Original Article

Open Prostatectomy for Benign Prostatic Hyperplasia: A Critical Analysis of Patient Presentation and Surgical Outcomes in a Contemporary Series

AO Obi[1,2,3], C Odo[1], DE Ogolo[1], CJ Okeke[1], AO Ulebe[1], EN Afogu[1]

[1]Department of Surgery, Alex Ekwueme Federal University Teaching Hospital Abakaliki, Ebonyi, [2]Department of Surgery, Ebonyi State University, Abakaliki, Ebonyi, [3]Urology Department, Alpha Urology Centre, Enugu, Nigeria

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Abstract

Background: Open prostatectomy (OP) is still a valid treatment option for benign prostatic hyperplasia (BPH), but it needs to be constantly reevaluated in the context of minimally invasive treatments (MITs). **Aim:** Our purpose is to present contemporary data on patient presentation and surgical outcomes of OP with which other OP series and MITs can be compared. **Methods:** A retrospective study of all OP was carried out in our institution from January 2011 to December 2020. All patients had a thorough preoperative workup and optimization of comorbidities before surgery. Data were collected in a predesigned pro forma and analyzed. **Results:** The mean age of the 148 patients studied was 66.2 (±7.9) yrs. The mean duration of symptoms before surgery was 32.2 (±33.7) mos. The mean preoperative prostate volume was 118.0 (±67.1) cm^3. There was a 54.4% comorbidity rate with diabetes mellitus (DM) topping the list (16.0%). An incidental prostate cancer rate of 6.1% was found. The overall complication rate was 45.3%. Perioperative hemorrhage requiring blood transfusion (BT) was the most common complication (26.1%). There was no significant difference in age, duration of surgery, and prostrate volume between subjects with and without BT ($P > 0.05$). Wound infection was significantly associated with diabetes ($P = 0.043$, OR = 3.507, 95% CI = 1.042–11.805). The reoperation rate was 1.4%, and mortality rate was 0.7%. The International Prostate Symptom Score (IPSS), quality-of-life (QOL) score, and post-void residual urine (PVR) volume were significantly improved ($P < 0.001$). **Conclusion:** OP was found to be a safe and effective procedure for the relief of bladder outlet obstruction (BOO) secondary to BPH. However, it was associated with high morbidity and low reoperation rate.

Keywords: *Benign prostatic hyperplasia, open prostatectomy, surgical outcomes*

Background

Benign prostatic hyperplasia (BPH) is the most common benign neoplasm in men.[1] Surgical treatment options for BPH include transvesical prostatectomy (TVP), retropubic prostatectomy (RP), transperineal prostatectomy,[2-5] and minimally invasive treatment (MIT) options such as transurethral resection of the prostate (TURP), laparoscopic simple prostatectomy (LSP), robotic-assisted laparoscopic simple prostatectomy (RASP), and laser procedures such as holmium laser enucleation of the prostate (HoLEP).[6-9]

The evolution of newer MITs has been driven by the need to reduce the morbidity associated with open prostatectomy (OP). While the newer techniques are credited with less morbidity, albeit with higher reoperation rates, the place of OP as the procedure that achieves complete removal of obstructing adenomatous tissue is currently unchallenged.[2,10,11]

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Address for correspondence: Prof. AO Obi, Department of Surgery, Alex Ekwueme Federal University, Teaching Hospital Abakaliki, PMB 102, Abakaliki, Ebonyi, Nigeria.
E-mail: draoobi@yahoo.com

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OP is recommended in patients with prostates above 80 grams, concomitant bladder diverticulum, inguinal hernia, bladder stones, and hip ankylosis precluding positioning in the lithotomy position or by the patient's choice.[7] In the Western world, the use of OP has declined greatly[11-13] because of the emergence of MIT options,[11-13] but in the developing world it is the most common treatment modality.[3,5,10,14] This is because the facilities and skilled manpower for the MIT options are largely unavailable.

The decline in the use of OP in the Western world has contributed to a reduction in the number of publications on OP in world literature with the ascendancy of numerous publications on MIT. This trend can have a negative impact on urology training. There is a need to continue to evaluate the outcomes of OP to have current data not only for urology resident training worldwide but also contemporary data with which the newer MIT can be compared.

The aim of this study is to present contemporary data on patient presentation and surgical outcomes of OP with which other OP series and the MIT can be compared. Unlike previous studies on OP that have relied mainly on the reporting of efficacy outcomes using symptom scores and urinary flow rates only,[1,5,11,12,15] detailed analysis of the predictors of negative outcomes associated with OP has been carried out. These negative outcomes have also been classified using the Clavien–Dindo scale, which is a widely accepted scale for the reporting of negative outcomes in surgical practice.[16-18] This study can therefore serve as a benchmark for evaluating other OP series.

Methods

This was a retrospective study of 148 patients who had OP from January 2011 to December 2020. All the patients were operated on by the author who had 19 years of experience as an urologist by December 2020. Patients' data were collected in a pro forma after each operation and stored in a file for later analysis. The data were updated at each follow-up visit. The study was approved by our institution's research and ethics committee.

The indications for surgery were severe and bothersome lower urinary tract symptoms despite medical therapy for BPH, and patients dependent on urethral or suprapubic catheter for voiding and also the presence of complications of BPH such as recalcitrant hematuria, recalcitrant urinary tract infection, vesical stones, and features of obstructive uropathy such as vesical diverticular, hydronephrosis, and deranged serum urea and creatinine.

Preoperative workup included estimation of packed cell volume (PCV), total serum prostate-specific antigen (PSA), serum electrolytes, urea and creatinine (SEUCr), platelet count, retroviral screening, urine cultures, blood sugar, chest X-ray, electrocardiography (ECG), abdominopelvic ultrasound scan, International Prostate Symptom Score (IPSS), quality-of-life (QOL), and post-void residual urine (PVR) volume. Patients with a total PSA above 4 ng/ml or nodular prostate on digital rectal examination had a transrectal prostate biopsy to rule out prostate cancer. We ensured sterile urine, normal platelet count, and SEUCr before surgery. Patients with comorbidities such as diabetes mellitus (DM), hypertension (HTN), or chronic obstructive airway disease (COAD) were referred to the relevant specialists for optimization before surgery. Antiplatelet medications were withdrawn for at least 10 days before surgery.

Patients had either TVP or RP as indicated. TVP was carried out using the standard Freyer's technique or a modified suprapubic prostatectomy technique.[19] Prostate specimens were weighed immediately after surgery.

Patients with an uneventful postoperative course were usually discharged home on postoperative day 6 or 7 after the removal of the urethral catheter. They were seen in the clinic at two weeks, four weeks, three months, six months, and yearly thereafter. At follow-up, the patients were evaluated by history and physical examination for any complications. At one-month follow-up, IPSS, QOL, PVR, and visual observation of the voided stream were evaluated, and where indicated, specific investigations were ordered to evaluate complications.

The following data were analyzed: age, PSA, duration of symptoms before presentation, duration of symptoms before surgery, comorbidities, prostate volume, presence of an indwelling catheter, PCV, type of surgery, type of anesthesia, duration of surgery, blood transfusion rate (BTR), percent incidental prostate cancer, duration of admission, pre- and postoperative IPSS, QOL and PVR, complications, predictors of negative outcomes, and duration of follow-up.

Statistical analysis

The data were analyzed using Statistical Package for the Social Sciences (SPSS) version 23.0 Armonk, NY: IBM Corp. The test of normality was carried out using the Kolmogorov–Smirnov and Shapiro–Wilk tests. The relationship between continuous variables was determined using linear regression (scatter diagram), while the association between categorical variables was determined using logistic regression. The means and medians of continuous variables were compared using

Student's *t*-test and Mann–Whitney U-test depending on their normality test results. A $P < 0.05$ level of significance was regarded as significant.

Results

Table 1 depicts the patients' perioperative characteristics. The mean age of the patients was 66.2 (±7.9) yrs (range 49–90 yrs). The mean duration of symptoms before surgery was 32.2 (±33.7) mos (range 0.7–182.6 mos). There was a 54.4% incidence of comorbidities with DM (16.0%) being the most common comorbidity, followed by bladder stones (11.5%), HTN (9.8%), hydronephrosis (4.7%), and urethral stricture (2.7%). There was a 0.7% incidence each of, splenomegaly, gall stones, left inguinal hernia, left nephrolithiasis, peptic ulcer disease, raised blood urea and nitrogen, bladder cancer, renal cyst, hypertensive heart disease (HHD), congestive cardiac failure, and Parkinson's disease in the study population.

Table 2 shows complications by the Clavien–Dindo classifications. The overall complication rate was 45.3%. The most common complication observed was perioperative hemorrhage requiring blood transfusion (BT) seen in 26.1% of patients, followed by clot retention (23.8%). The mortality rate was 0.7%.

Table 3 depicts the analysis of outcome variables. It shows statistically significant differences between the mean preoperative IPSS, QOL, and PVR and their postoperative values ($P < 0.001$).

Table 4 depicts the results of the tests of associations. Logistic regression analysis shows no correlation between BT and patient's age (t = 0.480, $P = 0.632$), duration of surgery (t = 0.028, $P = 0.978$), prostate volume (t = 1.602, $P = 0.112$), and presence or absence of HTN (t = 0.142, $P = 0.706$). Wound infection was significantly associated with diabetes ($P = 0.043$, OR = 3.507, 95% CI = 1.042–11.805).

Table 5 shows a summary of some studies on MIT options and comparative data from this study.

Table 1: Patient perioperative characteristics

Variable	Mean (SD) (range)
Age (yrs)	66.2 (± 7.9) (49-90)
Total PSA pre-op (ng/ml)	17.9 (± 20.8) (0.6-120)
Incidental CAP	7 (6.1%)
Duration of symptoms before the presentation (mo)	27 (± 33.2) (0.03-180)
Duration of symptoms before surgery (mo)	4.9 (± 9.1) (0.03-65.6)
Total duration (mo)	32.2 (± 33.7) (0.7-182.6)
Prostate volume pre-op (mls)	118.0 (± 67.1) (15-323)
• Prostate volume <80 cm^3 (*n*/%)	43 (35%)
• Prostate volume ≥80 cm^3 (*n*/%)	80 (65%)
Type of anesthesia	
• Spinal	71.9%
• Epidural	22.5%
• GA	3.4%
• Spinal converted to GA	2.2%
Type of surgery	
• TVP	91.9%
• RP	8.1%
Duration of surgery (mins)	99.6 (± 16.6) (60-150)
PCV pre-op	36.7 (± 4.2) (26.4-46.0)
PCV post-op	30.7 (± 4.2) (11.8-41.0)
Change in PCV	7.6 (± 4.5) (0-23.4)
Duration of admission (days)	7.9 (± 2.1) (5-21)
Duration of catheterization (days)	6.8 (± 2.3) (4-28)
Type of catheter drainage	
• 2-way only	45.5%
• 3-way only	22.8%
• 2-way + SPC	31.7%
Presentation in acute urinary retention (AUR).	
• Number of patients	102 (68.9%)
• Number of episodes (mean/range)	1.8 (range 1-20).
Catheterization	
• Number of patients on the catheter	106 (71.6%).
• Not on catheter	31 (20.9%).
• Not documented	11 (7.4%).

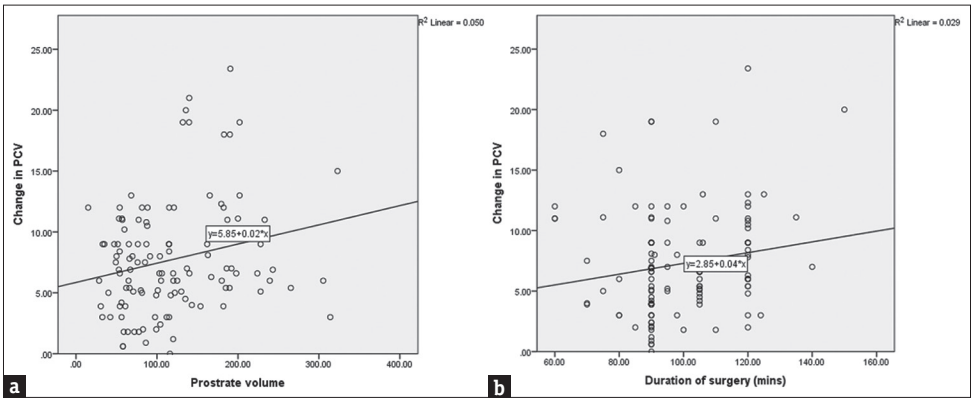

Figure 1: Scatter diagram showing relationships between prostate volume, duration of surgery, and change in PCV. (a) A scatter diagram showing the relationship between Prostrate volume and change in PCV. (b) A scatter diagram showing the relationship between Duration of surgery and change in PCV

Table 2: Complications by the Clavien–Dindo classification

Clavien–Dindo classification	Complication	Percentage	Management
-	Overall complication rate	45.3%	-
I	Clot retention	23.8%	Bedside catheter manipulation
	Clot retention requiring bladder syringe evacuation	21.4%	Bedside clot evacuation
	Stitch abscess	1.4%	Bedside management
II	Perioperative hemorrhage	26.1%	Blood transfusion
	Post-prostatectomy LUTS	13.5%	Anticholinergics/antibiotics
	SP urinary fistula	4.7%	Prolonged catheterization
	UTI	9.5%	Antibiotics
	Epididymo-orchitis	2.0%	Antibiotics
	Secondary hemorrhage	2.0%	Blood transfusion/antibiotics
	Seizure disorder, delirium, septicemia, prostatitis, persistent terminal hematuria, LVF, cardiac arrhythmias	0.7% each	Relevant drug treatment
IIIA	Superficial wound infection and dehiscence	7.4%	Secondary suturing
IIIB	Burst abdomen	0.7%	Reoperation
	Recalcitrant clot retention	0.7%	Reexploration
	Urethral stricture	0.7%	Urethroplasty
V	Death	0.7%	-

Table 3: Analysis of outcome variables

Variable	Pre-op Median (IQR)	Post-op Median (IQR)	*P**
IPSS	29.00 (6.25)	6.50 (3.00)	<0.001
QOL	6.00 (1.00)	1.00 (1.00)	<0.001
PVR	148.00 (233.00)	6.00 (6.00)	<0.001
PSA	8.53 (38.55)	2.85 (2.43)	<0.001

*Wilcoxon-signed rank test

Figure 1a shows a significant linear relationship between change in PCV and prostate volume ($P < 0.001$, r = 0.224). Figure 1b shows no significant linear relationship between change in PCV and duration of surgery ($P = 0.063$, r = 0.170).

The mean follow-up duration is currently 3.8 (±3.1) mos. (range 1–21 mos).

Discussion

OP is a time-tested surgical treatment for BPH with low reoperation rates and durable long-term outcomes and efficacy.[1,3,11,12,15,26] However, its short-term morbidity, catheterization, and hospitalization times are higher compared with MITs.[8,15,22,24,25] This study provides current data with which other OP series and the results of the MIT options can be compared.

The mean age in this study of 66.2 (±7.9) yrs is similar to the mean age of patients undergoing OP in several other studies.[3,14,16] This is not surprising since BPH is a disease of the middle-aged and elderly.

The mean preoperative prostate volume in this study was 118.0 (±67.1) cm^3 (range 15–323 cm^3). Our mean prostate volume was notably high but similar to findings in several other studies.[1,12,16,22,24] It has been observed that patients present with higher prostate volumes in this era because of the use of alpha-blockers.[15,22] Other contributory factors could be a late presentation and prolonged dependence on indwelling catheters. Thirty-five percent of our patients had a prostate volume that was <80 cm^3, while 65% of them had a prostate volume in excess of 80 cm^3. Thus, only a small fraction of patients in this environment qualify for TURP going by the American Urological Association (AUA) guidelines on BPH surgical treatment,[7] while the majority are best served by OP in the absence of competing techniques such as HoLEP and LSP.

Late presentation and delay in submitting to surgery were the rules rather than the exception in this study. The mean time to presentation was 27 (±33.2) months, and the mean time from presentation to surgery was 4.9 (±9.1) months. Other studies from the developing world have also documented late presentation and delay in having surgery[2,10,14] and attributed it to patient poverty. This late presentation is also reflected in the high mean preoperative IPSS of 28.2 (±5.7) in this study similar to the finding by Mgbakor in a study in this subregion.[5] Most of our patients presented with acute or chronic urinary retention for which they were catheterized. We had an indwelling catheter rate of 71.6% similar to what has been documented in some other studies.[5,26] In our environment, most patients are catheter-dependent while waiting to raise funds for definitive surgery. This is not surprising considering the endemic poverty and near absence of comprehensive health insurance.

Table 4: Tests of Associations

Variables	Variables			*P* Value
Blood Transfusion Vs				
	Transfused	**Not Transfused**	***t***	***P***
Age (Mean±SD)	65.58±5.87	66.32±8.56	0.480	0.632
Duration of surgery (mins)	99.52±14.49	99.61±17.19	0.028	0.978
Prostate vol. Pre Op (cm^3)	135.41±69.96	112.96±65.59	1.602	0.112
HTN -No (*n*/%)	20 (58.8)	54 (55.1)	χ^2=0.142	0.706
HTN -Yes (*n*/%)	14 (41.2)	44 (44.9)		
Complications Vs				
	Yes	**No**	***t***	***P***
Prostate Vol.(cm^3)(mean±SD)	114.84±67.55	120.60±67.57	0.469	0.640
Duration of symptoms before surgery (mos)	Median (IQR) 2.00 (5.09)	Median (IQR) 2.67 (4.92)	M-WU 2235.50	0.855
Type of surgery Vs				
	Transvesical Median (IQR)	**Retropubic Median (IQR)**	**Mann-Whitney *U***	***P***
Change in PCV	6.60 (6.15)	9.00 (4.40)	499.500	0.104
Diabetes Vs				
	Yes	**No**	**OR (95% C.I for OR)**	***P***
Wound -Yes	5 (23.8)	9 (8.2)	3.507 (1.042 – 11.805)	0.043
Infection -No	16 (76.2)	101 (91.8)		
Wound Infection Vs				
	Yes. Median (IQR)	**No. Median (IQR)**	**Mann-Whitney *U***	***P***
Change in PCV	6.30 (6.00)	6.90 (6.30)	865.00	0.625
Post op Biopsy result				
	BPH Median (IQR)	**Incidental cap Median (IQR)**	**Mann-Whitney *U***	***P***
Total PSA	9.60 (22.28)	42.00 (15.60)	61.00	0.002

M-WU - Mann-Whitney *U*

The comorbidity rate in this study was 54.5%, with DM and HTN featuring prominently similar to what has been found in other series.[3,4,14,26] The high incidence of DM and HTN can be explained by the high mean age at which patients undergo BPH surgery, as these two diseases tend to be associated most commonly with advancing age. We also had an 11.5% incidence of bladder stones, which is similar to that of Condie *et al*.[26] This may not be unconnected with the high indwelling catheter rate and delay in accessing surgical treatment in our study.

Spinal anesthesia was the most common form of anesthesia used, which is in keeping with findings from other studies.[2,3,14,27] Epidural anesthesia was used in 22.5% of cases and general anesthesia in 3.4% of cases. There was a 2.2% incidence of conversion from spinal to general anesthesia due to the wearing off of spinal anesthesia. This could be a drawback to the use of spinal anesthesia. Another drawback that we observed was the unpredictable changes in blood pressure with spinal anesthesia compared with epidural anesthesia. Currently, our preferred form of anesthesia is epidural anesthesia. Epidural anesthesia allowed us to better control the patient's blood pressure intraoperatively in addition to the administration of postoperative analgesia. The epidural catheter was usually left in place for 24 hours should there be a need for an early return to the theater for cystoscopic clot evacuation, which occurred in 0.7% of cases in this series.

TVP was carried out in 91.9% of patients in this study and RP in 8.1% of patients. Urologists differ considerably in their choice of either the TVP[16,17] or the RP procedure.[2,3] The TVP technique is particularly indicated in patients with bladder stones or diverticular.[3,16,17] The RP is acclaimed to be associated with better hemostasis because of direct access to the prostatic fossa,[3,12] but this may be difficult to accomplish in a patient with a narrow pelvis or small prostate. Despite the claim of better hemostasis, this study did not find any significant difference in the change in PCV between TVP and RP (U = 499.500, *P* = 0.104), similar to the finding in the study by Carneiro *et al*.[1]

The overall mean duration of surgery was 99.6 (±16.6) minutes. This is similar to the duration of surgery reported by some OP series,[4,6,24] bipolar TURP,[22] and HoLEP[8] but higher than reported for monopolar TURP.[20,21,25] Prolonged surgery did not impact blood

Table 5: Summary of outcomes of some minimally invasive treatment (MIT) studies and comparative data from this study

Reps	Monopolar TURP	Bipolar TURP	HoLEP	Laparoscopic prostatectomy	Open prostatectomy (this study)
Mean age	66.94±9.12[20]	62.79±10.93[22]	68.4 (8.4)[23]	67.4±6.0[9]	66.2 (± 7.9) (49-90)
	63.08±8.28[21]	64.38±7.52[21]	68.0±7.3[8]	70.53±6.01[24]	
Mean prostate vol. pre-op	57.974±21.79[20]	125.70±12.97[22]	75[23]	121.8±39[9]	118.0 (±67.1) (15-323)
	38.12 (±9.58)[21]	66.49±22.95[21]	53.5±20.0[8]	178.44±22[24]	
Duration of surgery (min)	62.6±34.72[20]	102.60±20.80[22]	94.6±35.1[8]	115±30[9]	99.6 (± 16.6) (60-150)
	52.4±26.4[25]	82.14±29.6[21]		123.22±35.9[24]	
	51.75 (±14.28)[21]				
Resected/enucleated prostate vol.	26.8±16.7[20]	65.40±15.60[22]	74.1±62.6[23]	77.2±32.4[9]	86.1±55.7 (10-256)
	28.4±20.3[25]		35.9±16.4[8]	94.43±44.31[24]	
Post-op irrigation (hours)	22.87±5.09[21]	22.57±6.26[21]	-	0.33±0.7 days[9]	No irrigation
Catheterization time (days)	53.71±12.53 hours[21]	2.1±0.5[22]	1.9±4.2[23]	4.0±1.7[9]	6.8 (± 2.3)
		53.33±11.59 hours[21]	27.6±10.4 hours[8]	6.34±0.47[24]	
Hospital stay (days)	2.51±1.36[20]	2-8[22]	1.2±1.0[23]	5.1±1.8[9]	7.9 (± 2.1) (5-21)
	8.0±6.1[25]	3.9±0.88[21]	53.3±15.9 hours[8]	5.11±2.06[24]	
	3.65 (±0.76)[21]				
Blood transfusion rate	7%[12], 2.9%[25]	-	3%[23], 0%[8]	3.3%[9], 4.4%[24]	26.1%
	6.89[21]				
Overall complication rate	34.4%[20]	-	9.5%[23]	27%[9]	45.3%
	11.1%[25]		9.5%[8]	4.5%[24]	
Re-catheterization	-	-	3.0%[23]	6.7%[9]	0%
			0%[8]		
Reoperation	16%[21], 5.6%[25]	6.1%[22]	3.9%[23], 8.4%[8]	-	1.4%
Incidental CAP	9.8%[25]		3%[8]	-	6.1%
Mortality	0.1%[25]	-	0[8]	-	0.7%
UTI	-	-	3.5%[23]	-	9.5%

loss in our study as logistic regression analysis showed no significant linear relationship between change in PCV and duration of surgery (P = 0.063, r = 0.170). The difference in the duration of surgery between subjects who were transfused and those who were not transfused was also not statistically significant (P = 0.978). These findings are in contrast to those of Kyei *et al*.[4] who found a significant association between blood loss, BT, and duration of surgery. This difference may be because 44% of the surgeries in Kyei's series were performed by residents in urology.

The mean preoperative PSA in this study was 17.9 (±20.8). Other studies[3,16] have also found elevated PSA in patients with a preoperative histologic diagnosis of BPH. The elevated serum preoperative PSA is not unconnected with our high mean prostate volume since there is a positive correlation between prostate volume and PSA elaborated by the prostatic epithelium.[3] Recurrent episodes of urinary retention and the high percentage of patients on indwelling catheter are also contributory, as these are factors that have been shown to also predispose to a rise in PSA.[3] There was a statistically significant difference between mean preoperative PSA and postoperative PSA (P < 0.001) similar to what was found by Helfand *et al*.[12] and is an indicator of the ability of OP to efficiently remove the prostatic tissue. We found an incidental prostate cancer rate of 6.1%, which is similar to that reported by Stillwell *et al*.[28] but lower than the 9.6% reported by Meier *et al*.[10] and Hill.[27] Logistic regression analysis showed that subjects with incidental CaP had a significantly higher preoperative total PSA than those with BPH (P = 0.002). The 6.1% rate of incidental prostate cancer in our series despite the high preoperative PSA results may be due to our efforts to screen for CaP before surgery.

The overall complication rate in this series of 45.3% is higher than what has been reported in some studies[15,26] but similar to that of some studies in our region.[10,16,17] The duration of symptoms before surgery and prostate

volume did not impact the complication rate in this study, $P = 0.855$ and $P = 0.640$, respectively, unlike the study by Elshal *et al*.[16] that found high-grade complications to be significantly associated with a greater enucleated prostate weight. We classified the complications according to the Clavien–Dindo classification,[18] which is an internationally accepted classification system for surgical complications. Most patients had either grade I or II complications [Table 2].

The most common complication observed was perioperative hemorrhage requiring BT seen in 26.1% of patients. Our BTR is similar to that of some OP series[4,17] but lower than that reported by others.[14,24] It is notably higher than that reported for the MITs[8,9,20,21,23-25] [Table 5]. Differences in BTR in OP may be due to differences in surgeon experience, operative technique, and other confounding variables such as emergency prostatectomy and varying preoperative hemoglobin levels. In this study, there was no significant difference in age, duration of surgery, and prostate volume between subjects with and without BT ($P > 0.05$). There was also no significant association between HTN and BT ($P = 0.706$) similar to the finding by Salako *et al*.[3]

We had a clot retention rate of 23.8%, which is higher than those of Okorie[19] and Ugwumba,[14] but lower than the 47% reported by Umunna.[29] Clot retention was easily managed by bladder syringe evacuation at the bedside. Only one patient required reexploration for recalcitrant clot retention. The reexploration rate in this OP study was 1.4%, which is much lower than the reexploration rates for monopolar and bipolar TURP and HoLEP.[8,21-23,25]

OP storage lower urinary tract symptoms (LUTS) were seen in 13.5% of our cases, similar to what has been reported by others.[12,14,27] This is an irritating complication of OP for both the surgeon and the patient and appears to be unrelated to surgeons' experience.[27] For patients who had predominantly storage LUTS preoperatively, it creates the impression that nothing has been achieved by the surgery. Fortunately, it resolves over a few days or weeks as observed in this series with Kegel exercises and in some instances with the addition of antimuscarinic agents. Cystitis must be ruled out in all cases.

We had a wound infection rate of 10.8%. This is higher than the 2%, 4.3%, and 6.9% reported by Condie *et al*.,[26] Varkarakis *et al*.,[11] and Oranusi *et al*.[17], respectively, but similar to what has been noted in other series.[3,5] Wound infection was significantly associated with diabetes ($P = 0.043$, OR = 3.507, 95% CI = 1.042–11.805), and subjects with diabetes were four times more likely to have a wound infection than those without diabetes. Sixteen percent of our patients were diabetic similar to the finding by Salako *et al*.[3] who also found DM to be a risk factor for wound infection. This association can be attributed to the immunosuppression and angiopathy seen in DM. The development of wound infection did not correlate with blood loss as logistic regression analysis did not show any significant difference in the change in PCV between subjects with and without wound infection ($P = 0.625$).

Our mortality rate of 0.7% is comparable to the mortality rate in several OP and TURP series.[3,14,25,26] The one mortality in this series was due to septicemia in an elderly diabetic patient.

The mean duration of admission in this series was 7.9 (±2.1) days, which is similar to what has been reported in several OP series.[2,3,9,16,24] This mean duration of admission is notably higher than documented for TURP,[20-22] HoLEP,[8,23] and LSP[9,24] [Table 5]. Similarly, the duration of catheterization of 6.8 (±2.3) days is comparable to that reported by several OP series,[2,6,9,10,22] but higher than the post-op catheter times of TURP,[21,22] HoLEP,[8,23] and LSP[9,24] [Table 5]. Prolonged hospitalization and long indwelling catheter rates are unarguably one of the drawbacks of OP.

We observed statistically significant improvements in IPSS, QOL, and PVR at one-month follow-up as shown in Table 3. The preoperative IPSS in this study of 29.0 was high, similar to what was found by a study in this subregion,[5] and this can be explained by the late presentation. On the contrary, some studies in the Western literature[11,12,15] document much lower IPSS that can be attributed to early presentation. PVR decreased from a pre-op median (IQR) of 148.0 (233.0) to postoperative values of 6.0 (6.0) ($P < 0.001$), showing the efficacy of OP to completely remove the obstructing adenoma. QOL decreased from a median of 6.0 to 1.0 ($P < 0.001$), an indicator of patient satisfaction with the outcome of OP. These results represent benchmark improvements in QOL, IPSS, and PVR that have been reported in only a few TURP and HoLEP series[8,23] and which MIT must strive to attain.

Compared with TURP and HoLEP, OP in our hands was associated with higher morbidity and lower reoperation rate, comparable mortality, and benchmark improvement in IPSS, QOL, and PVR. The drawback of this paper is the retrospective nature of the review. However, all relevant patient data were collected in a pro forma as each surgery was performed and updated at each follow-up visit, thus minimizing the number

of missing data. Noteworthy is the fact that this is a single surgeon (experienced surgeon) series and did not include cases done by urology residents as may be seen in some other studies.[4] A multi-institutional study by surgeons with comparable experience will be useful to shed more light on the outcomes of this study.

Conclusions

OP is a safe, time tested, and effective procedure for the relief of bladder outlet obstruction (BOO) secondary to BPH. However, it is associated with high morbidity and low reoperation rate. It is likely to remain an important treatment option for BPH, especially in the developing world because of the slow penetration of equipment, skilled manpower, patient poverty, and late presentation with associated bladder pathologies and predominantly large prostates.

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Conflicts of interest

There are no conflicts of interest.

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