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Randomized Clinical Trial

Combined urethral and suprapubic catheter drainage improves post operative management after open simple prostatectomy without bladder irrigation

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Abstract

AIM

To compare outcomes after open simple prostatectomy without bladder irrigation, in subjects drained by combined 2-way urethral catheter and suprapubic catheter (SPC) *vs* those drained by 2-way urethral catheter only.

METHODS

A total of 84 participants undergoing Freyer's simple prostatectomy over an 18-mo period were randomized into 2 groups ($n = 42$). Subjects in group 1 were managed with 2-way urethral catheter and *in situ* 2-way SPC while subjects in group 2 had a 2-way urethral catheter drainage only. In group 1 subjects, the SPC was spigotted and only used for drainage if there was clot retention. The primary outcomes were number of clot retention episodes, and number of clot retention episodes requiring bladder syringe evacuation. Other secondary outcomes evaluated were blood loss, requirement of extra analgesics, duration of surgery, hospital stay and presence or absence of post-op complications.

RESULTS

The mean age in the groups was $65.7 (\pm 7.6)$ in group 1 *vs* $64.8 (\pm 6.8)$ in group 2. The groups were similar with respect to age, prostate specific antigen, prostate volume, blood loss, duration of surgery, blood transfusion and overall complication rate. However statistically significant differences were observed in clot retention episodes between group 1 and 2: $0.8 (\pm 1.5)$ *vs* $3.5 (\pm 4.4)$, $P < 0.000$, clot retention episodes requiring evacuation with bladder syringe $0.4 (\pm 0.9)$ *vs* $2.6 (\pm 3.8)$, $P = 0.001$, requirement of extra analgesics $0.4 (\pm 0.5)$ *vs* $4.0 (\pm 1.5)$, $P < 0.000$ and duration of admission $8.6 \text{ d } (\pm 1.2)$ *vs* 7.3

$d (\pm 0.6), P < 0.000$.

CONCLUSION

Subjects drained with a combination of urethral and SPCs have fewer clot retention episodes and reduced requirement of extra analgesics but slightly longer hospital stay.

Key words: Open suprapubic prostatectomy; Catheter drainage; Clot retention; Post operative outcome; Benign prostatic hyperplasia

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Core tip: Most urologists will agree that the most worrisome post operative challenge after open suprapubic prostatectomy (OSP) is post operative haemorrhage and the attendant clot retention. This paper seeks to show that the use of a combination of suprapubic and urethral catheters as opposed to using only a urethral catheter to drain the bladder after OSP is associated with reduced clot retention episodes, reduced clot retention episodes requiring bladder syringe evacuation and therefore less post operative morbidity.

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INTRODUCTION

Despite the advent of transurethral resection of the prostate (TURP)^[1], holmium laser enucleation of the prostate (HoLEP)^[2] and other minimally invasive procedures, open simple prostatectomy (OSP) still remains a common treatment option for bladder outlet obstruction due to benign prostatic hypertrophy (BPH)^[3-5], especially in the developing world. OSP is usually indicated in patients with large prostates above 80-100 g, patients with diverticular, large cystoliths, where the facilities and skills for less invasive procedures are not available or due to patient preference^[3,4,6]. In developed countries TURP and Laser prostatectomy account for most procedures^[3,4,6] but in the developing world OSP either in the form of Freyer's transvesical or Millin's retropubic prostatectomy is the commonest treatment modality^[3-5,7].

The most worrisome post operative challenge after OSP is post operative haemorrhage and the attendant clot retention. Tinckler^[8] has pointed out that, apart from general patient management, patient care following OSP is mainly concerned with ensuring uninterrupted drainage of urine and blood from the lower urinary

tract until normal haemostasis is attained, avoiding accumulation of blood and clot retention. The urethral drainage catheter is frequently blocked by blood clots in the immediate post operative period leading to painful clot retention episodes requiring repeated clot evacuation and occasionally a return to the operating room for either cystoscopic evacuation or re-exploration with its attendant risks. Clot retention rates as low as 4.3%-8%^[4,9,10] and as high as 47%^[5] have been documented. Also re exploration rates as high as 4.3%^[4] have been reported for recalcitrant clot-retention in patients undergoing OSP. Byrne^[11] observed that a significant percentage of deaths that occur secondary to haemorrhage after OSP can be attributed to inadequate catheter drainage of the bladder.

Therefore effective drainage of the bladder after OSP is key to a smooth post operative course and successful outcome. Measures to drain the bladder and deal with the problem of clot retention in the post operative period after OSP have included such things as the suprapubic double glass tube of Cabot^[12], the use of various types of wide bore catheters such as the perineal tube of Fuller^[13], the rusch red rubber rectal catheter used by Plawker *et al*^[14], and special suction devices^[15]. In contemporary practice however most urologists use continuous bladder irrigation (CBI) through a 3 way catheter^[16-18] or *via* a combination of 2 way urethral catheter and a suprapubic catheter (SPC)^[4,6,19]. Some however practice non irrigation and use only a 2 way urethral catheter to drain the bladder^[10,20,21]. Open simple prostatectomy without continuous bladder irrigation has been shown to be safe^[7,10,20,21] and is our current practice. Manual evacuation of clots with the 60cc catheter tip syringe (bladder syringe) may be an adjunct to any of the above measures. In difficult cases there might be need to return to the theatre for cystoscopic evacuation or outright re exploration.

We hypothesized that on a policy of non irrigation, the addition of an *in situ* SPC acting as a safety valve against clot retention will greatly simplify post operative management after OSP and that the outcome will be better than using only a 2-way urethral catheter. We therefore conducted a prospective 2-arm open label randomized trial comparing patients managed post operatively on combined urethral and *in situ* SPC vs patients managed on 2 way urethral catheter drainage only. To the best of our knowledge there is no randomized study comparing these two modalities in patients managed without bladder irrigation.

MATERIALS AND METHODS

Following institutional research ethical board review and approval, 84 participants undergoing Freyer's simple prostatectomy at Federal Teaching Hospital Abakaliki, Ebonyi State, Nigeria and Alpha Specialist Hospital (Urology Centre), Enugu Nigeria over an 18 mo period, January 2014 to June 2015 were randomized using

prelabelled sealed envelopes into 2 groups. This was a prospective 2-arm parallel, open-label randomized trial conducted in compliance with the principles enunciated in the Helsinki declaration. The statistical review of the study was done by a biomedical statistician.

The study power was set at 95%, *i.e.*, $(1 - \beta) = 0.95$ and at a level of significance, α , of 0.01% to sufficiently detect a difference of 8%^[4,9,10] vs 47%^[5] in the proportion of those developing clot retention after open simple prostatectomy without bladder irrigation, in subjects drained by combined 2-way urethral catheter and SPC vs those drained by 2-way urethral catheter only.

The sample size required to detect the above effect size was determined using the following formula^[22]; $n = \{f(\alpha, \beta) [P_0(100 - P_0) + P_1(100 - P_1)]\} / (P_0 - P_1)^2$.

Where P_0 = proportion of participants in Group 2 expected to develop clot retention = 47%; P_1 = proportion of participants in Group 1 expected to develop clot retention = 8%. $f(\alpha, \beta) = 17.8$.

This returned a sample size of approximately 40 participants per arm of the study and 80 participants in both arms.

Group 1 patients were managed post operatively with combined 2 way urethral catheter drainage and *in situ* 2 way SPC while group 2 patients were managed post operatively with only 2 way urethral catheter drainage. Informed consent was obtained from all patients before surgery. Prior to surgery detailed clinical history of all patients was documented. Indications for surgery were severe lower urinary tract symptoms; IPSS (International Prostate Symptom Score > 19) and acute urinary retention necessitating urethral catheterization. Preoperative laboratory work up included urinalysis, urine microscopy culture and sensitivity, complete blood count, platelet count, prostate specific antigen (PSA), serum electrolyte urea and creatinine (S/E/U/Cr) estimation, abdominopelvic ultrasound scan, chest X-ray and electrocardiogram. Patients with PSA above 4 ng/mL were subjected to transrectal prostate biopsy and operated on only, if the result showed BPH. Sterile urine was ensured as well as normal platelet count and S/E/U/Cr. Pre-operative hemoglobin levels were optimized to at least 11.5 g/dL.

Operative technique

All patients had Freyer's transvesical prostatectomy done in standard fashion. All the surgeries were done by the author who had 12 years post fellowship experience at the commencement of the study. Patients were administered *I.V.* ceftriaxone 1 g and *I.V.* metronidazole 500 mg 15 min prior to surgery. These antibiotics were continued till the 4th post operative day following which, patients were converted to oral ciprofloxacin 500 mg bid till post operative day 10.

All surgeries were done under regional anesthesia (spinal or epidural). The bladder was assessed *via* a pfannenstiel incision and opened transversely in its lower half between two stay sutures. After finger

enucleation of the prostatic adenoma haemostasis was secured by running 2/0 polyglactin suture of the bladder neck between the 5 and 7 o'clock positions. Additional bleeding points were either electro fulgurated or suture ligated. The prostatic fossa was not packed. A size 22F, 2 way silicone Foley urethral catheter was introduced into the bladder. Its balloon was inflated to 40 mL within the bladder and used to apply traction against the bladder neck by means of gauze bandage tied to the catheter and pushed snugly against the penile tip. This traction was maintained at the end of surgery by strapping the catheter to the patients thigh with plaster. The decision on whether or not to add a SPC was taken at the point of closing the bladder by an independent investigator, using prelabelled sealed envelopes. The SPC (size 22F) was sited at the dome of the bladder in group 1 patients and brought out through a separate stab incision of the skin in the midline about two finger breaths above the pfannenstiel incision. The SPC was retained with 15 mL sterile water for injection and spigotted. The bladder was closed in 3 layers and the wound washed with normal saline. A perivesical wound drain of size 22F Foley catheter was placed in the perivesical space and the abdominal wound was closed in layers. The skin was closed with subcuticular 2/0 polyglactin suture. Traction on the bladder neck was released fully by 24 to 36 h. None of the patients had continuous bladder irrigation. Post operatively patients received, alternately 8 hourly intramuscular tramadol and pentazocine for analgesia.

Data collected and analyzed include demographic and clinical data such as age, prostate volume, PSA, pre and post operative hemoglobin, duration of surgery, clot retention episodes, clot retention episodes requiring evacuation with the 60 cc bladder syringe, requirement for extra analgesics, blood transfusion, hospital stay and complications. The primary outcomes were number of participants with clot retention episodes, and number of clot retention episodes requiring bladder syringe evacuation. Secondary outcomes evaluated were blood loss, requirement of extra analgesics, duration of surgery, hospital stay and presence or absence of post-op complications. Post operative hemoglobin was estimated on post operative day 2. Hospital stay was calculated from the day of operation to the day of discharge. For group 1 patients the SPC was left *in situ* as a safety valve. It was deployed for drainage of the bladder only when the urethral catheter was blocked by clots. The SPC was removed when the urine became consistently clear, usually by post operative day 2 or 3. The suprapubic cystostomy site was dressed and allowed to close naturally. The urethral catheters were spigotted by post operative day 5 or 6 and removed 24 h later. Patients in group 1 required an additional day or two to ensure closure of the SPC site. All enucleated prostates were sent for histology.

Statistical analysis

Data were analyzed using SPSS Version 16, Chicago IL,

Table 1 Demographic and clinic characteristics of groups 1 and 2 patients

Reps	Group 1 (mean \pm SD)	Group 2 (mean \pm SD)	P value
Patients (n)	42	42	
Age (yr)	65.7 (\pm 7.6)	64.8 (\pm 6.8)	0.598
Prostate volume (mL)	85.6 (\pm 49.1)	89.3 (\pm 42.1)	0.715
PSA (ng/mL)	15.3 (\pm 15.0)	12.6 (\pm 15.3)	0.417
Duration of surgery (min)	102.9 (\pm 18.8)	100.7 (\pm 14.9)	0.555
Blood transfusion (pints)	0.4 (\pm 0.6)	0.6 (\pm 0.9)	0.277
Clot retention episodes	0.8 (\pm 1.5)	3.5 (\pm 4.4)	0
Clot retention episodes requiring bladder syringing	0.4 (\pm 0.9)	2.6 (\pm 3.8)	0.001
Requirement for extra analgaesic	0.4 (\pm 0.5)	4.0 (\pm 1.5)	0
Change in haemoglobin (g/dL)	1.9 (\pm 1.2)	2.1 (\pm 1.1)	0.408
Duration of admission (d)	8.6 (\pm 1.2)	7.3 (\pm 0.6)	0

PSA: Prostate specific antigen.

United States. Student's *t* test was used to determine whether the observed differences in means was significant. Categorical variables were analyzed with the χ^2 test. *P* < 0.01 was taken as significant.

RESULTS

There were 42 patients in each group. The mean age of the groups was 65.7 (\pm 7.6) in group 1 vs 64.8 (\pm 6.8) in group 2. The groups were similar with respect to age, PSA, prostate volume, change in hemoglobin level, duration of surgery, blood transfusion and overall complication rate. However statistically significant differences were observed in clot retention episodes, clot retention episodes requiring evacuation with the 60 mL bladder syringe, requirement of extra analgesics and duration of admission (Table 1). Abnormally high PSA values were observed in some patients. However these patients had negative prostate biopsies prior to surgery and the resected specimens also had negative histology.

Overall complication rate showed that 33.3% of patients in group 1 and 35.7% of patients in group 2 had complications. The difference was not statistically significant. Detailed evaluation of complications showed a total of 39 complications; 24 (61.5%) in group 1 and 15 (38.5%) in group 2 (Table 2). Many patients in group 1 had more than one complication thus explaining the disparity in overall and actual complication rates. Post prostatectomy lower urinary tract symptoms (frequency, urgency, urge incontinence and dribbling) was the commonest complication accounting for 12 (30.8%), followed by urinary tract infection 10 (25.6%) and secondary haemorrhage 5 (5.1%). Details of complications are shown in Table 2. Persistent suprapubic urinary fistula was observed in 3 patients (8.1%) in group 1. No patient in group 2 had a urinary fistula. Urinary fistulas were managed by continuous

bladder drainage and treatment of urinary tract infection (UTI). Additional measure was to close the fistula with 2/0 nylon suture after freshening the edges. These 3 patients were discharged home on catheter. There was no mortality. There were no incidental prostate carcinomas. Follow up period is currently 7.13 (\pm 1.91) mo.

DISCUSSION

There has been a paradigm shift in the management of BPH in the last four decades towards less invasive procedures such as TURP^[1] and Laser prostatectomy^[2], especially for prostates less than 80-100 g. In the developed world these minimally invasive transurethral procedures account for most of the procedures, while open suprapubic prostatectomy (OSP) accounts for only 3%-40% of procedures^[3,23]. The reverse is the case in the developing world largely because of absence of skilled manpower and technology for minimally invasive transurethral procedures^[7]. It has also been noted that more and more patients are presenting these days with prostates in the 80 to 100 g range because of the increasing use of medical treatment or watchful waiting^[2,23]. Thus there will always be a place for OSP whether in the developed or developing world. While OSP is more invasive and requires an abdominal incision with subsequently longer hospitalization and convalescence than transurethral techniques, it results in an excellent functional outcome and low reoperation rates^[3,18,24].

Morbidity and mortality after OSP is closely tied to the problem of clot retention and adequacy of bladder drainage^[8,11]. Clot retention if left untreated, can lead to severe pain, tachycardia, azotemia, hypertension and bladder rupture^[14,25].

Traditionally effective drainage of the bladder and prevention of clot retention after OSP has been by means of continuous bladder irrigation (CBI) with normal saline through a 3 way urethral catheter^[16-18] or via a combination of 2 way urethral catheter and a SPC^[4,19] with or without manual evacuation of clots with the 60 cc catheter tip syringe. There might be a resort to cystoscopic evacuation or outright re-exploration if the latter fails. Some studies^[20,21] have queried the need for CBI pointing out, that clot retention still frequently occurs even under CBI and that there is a risk of bladder rupture with unregulated inflow of irrigant. CBI is also associated with increased workload on the staff and increased financial burden to the patient. OSP without CBI has been shown to be safe^[7,10,20,21] and is our current practice. Under this non irrigation protocol two options exist for draining the bladder; One is the use of a 2 way urethral catheter alone and the other is the use of a combination of 2 way urethral catheter with addition of a SPC as a safety valve against clot retention. This study compares post operative outcomes in patients managed with combined SPC and 2 way urethral catheter and those drained by 2 way urethral catheter only. All patients were managed without CBI.

Table 2 Overall complication rate and details of complications by Clavien Dindo grade observed in both groups *n* (%)

Complications	Clavien Dindo grade	Group 1	Group 2	Total	<i>P</i> value
Overall complications		14 (33.3)	15 (35.7)	29 (34.5)	0.5
Post prostatectomy (LUTS)	II	5 (12.8)	7 (17.9)	12 (30.8)	0.378
Post prostatectomy UTI	II	8 (20.5)	2 (5.1)	10 (25.6)	0.044
Secondary hemorrhage	II	4 (10.3)	1 (2.6)	5 (12.8)	0.18
Surgical site infection	IIIa	3 (7.7)	1 (2.6)	4 (10.3)	0.308
Persistent suprapubic fistula	IIIa	3 (7.7)	-	3 (7.7)	0.12
Delirium	II	-	2 (5.1)	2 (5.1)	0.247
Left ventricular failure	IVa	-	1 (2.6)	1 (2.6)	0.5
Cardiac arrhythmia	IVa	-	1 (2.6)	1 (2.6)	0.5
Septicemia	II	1 (2.6)	-	1 (2.6)	0.5
Total		24 (61.5)	15 (38.5)	39 (100)	

LUTS: Lower urinary tract symptoms; UTI: Urinary tract infection.

The mean age of the groups was respectively, 65.7 (\pm 7.6) in group 1 vs 64.8 (\pm 6.8) in group 2. These means are similar to the mean age of patients undergoing OSP^[4,20]. The age difference between the two groups was not statistically significant, *P* = 0.598. The difference between the two groups with respect to prostate volume, PSA and duration of surgery was also not statistically significant (Table 1). However statistically significant differences were observed in the mean clot retention episodes (CREs), clot retention episodes requiring evacuation with the 60 mL bladder syringe, requirement of extra analgesics and duration of admission.

The mean CREs in group 1 was much lower than that of group 2; 0.8 (\pm 1.5) (range 0-6) vs 3.5 (\pm 4.4) (range 0-16), *P* = 0.000. CREs of between 0.9% to 47% have been reported by various authors^[1,5,9,10]. The difference in CREs between the groups is not surprising because group 1 patients had an alternative route for bladder drainage in the event of clot retention. In this group the spigotted SPC was opened and connected to a urine bag once the first clot retention episode occurred. The SPC was then left open to drain the bladder alongside the 2 way urethral catheter until the urine became clear enough for the SPC to be removed. Formed clots naturally gravitate to a dependent position in the bladder and block the urethral draining catheter leaving the SPC which is sited at the dome of the bladder free to drain the bladder, while clot lysis is ongoing.

In the presence of clot retention, some clots may pass spontaneously or pass following milking of the urethral catheter. When these fail the next option is to evacuate the clots using the 60 cc bladder syringe. Evaluation of CREs requiring evacuation with the bladder syringe between the two groups showed that mean CREs requiring bladder syringe evacuation was 0.4 (\pm 0.9) (range 0-4) in group 1 compared to a mean of 2.6 (\pm 3.8) (range 0-14) in group 2. This difference was statistically significant, *P* = 0.001. Patients are better off with fewer CREs requiring evacuation with the bladder syringe. For one, clot evacuation can be tasking, time

consuming and sometimes inefficient, because the catheter walls tend to collapse under the negative pressure of the bladder syringe^[14]. There is also the risk of introducing infection into the bladder by too frequent flushing out of clots. None of the groups required reoperation for clot retention or cystoscopic evacuation and there was no mortality.

Clot retention is not just associated with increased demand on the time and resources of the staff but is also associated with increased patient discomfort, post operative pain and requirement of extra analgesic. The mean demand for extra analgesic between the two groups varied considerably. While it was 0.4 (\pm 0.5) (range 0-2) for group 1, it was 4.0 (\pm 1.5) (range 0-7) for group 2. This difference was statistically significant, *P* = 0.000. The reduced demand for extra analgesic in group 1 is in keeping with the fewer CREs and CREs requiring evacuation with the bladder syringe in this group. A cost analysis reveals an extra cost of approximately 42USD per patient for dealing with the burden of extra clot retention episodes and clot retention episodes requiring evacuation with the 60 cc bladder syringe observed in group 2. This is broken down into; cost of SPC-1.2USD, urine bag-0.5USD, 60 cc bladder syringe(average of 3/patient)-4.5USD, Normal saline for flushing the catheters(average, 4L/patient)-3.6USD, extra analgesic (average 8 ampoules of tramadol/patient)-3.0USD, extra demand on nursing services-20USD, change of soiled beddings and dressings-9USD. In a resource poor environment this extra 42USD can be a significant economic burden to the patient.

Mean blood transfusion was lower in group 1 compared to group 2; 0.4 (\pm 0.6) vs 0.6 (\pm 0.9) respectively. Also the mean change in hemoglobin was lower in group 1 compared to group 2; 1.9 (\pm 1.2) g/dL vs 2.1 (\pm 1.1) g/dL. These differences approached but did not reach statistical significance. *P* values, 0.277 and 0.408 respectively. Blood transfusion rates after OSP can vary greatly. While some authors claim zero transfusion^[10,21]. Most large series report blood transfusion in the range of 1% to 57.1%^[3,6,7]. Bleeding

after OSP occurs not just because of inadequate haemostasis but also because clots and clot retention cause over distension of the bladder. Over distention provokes further bleeding because the bladder and prostatic fossa are prevented from contracting down on the bleeding points. Therefore any measure that can reduce clot retention will reduce post operative bleeding. In this study the mean blood transfusion and change in hemoglobin concentration was lower in group 1 in keeping with the reduced CREs and CREs requiring evacuation observed in this group.

Overall complication rate in this study was 34.5%. This is similar to the 30% and 31.3% rates reported in some other series^[18,24]. Both groups were similar in terms of overall complication rate with 33.3% of patients in group 1 and 35.7% of patients in group 2 having complications $P = 0.500$ (Table 2). However detailed analysis of actual complications showed that there were more complications in group 1 than group 2 because some patients in this group had more than one complication (Table 2). Post prostatectomy lower urinary tract symptoms (LUTS) namely frequency, urgency, urge incontinence and dribbling was the commonest complication in both groups accounting for 30.8% of the overall complications. It was slighter commoner in group 2 than group 1; 7 (17.9%) vs 5 (12.8%). Others have also observed worrisome post prostatectomy LUTS to be a common complication after OSP^[1,9]. A range of 6.7% to 11.1% has been reported^[1,9] which is slightly lower than observed in this study. The condition usually resolves with keggel exercises over a short period of time with or without antimuscarinics. UTI has to be ruled out as a cause and treated. In this series all cases resolved within one month after discharge. The next most common complication was post prostatectomy urinary tract infection which accounted for 25.6% of complications. This is lower than the 40% figure reported by Bapat *et al*^[9] after Freyer's prostatectomy. It was seen more in group 1 than group 2; 8 (20.5%) vs 2 (5.1%). Post prostatectomy haematuria (secondary hemorrhage) was also commoner in group 1 than group 2; 4 (10.3%) vs 1 (2.6%). Haematuria may be a complication of UTI. The higher incidence of these two complications in group 1 may be related to the presence of the SPC. The suprapubic ostium may have been a source of bacterial entry into the urinary tract. Persistent suprapubic urinary fistula was observed in 3 patients (7.7%) in group 1. No patient in group 2 had a suprapubic urinary fistula. The urinary fistulas were managed by continuous bladder drainage and treatment of UTI if present. These three patients had UTI. In these three patients the suprapubic ostium was sutured and the patients discharged home on catheter. Mean duration of admission was 8.6 d (± 1.2) in group 1 and 7.3 d (± 0.6) in group 2, $P = 0.000$. This statistically significant difference in duration of admission between the two groups can be attributed to the extra time it took for the suprapubic fistulae to close in group 1 patients. There was no mortality in this series.

Draining the bladder with a combination of urethral and SPC is associated with a smoother post operative course because of fewer clot retention episodes and clot retention episodes requiring bladder syringe evacuation. It is also associated with reduced requirement of extra analgesic. These advantages have to be weighed against the disadvantage of an occasional persistent suprapubic fistula resulting in slightly longer hospital stay.

COMMENTS

Background

Despite the advent of newer technologies for treating benign prostatic hypertrophy (BPH), open simple prostatectomy (OSP) still remains a common treatment option for bladder outlet obstruction due to BPH. Currently some urologists advocate non bladder irrigation after OSP and they site several disadvantages of bladder irrigation such as cost, increased staff workload, patient discomfort, risk of bladder rupture, prolonged immobilization, and perhaps more importantly that it does not prevent clot retention. Two options exist for draining the bladder after non irrigated OSP; one is the use of a urethral catheter only and the other is to use a combination of urethral and suprapubic catheters (SPCs) so that the SPC acts as a safety valve should there be recalcitrant clot retention. It is expected that this latter method will guarantee uninterrupted drainage of urine and blood from the lower urinary tract until normal haemostasis is attained, avoiding accumulation of blood and clot retention.

Research frontiers

This study is important because it helps to support the advocacy for OSP without bladder irrigation. The disadvantages of bladder irrigation after OSP have already been clearly spelt out.

Innovations and breakthroughs

To the best of the knowledge this is the only study evaluating in a randomized fashion, bladder drainage after OSP.

Applications

The practical applications of using a combination of urethral and SPCs to drain the bladder after OSP is that because it is associated with fewer clot retention episodes, it requires less monitoring. It is therefore useful in settings where there is less manpower such as private hospitals and in developing countries. It is also cheaper because it is associated with less requirement of extra analgesic, need to evacuate clots and blood transfusion.

Peer-review

The subject of the study is original and the manuscript is well written.

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