CASE REPORT

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Personal Experience of Perioperative Pain by Pain Physician Subjected to Trans-Urethral Laser Prostatectomy

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Abstract

Background: This work is of exceptional character as the anesthetic technique was done by a senior Professor of Anesthesiology with long experience in acute peri-operative pain management and the patient is a Professor in Pain Medicine for the last 35 years.

Preparation: Pre-operative visit was done by the anesthesiologist for assessment and pre-anesthetic preparation. There was a history of active reflux esophagitis and duodenal ulcer. Physical examination of different body systems with revision of the basic investigations and concurrent medications was done. The patient was receiving antihypertensive therapy. Investigations included ECG, echocardiography, complete blood count (CBC) and coagulation profile. Liver and kidney profiles were also revised. The patient has Magnetic Resonance Imaging (MRI) as he has a long history of cervical spine pain in addition to a plain X- ray image for the lumbar spine.

Procedure: Pre-anesthetic medication was accomplished with fentanyl, midazolam and ranitidine after painless fixation of an intravenous (IV) cannula. Combined spinal and epidural anesthesia/analgesia was done between L4-5 interspace. Basic monitoring parameters were activated during the operative time [1]. IV fluids were given with caution. Anesthesia was verified with loss of motor power in the lower limbs and loss of sensation to cold pack up to the thoracic 7th spinal segment. The operative time was 2.30 hours. Postoperatively, patient epidural controlled analgesia was established with fentanyl and bupivacaine for 36 hours. Then the epidural catheter was removed for fear of infection [2] and the patient discharged from the hospital. For the next week the patient still suffering from pain for which he took oral medications guided by the three-step WHO analgesic ladder.

Conclusion: Combined spinal-epidural anesthesia/analgesia is an excellent technique for peri-operative anesthesia and analgesia for trans-urethral Laser prostatectomy. However, it should be extended for more than 36 hours postoperatively for optimum pain management.

Key words: *combined spinal-epidural anesthesia/analgesia; epidural fentanyl and /or bupivacaine; Holmium Laser prostatectomy.*

Introduction

Transurethral prostatectomy using the Holmium laser beam is a real step forward for such operation**.** Irrigation using distilled water of Glycine for fear of electric arch is an old technique which was over now. Normal saline (0.9 %) solution is a safe medium and irrigating fluid during laser surgery. Regional techniques such as spinal, epidural or combined spinal-epidural anesthesia/analgesia are the anesthetic techniques of choice. Most of the candidates scheduled for prostatectomy are senile with coexistent cardiovascular, respiratory, renal, hepatic or neurological problems. Any over irrigation of the urinary bladder during the surgery will be detected as symptoms and signs of circulatory overload. High abdominal pain in spite of successful anesthetic technique would be an alarming sign of urinary bladder perforation. The post-operative pain of Holmium laser technique is less than the old technique [3].

Aim of the work:

Is to assess and register the personal experience of combined spinal-epidural anesthesia/analgesia by a Professor of Pain Medicine on perioperative pain management after trans-urethral Holmium Laser prostatectomy. In the meantime, the adopted technique was done by another well experienced Professor in Anesthesia and Pain Medicine. It is an exceptional chance to describe the feeling of loss of sensation, motion, numbness and any other complications if present.

Perioperative Procedures

These procedures will be divided into, preparation for anesthesia and operation, pre-anesthetic medication, induction by anesthetic technique of choice, immediate postoperative and late postoperative analgesia.

Preparation for anesthesia and operation:

This was started by the history. The age of the patient (first author) was 71 years with a history of controlled hypertension by Valsartan 160 mg (angiotensin II receptor antagonist) plus Hydrochlorothiazide 12.5 mg once/day and Diltiazem 120 mg/day. Also, the patient was receiving anti-hyperlipidemic dugs in the form of Fenofibrate 300 mg plus Ezetimibe 10 mg. No anti platelets aggregation drugs were given due to active reflux esophagitis and duodenal ulcer. MRI revealed multiple cervical disc lesions. Mallampati Score was 2-3 [4]. Routine investigations included complete blood count (CBC), random blood glucose, liver and kidney profiles. In addition to electrocardiogram and echocardiography. The last test proved mild sclerotic aortic valve incompetence. Plain X-ray images for the chest and lumbar spine were also available. Pre-operative assessment of the venous access was done by anesthesiologist in charge. All the above parameters agreed with ASA II scoring system [5].

Pre-anesthetic medication:

The antihypertensive therapy was advised not to be taken in the morning of surgery. Venous cannulation was done with injection 1ml of 2% lidocaine along the line of the passage of the intravenous (IV) cannula. Premedication was accomplished with 50 µg fentanyl and 2 mg midazolam. Then followed by pantoprazole 40 mg [6]. The patient was calm with typical conscious sedation and aware about the surroundings [7]. The transfer from the ward to the operative theater was done with minimal amnesia but no respiratory depression.

The anesthetic technique of choice:

Combined spinal-epidural anesthesia/analgesia (CSEAA) would be the most suitable technique for trans-urethral Holmium Laser prostatectomy [8]. The technique was done under an extra dose of conscious sedation by 0.5 mg/kg of propofol [9]. Combined spinal-epidural anesthesia/analgesia was done at the level of inter-crestal line between L4-5 interspace in the sitting position [10]. Heavy bupivacaine (0.5%) 4 ml were injected intrathecally followed by threading of the epidural catheter sing needle through needle set (B. Braun's Espocan®, USA). Then, the patient was put in the lithotomy position with head up position 30 degrees to give time for the intrathecal dose to be fixed as low as possible at the saddle area and in the meantime to compensate for the loss of lumbar lordosis in this position [11]. Half an hour before the end of operation the patient felt slight manipulation by the surgeon during removal of the right lobe of the prostate but not so painful. An epidural dose of 10 ml of 0.5% bupivacaine with 50 µg fentanyl was given for the next half an hour and post-operative analgesia. The possible mechanism of this sensation may be due to start of wear off the intrathecal dose (after 2 h) with recovery of deep sensation of touch but still pain sensation was blocked [12].

Intra operative monitoring included the basic vital functions i.e. pulse oximetry, non-invasive blood pressure, temperature and ECG, with close observations of signs of fluid overload and drop of temperature. No sub-diaphragmatic pain, return of small volume of irrigation fluid or signs of circulatory overload were recorded [13]. Measuring urine output was not feasible due to the nature of the operation.

Immediate post-operative analgesia:

A dose of 80 mg of 0.5 % bupivacaine plus 200 µg fentanyl diluted in 200 ml of normal saline using the simple inflatable infusion pump (Accfuser, Woo Young Medical Co., Korea) with the rate of 5.0 ml/h for 36 h as patient controlled epidural analgesia (PCEA) [14]. There were complete motor loss, numbness and analgesia up to T7. The feeling of numbness was present instead of pain but still not a pleasant sensation. Recovery from complete motor loss and numbness started in the right lower limb 3 hours before the left one. This means the possibility of the presence of the tip of the epidural catheter in one of the intervertebral foramina of spinal nerves [15] with patchy block [16].. The sense of numbness still present at the level of the left L1 dermatome till the epidural catheter was removed (Fig.1). No pruritus or respiratory depression were reported due to epidural opioid [17].

During this time continuous wash up of the urinary bladder with 500 ml of normal saline/45 min till the urine output is clear of blood. With close observation of any signs of fluid overload such as bilateral basal pulmonary crepitations, high blood pressure, blurring of vision, nausea and vomiting [18].

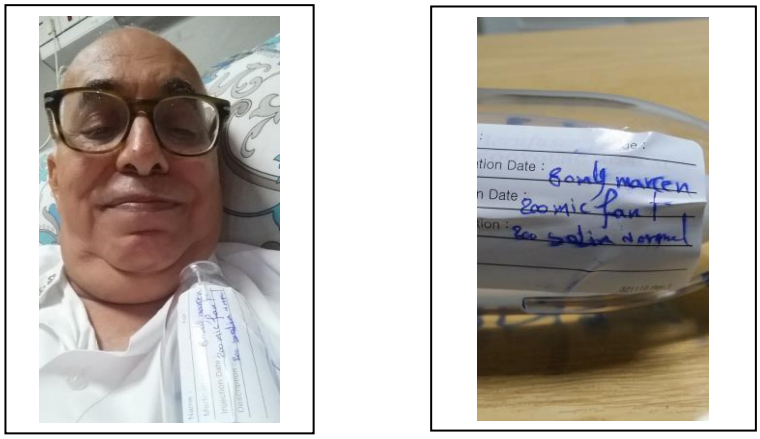

Fig. 1. Patient Controlled Epidural Analgesia (PCEA) 80 mg bupivacaine, 200 µg Fentanyl diluted in 200 ml of normal saline.

Late post-operative analgesia:

On discharge the suggested post-operative analgesics were paracetamol 1000 mg, codeine phosphate 16 mg and caffeine 60 mg/8 h. But it was not of help, so the patient shifted to tramadol 50 mg, paracetamol 1000 mg/8 h, in addition to pregabalin 75 mg and duloxetine 30 mg/12 h as step 2 of the WHO three-step analgesic ladder [19]. This last analgesic medication controlled the different types of pain generators from the site of operation.

These post-operative pains have different causes.

First, simple somatic inflammatory nociceptive pain of the urethra due to repeated in and out of the cystoscope during the operative procedures and indwelling urinary catheter post-operatively [20]. The flow of urine through the catheter initiated burning painful sensation for one week. The score of this pain was not more than 5-6 according to the Numeric Rating Score for Pain (NRSP) [21].

Second, at the start of emptying of urine from the bladder the pain was moderate but at the end of urination with contraction of the bare muscular wall of the bladder, severe agonizing pain (NRPS 8-9) with autonomic manifestation (bradycardia, 45-50 beats/min, sweating and dizziness). It is a complex type of somatic pain and autonomic (sympathetic and parasympathetic) visceral hyperalgesia with parasympathetic predominance which extended and remained even after the act of urination was over for about 15 min. This complex type of pain can be explained according to the innervation of the urinary bladder. The upper part of the bladder is mainly supplied by the efferent sympathetic superior and inferior hypo-gastric plexuses via the sacral nerve (T_{11-12}, L_{1-2}). While the lower part of the bladder is mainly innervated by the efferent parasympathetic fibers via the pelvic nerve (S_{2-4}) [22].

The definitive factor for autonomic innervation of the pelvic organs is the Pelvic Line. This line would follow the reflections of the peritoneum. Pelvic structures above the pelvic line are innervated by efferent sympathetic fibers, while other pelvic contents below the pelvic line *(urinary internal sphincter, lower end of the rectum and anal sphincter and the cervix of the uterus*) are innervated by efferent sympathetic with predominance of the efferent parasympathetic fibers. On top there are somatic nociceptive inflammatory mechanosensitive fibers [23]. This anatomical arrangement would explain the complex type of the described pain by the author as a personal but real experience (Fig. 2).

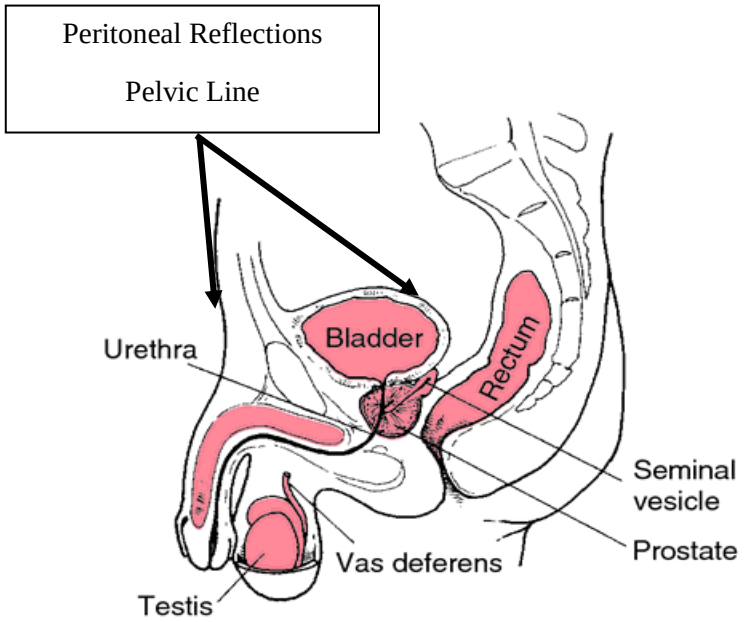

Fig. 2. Reflections of the peritoneum. Pelvic structures above the pelvic line are innervated by efferent sympathetic fibers, while other pelvic contents below the pelvic line are innervated by efferent sympathetic fibers with predominance of the efferent parasympathetic fibers [24].

Third, continuous dull aching referred testicular pain with exaggerated testicular sensation. In sitting position, the testicles will touch the chair with more pain. In standing position, the testicles are suspended with dragging type of pain. This problem was solved by sitting on an air ring or sponge cushion designed for ano-rectal, pilonidal sinus or prostatectomy operations. It is a certain type of acute referred visceral pain or acute visceral hyperalgesia. Most commonly testicular pain would be due to primary pathology in the testicles or referred from other pelvic structures. The presence of urinary catheter, infection and operative trauma are strong causes that result in severe testicular pain [25].

Fourth, the visceral pain signal has multiple connections in the reticular formation. There is a reciprocal innervation between medial prefrontal cortex, hippocampus and amygdala, which result in activation of Post-Traumatic Stress Disorder PTSD (laser transurethral prostatectomy). This would result in sleep disturbance and more perception of pain [26]. Sometimes inverted sleep rhythm will be extended even after the above-mentioned causes of pain are over [27].

The pathway of the autonomic and somatic fibers have the typical anatomical pathway until they reach the dorsal horn neurons. Somatic nociceptive pain would ascend as 2nd order neurons via the spino-thalamic tract to the thalamus, then the 3rd order neuron to the sensory cerebral cortex. But the autonomic fibers would ascend from the dorsal horn neurons as spino-reticular tract to relay in the reticular formation. Once in the multi-synaptic reticular formation the autonomic pain signal will show the phenomenon of spatial and temporal summation with distribution of the pain impulse to the adjacent sub cortical structures [28] (Figure 3). The **s**ympathetic fibers will relay in the **s**pinal part of the trigeminal nucleus while the parasympathetic fibers will relay in the nucleus solitarious. The last two nuclei will terminate in the paraventricular nucleus of the reticular formation. The later will send afferent

and efferent fibers to the hypothalamus, amygdala and hippocampus [29] (Figure 4). Then the paraventricular nucleus will stimulate the dorsal nucleus and nucleus ambiguous of the vagus nerve. The result will be stimulation of the parasympathetic vagal functions with bradycardia, hypotension and bronchospasm and in the meantime suppression of the sympathetic component which means no compensatory tachycardia or vasoconstriction [30] (Figure 5).

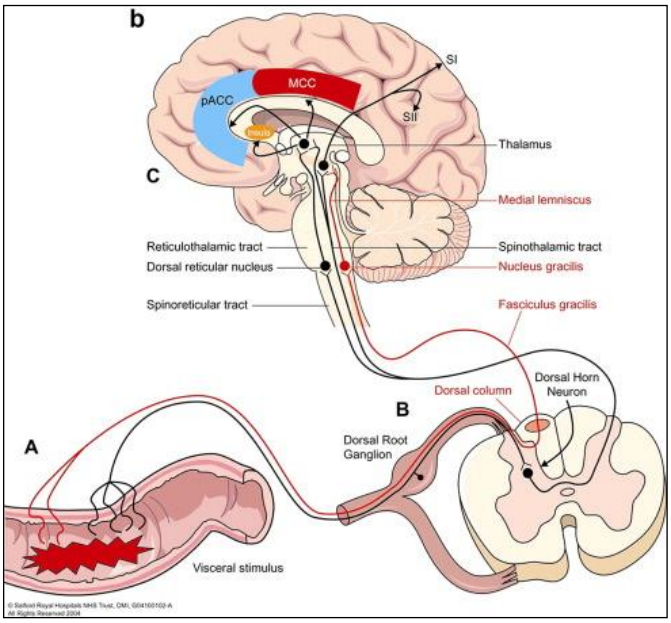

Fig. 3. Somatic pain fibers relay in the dorsal horn neurons then ascend in the Spino-thalamic tract to rely in the thalamus. Autonomic pain fibers relay in the dorsal horn neurons then ascend as spino-reticular tract to rely in the reticular formation [31].

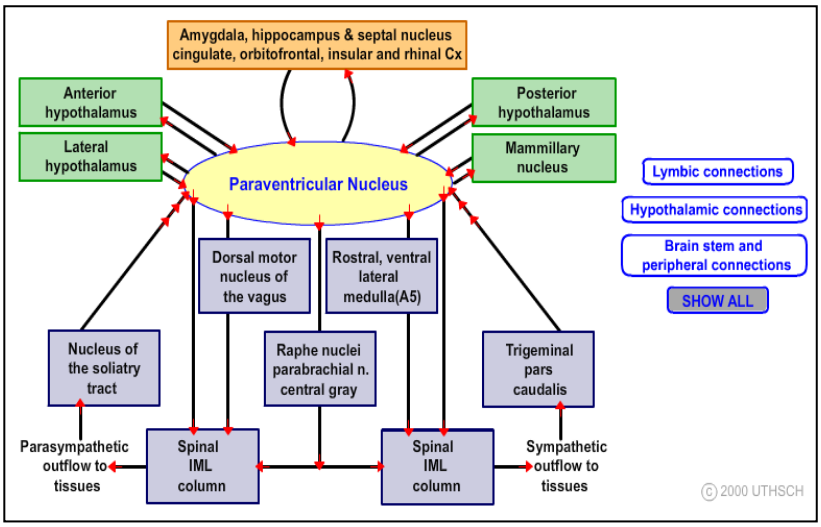

Fig. 4. The multi synaptic connectins of the asscending spinoreticular tract (sympathetic and parasymathetic fibers) in the reticular formation with the hypothalamic structres, amygdala and hippocampous with afferrent and efferernt conncetion with the paraventricular nucleus [32].

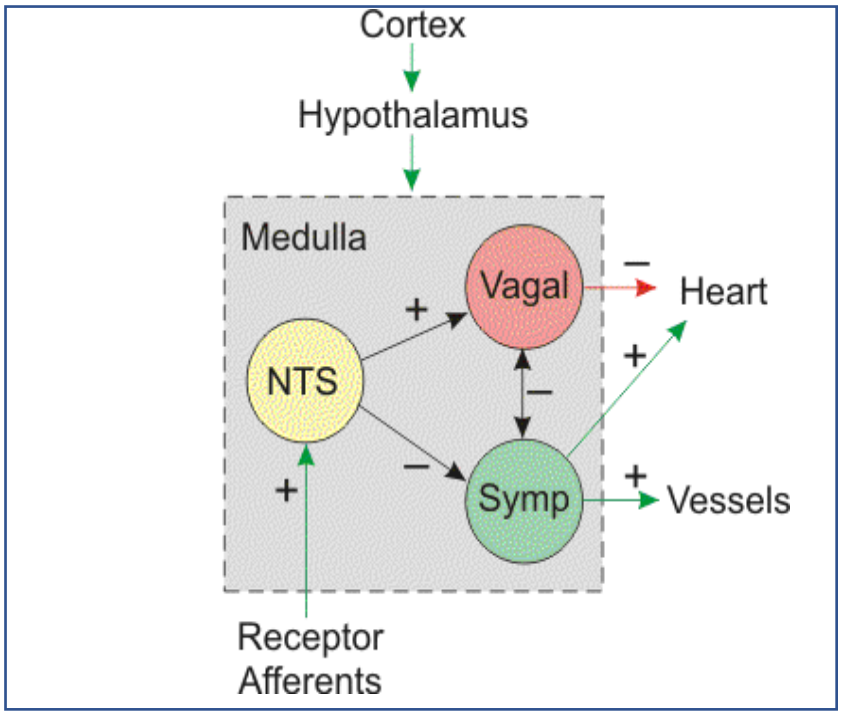

Fig. 5. Stimulation of the nucleus solitarious will activate the vagal nuclei to induce bradycardia and inhibit the sympathetic system from inducing tachycardia or vasoconstriction [33]

From the above mentioned pathophysiological mechanisms of post-operative pain after transurethral prostatectomy, it is evident that such type of pain is combination of somatic nociceptive, visceral, acute neuropathic and psychiatric pains. It will be reasonable enough not to adopt one line of analgesia but to start by extended preventive analgesia for acute perioperative pain to prevent the formation of chronic post-operative pain [34].

The use of the weak opioid tramadol would be more suitable analgesic due to additional serotonergic, and noradrenergic action at the level of the spinal neurons. In addition, more anti depressive serotonergic and dopaminergic effects at the level of the reticular formation including the amygdala and hippocampus [35]. So, tramadol is more effective than strong opioids such as morphine in such type of complex pain.

Paracetamol is a weak centrally acting NSAID which acts as co-analgesic with tramadol. It has no side effects like other peripherally acting NSAIDs. Hepatic toxicity will not appear except after 4 gm as one dose. Recent paracetamol with the amino-acid methionine will offer more hepatic resistance against such toxicity [36].

Pregabalin is the third weapon to control this complicated pain. It has calcium channel blockade and gaba-ergic activities. It is an analgesic adjuvant which act centrally at the spinal neurons, the reticular formation and on the sensory cortex [37].

The fourth tool is the anti-depressants amitriptyline or duloxetine which act as analgesic adjuvants at the spinal horn neurons in small doses. But act as frank antidepressants in higher doses.

The risk of male urinary retention is absent after prostatectomy but glaucoma, tachycardia and weight gain still a potential side effects but less with duloxetine [38].

Conclusion

Perioperative analgesia should be an integral part of any surgical technique. When the site of operation would result in complex somatic, visceral, acute neuropathic and psychiatric pain a multimodal perioperative pain management protocol should be adopted [39].

The patient said that "*Still if I am not an anesthesiologist and pain physician I would not complain from anxiety or fear from anesthesia and operation. I would recommend the technique and the doses adopted for routine pre-anesthetic medication".*

It will be great to start immediate perioperative preventive analgesia for the first 24-48 h after operation then continue with step 2 of the WHO 3-steps analgesic ladder for one week or more.

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