

**THE IMMEDIATE POSTOPERATIVE OUTCOME OF
PATIENTS UNDERGOING PROSTATECTOMY FOR
BENIGN PROSTATIC HYPERPLASIA AT KENYATTA
NATIONAL HOSPITAL**

A DISSERTATION PRESENTED IN PART FULFILMENT OF THE
REQUIREMENTS FOR THE DEGREE OF MASTER OF MEDICINE IN
SURGERY OF THE UNIVERSITY OF NAIROBI

BY

DR. DAN K. KIPTOON
(MChB NAIROBI)

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DECLARATION

Candidate:

This dissertation is my original thought and work and has not been published elsewhere or presented for award of a degree in any other university.

Signed:

Dr. D. K. Kiptoon

MBChB (Nbi)

SUPERVISORS:

This dissertation has been submitted for examination with our approval.

SIGNATURE: _____

PROF. G. A. O. MAGOHA (IOM, MBBS, FIBA, FWACS,
FICS, FABI, FMCS (Urol), FCS (ECSA)).
DEPUTY VICE-CHANCELLOR (A&F)
AND
PROFESSOR OF SURGERY
UNIVERSITY OF NAIROBI.
P.O. BOX 30197,
NAIROBI.

SIGNATURE: _____

MR. F. A. OWILLAH (MBChB, M.MED, Cert. (Urol))
CONSULTANT UROLOGIST & LECTURER
DEPARTMENT OF SURGERY
UNIVERSITY OF NAIROBI
P. O. BOX 19676
NAIROBI.

Dedication

This work is dedicated to my daughter Anne Jemutai and my wife Agnes.

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LIST OF ABBREVIATIONS

AUR	Acute urinary retention
BPH	Benign prostatic hyperplasia
BOO	Bladder outflow obstruction
DRE	Digital rectal examination
ELAP	Endoscopic laser ablation of the prostate
HIFU	High intensity focused ultrasound
IPSS	International Prostate Symptom Score
KNH	Kenyatta National Hospital
LUTS	Lower urinary tract symptoms
TURP	Transurethral resection of the prostate
TUVP	Transurethral vaporisation of the prostate
TUMT	Transurethral microwave thermotherapy
TUIP	Transurethral incision of the prostate
TULIP	Transurethral laser incision of the prostate
TUNA	Transurethral needle ablation
VLAP	Visual laser ablation of the prostate
UTI	Urinary tract infection

ABSTRACT

Objective: To describe the common postoperative complications of prostatectomy as seen at Kenyatta National Hospital.

Materials and Methods: This is a prospective study of patients who underwent prostatectomy for benign prostatic hyperplasia at Kenyatta National Hospital between 6th October 2003 and 21st June 2004.

Main outcome measures: Age, co-morbidity, type of surgery, complications, re-operation, mortality, postoperative catheterisation, and duration of postoperative hospital stay.

Results: A total of eighty five patients participated in the study, and their average age was 66 years. Open prostatectomy was the more common type of prostatectomy accounting for 81 % of cases while transurethral resection accounted for 19 % of cases.

The most common intra-operative complication during prostatectomy was haemorrhage which occurred in ten patients (11.8 %).

The most common postoperative complication following prostatectomy was wound sepsis occurring in 24 patients (35 %, n=69). Other postoperative complications observed were urinary tract infection (15 %), clot retention (10 %), pyrexia (10 %), and pneumonia (8.2 %).

Three patients (4.4 %) required re-operation due to complications of postoperative wound sepsis.

One patient had perforation of the bladder during transurethral resection and required a laparotomy to repair the bladder.

Twenty six patients (30 %) had co- existing medical conditions. There was a significant association between wound sepsis and diabetes mellitus ($p < 0.05$).

The mean duration of postoperative catheterisation was 6.66 days. There was a significant difference in the duration of postoperative catheterisation between open prostatectomy and transurethral resection ($p= 0.001$).

The mean duration of postoperative hospital stay was 8.16 days.

There was a significant difference in the duration of postoperative hospital stay between open prostatectomy and transurethral resection ($p= 0.001$).

Conclusions: The duration of postoperative catheterisation and hospital stay are mainly determined by type of prostatectomy, and the presence of diabetes mellitus significantly increased the risk of developing postoperative wound sepsis.

LITERATURE REVIEW

Benign prostatic hyperplasia (BPH) is the most common benign tumour in men, and its incidence is age-related¹. The prevalence of histological BPH in autopsy studies ranges from 20% in men aged 41-50 years, to 50% in men aged 51-60 years, and to over 90% in men older than 80 years. ^{1,2,3,4}

BPH results in bladder outflow obstruction (BOO)^{1,2}. There are various treatment options for BPH; ranging from watchful waiting to surgery. ^{1,2,3,4,5}

The operations for BPH are many but can basically be classified into two groups: ^{1,2,3,4,5,6,7,8}

i) Open Methods

- a) Retropubic (Millin's) prostatectomy
- b) Transvesical prostatectomy (Freyer's)
- c) Transperineal prostatectomy (Young's)

ii) Closed Methods

- a) Transurethral resection of the prostate (TURP)
- b) Transurethral incision of the prostate (TUIP)
- c) Transurethral vaporisation of the prostate (TUVP)

Surgery for BPH entails operating on an elderly population who may have pre-existing co-morbidities which contribute to mortality and morbidity associated with surgery^{9, 10}. Review of the literature shows a mortality of 0.2% - 10% associated with TURP and 1 -2.6% associated with open prostatectomy^{9,11,12,13}. Morbidity due to prostate surgery ranges from 6% -18%. ^{11,13}

ANATOMY OF THE PROSTATE

The prostate is situated at the bladder neck and encloses the first part of the male urethra. It is shaped like an inverted cone. The glandular alveoli are buried in a dense fibromuscular stroma that is directly continuous with the smooth muscle of the bladder neck. The prostate develops as five paired epithelial buds from the urogenital sinus during the third month in utero. These buds form acini and ducts by arborisation and canalisation.^{1,8,14}

The prostatic urethra extends from the internal urinary meatus to the apex of the prostate. A midline longitudinal ridge, the verumontanum, whose centre is marked by the utriculus masculinis, characterizes it posteriorly. The ejaculatory ducts perforate the prostate to open separately opposite the utriculus masculinis^{1,8}. The surface of the prostate is covered by a thin condensation of fibrous tissue that constitutes the true capsule. The prostate is separated from the pubic symphysis by the retropubic space of Retzius, and separated from the rectum by the recto-vesical fascia of Denonvilliers. The prostatic fascia completely invests the gland.⁸

The prostate obtains its blood supply from the inferior vesical and middle rectal arteries^{1,14}. The venous drainage of the prostate is into the prostatic venous plexus found between the prostatic fascia and the fibrous capsule of the gland. The prostatic plexus also drains the deep dorsal vein of the penis and the veins of the base of the bladder.^{1, 8, 14}

The prostate gland has a sexual function; its secretions optimize conditions for fertilization by acting as a buffer, increasing sperm motility and enhancing sperm transport and survival in both the male and female reproductive tracts.^{8, 14}

McNeal (1978) classified the prostate into three different zones: a peripheral zone that lies mainly posteriorly, a central zone which lies posterior to the urethral lumen and above the ejaculatory ducts, and the periurethral transition zone.¹⁵

PATHOLOGY OF BENIGN PROSTATIC HYPERPLASIA

Benign prostatic hyperplasia develops in the transition zone. It is a hyperplastic process resulting from an increase in cell number. Microscopic evaluation reveals a nodular growth pattern that is composed of stroma (collagen and smooth muscle) and epithelium.^{1,2,15}

As hyperplastic nodules in the transition zone enlarge, they compress the outer zones of the prostate resulting in the formation of a false capsule, the so-called surgical capsule. This also causes the appearance of typical “lateral” lobes. When hyperplasia affects the subcervical central zone, a “middle” lobe develops which projects up into the bladder.^{1,2,14}

PATHOPHYSIOLOGY AND SYMPTOMS OF BENIGN PROSTATIC HYPERPLASIA

The symptoms of benign prostatic hyperplasia are due to bladder outflow obstruction (BOO). This obstruction causes a secondary bladder response.^{2,8}

Obstructive symptoms are either static or dynamic. The dynamic component of obstructive symptoms is due to presence of smooth muscle in prostatic adenomas. The static component is due to mechanical obstruction by the adenoma. Obstructive symptoms are hesitancy, poor flow, intermittent stream, dribbling, sensation of poor bladder emptying and straining to urinate.^{1,2}

The irritative symptoms of benign prostatic hyperplasia result from the secondary response of the bladder to bladder outflow obstruction. They include frequency, nocturia, urgency, urge incontinence and enuresis.^{1, 2, 8}

Prostatic size on digital rectal examination (DRE) correlates poorly with symptoms, in part because the median lobe is not readily palpable. The dynamic component of obstructive symptoms may also vary depending on sympathetic tone.^{1,2,4,10}

Bladder outflow obstruction may result in acute urinary retention (AUR). Acute retention occurs when there is painful inability to void with associated bladder distension.^{2, 16}

Chronic urinary retention in which there is residual urine after voiding can occur due to bladder outflow obstruction. When the residual urine is more than 250 millilitres, the increased resting and filling bladder pressures result in functional obstruction of the upper urinary tract with the development of bilateral hydronephrosis and hydronephrosis. This leads to recurrent upper urinary tract infection and eventually to renal impairment.^{6, 16}

Haematuria may occur as a complication of benign prostatic hyperplasia. It may be due to bleeding urethral varicosities or infection.^{2, 8}

EVALUATION OF THE PATIENT WITH BENIGN PROSTATIC HYPERPLASIA

The symptoms of benign prostatic hyperplasia are usually assessed by the International Prostate Symptom Score (IPSS) (Appendix III).

The maximum possible score is 35. Scores of 0 – 8 are generally regarded as mild, 9 – 19 as moderate, and 20 or above as severe. Those with mild symptoms may require no further investigations. Those with moderate and severe symptoms require thorough evaluation and management.¹⁰

A detailed history focusing on the urinary tract excludes other possible causes of symptoms that may not result from the prostate, such as urinary tract infection, neurogenic bladder, urethral stricture, or prostate cancer.^{2,3,6}

Digital rectal examination (DRE) should be performed to assess the size and consistency of the prostate. Benign prostatic hyperplasia usually results in a smooth, firm, elastic enlargement of the prostate. Any induration needs further evaluation to exclude cancer.^{1,2,8,10,16}

A detailed neurological examination to eliminate any neurological lesion that may mimic bladder outflow obstruction is carried out. Some of these lesions are tabes dorsalis, disseminated multiple sclerosis and cauda equina lesions.^{2,8,16}

Urinalysis to exclude infection or haematuria must be done.^{1,2,3,6}

Serum creatinine, electrolytes and urea should be used to assess renal function. Renal insufficiency may be observed in up to 10% of patients with BPH and warrants upper urinary tract imaging. Patients with renal insufficiency are at increased risk of developing postoperative complications following prostatectomy.^{1,2,6,10, 13,16,17}

Transabdominal ultrasound is used to estimate the prostate volume and the post-void residual (PVR) urine volume. In general PVR values above 300 millilitres indicate a higher risk of acute urinary retention.¹⁸

Transrectal ultrasound is indicated if digital rectal examination is suspicious to facilitate biopsy to rule out cancer of the prostate.¹⁰

INDICATIONS FOR PROSTATECTOMY

Absolute indications for prostate surgery include refractory urinary retention (failed trial without catheter), recurrent urinary tract infection, recurrent gross haematuria, bladder stones, renal insufficiency or large bladder diverticulae due to benign prostatic hyperplasia.^{1, 6, 10}

Relative indications for prostatectomy are troublesome symptoms affecting the quality of life, and altered urodynamic function when the peak flow rate is less than 13 millilitres per second. The patient may also opt for surgery instead of other modalities of management.^{1, 10}

TYPES OF PROSTATECTOMY

A. OPEN METHODS

1. RETROPUBIC PROSTATECTOMY (MILLIN'S)

A transverse suprapubic incision is used. Prevesical fat and peritoneum are gently stripped upwards, and then the anterior surface of the prostatic capsule is cleared of fat and veins. The capsule is then divided longitudinally and the adenoma dissected out. The prostatic urethra is divided at the apex of the prostate to be delivered with the adenoma. The capsule is then closed over a three-way Foley catheter after haemostasis is achieved. ^{1,2,6,8,19}

Irrigation with normal saline is then commenced and continued until bleeding stops. A retropubic space drain is left in situ.

2. TRANSVESICAL PROSTATECTOMY (FREYER'S)

The bladder is exposed through a transverse incision and opened between stay sutures. The index finger is then introduced into the bladder neck and prostatic urethra and used to split the anterior commissure. The index finger is then used to mobilise the prostate laterally and posteriorly.

After enucleation the prostatic bed is packed tightly for about 5 minutes. The pack is then removed and bleeding vessels secured. A three-way Foley catheter is then passed into the urethra and its balloon inflated within the prostatic bed. Irrigation with saline is then commenced after the bladder is closed. A drain is left in the suprapubic space. ^{1,2,6,8,19}

B: TRANSURETHRAL RESECTION OF THE PROSTATE (TURP)

The patient is anaesthetised, then placed in lithotomy position and draped appropriately. Cystoscopy is then performed.

A resectoscope sheath is passed into the bladder and the working element introduced. Irrigation is then commenced through the resectoscope. The irrigation fluid used most commonly is 1.5% glycine.

Cutting is then commenced using the diathermy loops from the bladder neck to the verumontanum. The chips of cut tissue are removed via the resectoscope and once all chips have been removed and bleeding controlled, a three-way Foley catheter is introduced.

The bladder is then continuously irrigated with saline for 24-48 hours. The catheter is then removed a day or two later.^{1,2,3,6,8,19}

OTHER MODALITIES OF MANAGEMENT OF BENIGN PROSTATIC HYPERPLASIA.

A) WATCHFUL WAITING

This option is recommended for patients with mild symptom scores (0-8) , i.e. mild symptoms that do not interfere with daily activities^{1, 8,10}. Men with moderate symptoms can also be managed in this fashion if they so choose.

This entails follow up of patients for symptom progression.^{1, 10}

B) MEDICAL TREATMENT

This option is best suited for patients with moderate symptom scores and those with severe symptom scores who wish to delay surgery^{1,8,10,20,21}.

Contraindications to medical treatment of benign prostatic hyperplasia (BPH) include acute urinary retention, post-void residual urine volume greater than 300 millilitres, renal insufficiency, recurrent haematuria, bladder stones or

diverticulae, recurrent urinary tract infections due to BPH, and evidence of prostate cancer.^{1,10}

The modalities include:

Alpha-blockers – prazosin, doxazosin, terazosin, alfuzosin and tamsulosin.

These work by blocking α_1 – adrenoceptors in smooth muscle in the prostate and bladder neck.^{20,21}

The 5 α -reductase inhibitors (finasteride, episteride)

These block the conversion of testosterone to dihydrotestosterone, thus inhibiting prostatic growth. The resultant epithelial atrophy results in a reduction in the size of the prostate gland.^{20,21}

Phytotherapy: this involves the use of various plant extracts to treat benign prostatic hyperplasia e.g. *Serenoa repens*, *Pygeum africanum*, *Echinacea purpurea*, etc. These agents are largely experimental and of unproven efficacy.^{1, 6, 8, 10}

(C) MINIMALLY INVASIVE TREATMENT OPTIONS

Prostatic stents

Intraurethral stents are devices that are endoscopically placed in the prostatic fossa and are designed to keep the prostatic urethra patent. They are typically used for patients with limited life expectancy who are not deemed to be candidates for surgery or anaesthesia.^{1,10}

Balloon dilatation

This is performed with specially designed catheters that enable dilatation of the prostatic urethra.^{1,10}

Electrovaporization

Transurethral electrovaporization of the prostate uses the standard resectoscope but replaces the loop with a variation of a grooved rollerball.^{1,10,22,23}

Laser therapy

This involves ablation of prostatic tissue by use of laser. The energy sources used are neodymium- YAG laser and holmium-YAG laser. Techniques include transurethral laser incision of the prostate (TULIP), and visual or endoscopic laser ablation of the prostate (VLAP or ELAP).
21,22

Transurethral needle ablation of the prostate (TUNA)

This uses radio frequencies to heat prostatic tissue to high temperatures (120°C) resulting in coagulative necrosis.^{21,22}

Transurethral microwave thermotherapy (TUMT)

This uses a urethral microwave device to heat the prostate to 45 - 55°C resulting in necrosis.²⁴

Transurethral high intensity focused ultrasound (HIFU)

A special dual function ultrasound probe is placed in the rectum and is used to deliver bursts of high intensity focused ultrasound energy, which heats the prostate tissue and results in coagulative necrosis.^{21,22}

Focused extracorporeal pyrotherapy

Ultrasound waves are applied to the prostate transabdominally. This is still largely experimental.²¹

PERIOPERATIVE COMPLICATIONS OF PROSTATE SURGERY

Mortality

An overall mortality of 1.59%, with transurethral resection having a mortality of 1.25% and open methods a mortality of 2.28%, is to be expected^{5,13}. Most mortality is due to early post-operative myocardial infarction.^{5,9,11,12,13,25,26,27,28}

Some authorities state that mortality after open prostatectomy may be increased up to four times compared to transurethral resection of the prostate(TURP).⁷

In Ahmed's study 145 patients underwent open prostatectomy and the mortality was 2.7%¹¹. Singh et al¹³ reported a mortality of 1.28% for TURP and 1.39% for open prostatectomy. Ibrahim et al⁹ reported a mortality of 1% for TURP and no mortality for open prostatectomy. Neal⁵ reported a mortality of 1.6% after TURP and 2.5% after open prostatectomy. Mallya¹² reported a mortality of 1.7% after open prostatectomy. Hill et al²⁵ reported a 30-day mortality of 0.9% after open prostatectomy. In most studies the deaths occurred within the first week postoperatively and were due to sepsis, myocardial infarction and pulmonary embolism.^{11,12,13,29,30}

Haemorrhage

Haemorrhage may either occur intra-operatively or be secondary – occurring in the recovery ward after haemostasis had been achieved intra-operatively. Primary haemorrhage is more common after open prostatectomy than TURP.^{3,9,11,13,31,32} Secondary haemorrhage is more common after TURP^{7,13}. Ibrahim et al⁹ reported haemorrhage rates of 7% following TURP and 22% following open prostatectomy.

Clot retention

This is failure to void post-operatively due to obstruction by a blood clot.^{3,9,11,33,34}

Singh et al¹³ reported an incidence of clot retention of 1.6% after TURP and 0.92% after open prostatectomy.

Perforation of the prostatic capsule during TURP.

This results in leakage of blood, urine and irrigating fluid into the peritoneum leading to chemical peritonitis^{1,3,8,19}. Singh et al¹³ reported a 0.5% rate, while Doll et al³⁴ reported a 10% rate of capsule perforation.

Transsutheral resection syndrome (TUR syndrome)

This is due to absorption of the irrigation fluid during TURP. This results in a hypervolemic, hyponatraemic state due to absorption of hypotonic irrigation fluid. It presents with nausea, vomiting, confusion, hypertension, bradycardia, and visual disturbances^{3,8,19}. Mebust et al²⁷ reported a 2% rate of TUR syndrome.

Infection

Infection may affect the urinary tract, the surgical wound or present as epididymo-orchitis^{3,19}. Ahmed¹¹ reported a 7.7% rate of wound infection and 3.1% rate of epididymitis. Mallya¹² reported a 3.3% rate of epididymo-orchitis and 18.3% rate of wound sepsis. Dawam et al³³ reported a 14.4% rate of epididymo-orchitis and 45.3% rate of wound infection. Singh et al¹³ reported an overall infection rate of 16.1%.

Others complications

These include temporary postoperative vesico-cutaneous leakage, urinoma, wound dehiscence, and general complications of surgery or anaesthesia such as thromboembolism, myocardial infarction, pneumonia and postoperative pyrexia^{8,9,11,12,13,29}. Singh et al¹³ reported a 1.3% rate of pulmonary embolism.

OBJECTIVES

MAIN OBJECTIVE

To review the immediate postoperative outcome of prostatectomy in patients with benign prostatic hyperplasia (BPH) at Kenyatta National Hospital.

SPECIFIC OBJECTIVES

1. To describe the common complications that occur intra-operatively and within 72 hours postoperatively in those patients undergoing prostatectomy (open and TURP) for benign prostatic hyperplasia.
2. To determine how many patients require re-operation for immediate complications e.g. clot retention, etc.
3. To determine if the complications are related to:
 - (i) Age of the patient
 - (ii) The type of surgical procedure used i.e. open prostatectomy versus transurethral resection of the prostate(TURP) .
 - (iii) Any comorbidity the patient may have.
4. To determine and compare the average length of postoperative catheterisation and hospital stay in both open prostatectomy and TURP groups.
5. To determine and compare the mortality in both open prostatectomy and TURP groups.

JUSTIFICATION OF THE STUDY

Benign prostatic hyperplasia (BPH) is a common problem both locally and globally.^{33,35,36,37,39,40,41}

Operative management of BPH entails surgery on an elderly group of patients who may have other comorbid conditions which may affect outcome.^{9,26,28,38,41}

There are no studies that have been carried out at Kenyatta National Hospital to assess the morbidity and mortality associated with prostatectomy for benign prostatic hyperplasia.

This study seeks to assess the pattern of postoperative complications following prostatectomy as seen in Kenyatta National Hospital.

MATERIALS AND METHODS

STUDY DESIGN

This was a prospective hospital-based descriptive cross-sectional study.

STUDY SITE

The general and amenity surgical wards of Kenyatta National Hospital.

STUDY POPULATION

Those patients who underwent prostatectomy for benign prostatic hyperplasia at Kenyatta National Hospital between 6th October 2003 and 21st June 2004 and met the inclusion criteria.

SAMPLE SIZE

From previous studies the expected proportion of BPH patients admitted in surgical wards is 5%.

Given a confidence interval of 95%, a level of precision of 5% and a confidence interval of 5%, the minimum sample size for the study was obtained using the following formula:

$$N = \frac{Z^2(P(1-P))}{d^2}$$

Where: N= Sample size
P= Expected proportion among surgical admissions (5%)
Z= Standard deviation of the 95th percentile (1.96)
d= Level of precision (5%)

$$\begin{aligned} N &= \frac{(1.96)^2 (0.05 (1-0.05))}{(0.005)^2} \\ &= 72.99 \quad \simeq \quad 73 \end{aligned}$$

CASE SELECTION

INCLUSION CRITERIA

1. Patients admitted for prostatectomy at Kenyatta National Hospital.
2. Those who gave informed consent to take part in the study.

EXCLUSION CRITERIA

Those patients declining consent to be included in the study.

SAMPLING PROCEDURE

Consecutive sampling of patients meeting the inclusion criteria.

ETHICAL CONSIDERATIONS

1. Only those patients meeting the inclusion criteria who gave informed consent participated in the study.
2. All information obtained in the course of the study has been treated in confidence.
3. Approval for the study was obtained from the Kenyatta National Hospital Ethical Research Committee (Vide: KNH-ERC/01/1976 – Appendix IV).

STUDY DEFINITIONS

Prostatectomy – This is the surgical removal of hyperplastic prostatic tissue either by transurethral resection or open methods.

Haemorrhage - This is the loss of more than 1.5 litres of blood during surgery and during the immediate postoperative period requiring transfusion of more than two units of blood.

Co-morbidities- This is presence of hypertension, renal impairment, diabetes mellitus or bronchial asthma.

Clot retention - This is failure to void postoperatively due to obstruction by a blood clot.

Urinary tract infection- This is when an aseptically collected sample of urine yields more than 10^5 organisms when cultured.

Pneumonia - This is infection of lung parenchyma associated with radiological changes.

Wound sepsis - This is when there is either purulent discharge from the wound or organisms are isolated from an aseptically obtained culture of fluid from the wound.

Pyrexia - This is the elevation of body temperature above 37.8°C .

DATA COLLECTION AND ANALYSIS

The socio-demographic and clinical data of patients were obtained by the investigator using a pre-tested questionnaire (Appendix I) which was administered after obtaining informed consent.

Data on operative outcome, postoperative complications, duration of postoperative hospital stay and duration of postoperative catheterisation were entered into the questionnaire by the investigator.

Data validation was done before the analysis. Data analysis was done using Statistical Package for Social Sciences (SPSS Version 11.0, SPSS Inc. Chicago, Illinois). Pearson's Chi-square test was used to determine associations between variables. Differences were considered significant at $P < 0.05$.

Descriptive statistics such as means, frequency distributions and standard deviation were used for most data.

Data analysis was done in consultation with a statistician.

STUDY LIMITATIONS

The study was limited to patients undergoing prostatectomy for benign prostatic hyperplasia (BPH) at Kenyatta National Hospital. This may be a biased population not representative of all BPH patients in Kenya.

Patients were followed up for a short period and long term complications of prostate surgery were not evaluated.

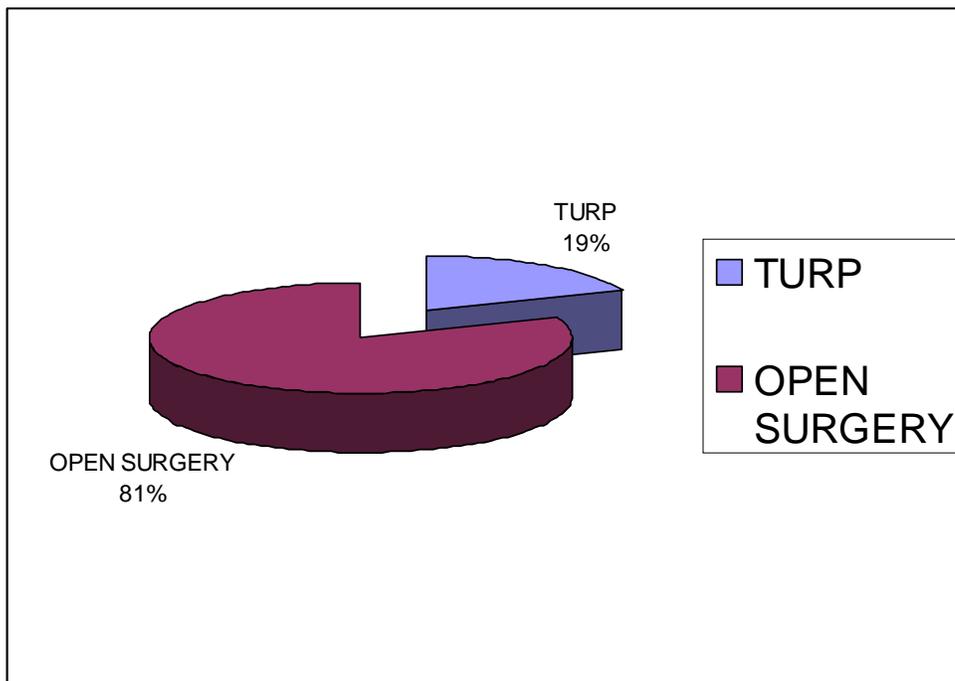
RESULTS

A total of 85 patients participated in the study; 16 of these patients underwent transurethral resection of the prostate (TURP) while 69 underwent open prostatectomy.

1. Type of surgery

A proportion of 18.8 % of patients underwent TURP and 81.2 % underwent open prostatectomy.

FIGURE 1: TYPES OF SURGERY

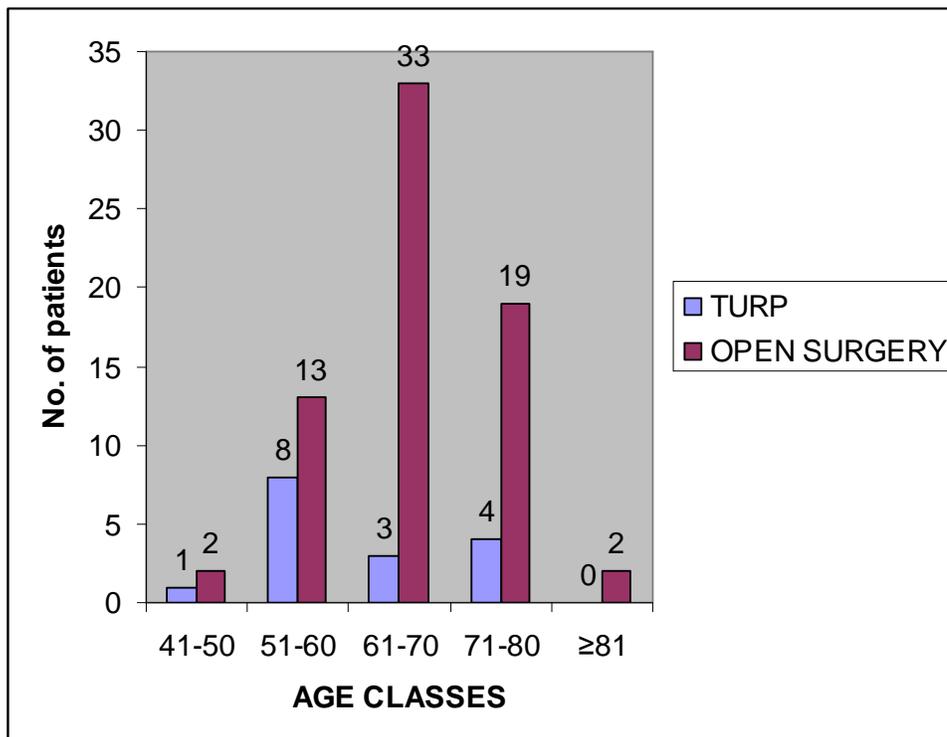


2. Age distribution of patients

TABLE 1: AGE CLASSES vs. TYPE OF SURGERY

TYPE OF SURGERY	AGE CLASSES (YEARS)					TOTALS	%
	41-50	51-60	61-70	71-80	≥81		
TURP	1	8	3	4	0	16	18.8%
OPEN SURGERY	2	13	33	19	2	69	81.2%
TOTALS	3	21	36	23	2	85	

FIGURE 2: TYPE OF SURGERY BY AGE CLASSES



The most frequent age class of patients undergoing prostatectomy was 61-70 years (36 patients), followed by 71-80 years (23 patients). The least frequent age group was >80 years (2 patients).

The mean age of all these patients was 66.71 years(range 46-85 years). The mean age of patients who underwent TURP was 66.5 years (range 49-75 years) while those who underwent open surgery had a mean age of 67.68 years (range 46-85 years).

3. Intra-operative complications

Intra-operative haemorrhage

Ten patients (11.8 %, n= 85) had intra-operative haemorrhage requiring transfusion of more than two units of blood; nine of them had undergone open prostatectomy (13%, n=69), while one had undergone transurethral resection (6.3%, n=16).

Other intra-operative complications

One patient in the transurethral resection group had inadvertent perforation of the bladder during surgery. This was recognised intra-operatively and repaired at laparotomy via a Pfannensteil incision.

No patient developed the transurethral resection syndrome.

4. Early postoperative complications

TABLE 2: POSTOPERATIVE COMPLICATIONS VERSUS TYPE OF SURGERY

COMPLICATION	TYPE OF SURGERY			
	TURP		OPEN SURGERY	
	NO.	% (n=16)	NO.	% (n=69)
Wound sepsis	-	-	24	34.8 %
Urinary tract infection	2	12.5 %	11	15.9 %
Clot retention	0	-	9	13.0 %
Pyrexia	1	6.3 %	8	11.6 %
Pneumonia	1	6.3 %	6	8.70 %

FIGURE 3: COMPLICATIONS BY TYPE OF SURGERY

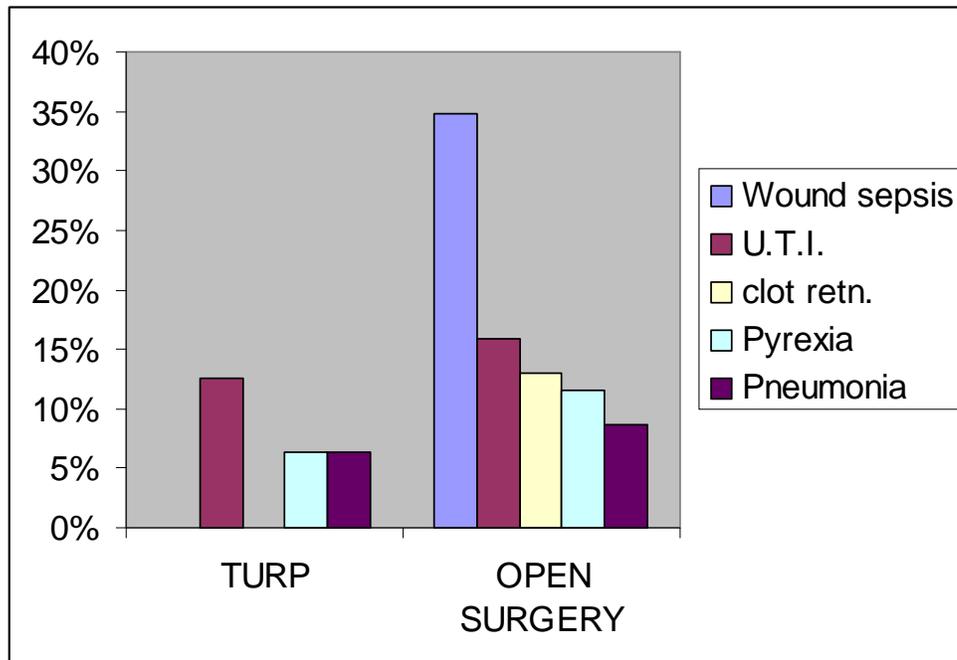


TABLE 3: Overall postoperative complications

Complication	No.	%
Wound sepsis	24	28.2 %
Urinary tract infection	13	15.3 %
Clot retention	9	10.6 %
Pyrexia	9	10.6 %
Pneumonia	7	8.2 %

A total of twenty four (34.8 %, n=69) of the patients who underwent open surgery had wound sepsis. Three (4.5 %) of these patients required re-operation: one (1.5%) for wound abscess and two (3 %) for wound dehiscence.

A total of thirteen patients (15.3 %) had urinary tract infection (UTI). Two (12.5 %, n=16) of the patients who underwent transurethral resection had UTI; while eleven (15.9 %, n=69) of those who had open surgery had UTI.

Nine (10.6 %) patients had clot retention. All the patients who had clot retention had undergone open surgery. No patient required re-operation for clot retention.

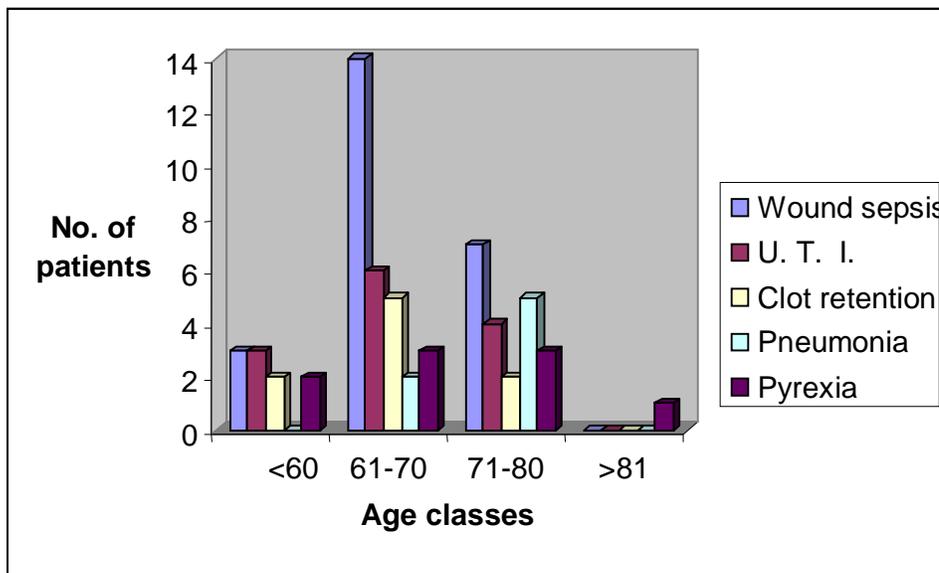
A total of seven (8.2 %) patients had pneumonia; six following open prostatectomy and one following transurethral resection.

A total of nine patients (10.6 %) had pyrexia; eight following open prostatectomy and one following transurethral resection of the prostate. Four of the patients who had pyrexia had received blood transfusions.

TABLE 4: COMPLICATIONS BY AGE CLASSES

Complication	Age classes (years)				
	41-50	51-60	61-70	71-80	>81
Wound sepsis	0	3	14	7	0
U. T. I.	0	3	6	4	0
Clot retention	1	1	5	2	0
Pneumonia	0	0	2	5	0
Pyrexia	0	2	3	3	1

FIGURE 4: Complications by age classes



5. Postoperative catheterisation

Table 5: Average duration of postoperative catheterisation

Type of surgery	Mean duration of postoperative catheterisation		
	Range (days)	Mean(days)	Standard deviation
TURP	1-14	3.62	3.24
Open prostatectomy	4-14	7.36	2.47
Both groups	1-14	6.66	2.99

The mean duration of postoperative catheterisation for all patients was 6.66 days (SD 2.99) with a range of 1-14 days.

The mean postoperative catheterisation period for patients who underwent transurethral resection of the prostate was 3.62 days (SD 3.24) with a range of 1-14 days. Out of the sixteen patients who underwent transurethral resection fifteen were catheterised for between 1 and 6 days while one was catheterised for 14 days. The patient who was catheterised for 14 days had had inadvertent perforation of the bladder during surgery.

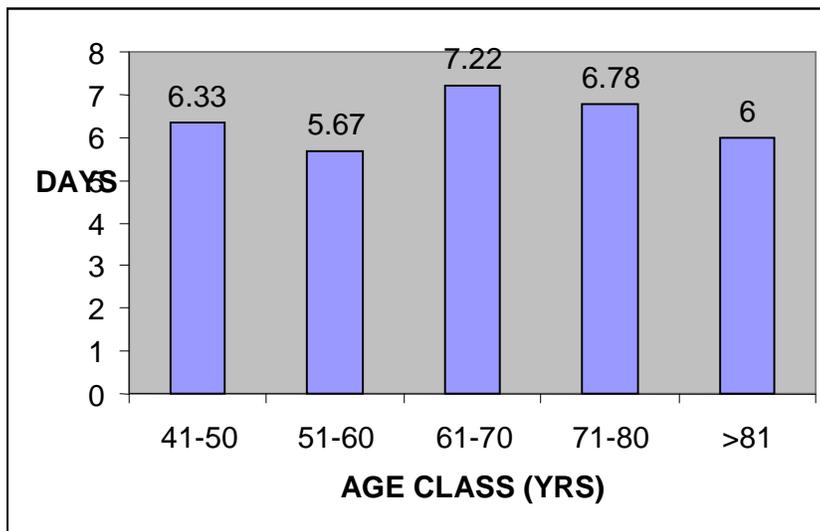
The mean duration of postoperative catheterisation for patients who underwent open prostatectomy was 7.36 days (SD 2.47) with a range of 4 to 14 days.

The duration of postoperative catheterisation was shorter for patients undergoing transurethral resection compared to those who underwent open prostatectomy with a mean difference of 3.74 days. This difference was statistically significant ($p= 0.001$).

Table 6: Average duration of postoperative catheterisation by age classes

Age class (years)	Average duration of Post-operative catheterisation(days)
41-50	6.33
51-60	5.67
61-70	7.22
71-80	6.78
>81	6.00

**FIGURE 5: AVERAGE DURATION OF POSTOPERATIVE CATHETERISATION
BY AGE CLASSES**



The age class that had the shortest average period of postoperative catheterisation was the 51-60 years group (5.67 days), while the 71-80 years group had the longest average period (6.78 days) of postoperative catheterisation.

6. Length of postoperative hospital stay

Table 7: Average duration of postoperative hospital stay

Type of surgery	Mean duration of postoperative hospital stay		
	Range (days)	Mean (days)	Standard deviation
TURP	3-8	5.19	1.72
Open prostatectomy	4-24	8.86	3.68
Both groups	3-24	8.16	3.68

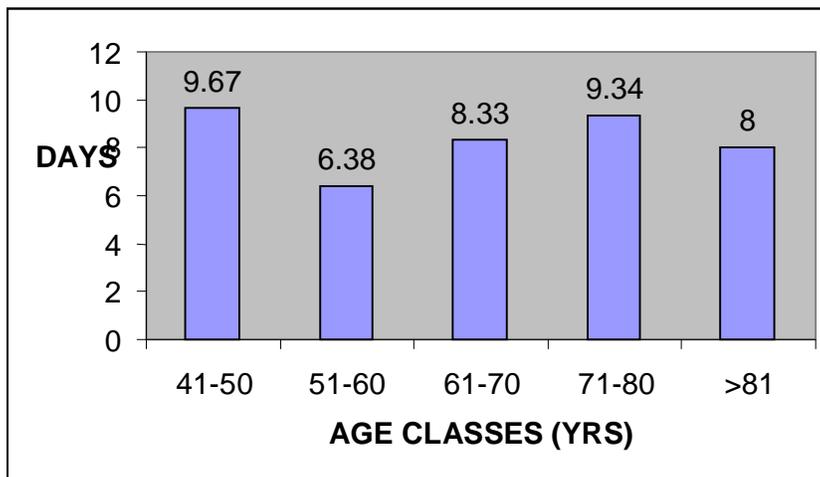
The average postoperative hospital stay for all patients was 8.16 days (SD 3.68) with a range of 3-24 days.

The average postoperative hospital stay for patients who underwent transurethral resection was 5.19 days (SD 1.72) with a range of 3 to 8 days while the average postoperative hospital stay for patients who underwent open prostatectomy was 8.86 days (SD 3.68) with a range of 4 to 24 days. This difference was statistically significant ($p=0.001$).

Table 8: Average duration of postoperative hospital stay by age classes

Age class (years)	Average duration of postoperative hospital stay (days)
41-50	9.67
51-60	6.38
61-70	8.33
71-80	9.34
>81	8.00

FIGURE 6: AVERAGE DURATION OF POSTOPERATIVE HOSPITAL STAY BY AGE CLASSES



The age group that had the longest postoperative hospital stay was the 71-80 years group (9.34 days). The age group with the shortest postoperative hospital stay was the 51-60 years group (6.38 days).

7. Co-morbidities

Twenty six patients (30.5 %) had co-morbidities. One patient had hypertension, chronic obstructive airway disease and diabetes mellitus.

One patient had both chronic obstructive airway disease and diabetes mellitus.

One patient had both chronic obstructive airway disease and hypertension.

Nine patients had both diabetes mellitus and hypertension. Fourteen patients had hypertension alone. No patient had impaired renal function. This information is graphically demonstrated in figure 7 below.

FIGURE 7: CO-MORBID CONDITIONS

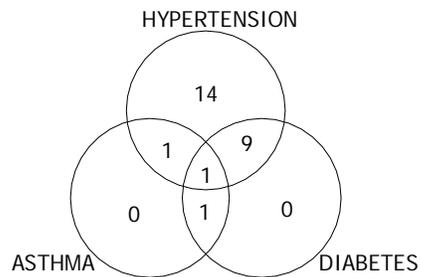


Table 9: CO-MORBID CONDITIONS

Co-morbid condition	No. of patients	% of all patients (n=85)
Hypertension	25	29.4 %
Diabetes mellitus	11	12.9 %
Chronic obstructive Airway disease	3	3.5 %

TABLE 10: CO-MORBID CONDITIONS BY AGE CLASSES

Co-morbid condition	Age classes (Years)				
	41-50	51-60	61-70	71-80	>81
Hypertension	0	9	9	7	0
Diabetes mellitus	0	4	4	3	0
Chronic obstructive Airway disease	0	1	1	1	0

7.i. Age of patients with co-morbidities

The mean age of patients with co-morbidities was 66 years (SD= 7.36) with a range of 55 to 80 years. The mean age of patients without co-morbidities was 67.02 years (SD 9.21) with a range of 46-85 years. This difference was not statistically significant.

7.ii. Type of surgery of patients with co-morbidities

Nineteen (73.1%) of the patients with co-morbidities underwent open prostatectomy while seven (26.9%) underwent transurethral resection.

7.iii. Intra-operative complications of patients with co-morbidities

Three (1.5%) of the patients with co-morbidities had intra-operative haemorrhage requiring transfusion of more than two units of blood.

7.iv. Early postoperative complications of patients with co-morbidities

Table 11: Postoperative complications of patients with co-morbidities

complication	No. of patients	% (n=26)
Wound sepsis	11	42.3 %
U. T. I.	5	19.2 %
Clot retention	2	7.7 %
Pneumonia	1	3.8 %
Pyrexia	2	7.7 %

Key: U. T. I. – Urinary tract infection

Eleven (42 %, n=26) patients with co-morbidities had wound sepsis. Eight of these patients had diabetes mellitus. A statistically significant link was found between diabetes mellitus and wound sepsis ($p < 0.05$). No such linkage was found for either hypertension or asthma.

Five (19 %) of the patients with co-morbidities had urinary tract infection.

Two (7.7 %) of the patients with co-morbidities each had clot retention and pyrexia; while one (3.8 %) of them had pneumonia.

7.v. Length of postoperative catheterisation of patients with co-morbidities

The average duration of postoperative catheterisation of patients with co-morbidities was 5.81 days (SD 2.80) with a range of 1 to 11 days. This compares well with the average duration for all patients of 6.66 days and for those patients who had no co-morbidities of 7.03 days (SD 3.02) with a range of 1 to 14 days.

7.vi. Length of postoperative hospital stay of patients with co-morbidities

The average duration of postoperative hospital stay for patients with co-morbidities was 7.73 days (SD 4.02) with a range of 3 to 22 days. This compares with the average postoperative hospital stay of those patients without co-morbidities of 8.36 days (SD 3.54) with a range of 3 to 24 days. The average postoperative hospital stay for all patients was 8.16 days.

8. Re-operation

A total of three patients (3.5 %) required re-operation due to early postoperative complications. All three had undergone open prostatectomy and developed wound sepsis. Two required re-operation due to wound dehiscence while the other one had wound abscess.

9. Mortality

There was no mortality following either open prostatectomy or transurethral resection of the prostate during the study period.

DISCUSSION

A total of 85 patients participated in the study, 16 (18.8%) underwent transurethral resection while 69 (81.8%) underwent open prostatectomy. This proportion is similar to that of older studies³⁸. However a more recent study by Ibrahim et al⁹ reported a transurethral resection rate of 72% and an open prostatectomy rate of 28%. The type of surgery was chosen by the surgeons, and the small proportion of patients undergoing TURP in this study could be due to the fact that patients in this centre presented with large prostate sizes not suitable for transurethral resection.¹⁰

The mean age of patients undergoing prostatectomy was 66.71 years (range 46-85 years) with a peak age group of 61-70 years. These figures are comparable to those reported by other centres.^{11, 12, 27, 32, 42, 43,44, 45, 46}

Ten patients (12 %) had intra-operative haemorrhage requiring transfusion of more than two units of blood. This is similar to the 11% rate reported by Ibrahim et al.⁹

A total of 9 patients (13 %) who had open surgery had intra-operative haemorrhage requiring transfusion of more than two units of blood. This figure is much lower than rates reported by earlier studies from Africa: 31 % reported by Ahmed¹¹ and 20 % reported by Ibrahim et al.⁹

However the 13 % transfusion rate is similar to those reported by a majority of contemporary studies.^{31, 47, 48, 49}

One patient (6.3 %, n=16) of those who underwent transurethral resection had haemorrhage requiring transfusion of more than two units of blood. This figure is similar to the 7 % reported by Ibrahim et al⁹ but is much lower than that reported in western series.^{27, 32}

One patient (6.3 %, n=16) had perforation of the bladder during transurethral resection, this is less than the 10 % reported by Doll et al³⁴. This was not associated with adverse outcome due to early recognition and prompt corrective surgery. The low rate of perforation could be due to the small number of transurethral resections carried out during the study period.

A total of twenty six patients (30.5 %) had co-morbidities. This is due to the fact that prevalence of these co-morbidities is age related and benign prostatic hyperplasia is also associated with aging.

Similar figures have been reported in previous studies by Pientka et al²⁸ (33 %), and Borboroglu et al (30.3 %).³²

The most common postoperative complication was wound sepsis which occurred in 24 (35 %) of the 69 patients who underwent open prostatectomy. This was not affected by the age of the patient. This figure compares with the 40 % reported by Bapat et al⁴⁹. However it is higher than 7 % reported by Ahmed¹¹, 9 % reported by Serretta et al⁴⁸ and 10 % reported by Lesiewicz et al.⁵⁰

Eleven of the twenty four patients who had wound sepsis had co-morbidities. There was a statistically significant association between wound sepsis and diabetes mellitus (p = 0.001). This is due to the fact that diabetes mellitus impairs phagocyte function and wound healing.

A previous study by Pientka et al had reported an increased risk of wound sepsis if the patient had co-morbidities.²⁸

Three patients (4 %, n=69) required re-operation due to wound sepsis: one (1.5 %) for wound abscess and two (3 %) for wound dehiscence. These rates for re-operation compare with reports of Bapat et al⁴⁹ (4 %) and Meier et al⁴³ (2.9 %).

Thirteen patients (15.3 %, n=85) had urinary tract infection documented by culture; two patients (12.5 %, n=16) after transurethral resection and eleven (15.9 %, n=69) after open prostatectomy. This was not affected by the age of the patient, the type of surgery or the presence of co-morbidities. However, there was no control for pre-operative bacteruria and for patients who had indwelling urethral catheters pre-operatively. These factors confound the postoperative findings.

The 15.9 % rate of urinary tract infection following open prostatectomy is similar to those reported by previous studies.^{46,48,51}

There was a 12.5 % rate of urinary tract infection following transurethral resection. Mebust et al²⁷ in a large multi-centre study reported a rate of urinary tract infection of 2.3 % following TURP but a more recent study reported a 14 % rate of post-TURP urinary tract infection³⁴.

Nine patients (10.6 %) had clot retention. All the patients who had clot retention had undergone open prostatectomy. This could be due to less bleeding after transurethral resection compared to open prostatectomy. The occurrence of clot retention was not affected by the age of the patient or the presence of co-morbidities. The rate of 10.6 % of clot retention is similar to those from previous studies.^{34,43,49}

Nine patients (10.6 %) had postoperative pyrexia. This was not affected by the age of the patient, the type of surgery or the presence of co-morbidities. Four of the patients who developed pyrexia had received blood transfusions and the fever could be due to transfusion reactions. Ibrahim et al⁹ reported a 27 % occurrence, while Mallya¹² reported a 6.7 % occurrence of postoperative pyrexia.

Seven patients (8.2 %) had pneumonia. This was not affected by the age of the patient, the type of surgery, or the presence of co-morbidities. However, since most patients had no pre-operative chest radiographs, pre-existing occult lung disease could

have been picked postoperatively. Lesiewicz et al⁵⁰ reported a 9.6 % incidence of post prostatectomy pneumonia.

The mean duration of postoperative catheterisation for all patients was 6.66 days. This was not affected by the age of the patient or the presence of co-morbidities. The mean duration of postoperative catheterisation following transurethral resection of the prostate was 3.62 days and after open prostatectomy was 7.36 days. This difference was statistically significant ($p < 0.05$).

The mean duration of postoperative catheterisation following transurethral resection of the prostate of 3.62 days is similar to that reported by other studies.^{27, 32}

Hill et al²⁵ reported a mean duration of postoperative catheterisation after open prostatectomy of 4.2 days. Other studies report similar durations of postoperative catheterisation following open prostatectomy: Serretta et al⁴⁸ reported 5.5 days, Tubaro et al⁵² reported 5.4 days, and Lesiewicz et al⁵⁰ reported 6 days. Thus the duration of postoperative catheterisation following open prostatectomy was longer for patients participating in this study than that reported in the literature.

The mean duration of postoperative hospital stay for all patients was 8.16 days with a range of 3 to 24 days. This was not affected by the age of the patient or the presence of co-morbidities.

The mean duration of postoperative hospital stay was 5.19 days after transurethral resection of the prostate and 8.86 days after open prostatectomy, this difference was statistically significant ($p < 0.05$).

The mean postoperative hospital stay of 5.19 days after transurethral resection of the prostate compares with a mean of 5 days reported by Mebust et al.²⁷

The mean duration of postoperative hospital stay following open prostatectomy of 8.86 days compares with reports from previous studies.^{25, 48, 49}

There was no intra-operative or early postoperative mortality associated with either open prostatectomy or transurethral resection of the prostate during the study period. However, patients were not followed up once they were discharged home and this could have introduced a bias as prostatectomy-related deaths have been reported as late as six weeks postoperatively.⁵²

CONCLUSIONS

1. Open prostatectomy is the more common type of surgery carried out for benign prostatic hyperplasia in Kenyatta National Hospital, accounting for 81.2 % of prostatectomies in this study.
2. Haemorrhage requiring transfusion of more than two units of blood was the most common intra-operative complication noted.
3. The most common postoperative complications are wound sepsis (34.8 %), urinary tract infection (15.9 %), and clot retention (13 %).
4. There was no correlation between the age of the patient and the development of postoperative complications. There was also no statistically significant difference in the development of between the open surgery and transurethral resection groups. The presence of diabetes mellitus significantly increased the risk of developing postoperative wound sepsis.
5. Both the mean durations of postoperative catheterisation and postoperative hospital stay are significantly longer for patients who have open prostatectomy compared to those undergoing transurethral resection of the prostate. Patients at Kenyatta National Hospital have longer average duration of postoperative catheterisation following open prostatectomy compared with reports from other centres.
6. There was no mortality in both open prostatectomy and transurethral resection groups during the study period.

RECOMMENDATIONS

1. Both open prostatectomy and transurethral resection of the prostate are safe procedures. However TURP is to be preferred as it requires significantly shorter durations of both postoperative catheterisation and postoperative hospital stay.
2. There is need for a further study with a longer follow-up period to assess long term complications such as urine incontinence, retrograde ejaculation, erectile dysfunction and urethral stricture.

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If Yes: Type I
: Type II

SECTION III

1. TYPE OF SURGERY

OPEN
TURP

2. INTRA – OPERATIVE COMPLICATIONS:

- (i) Haemorrhage requiring transfusion of > 2units of blood
- (ii) TUR SYNDROME
- (iii) PERFORATION OF CAPSULE DURING TURP

3. EARLY POST – OP COMPLICATIONS.

- (i) CLOT RETENTION. YES/NO
- (ii) U.T.I. YES/NO
- (iii) WOUND SEPSIS YES/NO
- (iv) PNEUMONIA YES/NO
- (v) THROMBOEMBOLISM YES/NO
- (vi) MYOCARDIAL INFARCTION YES/NO
- (vii) PYREXIA YES/NO
- (viii) OTHER (STATE) _____

4. DID THE PATIENT REQUIRE RE-OPERATION DUE TO ANY
COMPLICATION YES / NO

5. OUTCOME: DISCHARGE :
DEATH :
CAUSE OF DEATH _____

6. LENGTH OF POST – OPERATIVE HOSPITAL STAY IN DAYS _____

7. DURATION OF POST- OPERATIVE CATHETERISATION IN DAYS __

8. PRE – OPERATIVE INVESTIGATIONS:

Haemoglobin g/dl _____

Na+ (mmol/l) _____

K+ (mmoI/l) _____

Create (umoI/L) _____

Urea (mmoI/L) _____

APPENDIX II.

CONSENT FORM FOR STUDY PARTICIPANTS

Study Number:

Hospital Number:

NAME OF THE STUDY:

THE IMMEDIATE POSTOPERATIVE OUTCOME OF PATIENTS
UNDERGOING PROSTATECTOMY FOR BENIGN PROSTATIC HYPERPLASIA
AT KENYATTA NATIONAL HOSPITAL

Investigator

Dr. Dan Kiptoon

24 HOUR TELEPHONE CONTACT: 0722-702716

Introduction

We are requesting you to voluntarily participate in a research study. The purpose of this consent form is to give you information you will need to help you decide whether to participate in this study or not. You are free to ask any questions about what will be done, your rights as a volunteer, or anything else about the study or this form that is not clear. When all your questions have been answered, you can then decide whether to participate in the study or not.

Location of the study

The surgical and amenity wards of Kenyatta National Hospital.

Duration of the study

Your participation in the study shall be limited to the duration of your hospital stay.

Purpose of Study

The purpose of the study is to document the postoperative outcome of prostatectomy at Kenyatta National Hospital. No such information exists for patients in our country. Your participation in the study will help us generate data to design better management protocols for prostatectomy patients.

Procedure

At the time you enrol in the study, I will ask you questions about your medical history and about your family. I will also copy your pre-operative laboratory results and details about your operation from your medical records. I will also perform clinical examinations on you postoperatively, and take a urine sample for bacteriological studies. I may also request other tests e.g. chest X-ray and pus swab of the wound.

Benefits of participating in the study

Early detection of complications will benefit you in that your doctor will be informed and any such complications will be attended to early.

Risks / disadvantages of participating in the study.

There is no risk anticipated for those participating in the study.

The tests carried out in the study are those done for all patients undergoing prostate surgery.

Voluntary Participation

Your participation in this study is voluntary. You are free to decline consent or withdraw from the study at any time. You will not be penalised for declining consent to participate in the study or for withdrawing from the study: in particular, your treatment and standard of care will not be affected by any such action. Participation in the study does not entail any financial benefits.

Confidentiality

All the information obtained will be held in the strictest confidence and no information by which you may be identified will be revealed or published.

Ethical Consideration

This study has been approved by the Ethical Review Committee of the Kenyatta National Hospital.

Do you have any questions?

Do you agree to participate?

Participant

The study described above has been explained to me. I have had a chance to ask questions. I am aware that if I have further questions about the research or about my rights as a subject I can ask the investigator listed above. I understand that I am free to withdraw from the study at any time.

Having understood all the above, I voluntarily agree to take part in the study.

Signature _____ or Thumb print _____

Date: _____

Signature of investigator: _____

Name of investigator: _____

APPENDIX III
THE INTERNATIONAL PROSTATE SYMPTOM SCORE (IPSS)

	Not at all	Less than 1 in 5	Less than half the time	About half the time	More than half the time	Almost always	Patient score
1. Incomplete emptying Over the past month, how often have you had a sensation of not emptying your bladder completely after you finished urinating?	0	1	2	3	4	5	
2. Frequency Over the past month, how often have you had to urinate again less than 2 hours after you finished urinating?	0	1	2	3	4	5	
3. Intermittency Over the past month, how often have you found you stopped and started again several times when you urinated?	0	1	2	3	4	5	
4. Urgency Over the past month, how often have you found it difficult to postpone urination?	0	1	2	3	4	5	
5. Weak stream Over the past month, how often have you had a weak urinary stream?	0	1	2	3	4	5	
6. Straining Over the past month, how often have you had to push or strain to begin urination?	0	1	2	3	4	5	
7. Nocturia Over the past month, how many times did you most typically get up to urinate from the time you went to bed at night until the time you got up in the morning?	0	1	2	3	4	5+	
Total IPSS							
	Delighted	Pleased	Mostly satisfied	Mixed	Mostly dissatisfied	Unhappy	Terrible
Quality of life due to urinary symptoms If you were to spend the rest of our life with your urinary condition the way it is now, how would you feel about that?	0	1	2	3	4	5	6