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Original article

A RETROSPECTIVE REVIEW OF OPEN PROSTATECTOMY IN A RESOURCE-CONSTRAINED SETTING.

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Abstract

Background:

Open prostatectomy is an important treatment modality for prostate disease in resource-constrained settings, where access to minimally invasive surgery is limited. We conducted a review of open prostatectomies at a South African hospital.

Methods:

We reviewed the medical charts of 54 patients who underwent open prostatectomy at St. Aidan's Hospital in South Africa between 2015 and 2019. Data collected for each patient included demographic characteristics, comorbidity, prostate-specific antigen measurements, prostate volume measurements, preoperative catheterisation, indication for surgery, surgical approach, duration of surgery, postoperative length of stay, histological findings, and postoperative Clavien-Dindo complications. We analyzed the collected data with descriptive statistics.

Results:

The median age was 68.5 years old. Most patients were Black Africans (57.4%). Hypertension was the most common comorbidity (50.0%). Most patients (83.4%) had prostate-specific antigen levels of 10 ng/mL or less, and prostate volumes of 60-100 mL (57.4%). Preoperative catheterisation was common (77.8%). Lower urinary tract symptoms and failed medical therapy (74.1%) was the most frequent indication for surgery. All patients had surgery via the suprapubic approach, with surgery lasting >120 minutes for two-thirds of patients. Postoperative length of stay was 6-9 days for nearly half of the study sample (48.1%). Almost all patients had a histological diagnosis of benign prostate hyperplasia (94.4%). Postoperative complications were frequent and mostly minor (infection or blood transfusions).

Conclusion:

We confirm that open prostatectomy is still a relevant, safe, and effective method for managing prostate disease in resource-constrained settings.

Recommendation:

Open prostatectomy still be considered a primary treatment modality for prostate disease in developing countries until minimally invasive methods become more widely available.

Keywords: Open prostatectomy, Benign prostate hyperplasia, Prostate cancer, South Africa,
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1. Background

Prostate disease is an important cause of morbidity and mortality in males worldwide. The global prevalence of benign prostate hyperplasia increased by 70.5% between 1990 and 2019 [1], and absolute disability-adjusted life years associated with this condition increased substantially in low- and middle-income countries during the same period [1]. Prostate cancer was ranked as the second most important cancer amongst males worldwide in 2012, with an estimated 1.2 million new cases and nearly 308000 associated deaths reported in that year [2]. Furthermore, prostate cancer was the fourth most important cancer in terms of new cases and the sixth most important cancer in terms of deaths amongst males in the developing world in 2012 [2]. Urologic surgeons in high-income countries have mostly abandoned the use of open prostatectomy for treating benign prostate hyperplasia and prostate cancer in favour of minimally invasive enucleation surgical techniques [3]. However, there are circumstances under which open prostatectomy is still utilized. This includes scenarios in which there might be patients in whom the prostate mass is too large and minimally invasive surgery is technically impossible [4], or settings in which there are insufficient resources to support the adoption of minimally invasive surgical methods to treat prostate disease [5, 6]. The latter scenario is a crucial hindrance to prostate disease management in resource-constrained countries, including South Africa. A lack of equipment and limited training opportunities are cited as barriers to the adoption of endoscopic surgery in South Africa [7]. Surveys of surgeons from other low- and middle-income countries also confirm the lack of equipment and limited training opportunities as barriers to the adoption of endoscopic surgical methods [8]. Such barriers are unlikely to be addressed in the short term, and open prostatectomy will remain the first-choice surgical modality for treating prostate disease in resource-constrained countries for the foreseeable future. Given the current and future relevance of open prostatectomy for treating prostate disease in resource-constrained countries, studies involving this surgical procedure are necessary to identify potential areas for ongoing quality improvement. We conducted a review of open prostatectomies at a South African regional hospital with the aim of establishing the contemporary relevance of this treatment modality in a resource-constrained setting.

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2. Methodology

2.1. Study design and setting:

This was a retrospective review of medical charts for patients who underwent open prostatectomy at St. Aidan's Hospital between 2015 and 2019. The St. Aidan's Hospital is a public-sector facility located in the province of KwaZulu-Natal, South Africa. The hospital is a mid-tier facility in the South African four-tier hospital system and is a referral hospital for urology services to other facilities in the eastern region of the province. The drainage areas of the Urology Department at St. Aidan's Hospital include hospitals in the eThekwini, Ugu, and iLembe Municipalities such as King Edward VII Hospital, Wentworth Hospital, Prince Mshiyeni Memorial Hospital, Addington Hospital, Mahatma Gandhi Hospital, RK Khan Hospital, King Dinizulu Hospital, St Mary's Hospital, Stanger Hospital, GJ Crookes Hospital and Port Shepstone Hospital.

2.2. Study sample:

The study sample comprised 54 adults (>18 years old) consecutive patients who underwent open prostatectomy during the study period. These patients were identified for inclusion in the study from the theatre slate records for urology at the institution. Patients with missing demographic/risk factor data and missing postoperative inpatient outcomes data were excluded.

2.3. Patient management:

The treatment options for benign prostatic hyperplasia (BPH) vary from pharmaceutical interventions, such as alpha-blockers or 5α-Reductase

inhibitors, to minimally invasive procedures, like Transurethral Resection of Prostate (TURP), and the more invasive open prostatectomy. Surgical therapy is typically recommended for patients who fail to respond to or cannot tolerate pharmaceutical treatments. For patients requiring surgery, international guidelines recommend considering open simple prostatectomy as the preferred surgical option for those with prostate gland volumes greater than 80mL. Advancements in surgical treatment options for prostate disease have led to a revolutionary shift towards minimally invasive techniques, such as laparoscopic prostatectomy and robotic-assisted prostatectomy, which are now commonly used in well-resourced settings. Studies indicate that these modalities result in lower blood transfusion rates and shorter hospital stays. However, there is currently no compelling evidence to support one modality over the other in terms of overall benefits. Therefore, traditional open surgical methods, which are frequently employed in resource-limited settings, remain a valuable treatment option for prostate disease.

2.4. Data collection:

A collated list of patients who underwent open prostatectomy during the study period was developed and used to retrieve patient charts from the hospital's medical records department. The patient charts were then reviewed, and data were collected for the following variables: age, race, comorbidity, prostate-specific antigen measurements, prostate volume measurements (assessed clinically through digital-rectal examination), preoperative catheter use, indication for surgery, surgical approach, duration of surgery, postoperative length of stay, and histological findings from any tissue biopsies that were performed. Information on postoperative complications, occurring from the time of surgery until discharge from the hospital, was also collected for each patient. To reduce bias in this study, the following steps were taken: the objective of the study and study population were clearly defined before the data collection commenced; a validated method was used to establish and grade postoperative complications; and a standardized, blinded approach to data collection was taken.

2.5. Grading of postoperative complications:

Postoperative complications were graded according to the Clavien-Dindo method. This method of classifying postoperative complications has been widely used in urology research. Briefly, the Clavien-Dindo method categorises postoperative complications based on increasing severity and takes into account the management strategies used to treat these complications. There are five categories of postoperative complications based on the Clavien-Dindo method (Grade I-V), with complications at Grade III or higher often considered to be "severe complications". All data from the patient chart review was collected on a password-protected electronic spreadsheet.

2.6. Statistics:

The data on the electronic spreadsheet was imported into SPSS version 27.0. Descriptive statistics were then used to analyze the data. Categorical variables are presented as frequencies (with %). Continuous variables are presented as medians (with interquartile range).

2.7. Ethics:

Our study received approval from the ethics committee at the University of KwaZulu-Natal, Durban, South Africa (BREC/00004039/2022). As this was a retrospective chart review, individual patient consent was not possible, however, written permission to collect the patient data was obtained from the medical manager of St. Aidan's Hospital.

2.8. Data availability:

The data underlying this analysis is available from the corresponding author upon request.

3. Results

There were 64 patients who had open prostatectomy during the study period, of which 10 patients were excluded from this study due to missing data. Therefore, the study sample was comprised of 54 patients (Figure 1).

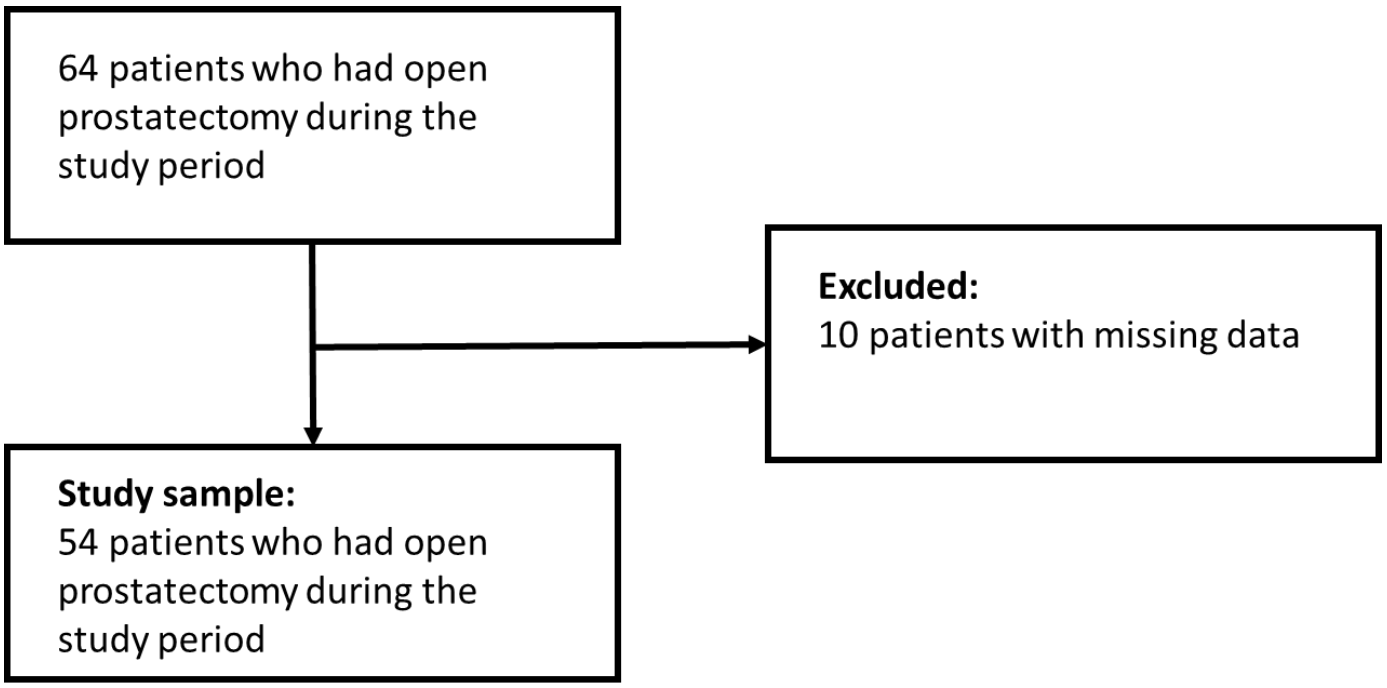

Figure 1: **Patient flow diagram for this study**

The preoperative characteristics of our study sample (N=54 patients) are shown in Table 1.

The median age was 68.5 years old, and most patients were Black Africans (n=31, 57.4%). Hypertension was the most common comorbid disease, prevalent in half of the study sample (n=27, 50.0%). Forty-five patients (83.4%) had prostate-specific antigen levels of 10 ng/mL or less. More than half the study sample (n=31, 57.4%) had a prostate volume of 60-100 mL (measured clinically through digital-rectal examination as we do not routinely estimate volumes through ultrasound or pathological investigation). More than three-quarters of the study sample (n=42, 77.8%) were catheter-dependent prior to surgery.

3.1. The operative characteristics of our study sample are shown in Table 2.

The most common indication for open prostatectomy was lower urinary tract symptoms and failed medical therapy (n=40, 74.1%). All patients had surgery via the suprapubic approach (n=54, 100.0%). Surgery duration was >120 minutes for two-thirds of our study sample (n=36, 66.7%). Postoperative length of stay was 6-9 days in 25 patients (48.1%), 10-15 days in 13 patients (24.1%), 15 days or more in 7 patients (13.0%), and <5 days in 8 patients (14.8%).

3.2. A description of postoperative complications, categorised according to the Clavien-Dindo method, is provided in Table 3.

There were 42 postoperative complications recorded for 29 patients in our study sample. Of these 42 complications, 41 (97.6%) were Grade II (22 were wound infections requiring antibiotics or dressing changes; 19 were blood transfusions) and 1 (2.3%) was a Grade IV complication (1 ICU admission). There were no Grade I, III, or V complications.

The overall histological findings for our study sample are presented in Figure 2. Fifty-one patients (94.4%) had a diagnosis of benign prostate hyperplasia on histology, while the remaining 3 patients (5.6%) were diagnosed with malignancy.

4. Discussion:

Our study has produced valuable insights into the characteristics, postoperative complications, and histological findings of patients who

Table 1: **Summary of preoperative characteristics in the study sample (N=54)**

Characteristic	Descriptive statistic result
Age in years	
Median (interquartile range)	68.5 (62.8-72.0)
Race	
Black African, n (%)	31 (57.4)
Indian, n (%)	9 (16.7)
Caucasian, n (%)	13 (24.1)
Mixed, n (%)	1 (1.8)
Comorbidity	
HIV, n (%)	2 (3.7)
Diabetes, n (%)	10 (18.5)
Hypertension, n (%)	27 (50.0)
Preoperative anaemia, n (%)	2 (3.7)
Renal impairment, n (%)	7 (13.0)
Prostate-specific antigen	
<5 ng/mL, n (%)	22 (40.7)
5-10 ng/mL, n (%)	23 (42.7)
11-20 ng/mL, n (%)	8 (14.8)
>20 ng/mL, n (%)	1 (1.8)
Prostate volume	
<60 mL, n (%)	18 (33.3)
60-100 mL, n (%)	31 (57.4)
>100 mL, n (%)	5 (9.3)
Catheter-dependent preoperatively	
Yes, n (%)	42 (77.8)
No, n (%)	12 (22.2)

Table 2: **Summary of operative characteristics in the study sample (N=54)**

Characteristic	Descriptive statistic result
Indication for surgery	
Lower urinary tract symptoms + bladder calculi	8 (14.8)
Lower urinary tract symptoms + failed medical therapy	40 (74.1)
Lower urinary tract symptoms + haematuria	1 (1.8)
Lower urinary tract symptoms + renal impairment	5 (9.3)
Surgical approach	
Suprapubic, n (%)	54 (100.0)
Retropubic, n (%)	0 (0.0)
Surgery duration	
<60 minutes, n (%)	10 (18.5)
60-120 minutes, n (%)	8 (14.8)
>120 minutes, n (%)	36 (66.7)

Table 3: **Summary of postoperative complications in the study sample (N=42)**

Clavien-Dindo complications	Descriptive statistic results
Grade I complication, n (%)	0 (0.0)
Grade II complication, n (%)	41 (97.6)
Grade III complication, n (%)	0 (0.0)
Grade IV complication, n (%)	1 (2.3)
Grade V complication, n (%)	0 (0.0)

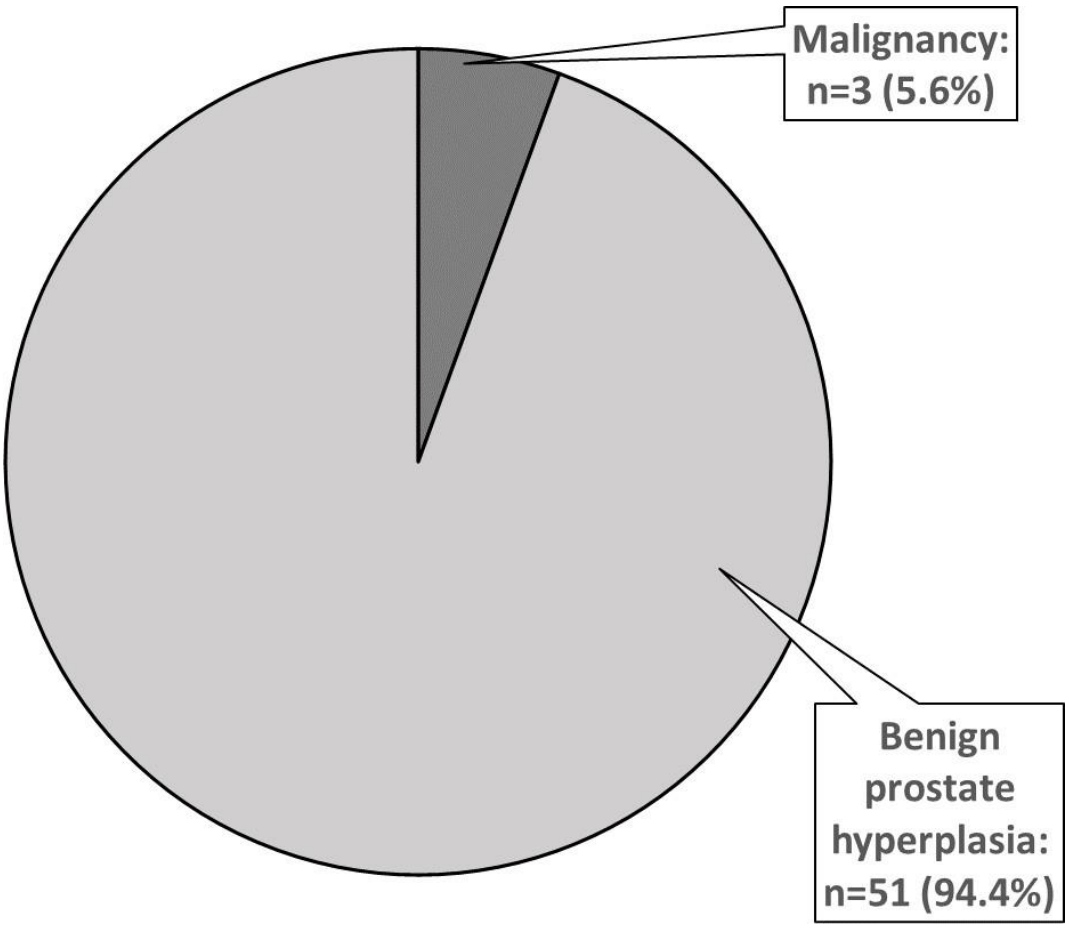

Figure 2: **2. Summary of histological findings in the study sample (N=54)**

underwent open prostatectomy at a resource-constrained hospital in South Africa.

The median age of our study sample (68.5 years old) was within the age range reported for open prostatectomy case series from other resource-constrained settings (63-73 years old) [4, 5, 9, 10]. This finding suggests that older males in resource-constrained settings, particularly those aged older than 60 years old, might benefit from prostate disease awareness campaigns and prostate disease screening interventions. The finding of a higher proportion of Black African patients in our study might reflect the higher risk of prostate disease in this race group when compared with other racial groups [11]. The elevated risk of prostate disease among Black males, as compared to males from

other racial groups, is believed to be due to a combination of factors, including genetics, cultural and socioeconomic factors, the burden of risk factors, and differences in knowledge and awareness of prostate disease across racial groups [11].

The finding of a high prevalence of hypertension in the study sample is not surprising. Concomitant hypertension has been reported in 25-30% of males with benign prostate hyperplasia [12], and up to 73% of males with prostate cancer [13]. Rather than hypertension is a risk factor for prostate disease, it is thought that the development of prostate disease and hypertension involve similar, still unclear pathophysiological processes [14]. Levels of prostate-specific antigen and prostate volume in the study sample were comparable to those reported for patients with prostate disease in other low- and middle-income settings [5, 6, 15]. We observed a high prevalence of preoperative catheter use in the study sample, which was higher than the prevalence of preoperative catheter use reported in the published literature [6]. Patients with diseased prostate glands, especially those patients who have prostate glands with larger ball-valving median lobes or intravesical protrusions, can develop urinary obstruction and urinary retention which would then necessitate catheterization [16]. Therefore, the patients included in our study may have presented with larger prostate glands which caused more severe urinary obstruction than what is reported elsewhere.

The presence of lower urinary tract symptoms which did not resolve with medical therapy was the most common indication for open prostatectomy in our study sample. This finding is in agreement with the findings of a recent scoping review article on the management of benign prostate hyperplasia in resource-constrained African countries [17]. All of the prostatectomies in our study sample were performed using the suprapubic approach. This finding is likely due to the surgeons' preference for the suprapubic approach in our setting versus the retropubic approach. The surgical duration of open prostatectomy is longer than that of minimally invasive surgery [6], and the finding that two-thirds of the study sample had a surgical duration of >120 minutes is expected based on the findings from other studies of open prostatectomy [18, 19]. Almost half of the patients in our study had a postoperative length of stay between 6 and 9 days. This postoperative length of stay is longer than that reported for minimally invasive prostate surgery but is within the range reported for open suprapubic prostatectomy [20].

The histological findings in our study suggest that benign prostate hyperplasia is the most common prostate disease in our setting. This finding is similar to what has been reported in a Nigerian study of 247 patients undergoing open prostatectomy, in which the histological prevalence of benign prostate hyperplasia was 95.5% [21]. This finding also correlates with the existing literature on benign prostate hyperplasia, which reports that the histological prevalence of the disease ranges from 8% during the fourth decade of life to 80% during the eighth decade of life [22]. Despite prostate malignancy being rare in our study population, it remains important in terms of morbidity and mortality [2]. Therefore, the findings of the histological analysis further emphasize the need to improve knowledge and awareness of both benign prostate hyperplasia and prostate cancer among older males in our resource-constrained setting.

The overall proportion of Grade II or lower complications in our study was very similar to that reported in a larger Nigerian study of 362 open prostatectomies [23]. In both our study and the Nigerian study, most of the reported complications were minor and classified as Clavien-Dindo Grade II or lower (97.6% in our study and 91.0% in the Nigerian study). Some of the most important Grade II complications in our study and the Nigerian study were wound infection (52.4% and 17.2%, respectively) and blood transfusion (45.2% and 51.7%, respectively). The reported rate of severe complications (Clavien-Dindo Grade III and higher) in our study and the Nigerian study was very low (2.3% in our study and 9.0% in the Nigerian study). There were no deaths reported during the postoperative period in both studies. These findings are encouraging and confirm the overall safety of open prostatectomy in resource-

constrained settings.

There are several limitations to our study. First, our data were collected from a single, public-sector hospital in KwaZulu-Natal, South Africa, which limits the generalizability of our findings to other parts of South Africa or to patients who receive treatment in private-sector hospitals, where a wider range of treatment options may be available. Additionally, our small sample size limited our statistical analysis to basic descriptive statistics. The retrospective nature of our study may have introduced bias in the data and statistical analysis. Furthermore, the presence of comorbidities in the patient's medical record was based solely on diagnosed comorbidities, and therefore undiagnosed or uninvestigated comorbidities may have been missed. Finally, our study did not include reliable follow-up data for patients after discharge from the hospital, preventing us from investigating post-discharge outcomes in our sample. These limitations should be addressed in future studies.

Based on the findings of this study, we recommend that open prostatectomy still be considered a primary treatment modality for prostate disease in developing countries, until minimally invasive methods become more widely available.

In conclusion, our retrospective review of open prostatectomy at a resource-constrained South African hospital yielded findings that are consistent with those reported in studies from other low- and middle-income countries. Our research suggests that open prostatectomy remains a relevant, safe, and effective method for managing prostate disease in resource-constrained settings where access to minimally invasive surgical methods may be limited. Our study highlights the importance of ensuring that traditional surgical methods continue to be available and accessible in resource-constrained settings, where they can be a critical part of the treatment armamentarium. Further research is needed to better understand the factors that contribute to the success of open prostatectomy in resource-constrained settings and to identify strategies for improving access to surgical care for patients in these settings.

5. Acknowledgements:

None.

6. List of abbreviations:

BPH - Benign Prostatic Hyperplasia
TURP - Transurethral Resection of Prostate

7. Conflict of Interest:

None declared.

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