

Increasing use of regional anaesthesia for prostatectomy – *University of Benin Teaching Hospital experience*

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ABSTRACT

Introduction: Regional anaesthesia is widely used for urological procedures. It may be better tolerated in the elderly, avoiding the cardiovascular and respiratory depressant effects of general anaesthesia, provided that there are no contraindications. Bladder outflow obstruction due to benign prostatic hyperplasia is common in the elderly. Our aim was to determine the preference of neuraxial block technique for prostatectomy in our institution.

Patients and methods: This was a prospective study of patients scheduled for elective prostatectomy with ages ranging from 49 to 94 years for a period of eighteen months. They were seen by anaesthetists, two or three days before surgery and all received oral diazepam, 5mg on the morning of surgery. Choice of anaesthesia was determined by the attending anaesthetist. Standard questionnaires were used to document patients' characteristics, technique of anaesthesia, intraoperative and postoperative complications, management and outcome.

Results: One hundred and twelve male patients aged 49–94 years (mean age 67.38 ± 11.33) were recruited in the study. Eighty six (77%) patients were 60 years and above while 26 (23%) were below 60 years. Intercurrent medical diseases were common in patients above 60 years. Fifty two patients (46.4%) had intercurrent medical diseases, with hypertension being the leading among them [31(59.6%)] followed by diabetes mellitus [7(13.5%)].

Seventy six patients (68%) had suprapubic transvesical prostatectomy, 21(19%) had retropubic (Millin) anaesthesia while 15 (13%) had transurethral resection of the prostate. The techniques of anaesthesia used were general for 6 (5%) patients, epidural anaesthesia for 39 (35%) patients and spinal anaesthesia for 67 (60%) patients. Intraoperative hypotension occurred in 17 (56.6%) patients in the spinal group and in 3 (21.42%) in the epidural group.

The incidence of intraoperative and recovery room complications was higher in the spinal group than in the epidural group, 32 (63%) compared to 19 (37%). The difference was not statistically significant. $P = 0.5257$, $OR = 0.6933$, $CI: 0.2977 - 1.107$.

Conclusion: We conclude that neuraxial block technique for prostatectomy has gained overwhelming popularity in our institution.

Introduction

After the age of 40 years, the prostate becomes increasingly hyperplastic. Only one in twenty males, however, becomes symptomatic after twenty years or more. In developing countries where patients are often late in seeking medical aid, retention of urine is the commonest presenting symptom.¹

Spinal anaesthesia is the most frequently used anaesthesia for transurethral resection of the prostate (TURP) in the United States and it is believed to be the technique of choice by many. A spinal anaesthetic provides adequate anaesthesia for the patient and good relaxation of the pelvic floor and the perineum for the surgeon.^{1,2} The signs and symptoms of water intoxication and fluid overload can be recognised early because the patient is awake.

Regional anaesthesia offers several advantages over general anaesthesia for prostatectomy. The incidence of deep vein thrombosis (DVT) is decreased and the amount of operative blood loss is reduced with regional anaesthesia.³ Many investigators have reported their findings in comparing spinal, epidural and general anaesthesia for retropubic prostatectomy.^{4,5} General anaesthesia, for a very long time, was the most popular technique of anaesthesia for prostatectomy in our institution, as evidenced by theatre and anaesthetic department records.

The aim of our study was to determine the preference of neuraxial block technique for prostatectomy by anaesthetists in our centre and to compare the haemodynamic changes.

Patients and methods

This was a prospective study carried out in patients scheduled for elective prostatectomy for a period of eighteen months (2005–2006) after obtaining Institution's Ethics Committee approval and informed consent from the patients.

All the patients were reviewed by the anaesthetists a few days before surgery. Investigations done were full blood count, urea and serum electrolytes, fasting blood sugar, blood grouping and cross matching, urinalysis, bed-side lung function tests, chest radiograph and ECG. Patients with intercurrent medical diseases (IMD) were optimised prior to surgery. Premedication consisted of diazepam tablet, 5mg, and specific drug therapy for IMD.

The anaesthetists in attendance were not restricted to a particular choice of anaesthesia. In the theatre multi-parameter monitors (for continuous monitoring of pulse rate, blood pressure, and oxygen saturation) were attached to the patients and baseline vital signs were obtained and recorded. An intravenous line was sited on the hand using an 18 gauge cannula and Ringer's lactate or normal saline. The techniques of anaesthesia used were general, spinal and epidural anaesthesia, with indwelling epidural catheter for top-ups and for postoperative pain management.

General anaesthesia entailed the use of thiopentone sodium, 3–5 mg/kg for induction, suxamethonium for laryngoscopy and tracheal intubation. Intermittent positive pressure ventilation

Table I: Incidence of intercurrent medical disease

Intercurrent medical disease	Frequency	Percentage (%)
Hypertension	31	59.6
Diabetes mellitus	7	13.46
Hypertension/diabetes	5	9.61
Anaemia	4	7.69
COAD	3	5.8
CCF/Abd Kochs	1	1.92
Hypertension/CRF	1	1.92
Total	52	100

ventricular hypertrophy (LVH), right ventricular hypertrophy (RVH), old infarct, R bundle branch block, QRS abnormality or left axis deviation.

The types of IMD are shown in Table I. The incidence was 46.4%; it was higher in patients over 60 years.

The incidence of hypertension was very high, $n = 31$ (59.6%). This was statistically significant, $P = 0.0065$, $OR = 0.3698$, 95% $CI: 0.1822 - 0.7508$.

The types of prostatectomy done were transurethral resection of the prostate [15 (13%)], retropubic prostatectomy [21 (19%)] and suprapubic transvesical resection [76 (68%)] (Figure 1).

with the use of pancuronium or atracurium was instituted. Intraoperative analgesia was achieved with fentanyl or pethidine. Residual muscle paralysis was reversed with a combination of neostigmine and glycopyrrolate. Preloading of the circulation was achieved with 15–20 mls/kg body weight of warmed normal saline or Ringer's lactate before establishing regional anaesthesia. Under aseptic technique, regional anaesthesia was performed. For spinal anaesthesia a size 23 or 25 gauge pencil-point spinal needle was used with the patient in a sitting position, using L2–L3 or L3–L4 intervertebral space, 0.5% heavy bupivacaine (Astra) was injected into the subarachnoid space when there was free flow of cerebrospinal fluid.

Touhy needle, size 18 gauge (8–11cm in length) was used for the epidural technique. Plain bupivacaine 0.5% was given following a 2 mls test dose through the epidural catheter and bacterial filter after confirming the epidural space by using loss of resistance technique with air. Sensory blockade was assessed with loss of temperature discrimination and motor blockade of the lower limbs was also assessed in the spinal and epidural groups.

Top-ups were administered when indicated. Haemodynamic variables were monitored throughout the intraoperative period. The epidural catheter was removed in the ward twenty-four hours after surgery. Intraoperative and recovery room complications were identified and treated.

In case of hypotension (systolic of 80 mmHg or 20–30 mmHg lower than the baseline), intravenous fluid was rapidly administered with or without intravenous ephedrine. Severe bradycardia (pulse rate below 50 beats per minute) was managed with atropine or glycopyrrolate.

Standard questionnaires were used to record patients' characteristics, IMDs and drug therapy, technique of anaesthesia, estimated blood loss, intraoperative and recovery room complications, management and outcome, duration of hospital stay. Haemodynamic changes and other complications associated with spinal and epidural anaesthesia were evaluated.

The data were analysed using Instat Graph Pad tm. P -value < 0.05 was considered significant.

Results

One hundred and twelve patients were recruited in the study. Their ages ranged between 49–94 years (mean age 67.38 ± 11.33). The patients were classified according to the American Society of Anesthesiologists (ASA) health status 1 ($n = 13$), 2 ($n = 33$), 3 ($n = 63$), 4 ($n = 3$). Eighty six (78%) patients were 60 years and above while twenty three (22%) were below sixty years old.

Radiograph results showed normal x-ray in 60 patients and abnormal findings in 52 patients. (Unfolding of the aorta and cardiomegally.) ECG findings in some of the patients were left

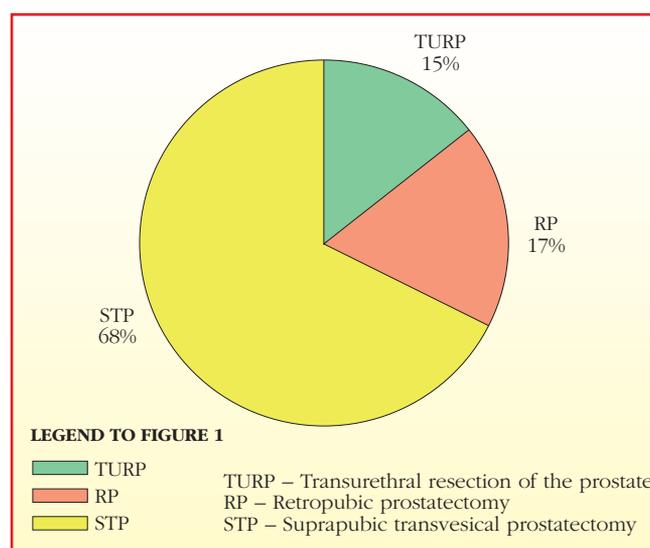
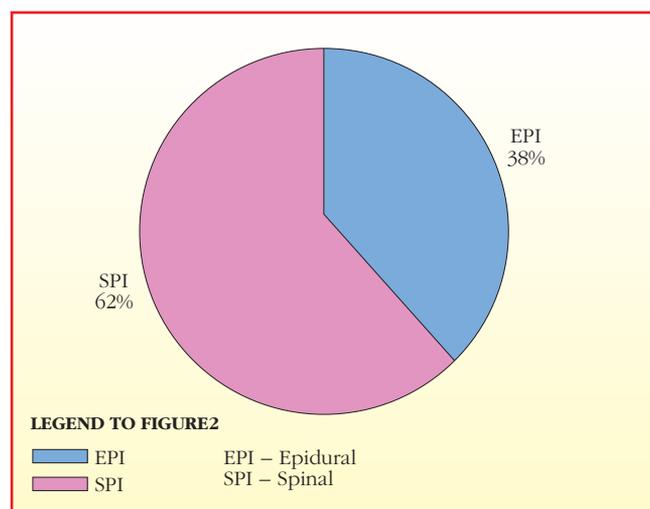
Figure 1: Technique of prostatectomy

Figure 2 shows the techniques of anaesthesia used. Thirty-nine (36.79%) patients were offered epidural anaesthesia while 67 (63.20%) had spinal anaesthesia.

Figure 2: Technique of anaesthesia

A mean dose of 16.72 ml of 0.5% plain bupivacaine was used for epidural anaesthesia while for the spinal group a mean dose of 2.5ml of 0.5% heavy bupivacaine was injected. The difference of the means was extremely significant statistically. The highest level of sensory blockade was T8

for the spinal group and T10 for the epidural group. A greater volume of intravenous fluid was used in the spinal group. Estimated blood loss was also more in the spinal group (907.03 mls) than in the epidural group (653.85 mls) as shown in the table.

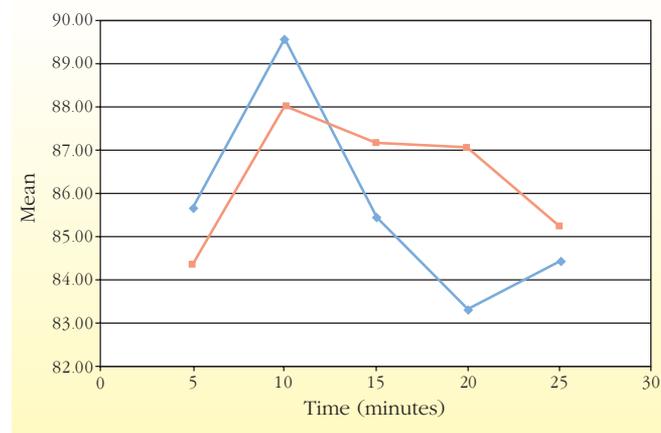
Table II: Intraoperative characteristics of subjects

Parameter	Epidural group n = 39	Spinal group n = 67	P value	Significance
Dose of heavy bupivacaine (ml) Mean/ SD	16.72 ± 4.01	2.70 ± 0.24	<0.0001	VS
IVF used (L), mean/SD	2.95 ± 1.00	3.05 ± 1.01	<0.0001	VS
EBL (ml), mean/SD	653.85 ± 338	907.03 ± 488.26	0.4705	VS
Transfusion requirement	6 (15.3%)	20 (29.8%)	0.1014	VS
Ephedrine requirement	5 (12.8%)	10 (14.9%)	>0.05	VS
Intraoperative complications	4 (10.2%)	25 (37.3%)	0.5257	VS

NS – Not Significant
Spinal – 67
Epidural – 39

Figures 3a, 3b and 3c show variations in mean pulse rates, systolic and diastolic blood pressure at 5, 10, 15 and 20 minutes and after drug administration.

Figure 3a: Variation in pulse rate (pbm)



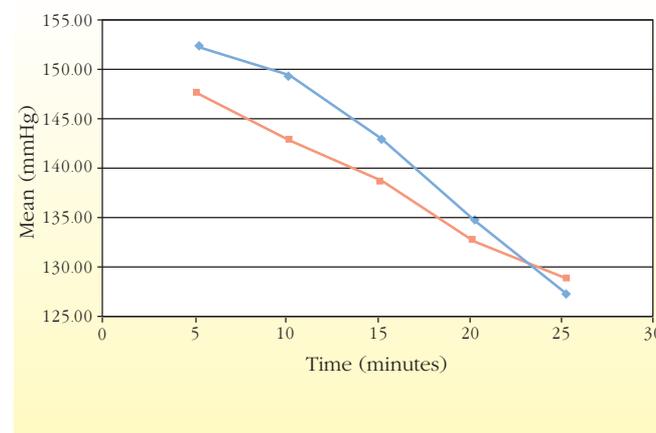
Legend to Figure 3a:

1. Epidural group
2. Spinal group

The changes in pulse rate and blood pressure were analysed using the One Way Analysis of Variance (ANOVA). There was no statistical difference between the two groups with regard to pulse rate and diastolic blood pressure but the differences were extremely significant with regard to systolic blood pressure at 5, 10, 15 and 20 minutes after administration of bupivacaine. The changes are shown graphically in Figures 3a–c.

Spinal anaesthesia was associated with a higher incidence of complications. The most frequently observed intraoperative complications were hypotension (n = 20) and bradycardia (n = 13). Hypotension and bradycardia were managed with ephedrine, 3–5 mg and glycopyrrolate or atropine respectively.

Figure 3b: Variations in systolic blood pressure



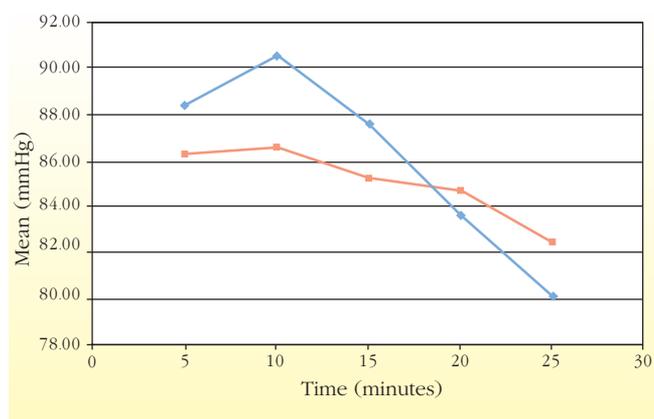
Legend to Figure 3b:

1. Epidural group
2. Spinal group

The other complications identified were managed accordingly with good outcome.

The incidence of intraoperative complications was higher than recovery room complications for both groups. The difference was not statistically significant. Intraoperative pain was managed with top-up doses of plain bupivacaine through the epidural catheters in the epidural group while sub-hypnotic doses of ketamine were used to manage pain in the spinal group.

Duration of surgery ranged between 55 and 150 minutes. There was no perioperative mortality. The duration of hospital stay

Figure 3c: Variations in diastolic blood pressure**Legend to Figure 3c:**

- 1 ————■———
 2 ————◆———
1. Epidural group
 2. Spinal group

ranged between 8 and 21 days. The TURP patients had a shorter hospital stay of 5–7 days.

An 86 year old diabetic and hypertensive patient weighing 60 kg, classified ASA III died two months after surgery. The cause of death was septicaemia with cellulitis of the penis. The second mortality was a 74 year old, ASA111 patient, weighing 40 kg who presented with abdominal tuberculosis and congestive cardiac failure. He died after suprapubic prostatectomy, on the 13th post-operative day, due to IMD.

Discussion

Patients presenting for prostate surgery are often elderly and may have co-existing morbidities. Cardiovascular and respiratory problems are not uncommon, and they are often on various medications. Specific problems related to their prostatic disease include an element of renal impairment, anaemia due to recurrent haematuria or urinary tract infection. This study showed that fifty two patients had intercurrent medical diseases, the commonest among them being hypertension, diabetes mellitus and respiratory infections. Hypertension, the commonest medical problem in this study has also been reported to have a high incidence among Africans including Nigerians.^{6,7,8} The prevalent age of

IMD was 60 years and above as reported by previous studies.⁹ General and regional anaesthesia (epidural or spinal) result in comparable short and long term cardiac morbidity and mortality in the elderly following TURP.¹⁰

In general, elderly patients with pre-existing morbidity or decreased functional reserve of organ system become increasingly intolerant to surgical stress, thus explaining the higher incidence of perioperative complications and death. Maintaining intraoperative and postoperative haemodynamic stability is crucial to ensuring a balance between myocardial oxygen delivery and oxygen demand in the elderly.¹¹ Hypertensive patients are prone to wide fluctuations in these parameters during surgery especially at induction of anaesthesia and tracheal intubation because of decreased intravascular fluid volume and baroreceptor sensitivity.¹² Antihypertensive therapy should be continued on the day of surgery with the exception of drugs such as reserpine. Clonidine or a beta-blocking drug should be given preoperatively to patients with mild or moderate hypertension or admission systolic hypertension.¹³ Antihypertensive agents ranging from diuretic to beta blockers were used for the hypertensive patients in addition to the routine premedication in our study.

Some of the patients had open prostatectomy (retropubic, suprapubic, transvesical). These operations are associated with a longer hospital stay of up to two weeks or more. The TURP patients in our study had a shorter hospital stay.

A recent meta-analysis of all trials with randomisation of intraoperative neuraxial blockade demonstrated a reduction in mortality rates of approximately 30% of patients allocated to neuraxial blockade.¹⁴ At comparable doses, both the duration and extent of spinal blockade increase after intrathecal administration of local anaesthetic agents, similarly the number of blocked segments after the epidural administration of local anaesthetic agent increases. Their doses had to be reduced in elderly patients.¹⁵ Therefore it is recommended to reduce the normal segmental doses of local anaesthetic agent.¹⁶

With epidural anaesthesia, the drop in blood pressure was gradual and minimal compared with spinal anaesthesia as evidenced by our findings. Reduced blood loss and intermittent administration of top-up doses of local anaesthetic agents for postoperative pain management through an indwelling epidural catheter are the other advantages associated with the use of epidural anaesthesia compared with spinal. The time interval before analgesics are required post-operatively was much greater after epidural analgesia than after spinal anaesthesia. With regional techniques, good urinary drainage is established early with consequent reduction in the risk of blocked catheters.¹⁷

Subarachnoid anaesthesia is generally preferred over continuous epidural anaesthesia because it is technically easier to perform.

Table III: Intraoperative and postoperative complications

Complication	Intraoperative		Postoperative	
	Epidural group n = 39	Spinal group n = 67	Epidural group n = 39	Spinal group n = 67
Bradycardia	6 (42.85%)	7 (23.4%)		
Hypotension	3 (21.42%)	17 (56.6%)	1 (20%)	
Shivering	2 (14.28%)	2 (06.6%)		
Pain	3 (21.45%)	4 (13.4%)		
Restlessness			2 (40%)	2 (100%)
Backache			2 (40%)	
Total	14 (100%)	30 (100%)	5 (100%)	2 (100%)

Furthermore, the incomplete block of sacral nerve roots that occasionally occurs with the epidural technique is avoided with subarachnoid anaesthesia.

Other advantages of regional anaesthesia are the patient's ability to alert the anaesthetist of impending changes in his condition, for example in TURP syndrome,¹⁸ and also bladder perforation can be diagnosed earlier.

TURP syndrome comprises central nervous system and cardiovascular system alterations resulting from intravascular absorption of irrigating fluid. It is characterised by nausea and vomiting, visual disturbances and altered states of consciousness.¹⁹ The full syndrome manifests better under regional anaesthesia. The triad has been described as consisting of:

- I. A rise in systolic and diastolic pressure accompanied by an increase in pulse pressure.
- II. A slowing of the pulse rate.
- III. Mental changes in the form of restlessness, confusion associated with nausea, retching, headache, dyspnoea and cyanosis.²⁰

During general anaesthesia, subjective signs do not become evident. In our study, signs of TURP syndrome were not observed in the patients.

Maintenance of body temperature pre, intra and postoperatively is essential. Elderly patients may be unable to increase their metabolic rate to counteract heat loss. Shivering may increase oxygen demand above respiratory capacity. Conservation of heat by the use of active warm air systems, warm intravenous fluids and by operating, where possible, in a warm ambient environment all help to maintain body temperature and aid recovery.²¹

The incidence of severe complications during the perioperative course increases with age. In a large prospective multicentre trial including 17,200 adults who received general anaesthesia for elective surgery, age was one of the strongest predictors of severe cardio-respiratory outcome such as severe arrhythmia, hypotension and death. The two most important factors, which explain the increased risk of perioperative complications in elderly patients, may be age-related physiological alterations and multi-comorbidities.²²

Our study showed a high incidence of hypotension following spinal anaesthesia despite fluid preloading of the circulation. The high incidence of hypotension can be explained by the fairly large dose of bupivacaine used in some patients. Precipitous arterial hypotension due to high levels of sympathetic block remains a common and acute problem associated with spinal anaesthesia in geriatric patients. The main factor causing hypotension is sympathetic block, which results in arterial and venous vasodilatation. Current accepted practice is to administer a vasopressor to contract arterial dilatation and fluids to compensate for venous dilatation.^{23,24} The decrease in systolic arterial pressure is said to be related to the height of block.²⁵ Spinal anaesthesia was associated with a higher incidence of hypotension and it was more profound with spinal than epidural anaesthesia in our study. The requirement for vasopressor and larger volume of intravenous fluids was higher in the spinal group. This further confirms the severity of hypotension associated with spinal anaesthesia. Hypotension was managed with rapid administration of intravenous fluids and ephedrine. Bradycardia was treated with glycopyrrolate and atropine. In addition to administration of oxygen, low dose midazolam was given to the patients that were restless, after excluding pain as the cause of the restlessness. Pain was a sign of inadequate anaesthesia. Top-up doses of plain bupivacaine were injected through the epidural catheters in the epidural group while sub-hypnotic doses of ketamine were used to manage pain in the spinal group.

Shivering is often seen following general and regional anaesthesia. Sympathetic blockade abolishes peripheral vasoconstriction in the distribution of the block and heat generation from muscle is decreased by muscle relaxation. Spinal thermoregulatory

centres may be depressed by spinal or epidural local anaesthetics or narcotics. The patients that develop shivering were given warmed intravenous fluids and covered with more drapes. The theatre air conditioners were either reduced or switched off.

Patients undergoing prostatectomy are prone to DVT for a number of reasons, including advanced age and the presence of malignancy, cardiac disease, varicose veins and obesity. The increased blood flow resulting from the sympathetic blockade of regional anaesthesia may play a role in reducing DVT formation.²⁶

The other advantages of regional techniques are reduced post-operative negative nitrogen balance, amelioration of endocrine stress response to surgery, reduced post-operative mental confusion and reduction in blood loss.

Conclusion

Our study showed preference for spinal and epidural anaesthesia for prostatectomy. Spinal and epidural techniques carry many benefits with little or no side-effects in experienced hands.

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