SURGICAL MANAGEMENT OF BENIGN PROSTATIC HYPERPLASIA IN THE UNIVERSITY TEACHING HOSPITAL, LUSAKA

By

Dr John Sivah Kachimba BSc(HBiol), MBChB(UNZA)

A Dissertation Submitted in Partial Fulfillment of the Requirements for the award of the MASTER OF MEDICINE (SURGERY) Degree of The University of Zambia

SUPERVISOR:

Dr. M.A. Labib MD(Urology)

Lecturer in Surgery

School of Medicine

University of Zambia

Lusaka

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CERTIFICATION

This is to certify that this dissertation, titled Surgical Management of Benign Prostatic Hyperplasia in the University Teaching Hospital, Lusaka by Dr John Sivah Kachimba, is now ready for examination.

Signature of Supervisor.....HABIB.....

Date .....June 1998.....

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Signature of Candidate: _____ Date: 28/6/99

Signature of Supervisor: _____ Date: 29/6/99

APPROVAL

This dissertation of Dr. John S. Kachimba is approved in partial fulfilment of the requirements for the award of the Master of Medicine in Surgery by the University of Zambia.

Signature	Date
	28/6/99.
	28/6/99
	29/6/99

ABSTRACT

A prospective study of the surgical management of Benign Prostatic Hyperplasia (BPH) in the University Teaching Hospital (UTH), Lusaka was carried out over a period of one year (1st November 1996 to 31st October 1997). It aimed to study the efficacy of Transabdominal Ultrasonography (TAUS) in prostate weight determination in BPH and also to compare the operative outcomes of open prostatectomy and transurethral resection in the management of BPH. Eighty-two patients presenting to the Urology Clinic, in the UTH with symptoms of bladder outlet obstruction due to BPH were entered into the study. The inclusion criteria was as follows: symptoms of urinary retention or severe prostatism, (hesitancy, poor flow, intermittent stream, dribbling, frequency, nocturia , urgency, urge incontinence, enuresis), residual urine volume exceeding 100mls, age not exceeding 85 years, absence of severe medical disease and prostate gland size ranging from 30-85 grams. The details of each patient were collected and entered on a proforma designed for the study. The information collected included name, and age of the patient, file number, date of admission, evolution of disease, physical examination results of investigations, mode of surgery and outcome of surgery. Each patient underwent suprapubic transabdominal ultrasound scanning for prostatic volume determination and evaluation of any abnormalities in the urinary tract. The ultrasonography was performed by a Consultant Radiologist. With regard to the prostate, the scan evaluated shape, size, symmetry, echogenicity and volume.

Prostatic volume was determined using the formula V = 3/4 II x r3 and the weight was estimated on the fact that density of prostatic adenoma tissue is approximately equivalent to 1.00gram per millilitre. The patients were divided into two groups: 53 patients underwent open prostatectomy (49 Transvesical, 4 Retropubic) and 29 patients had TURPs. Prostatic adenomas enucleated by open operation were weighed. Prostatic weights determined from the surgical specimens were then compared with ultrasound estimated weights. Prostatic chips derived during TURP were collected and weighed.

Fifty-three patients underwent open prostatectomy: 49 Transvesical and 4 Retropubic. In these patients prostate weight was estimated by TAUS and well correlated with the surgical specimen. In this open surgery group, complications encountered included: intraoperative haemorrhage (n=1), catheter blockage (n=5), urinary retention (n=1), epididymitis (n=1), persistent vesicocutaneous fistula (n=1) and urethral stricture (n=4).

Twenty-nine patients underwent transurethral resection of the prostate. The weight of prostate tissue resected was not determined, neither was ultrasonography performed postoperatively. In this group of patients, one died in the immediate postoperative period following severe intraoperative bleeding. Other complications noted following TURP were: significant intraoperative bleeding (n=2), catheter blockage (n=5), urinary retention (n=2) and septic shock (n=1).

Both modes of surgery were found to have a comparable incidence of complications, though the postoperative hospitalisation period was shorter following TURP. Based on the comparison of prostate weight estimated by TAUS preoperatively and weights of surgical specimens obtained at open prostatectomy, TAUS appears to be an accurate method of determining the size of the prostate gland in patients with BPH.

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CONTENTS

LIST OF TABLES AND FIGURES

ABBREVIATIONS

BPH	-	Benign Prostatic Hyperplasia
CT	-	Computerised Tomography
DHT	-	Dihydrotestosterone
GnRH	-	Gonadotrophin Releasing Hormone
TAUS	-	Transabdominal Ultrasonography
TRUS	-	Transrectal Ultrasonography
TURP	-	Transurethral Resection of the Prostate.

INTRODUCTION

Benign Prostatic Hyperplasia (BPH) is a common cause of bladder outlet obstruction in Zambia where it poses a burden on the country's health services. Its treatment is expensive in terms of money and expertise, while complications arising from surgery cause great morbidity and mortality. There are different modes of treatment that have evolved for the management of the symptoms arising from BPH : watchful waiting, alpha blocker therapy, finasteride therapy and surgery. Yet irrespective of the initial degree of symptom severity, prostate surgery yields the most certain results. In the University Teaching Hospital (UTH) Lusaka, BPH induced bladder outlet obstruction is managed surgically.

The goal of surgery for BPH is to remove the obstructing mass from within the capsule. This can be removed by several methods. Selection of an open versus a closed operation depends on the surgeon's preference and skill in different approaches, size of the prostate and the associated anatomical features (such as hip immobility which may rule out lithotomy postion). or secondary disease processes (such as large diverticula).

While the proportion of prostatectomies performed transurethrally has increased worldwide; in the UTH there remains a considerable number of patients undergoing open surgery. Prostatectomy has a high operative risk because it is a major operation performed on elderly patients who frequently have complications and concurrent medical disease. Transurethral resection, the gold standard of prostate surgery, is supposed to reduce the risks of surgery. Thus over the years, with specialisation it is logical to expect a greater proportion of patients to undergo TURP. However, in the University Teaching Hospital this trend has not been seen and no publications are

available comparing the outcome of open and closed technique of prostatectomy.

It was with this in mind that we decided to investigate the surgical management of BPH in the UTH with a view of comparing the outcomes of open and closed surgery. During the course of this study we evaluated the efficacy of transabdominal ultrasonography in assessing prostate size.

OBJECTIVES

1. To evaluate the reliability of transabdominal ultrasonography in prostate weight estimation in Benign Prostatic Hyperplasia (BPH) .

2. To compare the short term operative outcomes of transurethral resection and open surgery in the management of BPH in the University Teaching Hospital (UTH), Lusaka.

RATIONALE

In the University Teaching Hospital (UTH), Lusaka, patients with BPH are managed principally by the Urology Unit of the Department of Surgery. These patients may be referrals from other health institutions in the country or local residents. Although figures of men afflicted with BPH induced bladder outflow obstruction are said to be lower in Africans, a large number of patients are seen in this unit and prostatectomies represent the major part of the Urology Unit's workload.

Needless to say specialisation improves operative results and this may well be the case with the UTH but no work has been carried out to attest to this fact. It is with this in mind that this study was undertaken to evaluate our results with prostate surgery for benign disease while at the same time comparing our performance with other centres in the subregion. This data will be useful in helping us improve on our shortcomings and consolidate good urological practice in the UTH.

LITERATURE REVIEW

The prostate, despite its small size, is one of the most disease prone organs of the human body(1). Benign prostatic hyperplasia and prostate cancer are the two primary diseases that affect this gland. BPH is a common disease among older men; statistics show that it is found in 88 percent of autopsies performed in men over 80 years, with compatible symptomatology reported in nearly 50 percent of men over 50 years in the general population(1,2). Despite the high prevalence of BPH and its impact on public health, only recently has there been interest in its epidemiology or in the natural history of untreated disease(1,3). This lack of information has been identified as one of the major reasons for the current controversies regarding indications for therapy.

The standard treatments for BPH have traditionally been surgical, such as open prostatectomy and more recently transurethral prostatectomy (TURP)(4). Later developments include therapy with alpha-adrenergic blockers, 5 alpha - reductase inhibitors, and innovative treatment approaches using hyperthermia and lasers (4,5). In a study of the impact of different therapies on symptoms of BPH, Kawachi et al (6) were able to demonstrate that men who underwent prostatectomy reported the biggest improvements in lower urinary tract symptoms. Irrespective of the initial degree of symptom severity, prostate surgery resulted in larger improvements than those reported for either finasteride or alpha blocker therapy. In this prospective, observational study, prostate surgery was associated with statistically and clinically significant improvements in BPH symptoms.

Several circumstances have combined recently to unsettle practicing urologists(5,7). For over four decades it has been widely accepted that for most men with bladder outflow obstruction requiring surgical treatment,

TURP is the best option. However, recent studies have shown that a quarter of men fail to do well after TURP(5,7,8) and that in the long term about a fifth undergo a second operation(7,8). Although conventional wisdom favours TURP over open prostatectomy for most patients, Wenneberg's study (7,8,9) evaluating outcomes indicated that open prostatectomy had better long term results measured by lower frequency of subsequent prostatectomy, urethral strictures and postoperative cystoscopy. This study found evidence for possible advantages of open prostatectomy even though this operation has been largely replaced by TURPs in the developed world(9).

There has even been a suggestion that TURP carries an excess late mortality compared with open prostatectomy(5,8). New treatment such as alpha-adrenergic antagonists, 5 alpha reductase inhibitors, intraurethral devices and balloons are emerging through and challenging TURP as standard treatment(4,5,10). This has been driven to a large extent by quality of life issues, which are major factors in the introduction of alternative treatments for BPH(9,11).

For countries in this subregion, such as Zambia, the bulk of surgery is, and will continue to be, performed by open operation and by surgeons with no specialist urological training(12). Uncomfortable as this truth may be, there is no prospect of remedying the situation in the foreseeable future, since there is a nation-wide shortage of urological departments and urologists, which will take years to put right. Nevertheless, Ahmed was able to show that even in circumstances where facilities are limited, open prostatectomy can be safe, simple and probably even economical(13). This is a finding reflected by Jumbe with his experience with prostatectomy in Zanzibar using roll gauze packing. Though no longer practiced, this old method of prostatectomy provided, under conditions where facilities and technology are limited, a

method that proved itself simple, safe, time-saving and economical(14).

Natural history and epidemiology

Urinary difficulties have presented problems to elderly men and their physicians dating back to antiquity(1). Despite its long history, BPH was not identified as a disease entity until the 19th Century and it was only during the present century that effective treatment became available. Furthermore, only in the last few decades has information regarding its epidemiology and the natural history of the disease become available.

The only risk factors that have been clearly established so far are increasing age and normal male androgenic function(3,15,16). The prostate gland is separated into two zones that are functionally independent; the central zone and the peripheral zone. These zones are separated by a transitional zone comprising glandular tissue histologically identical to that of the peripheral zone. Carcinoma occurs mainly in the peripheral zone, whereas BPH occurs in the periurethral glandular tissue of the central zone.

The prostate grows rapidly during adolescence, reaches adult size in the third decade and then grows slowly until men are in their 40's and 50's when it begins to increase progressively in size(3,15). It has also been determined that BPH increases in incidence with age, starting in the third decade of life, and becomes universal by the time a man is in his 80s or 90s(1,3,15,16).

Endocrine Pathogenesis of BPH

There is considerable evidence that BPH has an endocrine basis(10,15). Although prepubertal castration is no longer performed, it is known to have occurred in ancient societies, and the boys who had been castrated before puberty did not develop BPH as adults. Likewise, genetic diseases that impair

androgen action or production are associated with inhibition of prostate growth. Androgen ablation, by medical therapy or surgical castration, leads to shrinkage of the hyperplastic prostate. Thus there is considerable evidence from endocrine manipulations that there is a close relationship of androgens to BPH. The principal prostatic androgen is dihydrotestosterone (DHT). It has been determined that testosterone in the male foetus is critical for differentiation of the Wolffian duct into the internal male genitalia (epididymis, vas deferens and seminal vesicles). During puberty and adulthood, testosterone seems to be the critical factor in the development of the male voice, laryngeal enlargement, male sexual function, libido and sperm production. Testosterone is also required for further enlargement of the male genitalia.

DHT, on the other hand, seems to be essential for the normal foetal differentiation of the external male genitalia and the development of the prostate(10,15). A male foetus deficient in DHT will therefore not have normal differentiation of the external genitalia and will be a pseudohermaphrodite at birth. In addition, males who are born deficient in DHT have a relatively rudimentary prostate that does not become enlarged with age. The physiological role of DHT after puberty is not known, but normal circulating levels of DHT are associated with three syndromes: acne, male pattern baldness and benign prostatic hyperplasia.

Symptoms of Outflow Obstruction and the Enlarged Prostate

BPH can produce bladder outflow obstruction by two mechanisms(10,15). Mechanical (ie anatomic) obstruction of the bladder outlet by an enlarged prostatic adenoma is one. This type of obstruction occurs predominantly because of enlargement of the periurethral area (ie transitional zone) of the prostate. Gonadotrophin-releasing hormone (GnRH) from the hypothalamus

stimulates the anterior lobe of the pituitary gland to release Luteinizing hormone; which in turn stimulates the testicular Leydig cells to release testosterone. Testosterone circulates to the prostatic epithelial cells, in which, under the influence of 5alpha-reductase, it is converted to the potent androgen DHT. DHT then induces cellular hyperplasia of both the glandular and stromal components of the gland with resultant BPH. Inhibition of any step along the hypothalamic-pituitary-gonadal hormonal axis will lead to a subsequent decrease in protein synthesis by prostatic cells and shrinkage of the prostatic adenoma(3,5,10)

The second mechanism of bladder outlet obstruction is dynamic, caused primarily by the tone of smooth muscle in the bladder neck and prostatic capsule(10,15). These smooth muscle fibres are richly innervated with alpha-1-adrenergic receptors. Stimulation of these receptors leads to increased tension of the smooth muscle fibres and an increase in resistance to urinary outflow. Blockade of these receptors relaxes the smooth muscle tension of the urinary outflow tract, resulting in improvement in the patient's signs and symptoms(2,3,10).

Thus because of BPH, the outflow becomes obstructed, distorted, and rigid causing detrusor dysfunction(10,15,16). Consequently, there should be an association between BPH and symptoms of poor flow, hesitancy and poor bladder emptying. Men with irritative symptoms such as frequency, nocturia, urgency and urge incontinence are those who have developed secondary detrusor instability(5,7). In the long term, the complications of detrusor failure may occur resulting in increased residual urine, infection, stone formation and renal impairment(5,15).

Complications of Outflow Obstruction

Long term complication of BPH include both acute urinary retention and the complications of chronic urinary retention(2,5,15): chronic renal failure secondary to obstructive uropathy, serious urinary tract infection and irreversible bladder decompensation.

1. **Acute Retention**

   In studies of men undergoing prostatectomies, 25 to 30 percent had an episode of acute retention(2). It has been proposed that rather than being an end stage result of long-standing BPH, acute retention may represent an event unrelated to the severity of bladder outlet obstruction, perhaps caused in many cases by an acute prostatic infarction(2) or acute urinary tract infection. Many studies have shown the increased risk of emergency treatment of patients presenting in retention(5). Other risk factors include renal impairment, infection, age, medical problems and an inexperienced surgeon(5,7). Nevertheless, a recent study of nearly 4000 men undergoing prostatectomy from North America, 27 percent of whom had retention, reported a mortality of 0.1 percent for benign disease, and although morbidity was increased with retention, there were no excess deaths(8).

2. **Chronic Retention**

   Chronic retention, often accompanied by upper tract dilatation and renal impairment, is the most worrying complication(2,15). It is these men who have serious morbidity if operated on too soon after admission before catheterization stabilises renal function. It is clear that men can develop this complication with minimal symptoms and that the renal dysfunction may not be completely reversible. The normal rise in detrusor pressure from zero volume to full capacity is under 15cmH_2O. Patients with chronic retention who have pressure rises of less than 25cmH_2O are classified as having a low filling pressure. Those with

pressure rises above 25cmH_2O are classified as having high pressure chronic retention(17). This division of patients with chronic retention of urine enables the accurate prediction of outcome of prostatic surgery. Patients with high bladder pressures tend to do well after adequate prostatic surgery, but results in those with low bladder pressures are less satisfactory. Patients with persisting symptoms should be reassessed urodynamically, since symptoms might be due to detrusor failure rather than persisting obstruction and further prostatic surgery might lead to incontinence(7,15). It is important to identify these men early, a point in favour of routine measurement of residual urine in order to identify those at risk. A large residual urine is a sign of detrusor failure(5).

3. **Serious Urinary Tract Infection**

Like obstructive uropathy, urosepsis secondary to chronic urinary retention is a serious complication of BPH : infection doubles the risk of mortality from prostatectomy(18,19). Marshall's (18) mortality of 3.6 percent rose to 6.7 percent when a patient's urine was infected before the operation.

4. **Bladder Decompensation/Detrusor Instability**

With long-standing bladder outlet obstruction, anatomical changes such as trabeculation and diverticula formation can be seen(2). About 50 to 60 percent of men with bladder outlet obstruction have cystometric evidence of uninhibited contractions of the detrusor, so called detrusor instability(2,5). This instability correlates, at least in some studies, with the irritative symptoms of prostatism. In more than half these men this detrusor instability eventually disappears after prostatectomy(2,5,7).

In histologic studies of trabeculated human bladder tissue, fibrosis can be seen in the muscle of the obstructed bladder(2). This raises the possibility of progressive bladder decompensation among some men with BPH as part of the natural history of the disease. Such progressive

pathology might have worse symptomatic outcomes than in men who opt for early surgical treatment. Ashley, Howlett and Morris (20)were able to demonstrate that the vital factor in the management of BPH in England and Wales was prostatectomy. Of the 35 unplanned admissions who died, their study showed that 26 were not operated upon. There was a definite risk in prostatectomy, but more than a 1-in-3 risk of dying without it. Even researchers whose work supports the policy of watchful waiting for mild on moderately symptomatic patients caution that any benefits of waiting for surgery would have to be balanced against any increase in urinary tract pathology or co-morbidity that men will suffer whilst waiting as these will increase the likelihood of any adverse outcome of surgery(2,5).

Transabdominal ultrasonography in the assessment of prostatic volume and weight

Traditionally, the index finger of the Urologist has been and probably always will be the main means of evaluating disease within the prostate gland(21). With experience digital palpation can be reliable, but there are limitations. Imaging, by any means, that can reveal the intimate details of the prostate has always been an attractive idea and the application of ultrasound to the study of the prostate was inevitable(21,22). Ultrasound can assess upper tract changes, determine post voidal residuals, estimate prostatic volume, determine zonal anatomy and internal changes within the prostate(21,22,23).

There are 3 access routes (transabdominal, transurethral and transrectal) used to create good ultrasonic images of the prostate. Transabdominal scanning is the simplest method of imaging the prostate by ultrasound(21,24). The technique truly is non-invasive and requires no special equipment other than a general purpose ultrasound scanner, which is currently standard in most

hospitals. Furthermore, the transabdominal suprapubic approach has become more promising since the development of high resolution real-time sectorscanners(22). The small size of the transducer head and sector-shaped field of view has made the suprapubic examination of the pelvic organs through the full bladder, functioning as an acoustic window, much more practical and much more comfortable for the patient than transrectal or transurethral approach. Since ultrasound waves are not alternated by urine, high frequency transducers can be used, resulting in good resolution.

The prostate is one of the most suitable pelvic organs for ultrasonic examination because of its size, location and structure(21,22). Hitherto it has been thought that the suprapubic transabdominal approach to the prostate could only be useful in patients with large prostates. However, experience has shown that the prostate can be visualised in every patient; even in the child(22). This imaging route can clearly distinguish the different regions within the prostate according to their tissue composition and their susceptibility to pathological conditions such as inflammation, degeneration, hyperplasia and neoplasia(22,23).

In the evaluation of the patient with BPH, ultrasonography may be used to evaluate prostate size, shape, symmetry, echogenicity, presence of calcification and nodules. Further, prostatic volume may be determined using the formula V=3/4 IIxr3, where V is volume of the prostate, II is pi with a value of 3.142 and r is the radius of the prostate(23,25,26,27) and from this the prostatic weight may be estimated as the density of the prostatic adenoma tissue is equivalent to 1.05grams per millilitre(25,27,28).

Studies to evaluate the reliability of suprapubic transabdominal ultrasonography in assessing the size of the prostate in comparison to

transrectal ultrasonography (the gold standard) found a strong correlation in performed measurements. According to the results of these studies, suprapubic transabdominal ultrasonography appears to be as reliable as transrectal ultrasonography is assessing the size of the prostate in patients with BPH(21,29). In fact, direct comparison of CT scanning of the prostate with suprapubic transabdominal or transrectal scanning of the prostate showed the superior quality of ultrasound techniques in imaging the prostate and estimation of prostatic volume(21). In both ultrasound techniques, the volume derived weight estimates correlated well with the removed prostatic weight(29). However, transabdominal ultrasound scanning cannot match the resolution and detail of imaging achieved by the rectal route(21). Therefore transrectal ultrasound scanning would appear to be the most acceptable route to image the prostate. However, discomfort and pain may occur during the examination, resulting in faintness and syncope. Perhaps the greatest advantage of transrectal ultrasonography is the adaptability for transperineal biopsy of areas of interest in the prostate, such as suspected carcinomas, under ultrasonic guidance.

We opted to use transabdominal ultrasound because it is the modality that is readily available in the University Teaching Hospital. Secondly, though we have been using this equipment for this purpose for years, there has been no study to attest to its reliability in our unit.

Outcome of prostatectomy

Mortality

An excess death rate has been found in the long term in men undergoing transurethral prostatectomy, particularly those presenting with urinary retention(5,8). The reasons remain obscure. A study of 54,000 men in Denmark, Canada and England found that there appeared to be a 1.5 to 2 fold excess risk of death from cardiovascular disease at 90 days, 1,5 and 8 years after TURP compared with open operation(8). This trend was supported in the fittest cohort of men studied in Manitoba, Canada where in virtually all strata and after controlling for age, the relative risk of death was elevated among patients undergoing transurethral prostatectomy as compared with those undergoing open prostatectomy.

Relief of symptoms

For most patients, prostatectomy works well in reducing the symptoms of prostatism in the year following surgery(11). The improvement reported by patients is far in excess of that observed among patients who receive no treatment(6,11). The operation is particularly effective for the most severely symptomatic (11).

Symptoms are not improved for all patients, however. Those who are only mildly symptomatic prior to surgery do not experience much symptomatic improvement as a result of surgery. Long-term incontinence is a persistent problem for about 4 percent of patients who had not had any such previous problem, and 5 percent of men who report themselves sexually active prior to the operation are unable to have an erection during the year after surgery(5,11,30).

Reoperation after prostatectomy

The rate of reoperation is a crude indicator of poor outcome and patient dissatisfaction. One in 5 men after TURP undergoes repeat prostatectomy after 8 years: a rate which is 3 to 5 times in excess of that found after open operation(5,8). The more complete removal of prostatic tissue during an open prostatectomy provides a reasonable explanation for the decreased frequency of cystoscopy and reoperation after the procedure as compared with TURP. It is not known whether these men get better after their second operation nor is the extent of the repeat operation determined.

It is often assumed that these men have undergone an incomplete TURP and might have been better served by an open operation(8). Unfortunately, issues are more complex than that and reasons for the high rate of revision uncertain. It may be surgeon-related and a result of an imperfectly performed operation(7). It may be limited to the larger gland which might be better treated by open operation. Conversely it may be more common in very small glands which might be subject to subsequent bladder neck stenosis and might have been better treated by bladder neck incision.

It is possible that a significant number of men who experience a poor outcome after prostatectomy probably do so because of unsatisfactory selection : some of them undergo an unnecessary, not an imperfectly performed operation(5). Thus in order to decrease the number of men with poor outcome after operation, we need a way of improving selection for prostatectomy.

PATIENTS AND METHODS

This was a prospective study carried out in the Urology Section of the Department of Surgery of the University Teaching Hospital in Lusaka. This hospital caters for the population of Lusaka and serves as the tertiary referral institution for the whole of Zambia. The study was carried out for a period of one year from 1st November 1996 and involved patients managed by one of the two Urology Units.

Patients

Subjects were men presenting to the Urology Clinic with Benign Prostatic Hyperplasia and selected for surgical treatment. They were drawn from all over the country; a fact that made long term follow up difficult.

Patients were included in this study if they met the following criteria;

1. Symptoms of urinary retention or severe prostatism (hesitancy, poor flow, intermittent stream, dribbling, frequency, nocturia, urgency, urge incontinence, enuresis).
2. Residual urine volume exceeding 100mls.
3. Age not exceeding 85 years.
4. Absence of severe medical disease.
5. Prostate gland size ranging from 30 - 85 grams.

Preoperative evaluation

Prior to hospitalisation, the patients were seen in the Outpatient Clinic where a general physical examination, including a careful rectal palpation of the prostate, was performed. Cystoscopy was also performed where prostate enlargement was confirmed, bladder wall changes documented and residual urine volume measurements made. A urinalysis was also carried out. Before surgery routine laboratory tests such as haemoglobin estimation, white cell

count, serum electrolyte, urea, serum creatinine and blood typing were mandatory. Each patient underwent suprapubic transabdominal ultrasound scanning for prostatic volume determination and evaluation of any abnormalities in the urinary tract. With regard to the prostate, the scan evaluated shape, size, symmetry, echogenicity and volume. Prostatic volume was determined using the formula V = 3/4 II x r3 and the weight was estimated on the fact that density of prostatic tissue is approximately equivalent to 1.05 gram per millilitre.

The patients were divided into two groups: 53 patients underwent open prostatectomy (49 Transvesical, 4 Retropubic) and 29 patients had TURPs. Prostatic adenomas enucleated by open operation were weighed. Prostatic weights determined from the surgical specimens were then compared with ultrasound estimated weights. Prostatic tissue derived during TURP were collected and weighed.

The operations

1. **Transurethral Resection of the Prostate**

   The intraoperative routine included the use of size 27 resectoscope sheath and distilled water for irrigation. Strips of prostate adenoma tissue were cut from the bladder neck down to the level of the veramontanum. Cutting was performed by a high frequency diathermy current which is applied across a loop mounted on a hand held trigger of the resectoscope. Coagulation of the bleeding points was achieved and the 'chips' of prostate were then removed from the bladder using an Ellik evacuator. At the end, careful haemostasis was performed and a 2 way self retaining catheter was introduced. The bladder was irrigated with isotonic saline via a trocar introduced suprapubic catheter. Irrigation was continued till the outflow was pale pink and the

catheters removed on the 2nd or 3rd postoperative day.

2. **Retropubic Prostatectomy**

Using a low curved transverse suprapubic Pfannenstiel incision, which included the rectus sheath, the recti were split in the midline and retracted to expose the bladder. With the patient in the Trendelenburg position, the bladder and prostate were separated from the posterior aspect of the pubis. In the space thus obtained, the anterior capsule of the prostate was incised with diathermy below the bladder neck. Care was taken to obtain complete control of bleeding from divided prostatic veins. The prostatic adenoma was exposed and enucleated with a finger. The good exposure of the inside of the prostatic cavity allowed control of haemorrhage which was achieved with diathermy and suture ligation of bleeding points before closure of the capsule over a Foley catheter (inserted per urethram) draining the bladder. Irrigation of the bladder was achieved by suprapubic catheter.

3. **Transvesical Prostatectomy**

The bladder was exposed via a Pfannenstiel incision and opened extraperitoneally through a vertical incision. The prostate was enucleated by putting a finger into the urethra, pushing forwards towards the pubes to separate the lateral lobes, and then working the finger between the adenoma and the false capsule. Haemostasis was achieved by packing the prostatic fossa for approximately 5 minutes as well as applying haemostatic suture ligatures at 4 and 8 o'clock positions. The bladder wall was closed after inserting a urethral catheter, a suprapubic catheter for irrigation and a retropubic drain.

Post operative evaluation

Post operative progress was monitored on a daily basis on the ward and complications arising were recorded. At one month review the patients'

symptoms were reassessed and quality of life evaluated. Unfortunately, further long term reviews proved difficult as most patients were lost to follow up as they were referred from distant parts of Zambia.

RESULTS

1. Age

The age distribution of patients is shown in figures 1 and 2. The majority of patients were aged between 60 and 80 years.

2. Indications for Surgery

Tables 1 and 2 summarise the indications for surgery in the different age groups for both study groups. It shows that the majority of patients undergoing open surgery, 88.6% presented with retention while in 6 patients (11.4%) prostatism was the indication for surgery. In the TURP group; 11 patients (37.9%) presented with retention while 18 (62.1%) had symptoms of prostatism.

3. Correlation between Estimated weight and Actual weight of surgical specimen.

In the Open Surgery group, the weight estimated from ultrasound derived prostatic volume measurements correlated well with the prostatic weight as determined from the surgical specimens. (Kruskal-Wallis H = 42.087, df = 11, p value = 0.000). These are tabulated in Table 3.

4. Complications

The incidence of complications is given in Table 4 and specified in Table 5.

(a) **Operative Mortality**

There was one death in the 29 TURPs (3.5%) and none in the 53 open cases. The cause of death was haemorrhagic shock resulting from uncontrolled bleeding following resection.

(b) **Intraoperative Haemorrhage**

Intraoperative haemorrhage necessitating transfusion complicated 2 TURPs while it occurred in one open case.

In one TURP, severe haemorrhage led to curtailing of

further resection. This patient required reoperation later.

(c) **Catheter Blockage**

This complicated 5 TURPs (17.2%) in the immediate postoperative period and 5 patients (9.4.%) who had open prostatectomies.

(d) **Urinary Retention**

Following removal of catheters, urinary retention complicated 2 TURPs (6.9%) necessitating admission. In one patient this was relieved by evacuating obstructing prostatic tissue and in the second patient recatheterization was needed. In the open cases, one patient (1.9%) developed urinary retention that was relieved after catheterisation.

(e) **Infection following Prostatectomy**

Epididymitis occurred in one patient (1.9%) following open surgery. None was recorded in the TURP group.

Septic shock occurred in one patient after TURP (3.4%) and on admission large quantities of infected, necrotic prostatic chips were evacuated from the bladder. He responded to high doses of intravenous antibiotics and had to be hospitalised for 28 days.

Wound infection following open surgery occurred in 11 patients (20.8%) of the 53 cases.

(f) **Abdominal Fistula**

A persistent vesico-cutaneous fistula complicated one open case (1.9%) following removal of a suprapubic catheter. This was managed conservatively with urethral catheterization till spontaneous closure.

(g) **Urethral Stricture**

This was a complication limited to open surgery in this study. It was noted in 4 patients (7.5%), these patients responded

to a few dilatations in the postoperative period.

5. **Hospital Stay**

The average stay in hospital for patients who had open prostatectomies was 10.1 days. In the TURP group, the average stay in hospital was 4.53 days (when the patient who developed septic shock is excluded: average hospital stay falls to 3.67 days)

TABLE 1:: Age distribution and indication for surgery

OPEN PROSTATECTOMY

AGE GROUP	INDICATIONS			
	RETENTION		PROSTATISM	
	N	%	N	%
50-70	30	(56.6)	5	(9.4)
ABOVE 70	17	(32)	1	(2.0)
TOTAL	47	(88.6)	6	(11.4)

(Figures enclosed in brackets represent percentages of the total number of patients undergoing open prostatectomy i.e 53 patients)

TABLE 2: Age distribution and indication for surgery - TURP

AGE GROUP	INDICATIONS			
	RETENTION		PROSTATISM	
	N	%	N	%
50-70	10	(34.5)	13	(44.8)
ABOVE 70	1	(3.5)	5	(17.2)
TOTAL	11	(38.0)	18	(62.0)

(Figures enclosed in brackets represent percentages of the total number of patients undergoing TURP i.e 29 patients)

Fig 1: Age distribution -Open Surgery

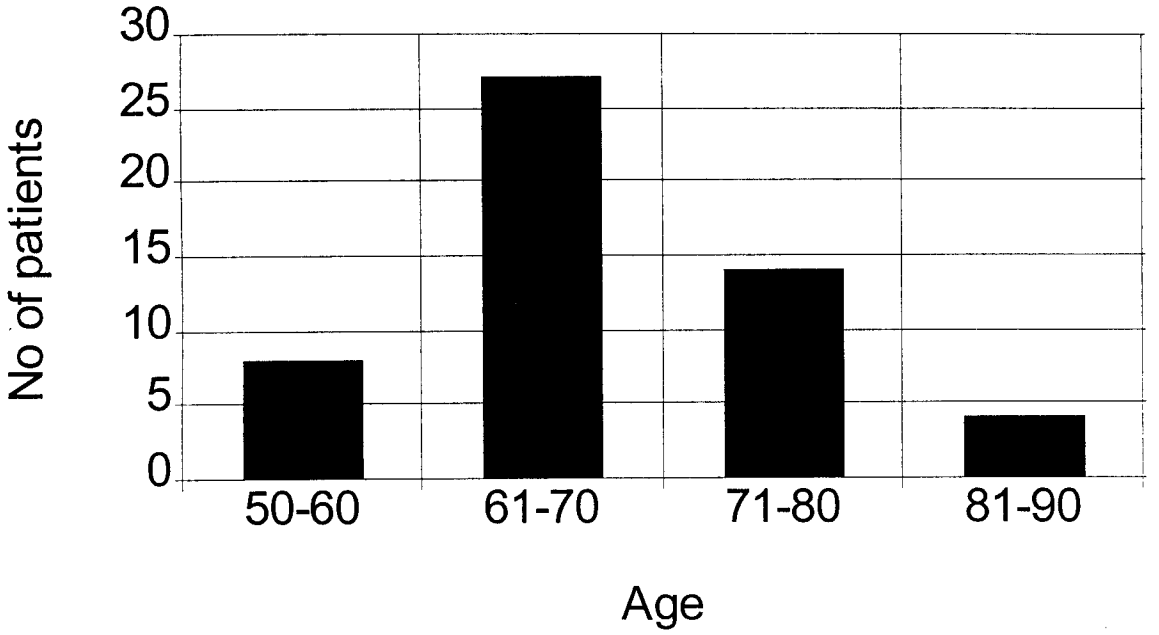

Fig 2: Age distribution - TURP group

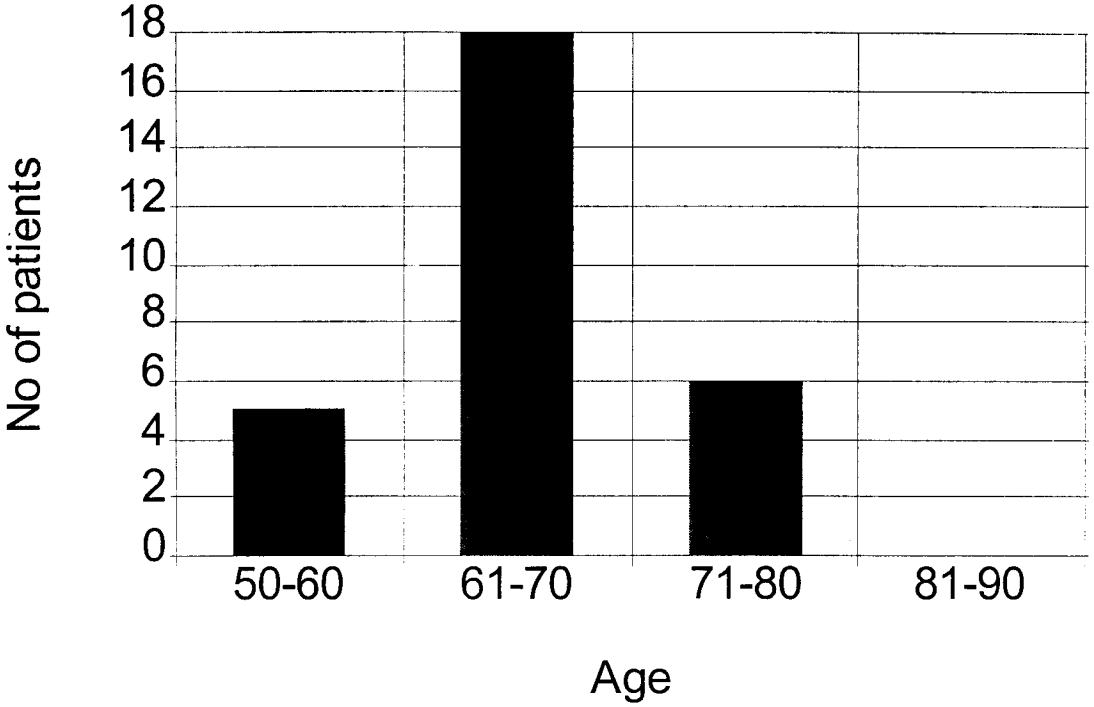

Table 3: Correlation between Estimated Weight and Actual Weight of Surgical specimen

PATIENT NO	ETSIMATED WEIGHT (grams)	ACTUAL WEIGHT (grams)	DIFFERENCES
1	49	45	4
2	44	45	-1
3	59	48	11
4	46	48	-2
5	41	40	1
6	60	65	-5
7	73.7	70	3.7
8	48.8	50	-1.2
9	54	50	4
10	48.4	45	3.4
11	50.6	45	5.6
12	51.3	48	3.3
13	39	35	4
14	42.6	40	2.6
15	51.9	48	3.9
16	43	40	3
17	42.6	No Specimen Weight	-
18	46.5	43	3.5
19	37.5	35	2.5
20	40	40	0
21	40.9	40	0.9
22	42.9	40	2.9
23	48.4	45	3.4
24	54	50	4
25	43.8	40	3.8
26	43.6	40	3.6
27	48.6	45	3.6
28	42.8	40	2.8
29	40.6	40	0.6
30	49.3	45	4.3
31	45.6	45	0.6
32	49.8	40	9.8
33	51.9	45	6.9
34	47.1	45	2.1
35	48.7	45	3.7
36	49.4	46	3.4
37	51.9	50	1.9
38	58	55	3
39	49.3	45	4.3
40	54.4	50	4.4
41	50.8	50	0.8
42	55.5	50	5.5
43	52.7	50	2.7
44	54.3	50	4.3
45	61.5	60	1.5
46	58.6	55	3.6
47	55.7	50	5.7
48	54.8	52	2.8
49	52.7	50	2.7
50	48.9	46	2.9
51	51.9	50	1.9
52	50.6	48	2.6
53	48	45	3

TABLE 4: COMPLICATIONS

	OPEN SURGERY	TURP
INTRA OPERATIVE Bleeding Haemorrhage	1	2
POST OPERATIVE		
Catheter Blockage	5	5
Abdominal fistula	1	-
Bleeding	-	-
Epididymitis	1	-
Septic shock	-	1
Urethral Stricture	4	-
Wound infection	11	-
Reoperation	-	1
Urinary Retention	2	2
Death	-	1

DISCUSSION

Benign Prostatic Hyperplasia is a common surgical problem in developing countries(13). Jumbe's work in Tanzania (14) has shown that the highest age incidence of BPH is in the seventh decade of life in Africans in that region. This is a fact borne out in our study where the majority of patients were in the 60 to 80 year age range. The average ages in the two groups; 66.1 years for TURP group and 68.3 years in the Open Surgery group is in agreement with other series in Africa and most Western series (7,10,19,31). The majority of patients were managed by open prostatectomy 53 patients (64.6%) as opposed to TURP 29 patients (35.4%). This lower incidence of transurethral operations reflects the fact that the majority of these cases were performed with and for the benefit of General Surgical Registrars in training. It may also be a reflection of the difficulties that exist in our institution where there is a shortage of endoscopic equipment. This is a situation that is presently pertaining in most of the Sub-Saharan African countries where the bulk of prostatic surgery is, and will continue to be, performed by open operation and by surgeons with no specialist Urological training (12). Sach and Marshall (19) reported a similar situation in an Australian Teaching Hospital in the seventies where 84 percent of patients underwent open operations that were performed by General Surgeons. The one obvious drawback with transurethral resection is that it is not an operation for the occasional endoscopist(12,32), this technique requires protracted apprenticeship and a dedication to the speciality of Urology.

Indications for Prostatectomy

The indications for prostatectomy in this study were retention of urine in 58 patients (70 percent) and severe prostatism in 24 patients (29.3 percent). Similar figures were reported from Tanzania where study showed that all

patients in Jumbe's series were admitted as urgent cases with retention of urine(14). In Zimbabwe a study of prostatic surgery in Bulawayo revealed that 88.8 percent of patients presented in urinary retention(12); a fact that is reflective of virtually all African series. Many Western series on the other hand have lower number of patients presenting in retention. In a British study evaluating TURP, Chilton et al found that approximately 34.5 percent of their patients presented in retention(32). Similarly, MacKenzie in a large American series spanning seven years, found that 32 percent of patients were admitted to hospital in acute retention(33). Sach and Marshall in a survey of prostatectomies performed in an Australian Teaching Hospital found that approximately 51 percent of patients presented in retention(19). Luttwak et al found that 54 percent of patients in their Israeli series presented in retention(34).

Studies have shown that men in their 5th, 6th and 7th decade of life have a significant increase in hesitancy, intermittent or weak stream, nocturia and urge incontinence, but many see these symptoms as part of normal ageing (5). Thus most patients, especially those from developing countries like Zambia who have poorly developed health-seeking practices, will only seek surgical intervention when urgent symptoms such as urinary retention supervene. This feature may well explain the high proportion of patients in our study who presented with retention of urine.

Transabdominal Ultrasonography for Estimation of Prostate Size

In the investigation of bladder outlet obstruction due to prostatic disease; accurate measurement of the size of the prostate gland is important so that the best operation is selected. Difficulties can arise at open operation when the gland is found to be much smaller than expected. On the other hand, if the

size is underestimated, a prolonged endoscopic resection may be undertaken with all its attendant risks (24). Transabdominal Ultrasonography is an accurate method of determining the size of the prostate gland irrespective of whether the gland is grossly enlarged or only slightly enlarged (24). In this study, there was a close correlation between size determined by ultrasonography and actual size as determined by weighing the surgical specimens. This concurred with results from other researchers on this investigative modality such an Miller at al (24), Clements (26) and Prassopoulos(29). In all these studies, transabdominal prostatic ultrasound, which is nearly universally available, was found to provide excellent anatomical information regarding prostatic enlargement. Using the urine-filled bladder as an acoustic window, prostatic size, volume (and hence weight derived), shape and intravesical extent could be determined accurately (22,27) as was shown in our study. One major advantage of this procedure is the non-invasive nature of transabdominal ultrasonography(21) which was carried out without discomfort to the patient.

Admittedly, the adenoma removed at operation does not represent the total amount of prostatic tissue and for this reason our findings may not be as accurate as they seem. However, even with this reservation we believe that we have demonstrated that transabdominal ultrasonongraphy is a most accurate method of determining prostate gland size and can be used effectively in this institution.

Fifty-two of the 53 patient who underwent open surgery had the weight of their surgical specimens determined; the average weight being 46.7 grams. This was consistent with the criteria set for inclusion in this study. In contrast, among patients who under went TURP the amount of prostate tissue recovered weighed much less than expected from ultrasound estimates. The expected

average in this group was 39.2 grams, but the average obtained at actual resection was 19.3 grams. A number of reasons may explain this finding as it has been observed by other researchers. In an anatomical study by Shah et al (35), it was found that in most patients one can expect at least 10-20 percent of the prostate to lie inferior to the verumontanum. Urodynamic studies suggest that resectionists leave this part of the prostate unresected. A study of post prostatectomy problems suggests that unresected adenoma may protect some patients from stress incontinence. It might be added that not all the chips from a TURP find their way into the specimen jar and may remain within the bladder. Resection itself tends to make the chips lose weight by desiccation(36). Lund and Dingsor (31) estimated that the weight of resected tissue had to be increased by 30-40 percent in order to compensate for the weight loss due to the "cooking effect" on the tissue by the electrical current.

COMPLICATIONS

Operative Mortality

There was one death attributable to TURP arising as a consequence of massive intraoperative haemorrhage. A mortality rate of 3.5 percent for TURP and no mortality in the open prostatectomy group. This TURP mortality rate compares unfavourably with other studies: Kanyi and Eshleman (0 percent), Lund and Dingsor (0.37 percent), Muguti and Wolukau-Wanambwa (2.9 percent), Chilton et al (1.0 percent) and MacKenzie (0.4 percent) (37,31,12,32,33). Our mortality rate fares even poorer when one notes that in the series quoted TURP was used in study populations where a significant proportion were old and had coexisting complicating cardiopulmonary disease. A feature that was eliminated in our study.

Intraoperative Haemorrhage

Significant haemorrhage is encountered during prostatectomy, especially open surgery. However, in our study open prostatectomy was complicated by

significant intraoperative bleeding in one patient (1.9 percent) as opposed to 2 patients (6.9 percent) during TURP. This is in contrast to virtually all series reviewed. Mallaya reported a high rate of blood transfusion during and after open prostatectomy and reported that it reflected the amount of bleeding encountered during open surgery(38). Kanyi and Eshleman on the other hand had a low complication rate in their TURP study and found no need for blood transfusion(37).

However, one study that reported significant problems with operative haemorrhage was MacKenzie's seven year review of TURP at Long Beach Memorial Hospital in New York. In this study 3 patients (1.2 percent) were returned to the operating theatre for control of bleeding on the day of the operation, and needed blood transfusion(33). In all these patients prostates resected weighed over 100 grams and were larger than those for patients in our study. Studies assessing both intraoperative and postoperative blood loss have demonstrated that intraoperative loss is related to both the weight of the resected gland and duration of resection(39). Unfortunately, our study did not record duration of resection as this may explain the observed incidence of bleeding in the TURP patients. A cardinal rule that should always be borne in mind when performing a TURP is that haemostasis should be secured in an area of resection before resection in another area is begun(40). If this is not done, bleeding from multiple sites will obfuscate the operative field and worsen haemorrhage.

Clot Retention

Clot retention complicated 5 open cases (9.4 percent) and 5 TURP cases (17.2 percent). Our system of bladder washout by urethral and suprapubic catheters which should have provided a simple solution to this problem proved rather less effective than expected. This is in contrast to Materu's assertions that this

system proved very efficient in his open prostatectomy series where 10.3 percent of patients had clot retention(41). When it did occur, the suprapubic catheter provided an immediate alternative outlet for urine and the drainage system was simply reversed so that the washout saline run in through the urethral catheter and cleared the clot through the suprapubic catheter.

Abdominal Fistula

Some leakage of urine is inevitable immediately after removal of the suprapubic catheter but usually clears within two days. One patient (1.9 percent) had leakage for up to 7 days following open surgery which was managed conservatively with prolonged urethral catheterization. This is comparable to studies in Tanzania where fistulae were noted in 3.5 percent of patients following open surgery(41). In their comparative study of TURP and Open Surgery, Lund and Dingsor reported abdominal fistulae formation in 4.5 percent of patients after open surgery. In all these series, this complication was managed conservatively with good results.

Epididymitis

Epididymitis is a well recognised comparatively minor complication of prostatectomy the incidence of which appears to be falling (30). The cause of epididymitis is probably the retrograde flow of urine, with or without infection, down the vas deferens. The decreasing incidence may be due to improved antibiotics, catheters, instruments and surgical techniques which leave the verumontanum and ejaculatory ducts undisturbed. Prophylactic preoperative vasectomy was undoubtedly a worthwhile procedure 30 years ago; whether it is still necessary is questionable. It is not practised in the University Teaching Hospital, Lusaka. Epididymitis complicated one open case (1.9 percent) in our study and none of the TURPs performed. This compared favourably with series reviewed from East Africa (17.2 percent of

open cases), Norway (0.8 percent of TURPs and 10.5 percent of Open cases) and America (3.4 percent of TURPs) (41,31,33).

Wound Infection

The complication which gives us most concern was the high rate of postoperative wound infection. Our wound infection rate of 20.6 percent of open prostatectomies was comparable to that reported in Mallaya's series (18.3 percent), but less than figures in a Bulawayo study (33.3 percent of open cases) (38,12). Fortunately, serious sequelae of infection were rare and septic shock occurred in only one patient following TURP (1.9 percent). This rate of Septicaemia was consistent with that of Chilton et al who reported rates of 1.8 percent in TURP cases and 1.9 percent in open cases(32).

The question of whether systemic antibiotic prophylaxis is advisable following prostatectomy in patients with sterile urine is as yet unresolved. Antibiotic therapy was only instituted when signs of infection manifested. This practice is in agreement with findings of Quist et al that in view of the relatively low risk of infection and the few side effects of the infections that occur prophylactic treatment was not indicated in patients with sterile urine (42). Their study concluded that infection was principally due to catheterization and dependent on catheter care.

Postoperative Urethral Stricture

In this study, urethral stricture not present preoperatively was evident in 4 patients following open surgery (7.6 percent) and in none of the TURP patients. This was higher than the figures reported by Mallaya (2.2 percent) and Chilton et al (5.7 percent temporary and 3.8 percent permanent strictures) following prostatectomy (32,38). The incidence of stricture reported in our study may even be high as only patients who had symptoms were investigated

by passage of a bougie.

Acute Retention of Urine

Four patients were readmitted with acute retention of urine following removal of urethral catheters : 2 patients in each group (3.8 percent of open cases and 6.9 percent of TURPs). In the patients who had retention following open prostatectomy no actual explanation was found and they responded to a further period of catheterization. In the 2 patients with post TURP retention; one was found to have prostatic chips obstructing the urethra and was managed by evacuating these remnants from the urethra and bladder. In the second patient, cystoscopy revealed that a large portion of the prostatic adenoma was left unresected. This patient underwent a second prostatectomy. Muguti and Wolukau-Wanambwa reported that only one patient among 266 resections (0.4 percent) went into retention after surgery but did not elucidate reasons for this complication (12). Their superior results reflect their greater experience with TURP.

Reoperation

As stated above only one patient in this study had to have another prostatectomy following TURP (1.9 percent). This figure fares poorly against larger, longer running series in this subregion where reoperation rate following TURP were much lower; Muguti and Wolukau-Wanambwa (0.4 percent) and Kanyi and Eshleman (0 percent). It however is comparable to other series that recorded high rates of reoperation following TURP for BPH : Singh et al (2.8 percent), Matani et al (4.2 percent) and MacKenzie (4.5 percent) (36,43,33). In our study, incomplete removal of tissue on the first occasion was the result of profuse intraoperative bleeding and in this instance the patient had to have residual tissue removed later by transvesical prostatectomy. The need for subsequent repeat resection is one of the more

common criticisms of transurethral prostatectomy (33).

Hospital Stay

An obvious advantage of endoscopic resection over open prostatectomy noted in this study was the shorter postoperative hospitalisation period. We recorded average hospital stays of 4.5 days after TURP and 10.1 days following open prostatectomy. The average stay after TURP was significantly increased by the patient who developed Septic Shock. He had to be hospitalised for 28 days (when excluded from the TURP group average hospital stay falls to 3.7 days). Nonetheless, these figures compared well with other series such as Singh et al (8 days after TURP and 18 days for Open prostatectomy), Muguti and Wolukua-Wanambwa (5.4 days for TURP and 10.8 days for Open prostatectomy) and Mallaya (12 days for open prostatectomy) (36,12,38). This is an important consideration in the present stringent economic climate.

CONCLUSIONS

From this study the following conclusions can be drawn:

1. Transabdominal Ultrasonography appears to be an accurate method of determining the size of the prostate gland in patients with BPH.
2. The main indication for prostatectomy in patients with BPH was retention of urine as most patients presented with this acute symptom and invariably received priority over the large number of BPH patients presenting with other symptoms.
3. The majority of patients with BPH induced bladder outlet obstruction were managed by Open prostatectomy rather than TURP because of the inadequate supply of endoscopic equipment and theatre facilities.
4. During prostatectomies haemorrhage was encounted in both Open Surgery and TURP with no significant difference in the two techniques.
5. There was a high rate of postoperative wound infection following open surgery for BPH.
6. The incidence of other complications was comparable in both groups. The significant advantage of TURP noted in this study was a shorter postoperative hospitalisation period.

RECOMMENDATIONS

1. Both endoscopic and open techniques of prostatectomy should be advocated in the training of local surgeons.

2. It is recommended that efforts are made to improve the supply and quality of endoscopic equipment in the UTH, Lusaka. The equipment supply should include the appropriate teaching aids to help train surgeons in endoscopic surgery. This will bring about a new generation of urological specialists who will be able to competently provide this service on a wider scale. Only then will the country enjoy the full benefits of endoscopic surgery in Urology.

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APPENDIX

BPH STUDY - DATA ENTRY FORM

NAME:_____ FILE NO. _____

AGE: _____ PROJECT NO. _____

I SYMPTOMS/DURATION

_____ INCOMPLETE EMPTYING ___ ___ WEAK STREAM

_____ FREQUENCY (D:N RATIO) ___ ___ HESITANCY

_____ INTERMITTENCY _____ _____ HAEMATURIA

_____ URGENCY _____ RETENTION

II PAST MEDICAL HISTORY _____

III PHYSICAL FINDINGS:

GENERAL _____

ABDOMEN/GENITALIA: _____

P/R - PROSTATE: SIZE ____ G SYMMETRY _____

CONSISTENCY ____ NODULES _____

SURFACE _____

IV INVESTIGATIONS:

URINE: MICROSCOPY _____

CULTURE _____

RENAL FUNCTION TESTS: Na+ _____ K+ _____

Cl ___ Urea ___ Creat _____

FBC RESULTS: _____

KUB REPORT: _____

PRE-OP RESIDUAL VOLUME: _____

CYSTOSCOPY FINDINGS:_____

U/S REPORT : KIDNEY _____ BLADDER _____

PROSTATE _____

PROSTATIC VOLUME _____

ESTIMATED WEIGHT _____

V. OPERATION : DATE _____ SURGEON _____

TYPE ____ OPEN _____ CLOSED _____

IF OPEN: APPROACH _____ TRANSVESICAL _____

RETROPUBIC _____

A. PEROPERATIVE COMPLICATIONS:

___ HAEMORRHAGE __ DURATION __ TRANSFUSION __

___ HYPOTENSION

___ PERFORATION OF PROSTATE CAPSULE :

LAPAROTOMY _____

___ OTHERS : SPECIFY _____

B. POSTOPERATIVE COMPLICATIONS :

___ HAEMORRHAGE _____ VESICO-CUTANEOUS FISTULA _____

___ ABDOMINAL DISTENSION _____ URINARY INCONTINENCE DURATION _____

___ BLADDER DISTENSION/ATONY _____ URINARY RETENSION _____

___ CATHETER BLOCKAGE ___ URETHRAL STRICTURE

___ WOUND INFECTION ___ BLADDER NECK STENOSIS

___ BLADDER NECK PERFORATION ___ EPIDIDYMITIS,

TREATMENT _____

___ OTHERS, SPECIFY _____

_____

VI OUTCOME _____ DISCHARGE DATE _____

POST OP RESIDUAL VOLUME _____

DEATH DATE _____

VII HISTOLOGY _____

SPECIMEN WEIGHT _____

VIII REMARKS _____

_____

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