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## RESEARCH ARTICLE

### **Acute Urinary Retention [AUR] Secondary To Benign Prostatic Hypertrophy [BPH]- A Review Of Current Practices.**

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#### **Background**

Acute urinary retention (AUR) is one of the most dreaded complications of lower urinary tract symptoms suggestive of benign prostatic hyperplasia (BPH). The management of AUR is subject to debate and varies considerably among countries.

#### **Objective**

To review the current management of AUR secondary to BPH.

**Definition:** - AUR is defined as the sudden inability to pass urine and usually painful except when it is as a result of neurological problem<sup>1,2,3,4</sup>

#### **Epidemiology**

Benign prostatic hyperplasia is the cause for the AUR in at least 65% of men presenting with AUR<sup>5</sup>. Men with AUR often have lower urinary tract symptoms (LUTS) for an average of 32 months prior to the AUR<sup>6</sup>.

Acute urinary retention (AUR) has been reported as one of the most significant complications of long-term benign prostatic hyperplasia (BPH)<sup>7</sup>.

In the past it has been an immediate indication for surgery. In recent times also, most patients failing to void after attempted catheter removal still undergo surgery or when Trial without catheter (TWOC) especially when combined with alpha adrenergic blocker, has been unsuccessful. For this reason alone, AUR is an important event, from economic standpoint as well as from the quality of life of the patient<sup>8</sup>. The patient originally has inability to urinate, with increasing pain, and eventually a visit to his physician, catheterization, follow-up visits to the

physicians, an attempt at catheter removal, and eventual recovery or surgery, which is both painful and time consuming. In some literatures, the risk of recurrent AUR was cited as 56% to 64% within 1 week of the first episode and 76% to 83% in men with diagnosed BPH.<sup>9-11</sup>

AUR has been reported to represent significant public health issue globally<sup>1,2,3</sup>. It is estimated that 10% of men in their seventies and a third in their eighties will have AUR within the next 5yrs<sup>12-14</sup>, while a 60-year old man has a 23% probability of experiencing an episode of AUR if he survived another 20yrs<sup>11</sup>.

The incidence rates of AUR ranges from 0.4 – 25% per year in men seen in Urological practice worldwide<sup>14</sup>.

In UK & USA, AUR is the presenting feature in 23 – 27% of men undergoing prostatectomy for benign conditions.

#### **Clinical Types of AUR**

1. Precipitated AUR (pAUR) – follows a triggering effect, such as a surgical procedure with general anaesthesia (GA) or loco-regional anaesthesia, excessive fluid intake, urinary tract infection (UTI) or intake of medications with sympathomimetic or anticholinergic effects<sup>15-16</sup>.

2. Spontaneous AUR (sAUR)- occurs when no triggering event is identified but is attributed to natural history of BPH<sup>2</sup>.

Besides, men with sAUR were less likely to undergo TWOC than those with pAUR<sup>2</sup> while men with sAUR are more likely to undergo operation than men with pAUR<sup>4</sup>.

It has been confirmed by some studies that there are differences in the clinical profile and management of sAUR and pAUR. BPH was

revealed by the AUR event in 52.3-54.3% of men with pAUR, compared with 25.9% of men with sAUR. Moreover, men with pAUR had less severe LUTS, smaller prostates and a lower percentage of significant post void residual urine [PVR] values before the AUR event<sup>2</sup>.

### **RISK FACTORS FOR AUR IN PATIENT WITH BPH**<sup>1,3, 11, 17- 20,37</sup>

1. Age-The risk increases with age. The commonest age range in Ekiti-Nigeria was reported to be 70-79 years.
2. Severe LUTS- In men with mild symptoms, it has been well documented that AUR incidence increased from 0.4/1000 person-years for those 45 to 49 years old to 7.9/1000 person-years for those 70 to 83 years old. In men with symptom scores of 8 to 35, rates increased from 3.3/1000 person-years for those 45 to 49 years old to 11.3/1000 person-years for those 70 to 83 years old. Men with a clinical diagnosis of BPH and a symptom score of 8 or greater had the highest rates (age-adjusted incidence 13.7/1000 person-years). All seven lower urinary tract symptoms comprising the American Urological Association symptom index individually predicted AUR. The sensation of incomplete bladder emptying, having to void again after less than 2 hours, and a weak urinary stream were the best independent symptom predictors<sup>7</sup>.
3. A low peak flow rate – This is associated with high risk of AUR. Relative Risk [RR] – 3.9, 95% CI = 2.3 – 6.6
4. Increased post void residual urine (PVR).
5. Enlarged prostate – RR 2.0, 95% C.I (1.0 -9.0) .
6. High serum PSA levels – A detailed analysis has shown a near linear increase in risk for AUR with increasing thresholds of serum PSA .It has been reported as the strongest predictor of AUR out of LUTs, large prostate and PSA level.
7. Deteriorating dynamic variables under treatment e.g. symptom & post void residual urine (PVR).
8. Post traumatic
9. Acute medical condition- Use of medications with adrenergic or anticholinergic side effects also predicted acute urinary retention.
10. Urinary tract infection [UTI].
11. Prostate volume of about 230ml on TRUS .

### **CAUSES OF AUR IN BPH PATIENT**<sup>21-23</sup>

1. Excessive fluid intake

2. Alcohol consumption
3. Alpha – adrenergic over activity
4. Prostate infection
5. Bladder over distention
6. Need to postpone voiding (car traveling, immobilization)
7. Sexual activity- Postcoital urinary retention secondary to urogenital diaphragm spasm
8. Prostatic infarction
9. Acute anorectal pain
10. Urolithiasis
11. After surgery especially post instrumentation e.g. cystoscopy.

### **PATHOGENESIS OF AUR IN PATIENT WITH BPH**

There are various postulations:

1. Mechanical/Dynamic theory- It has been discovered that there are some conditions that require higher than normal pressures to start off the voiding cycle –e.g. any event or process which increases the resistance to the flow of urine-will lead to AUR. This may be a mechanical obstruction such as a foreign body, prostatic mass or a dynamic obstruction resulting from increased smooth or striated muscle tone or both<sup>1,24</sup>.

2. The receptor theory-Human prostate, especially the prostatic capsule, has a lot of alpha – adrenergic receptors<sup>24</sup>.

This has led to the use of a rapid acting alpha blocker which has been shown to relieve AUR in some cases. Bladder distention leads to an increase in sympathetic activity, which results in a rise in intravesical pressure but low pressure at the bladder neck during AUR. This may be attributable to a mechanical stretching of the detrusor fibers pulling the bladder neck open or by reciprocal relaxation of the bladder neck in the presence of severe urge to void via spinal reflexes<sup>25-28</sup>.

As the bladder overfills, a reflex relaxation of the pelvic floor occurs in conjunction with a reduction in external sphincter and bladder neck pressures. However, there is stimulation of alpha adrenergic receptor in the prostate leading to a rise in intra-urethral pressure resulting in AUR.

3. Infection/Inflammatory theory-Prostatic infarction and other processes such as acute prostatitis contribute to this process. Prolonged bladder distension in retention may directly affect detrusor function either by bladder wall ischaemia or axonal degeneration, resulting in the failure of detrusor muscle to initiate bladder contraction. Supplementary stimulation of the prostatic alpha – receptors – caused by bladder distention, together with the secondary

decrease in the intravesical pressure, perpetuates the retention<sup>4</sup>.

#### 4. The ratio of stromal to epithelial tissue theory-

It has been reported by several authors that the ratio of stromal to epithelial tissue is decreased in patents with AUR secondary to BPH. That is to say the epithelial tissue is high in AUR, secondary to BPH than symptomatic BPH without AUR<sup>29</sup>

The sequence of event is such that the differential epithelial/stromal growth predisposes the prostate to infarction through effects on the vascular supply, prostatic infarction leads to swelling and a rise in intraprostatic urethral pressure.

This in turn stimulates efferent alpha – adrenergic receptors resulting in a further rise in intra urethral pressure sufficient to exceed maximal detrusor pressure resulting in AUR.

## MANAGEMENT

In the past the only way to treat AUR was by decompression of the bladder using catheter<sup>1</sup>.

However, recent developments offer hope of better management from studies conducted by various researchers.

Firstly, our understanding of the epidemiology and pathogenesis of AUR has improved based on high quality experimental and community based studies.<sup>1</sup>

Secondary, recent reports have proved that AUR may be preventable in some men<sup>1</sup>.

Thirdly, development in Catheter technology might improve management<sup>1</sup>.

Management shall be divided into treatment and prevention.

### I. Treatment:

**1. Catheterization-** Immediate bladder decompression –commonly through the Urethral or through suprapubic site, if the urethral Catheterization fails<sup>30</sup>. Advantage of urethral- it is easy and quick and does not block easily.

Advantage of suprapubic- Decreased risk of UTI and urethral stricture formation and permits a trial of micturition without removing the catheter

Disadvantages of suprapubic-dislodgement, bowel perforation<sup>31</sup>, acute peritonitis secondary to infected extravasated urine arising from the cystotomy site<sup>7</sup>, late intraperitoneal posterior bladder wall perforation [8], migration of the suprapubic catheter to the anterior urethra<sup>9</sup>, and implantation metastasis in a case of bladder cancer<sup>32-36</sup>.

**2. Trial without catheter [TWOC]-** which involves removing the catheter after 1day to 3 days. Has become a popular practice in many centers<sup>30</sup>.

The catheter is removed and patient observed for ability to void without discomfort and thereafter discharged.

This practice reduces the discomfort and potential morbidity associated with an in situ Catheter. If prostatectomy is required, this can be scheduled at a mutually convenient time for both the patient and the surgeon, which has reduced morbidity and mortality compared with an acute procedure<sup>30</sup>.

If a TWOC was initially successful, 56% of men experienced recurrent AUR within a week, 62% after a month and 68% after a year. Patients with a retention volume of > 500 mL had a 3.6 times higher risk of recurrent retention and 2.7 times higher surgical treatment rate than patients with a volume of < 500 mL (P = 0.008 and P = 0.001, respectively). Patients with no provocative situation[sAUR] had a risk 1.9 times higher for recurrent retention and a 1.7 times higher surgical treatment rate than patients with a provocative situation[pAUR] (P = 0.02 and P = 0.009, respectively). Men who produced a maximum flow rate of > 5 mL/s were less likely to experience repeat AUR. In contrast, men with poor flow rates (< 5 mL/s) were very likely to experience repeat AUR. The ability to void at least 150 mL was associated with a significantly lower recurrent retention than in those with a voided volume of < 150 mL (60%).

**3. Alpha 1 – blockers-** The use of alpha-1 blockers has revolutionized the management of AUR in recent times. The rationale for the use is based on the fact that AUR related to BPH may be a dynamic one resulting from stimulation of alpha1-adrenergic receptors at the prostate and bladder neck<sup>24</sup>. Alpha blockers act by reducing sympathetic tone, bladder outlet resistance and post void residual urine<sup>14</sup>.

There are various alpha1 –blockers that are in use. These include, alfuzosin 10mg dly, Tamsulosin 0.4mg, Doxazocin-[dose ranges from 2mg to 8mg] daily.

**4. TWOC and alpha-adrenergic receptor antagonist-**The combination of any of these with Catheter has greatly improved the success of TWOC and reduces the incidence of AUR. The study that was conducted in Ekiti - Nigeria using Contiflo OD reported 68% success of TWOC and 88% of the patient had no recurrent AUR within three months after its use. Alpha 1-blockade followed by a TWOC is now favoured in most centres<sup>30, 38,39</sup>.

**5. The duration of catheterization-**duration of catheter in most centres ranges from 2 to 7 days before TWOC<sup>30, 33, 37,38 39</sup>.

Djavanetal.reported that there was no significant association between failure of TWOC and duration of catheterization despite contrary reports by previous reseachers. However, younger men (< 75 years old) with a retention volume of < 1000 mL and men who achieved maximum detrusor pressures after catheter removal of > 35 cmH2O were more likely to void after removal of the catheter in less than 24 hours<sup>33</sup>.However, patients who had retention volumes of > 1300 mL benefited most from prolonged catheterization.

Except when absolutely necessary, prolonged catheterization should be discouraged<sup>30</sup>.

Complications associated with prolonged catheterization include greater comorbidity and prolonged hospitalization.

**6.Prostatectomy-** There is evidence from the National Prostatectomy Audit that urgent prostatic surgery after AUR is associated with greater morbidity and mortality than in men with elective prostatectomy for LUTS only<sup>15</sup>. This is in part due to a greater risk of intraoperative complications, with relative risks (RRs, 95% CI) of 1.8 (1.3–2.5), bleeding requiring transfusion of 2.5 (1.8–3.3), postoperative complications of 1.6 (1.2–2.0) and hospital mortality within 30 days of 3.3 (1.2–9.3). It is well known that bacterial colonization of a urinary catheter is significantly greater after 3 days of catheterization and can result in major morbid events such as fever and possible progression to bacteraemia/septicaemia<sup>16,40</sup>. Furthermore, there is a greater incidence of septicaemia in men with bacteriuria and undergoing surgery<sup>41</sup>.

**7.LASER THERAPY-**This has been recognized as alternative treatment modalities to prostatectomy especially in developed countries where facilities are available.

[1].Interstitial treatments which involve the delivery of heat through a needle have been used with moderate success in AUR<sup>42</sup>. Transurethral balloon laser thermotherapy (TUBAL-T) of the prostate was performed in 12 patients with BPH and urinary retention who were poor candidates for prostatectomy<sup>43</sup>. Their mean (range) age was 78.9 (66–93) years and the mean duration of bladder catheterization before the procedure was 11 (2–48) weeks. Laser energy was applied with a Nd:YAG laser balloon under local anaesthesia. Spontaneous voiding was achieved in all patients at a mean of 2.8 (1–7) days after TUBAL-T and 75% of patients continued to void spontaneously in the long-term. The authors concluded that TUBAL-T was a safe and effective alternative to treating unfit patients with BPH in urinary retention.

[2]. Holmium:YAG laser resection of the prostate (HoLRP) was performed in 36 men who presented in AUR<sup>44</sup>. The mean (range) duration of postoperative catheterization was 1.5 (1–8) days and improved voiding was sustained through 6 months of follow-up. The long-term failure rate of urinary retention was 5.6%. The authors concluded that HoLRP was an effective surgical treatment for patients with bladder outlet obstruction [BOO] presenting in AUR.

[3]. In another study, Nd:YAG laser coagulation prostatectomy was performed in 67 men (mean age 71 years) who presented with acute or chronic urinary retention<sup>45</sup>. The median postoperative duration of catheterization was 10 days, the short-term failure rate was 6% and the long-term failure rate 9%.

[4]. Nd:YAG laser transurethral evaporation of the prostate (TUEP) was performed in 22 consecutive patients presenting with urinary retention caused by BPH<sup>46</sup>. All patients failed at least one voiding trial and the mean duration of catheterization before the procedure was > 30 days. Two patients were lost to follow-up and TUEP failed in two. The mean time to catheter removal was 3.5 days and all patients who successfully underwent TUEP were urinating spontaneously by 10 days. High-energy VLAP was performed in 17 men (mean age 69 years) in urinary retention<sup>47</sup>; the mean follow-up was 12 months and 82% were satisfied with their outcome. The authors concluded that high-energy VLAP was an effective procedure for the relief of BOO in men with AUR<sup>47,48</sup>.

[5]. Transurethral needle ablation of the prostate (TUNA) was performed in a pilot study of 10 patients in urinary retention [48]. After treatment, nine patients voided at a median of 3 days but a further two required TURP. The authors concluded that their early experience was encouraging and that TUNA was an effective day-case procedure which could be undertaken with no anaesthesia.

## 8. NEWER THERAPIES IN THE MANAGEMENT OF AUR

### 1. Prostatic devices/stents<sup>49</sup>

Use of prostatic catheters – serve as stent in the prostatic bed<sup>1</sup>.

The prostatic Catheter is predicted to keep the bladder neck and prostate open and also allow external (voluntary) sphincter to function<sup>1</sup>.

- As good as prostatic devices would have been, they are still at experimental stage and not readily available for use
- Even if there are available, a lot of work is still required on them to meet the desirable characteristic of synthetic biomaterials usable in the Urinary tract. These characteristics include complete inertness, durability, partial flexibility, partial rigidity, resistance to encrustation, workability, sterilisability, permanence of physical characteristics and ability to resist biofilm formation.

A. Permanent stents – E.g. Titan, wall stent, memotherm, ultraflex, urolume,

B. Temporary stents –E.g. Uro-spinal, prostakath, intraurethral Catheter, prostacoll, memokath, biofix, barnes stent and trestle

Permanent stents<sup>31</sup> –

Have wide spaces between their wires allowing tissue ingrowth and permanent incorporation of the stent into the prostatic mucosa.

There is a loss of contact with urine which reduces the risk of encrustation and infection and the longer internal lumen permits subsequent endoscopic maneuvers.

However, the tissue response can result in luminal narrowing or even occlusion and very difficult to remove.

Furthermore, of concern are the biocompatibility of the material, potential carcinogenicity secondary to a chronic inflammatory reaction, tissue interaction and migration of corrosion particles.

Temporary stents

- It is easy to insert under local anaesthesia
- It is cheaper
- It has contact with urine making it to be prone to displacement, infection and encrustation

2. Role of endothelin antagonists. Human prostate tissue produces endothelin and in the presence of smooth muscle, contractions have been observed which are not inhibited by  $\alpha$ -blockers. Recently, a new orally active endothelin antagonist was found to inhibit endothelin-induced prostatic contractions in a dose-dependent way<sup>50</sup>

## II. PREVENTION

1. Finasteride decreases the risk of both spontaneous and precipitated AUR – a selective inhibitor of 5 alpha – reductase.

- It reduces the size of the prostate by inhibiting the formation of dihydrotestosterone from testosterone.
- It is associated with about 57% lower risk of acute urinary retention compared to men on placebo. Among men with symptoms of urinary obstruction and prostatic enlargement, treatment with finasteride for four years reduces symptoms and prostate volume, increases the urinary flow rate, and reduces the probability of surgery and acute urinary retention<sup>51</sup>.

2. Combined medical management

The MTOPS (Medical Theory of Prostate Symptoms) trial is the largest and longest clinical study of medical therapy for BPH to date. A total of 3047 men were randomized to receive placebo, finasteride, doxazosin or combination therapy for a mean of 4.5 years. The reductions in risk of AUR in the finasteride, doxazosin and combination groups were 68%, 35% and 81%, respectively. The risk reductions for surgical intervention in the finasteride, doxazosin and combination groups were 64%, 34% and 67%, respectively. The MTOPS study hence confirmed that combined medical treatment significantly reduces the risk of progression to AUR and the need for surgical intervention in BPH patients. Kim CI *et al.*, from a retrospective analysis of 341 patients (192 patients in alpha blocker only group, 149 patients in combination treatment, followed up for six to eight years) reported the incidence of AUR in BPH patients receiving alpha blockers alone and combination of alpha blocker and alpha-reductase inhibitor. In the alpha blocker group 17.7% patients and 12.1% in the combination group experienced AUR ( $P < 0.05$ )<sup>52</sup>.

Conclusion

Therefore combined medical treatment is superior to monotherapy, eg Dutasteride.

TWOC in combination with alpha-adrenergic receptor antagonist has improved the success rate of TWOC.

Furthermore, newer therapies even though hopeful, are not practicable in most centers.

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