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Original Article

Prospective observational study on caudal epidural block for transurethral resection of prostate in patients with comorbidities

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Abstract

Background: The most important goal of anaesthesia for geriatric patients with comorbid diseases is to maintain normal homeostasis of different systems during and after surgery. This prospective study was conducted to evaluate the success rate and associated complications of the caudal epidural block for transurethral resection of prostate in elderly patients with comorbid diseases.

Methods: This is a prospective study of a cohort of 100 elderly patients posted for transurethral resection of prostate with comorbid diseases belonging to American Society of anaesthesiologist's physical status II, III and IV over a period of 1 year from April 2015 to April 2016. Standard recommended technique for caudal epidural block was followed. Time of onset, spread, duration of analgesia, intensity of block, complications, and unwanted effects were noted.

Results: The mean age was 73.5 ± 7.69 . Eighty-two percent patients belonged to ASA III and IV grade. The majority (87%) had excellent to a good quality of anaesthesia with no motor block. 83% of patients had the onset of analgesia between 5-15 minutes and 78% had a duration between 90-130 minutes. Three patients had patchy analgesia and they were considered as a failure. No death was encountered in the study.

Conclusion: Caudal epidural block is a safe, effective anaesthetic technique for transurethral resection of the prostate in elderly with comorbid diseases of other systems.

Keywords: caudal anaesthesia; comorbidities; elderly; transurethral resection of prostate

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Introduction

“Health and disease do not have any political or geographical boundaries”

said Paul Russell once

This is very much true in cases of diseases of the urinary tract like prostate pathology, which is a major health care problem throughout the world amongst all societies whether rich or poor. Prostate pathology ranks 2nd out of all urinary tract diseases. Approx. 40,000 TURP's are performed annually in the UK.¹ Despite the development of newer technologies for removal of the prostate gland. Transurethral resection of prostate (TURP) is still considered as the gold standard for surgical treatment of patients with moderate to severe symptomatic benign prostatic hyperplasia (BPH). Ideally, TURP should be reserved for prostate weighing below 60 grammes.¹⁻³ As this is a disease of old age, so a large number of these patients also suffer from diseases of other systems, which add to increased morbidity and mortality. Myocardial ischaemia may occur in up to 25% of these cases whereas 1-3% patients may develop myocardial infarction during surgery.^{4,5}

The pelvic viscera receive double innervation from the sympathetic nervous system via the inferior hypogastric plexus and parasympathetic via the pelvic parasympathetic outflow from S2-S4. So any neuraxial block up to T10 is sufficient for TURP and spinal anaesthesia became the standard anaesthetic management. But still, there exists some controversy over objective data to support the dogma that low spinal anaesthesia is much safer for TURP than other techniques. Moreover, enough literature does not exist till date about the role of using caudal epidural block (CEB) for TURP in patients with associated other systemic diseases.⁶ So we planned to conduct a prospective study during one year period from April 2015 to April 2016 at Nobel Medical College Teaching Hospital to see if caudal epidural block alone is sufficient to conduct TURP or not and is it safe in terms of morbidity and complications amongst geriatric patients with associated other comorbid diseases.

Methods

After obtaining the clearance from the hospital ethical committee, a convenient sample of 100 patients with obstructing prostatic enlargement requiring TURP along with some comorbid diseases of other systems and willing to participate in the study were recruited from the department of urosurgery and were included in the study. All the patients had one or other comorbid diseases of other systems like hypertension (HTN), diabetes mellitus (DM), COPD, ischaemic heart disease, dilated cardiomyopathy. Informed consents were obtained from all the patients. A thorough pre-anaesthetic check-up and all necessary investigations were done and documented. For every patient, CBC, blood sugar, renal and cardiac profile, chest X-ray, ECG, and transthoracic echocardiography were

done. PFT, TMT or stress TMT and coronary angiography were also advised in cases where these were needed. All the patients were on several drugs for their associated diseases, which were continued till the day of operation except metformin, and enalapril, which were stopped 24 hours before surgery. Aspirin was withheld 7 days before surgery.^{6,7} Premedication was done with lorazepam 2mg and ranitidine 150 mg orally the previous night and 2 hours prior to the surgery. Patients with obesity, coagulopathy, excessive fat deposition over the sacrum, the anatomical anomaly of the lumbosacral and sacral region and local infection were excluded from the study.

On arrival at the operation theatre, an intravenous infusion of RL/NS was started with an 18G cannula at the rate of 6ml/kg 20 minutes before the surgery. All baseline parameters like HR, ECG, SPO₂, SBP, DBP and MAP were noted. All the blocks were performed in prone position under strict aseptic measures with a pillow under the anterior iliac crests, both the legs abducted 20° and toes turned in. Hiatus was located by palpating the triangular shaped gap at the posterior lowermost part of the sacrum bounded on both sides by the two sacral cornua.

For reconfirmation both the posterior superior iliac spines were located and by using a line between them as one side of an equilateral triangle, the apex of the triangle coincided with the sacral hiatus. Under strict aseptic conditions, a wheal was then raised over the hiatus, using no more than 2 drops of local anaesthetic. A 20/21G 1.5" hypodermic blunt tipped needle (BD blunt needle) was then inserted through the sacrococcygeal membrane so that it made an angle of about 20° with a line drawn at right angles to the skin surface. Once through the membrane with a 'pop'; the needle was depressed further 45° towards the intergluteal cleft and finally the needle was advanced into the sacral canal for not more than 1-1.5 cm in the midline using the loss of resistance technique.^{6,8,9} Proper care was taken to ensure that tip of the needle did not ascend higher than the line joining PSIS. After negative aspiration for CSF and blood and absence of air crepitus in the subcutaneous tissue while injecting air, 25 ml of local anaesthetic solution of 1% preservative-free lignocaine hydrochloride (loxicaid®), mixed with freshly prepared 125mcg of adrenaline so that the strength of adrenaline became 1:200000, was injected. To make this, 12.5ml of normal saline was mixed with 12.5 ml of 2% preservative-free lignocaine hydrochloride (loxicaid®). Separately 1mg of adrenaline i.e, 1ml was diluted to 20ml with 19 ml of NS. 1ml of this resultant solution contains 50mcg of adrenaline. So 2.5 ml of this solution was added to 25 ml of 1% preservative-free lignocaine hydrochloride (loxicaid®) to make the final solution of 1% preservative-free lignocaine hydrochloride (loxicaid®) with adrenaline in the strength 1:200000. Immediately the patients were turned supine. All the patients received oxygen at a flow of 4-6 litres /min via face mask. The intensity of motor block was evaluated as per modified Bromage scale.¹⁰ Complications and side effects if any were noted and treated promptly.¹¹

All vital parameters like HR, SPO2, ECG and SBP, DBP and MAP were noted every 5 minutes for 15 minutes then at 10 minutes interval throughout the surgery. Patients were also asked to communicate if they feel any pain or discomfort during the whole procedure. For proper sedation and analgesia, all the patients received i.v midazolam 1-2.5 mg and fentanyl 50-100 mcg as per body weight and physical status. The onset of analgesia was tested with blunt pinprick at the penis, scrotum and perineum and spread was evaluated over the bony prominences. Once analgesia spread to T10 the patients were put on lithotomy position. When the level of the block did not extend above T12 it was considered as an inadequate block. When the block failed, general anaesthesia was administered to patients. Premedication was done with glycopyrrolate and midazolam, then propofol, fentanyl and isoflurane were administered as per body weight and patient was kept on spontaneous ventilation. The surgeon performed TURP with a 24G fibre-lit resectoscope with continuous irrigation of the bladder with 1.5% glycine. Postoperatively normal saline was used for irrigation of the bladder. Throughout the procedure, all the vital parameters and any signs and symptoms of TURP syndrome were observed carefully. At the end of the surgery, patient was transferred to post anaesthesia care unit for observation. Patients, as well as surgeons, were also asked about their comment of the whole procedure in the operation theatre.

Results: In the present study ages of 100 patients ranged from 62 to 95 years with a mean of 73.5 ± 7.69 . A 92-year male diabetic, hypertensive with multiple ventricular ectopics participated in the present study that had a transient cardiac arrest one year back after spinal anaesthesia for TURP in a neighbouring tertiary care hospital. He reported to us for TURP, as he was unable to lead a hygienic life with the urinary catheter. He had an uneventful recovery after TURP was done under CEB. In the present study, some unanticipated technical difficulties were encountered during the needle placement in 6 cases due to calcified ligaments. Blood was transfused in 5 patients.

Table 1: Prevalence of comorbid diseases and ASA grading

ASA physical status	Comorbid conditions	Number of patients (%)
ASA-PS II	Controlled HTN	10(10)
	Controlled Asthma with Controlled DM	8(8)
	CAD	16 (16)
ASA-PS III	COPD and poorly controlled DM	11 (11)
	AF with H/O Syncope	9 (9)
	ESRD on Regular Dialysis	8 (8)
	COPD with poorly controlled HTN and DM with LVEF<35%	27(27)
ASA-PS IV	CAD with H/O stroke and low LVEF (20-30%)	11 (11)

*ASA-PS- American Society of Anaesthesiologists- Physical Status

HTN- Hypertension, DM- Diabetes Mellitus, CAD- Coronary Artery Disease

COPD- Chronic Obstructive Pulmonary Disease, AF- Atrial Fibrillation

LVEF- Left Ventricular Ejection Fraction

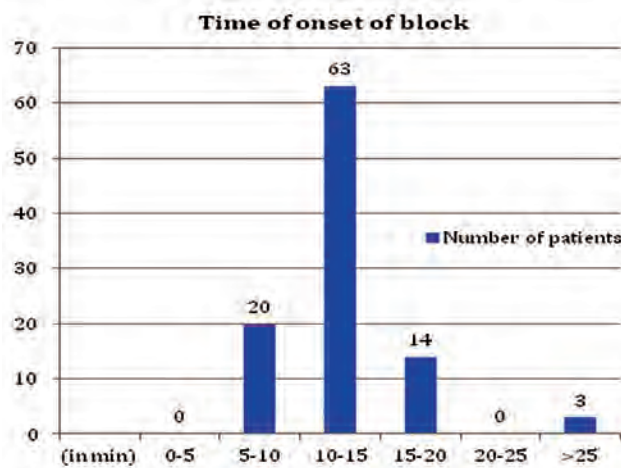


Figure 1: Time of onset of block

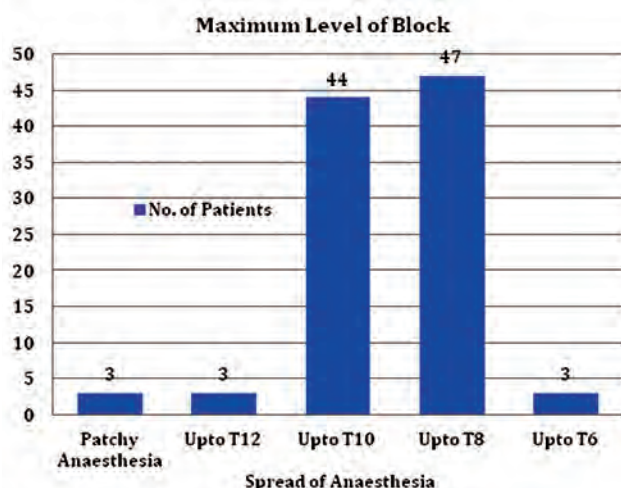


Figure 2: Spread of anaesthesia (maximum level of block)

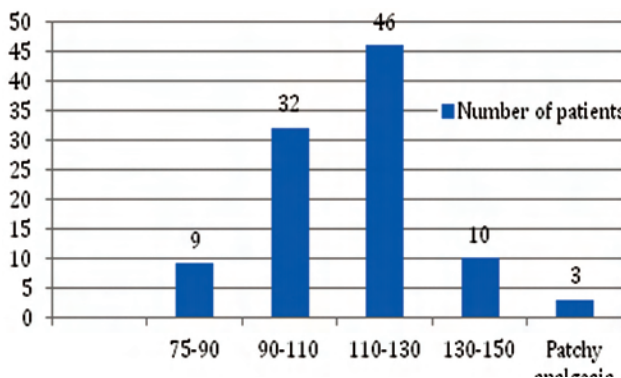


Figure 3: Duration of analgesia in minutes

In the present study, TURP lasted between 50-75 min.

Table 3: Intensity of motor block

Bromage Scale	Number (%)
Grade 0	89 (89)
Grade 1	8 (8)
Grade 2	3 (3)
Grade 3	Nil

GA was administered to 3 patients where the block failed. Throughout the surgery SPO2 of all the patients were maintained between 94% and 100% on oxygen. Throughout the surgery HR, SBP, DBP, MAP were stable and did not show any major fluctuation except in three patients who had mild hypotension and bradycardia where analgesia extended up to T6 and responded well to iv infusion. There were no incidences of death, dural puncture, headache, and hematoma or transient neurological sequel.

Discussion

Since ancient times regional anaesthetic techniques have been used in Egypt, and have been mentioned in Erb's papyrus. These were given up later till the beginning of the 20th century.¹² But since mid-1970's there was a dramatic boost in the use of regional anaesthesia (RA) for the treatment of pain particularly chronic pain as well as for various surgeries. Today a well-conducted RA technique is a thing of beauty and gives satisfaction and comfort to the patients, anaesthesiologists and surgeons. As a matter of fact, many patients today are requesting the surgical team for RA for their surgeries. CEB is no exception to this, particularly for geriatric patients with limited cardiopulmonary reserve or other associated diseases undergoing surgery below the umbilicus like TURP, which is still the gold standard surgical treatment for prostate pathology. The nerve supply to the prostate originates from inferior hypogastric plexus and carries both sympathetic fibres from T11 to T12 and parasympathetic fibres from S2 to S4. Pain fibres from the prostate, prostatic urethra, bladder mucosa, lower anorectal area and perineum originate from the S2 to S4 sacral nerves. Pain signal from bladder distension travels along T11 and T12 sympathetic fibres whereas parasympathetic fibres of S2-S4 carry stretch sensation of the bladder.^{4,9,13,14} TURP can be performed under GA, SA, epidural, CSEB. But the choice of the majority is low spinal anaesthesia with its inherent perioperative and postoperative morbidity and mortality particularly for geriatric patients with limited cardiac reserve and other associated diseases.^{1,4,6,14} All these drawbacks of low SA are applicable to GA as well. Besides these GA for TURP in such geriatric patients with comorbid diseases and limited cardiac reserve may be very problematic and life threatening because of many factors like more incidence of moderate to severe hypotension, arrhythmias, regurgitation and aspiration, sudden cardiovascular catastrophe and respiratory insufficiency in the lithotomy position.¹¹ In light plane of anaesthesia penile erection is a great problem.¹¹ For all these CEB may

be a better alternative than GA, SA, epidural and CSEB for TURP in elderly with comorbid diseases. Definitely, CEB reduces perioperative and postoperative morbidities.¹⁵ Early discharges are possible so cost is less. It also gives prolonged early postoperative analgesia if proper local anaesthetic mixtures are used, less blood loss during surgery, and no need for tracheal intubation with its complications in geriatric age group and reduces the incidence of DVT. For all these factors CEB is gradually gaining popularity for TURP and reports are appearing in the literature about its use. But exclusive literature on the use of CEB with preservative free lignocaine hydrochloride mixed separately with adrenaline (1:200000) in geriatric patients with limited cardiac reserve are scarce.¹⁵ So in the present study an attempt has been made about the usefulness of CEB for TURP in geriatric patients with comorbidities.

CEB was introduced by Sicard¹⁶ and Cathelin¹⁷ in 1901 in France and was used first for operation by Schimpert of Freiburg in 1913.⁴ But, before this Stoek et al reported its use for painless vaginal delivery.¹⁸ Hingson from Cleveland Clinic after extensive work recommended its use for operations where a block of the sacral and lumbar nerves are adequate like TURP.¹⁹ Zito SJ in 1984 reviewed CEB extensively for the period from 1901 to 1969 and finally concluded that CEB has distinct advantages over spinal and lumbar epidural for lower abdominal and urological surgeries.^{8,11} CEB avoids most of the complications of spinal and lumbar epidural anaesthesia such as severe to moderate hypotension, transient radicular irritation and epidural hematoma. Another great advantage of CEB compared to any other technique of neuraxial anaesthesia is that all the vital parameters of all the patients were stable and did not need any aggressive treatment. This is because CEB anaesthesia is apparent without effect on the CNS, CVS, musculoskeletal and GI system.⁶

Very recently some researchers like Okeke LI⁶, Yadav et al¹¹, Bhattacharya et al¹⁴, Kose et al¹⁵, followed up Zito's study and also concluded that CEB should be recommended for TURP in patients for prostate surgeries with associated comorbid diseases. Caudal epidural block involves the injection of a local anaesthetic drug into the epidural space through the sacral hiatus. Drugs injected act directly on spinal nerves and receptors in the spinal cord due to diffusion across the dura and CSF. The level of anaesthesia is predictable and controllable so that sensory block below T8 can be easily achieved.²⁰ But anomaly of sacral anatomy, thick presacral fat, excessive fatty gluteal region and calcified ligaments sometimes makes it difficult to perform the technique, leading to more failure rate. But these can be overcome by practice and experience. Though in paediatric age group it became quite popular since long, but could not find its place as a popular technique in adults. Several factors played a part for this like failure rate is higher than spinal or epidural as it is time-consuming, lack of training and experience, surgeon's preference for other techniques.

As a result, anaesthesiologists are not well versed and trained in the technique. So in practice, they feel uncertain about the block and instead use GA or other technique forgetting its usefulness in problematic geriatric patients with comorbid diseases in whom these other techniques may be life threatening or with increased morbidity and mortality. But a well-versed anaesthesiologist should be well trained in all techniques of anaesthesia so that he or she can tailor the anaesthetic technique as per need and risk of the patient.

CEB is also safe and cost-effective and is a very important factor for underdeveloped and developing countries. In the present study, adrenaline was mixed separately with 1% loxicard so that the strength of adrenaline becomes 1:200000. This was done because commercially available xylocaine with adrenaline contains methylparaben and sodium metabisulphite as preservatives, which may give rise to allergic or any other unwanted side effects particularly in geriatric patients with cardiac and other diseases. Literature did not reveal any such use of preservative free xylocaine and adrenaline. Probably this may be one of the reasons why in the present study perioperative side effects were minimum and duration of analgesia was little less compared to many other studies. Further study on this will be very much helpful and may open a new horizon in the field of RA. In the present study, 25 ml of LA was used. This is as per the recommendation of many workers.^{6,15} Onset of analgesia, spread of analgesia, intensity of sensory and motor block in the present study were very good and similar to the previous studies like Kose et al¹⁵, in 2012, Yadav et al, in 2015.¹¹ Patchy analgesia in 3 patients may be due to sacral sparing and inability to break all the septa leading to incomplete sacral nerve root block which was considered as failure.¹⁴ Majority of patients in the present study had duration of analgesia from 90 to 130 minutes; almost similar was the observation by Yadav et al¹¹, the duration is comparatively less than observed by others. This variation may be because we prepared the loxicard[®] and adrenaline ourselves so there may be some human error.

Twenty seven patients who had poorly controlled HTN and DM with LVEF <35% were taken up for surgery because they were developing features of obstructive uropathy and had frequent UTI. They were not able to live a healthy hygienic life because of obstruction. Also this might be one of the reasons why HTN was not getting controlled and optimized. These ASA physical status III and IV patients were taken up for anaesthesia and were considered as surgical urgency.

Limitations of the present study were that 1% preservative free xylocaine with adrenaline was not available commercially. As previous reports to compare with were not available on this subject, especially in patients with comorbid diseases, it was another limitation.

Recommendations for remedies are pharmaceutical firms should be convinced to prepare 1% preservative free lignocaine with adrenaline and trainees and residents should be exposed more to the technique of caudal epidural block. Lastly more research on the work to be reported.

Conclusion

“ In many instances, local anaesthesia means the least strain to the patients”
- T. Gordh (1907 to 2010)

The present study justifies this statement of Gordh and concludes that CEB with an adequate volume of LA drug is recommended and should be practised, as it is safe and effective for TURP in elderly patients who have associated comorbid diseases. It provides adequate satisfactory anaesthesia with hemodynamic stability and sensory block up to T10. But it should be administered by a well-trained experienced anaesthesiologist as –

“Bright is the ring of words when the right man rings them up”
- Robert Louis Stevenson

Informed consent: Informed consent was obtained from all individual participants included in the study.

Conflicts of interest: There is no conflict of interest declared.

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