumor, with setting adjusted between 70–80W for cutting and 50–60 W for coagulation.

During the operative procedure, surgeons observation was noted for primary endpoint of the study i.e resectability of the tumor whether hampered or unhampered due to adductor reflex. Adductor reflex was described as jerky adduction, and external rotation of the thigh at hip joint associated with interruptions of tumor resection. Bladder injury mandating the need of blood transfusions and bladder perforation were the secondary endpoints.

All patients who had unresectability of the tumor due to adductor jerk were managed under general anesthesia with adequate muscle relaxation.

Results

All twenty patients who underwent this technique of ONB were males aged between 59–73 years. Mean age of the patient undergoing the procedure was 65.4 years (SD 3.92). Duration of the surgery ranged between 37–57 minutes (Average 44.25 minutes). Obturator jerk was seen in 15% of the patients undergoing this procedure. (Fig 2) Complete resectability was hampered in 30% of the patients and 50% of these had associated abductor jerk. (Fig 3) Injury in the form of bladder wall tear was seen in 20% of the patients and necessitating blood transfusion in 10%. (Fig 4) However, bladder perforation was not noted in our study. As per the surgeon observation it was noted that there was overall a better ability to resect the tumor with reduced adductor reflex by the usage of ONB. Overall 85% surgeon satisfaction regarding absence of abductor jerk for successful surgery was observed in our study.



Fig. 1: Image showing usage of peripheral nerve stimulator to locate the obturator nerve.

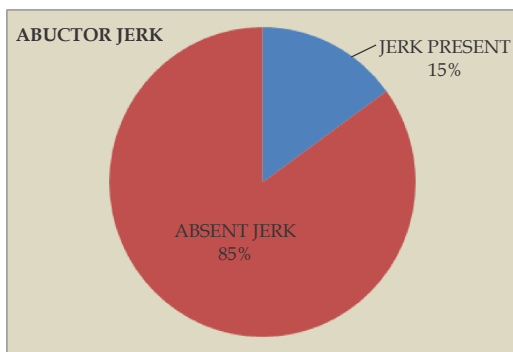


Fig. 2: Image showing percentage of patients having obturator jerk.

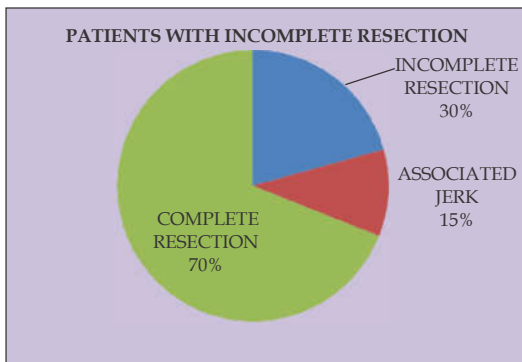


Fig. 3: Image showing percentage of patients with incomplete resection.

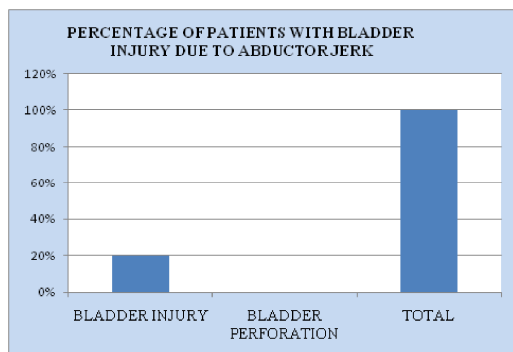


Fig. 4: Image showing percentage of patients having bladder injury and perforation.

Discussion

TURBT is widely used surgical technique for both diagnosis and treatment of bladder cancer. Usually when performed under spinal, obturator nerve sparing can produce adductor jerk causing difficulty in completing TURBT. Obturator nerve which courses along the lateral wall of the bladder in the pelvis can be easily stimulated by the electrical current passing through the Monopolar loop used for resection evoking an intense involuntary response in the form of jerk from adductor muscles i.e adductor longus, brevis, magnus, gracilis and external rotation by obturator externus of hip. This jerk can cause serious injury such as bladder injury, vessel wall laceration with profuse bleeding necessitating the need for blood transfusion, bladder wall perforation, and sometimes even incomplete resection due to frequent distractions and interruptions to the operating surgeon.^{2,9}

Several methods were attempted to abolish this reflex including reducing the diathermy power and using bipolar instead of Monopolar cautery but none have been completely successful. Abolition of nerve stimulation with the use of current of low power such as 50 W for cutting and 40 W for coagulation, was reported by Gupta et al.⁴ but these settings are too low for satisfactory and complete resection. Usage of ONB facilitated use of higher power sources compared to that used in Gupta et al facilitating complete resection. A study by Venkatramani et al. compared monopolar with bipolar cauterization concluded that bipolar TURBT was similar and not superior to unipolar TURBT with respect to bladder perforation, obturator jerk, and hemostasis.⁵ Various other strategies, such as modification in the surgical procedure such as resecting the tumor on thinner slices, laser resection, usage of general anesthesia with muscle relaxants, partial filling of the bladder during resection, reversing polarity of electric current, and change in site of inactive electrode have been adapted to avoid complications during surgery but with wide variability in the results.⁶ Smoking is an important risk factor for bladder tumor, and many of these patients have associated COPD due to long term smoking. General anesthesia is not always a suitable option as many of these patients are elderly and may have co-morbidities forbidding the use of the same especially due to associated pulmonary complication of general anesthesia.

Various methods have been described in literature to block obturator nerve. Peripheral nerve stimulation, USG guided and transvesical

block to name a few. Kennedy et al described nerve stimulation technique with a success rate between 83.8% and 85.7% with classic approach.⁷ A comparative study by Moningi S et al between the Classical technique described by Labat and the inguinal approach by Choquet Parks showed the latter approach more effective and lesser vascular complications than classic approach.⁸ Augspurger and Donohue stated that 83.8% success can be achieved with abolishing obturator jerk through blind anatomic approach which is significantly lower compared to peripheral nerve stimulation technique described above.¹⁰ Gasparich et al.¹¹ used the nerve stimulation approach with 0.5 mA, and 3–4 ml of 1% lignocaine with a success rate of 100%, while Kobayashi et al.¹² and Kuo et. al also used nerve stimulation with 0.5 mA and injected 7–40 ml of 0.25% bupivacaine with a success rate of 89.4%.¹³

Khorrami et al.¹⁴ compared 30 patients each of transvesical blockade of obturator nerve with 10 ml 1% lignocaine injected through cystoscope along with spinal anesthesia with spinal anesthesia only. They observed a significant jerk in the spinal only group (16.5%) compared to the ONB through transvesical group (3%). Malik et al. compared ONB through peripheral nerve stimulation and transvesical route and reported transfusion in 25% of patients (11/42) after TURBT with peripheral nerve stimulation group.¹⁵ Collado et al.² have reported 3.4% incidence of blood transfusion. Lower preoperative hemoglobin levels may be responsible for more transfusions. The above results are in comparison with our study. Rates of visibility of common obturator nerve, and anterior branch of obturator nerve with ultrasound were determined in 12/16, 13/16 respectively as per Akkaya Taylan et al. 93% of the patients reported satisfaction from the block by USG method.¹⁶ This improved efficacy using newer techniques is probably attributed to the better visualization of the nerve and accurate localization before injecting the anesthetic drug.¹⁷

In our study, although bladder wall injury was noted in the form of bladder wall tear and 2 of the 4 necessitating transfusion, no bladder perforation was observed in any patients.

Conclusion

ONB using a peripheral nerve stimulator is a safe, effective and essential method to abolish adductor jerk in patients with bladder tumors undergoing TURBT under spinal anesthesia. It is simple and feasible with short learning curve which can achieve successful blocks with lesser patient complications

and improved surgeon satisfaction. However, it is not absolute in the abolition of the adductor jerk. Hence in future, it is necessary for comparative studies with newer techniques of anesthetic drug delivery such as USG guided obturator nerve block etc. for better accuracy in achieving the block.

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