Managing and Preventing Acute Urinary Retention

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Acute urinary retention (AUR), an uncomfortable and potentially dangerous condition, often occurs in men who have benign prostatic hyperplasia. Although the reported incidence of AUR varies in the literature, there are a number of events that are known to precipitate episodes of AUR, including ingestion of certain agents, infection, general anesthesia, and performance of various diagnostic genitourinary procedures. Because it is preferable to avoid the need for catheterization (and the associated risks) in men at high risk for AUR, certain measures have been studied as means to prevent AUR episodes. Specifically, α-blockers and 5-α-reductase inhibitors have been shown to reduce the incidence of initial and subsequent AUR episodes in certain at-risk men.

[Rev Urol. *2005;7(suppl 8):S26-S33*]

Key words: Acute urinary retention • α-Blockers • Herniorrhaphy • Transurethral microwave thermotherapy

Acute urinary retention (AUR) is an extremely uncomfortable and potentially life-threatening condition characterized by a sudden inability to urinate associated with intense suprapubic discomfort. Because of the necessity to seek immediate medical attention in order to relieve the severe discomfort, renal insufficiency is not often a complicating factor. AUR commonly occurs in men with underlying benign prostatic hyperplasia (BPH). Often, there is a precipitating event, such as exposure to cold weather, excessive ethanol consumption, or ingestion of a medication that inhibits bladder contractility or increases bladder

Table 1
Factors Precipitating Acute Urinary Retention

- Excessive alcohol consumption
- Exposure to cold weather
- Medications
- Genitourinary instrumentation
- Non-genitourinary surgical procedures
  – Contributing factors: anesthesia, pain, perioperative fluids, immobilization
- Transurethral microwave thermotherapy
- Brachytherapy for localized prostate cancer
- "Early" removal of urinary catheter following radical retropubic prostatectomy

outlet resistance (Table 1). On rare occasions, a bladder calculus or blood clot may acutely obstruct the urinary outlet and cause AUR.

AUR may also be precipitated by genitourinary diagnostic procedures, such as cystoscopy, transrectal ultrasound (TRUS)-guided biopsy of the prostate, and ureteroscopy; minimally invasive procedures for treating BPH; and brachytherapy for the treatment of localized prostate cancer. Acute bacterial prostatitis and viral infections may also precipitate AUR. In younger men, a urethral stricture or primary bladder neck hypertrophy may be the cause of the underlying bladder outlet obstruction (BOO). AUR also has recently been recognized as a consequence of early catheter removal following radical retropubic prostatectomy.

The insidious development of chronic urinary retention is more commonly related to diabetes and neurologic disorders. Chronic urinary retention is more often associated with urinary tract infection and chronic renal insufficiency.

Risk of AUR in Men

Until recently, the natural history of BPH was poorly understood because of a lack of appropriately designed prospective studies. Historically, the 10-year risk of AUR development in men with BPH was reported to be between 4%[1] and 73%.[2]

Several recent studies have provided more reliable information related to the risk of AUR in the male population (Table 2). The Olmsted County Study represents the best characterization of the natural history of BPH in the general community.[3] The advantage of this community-based study is that it was not limited to men with clinical evidence of BPH. In this study, 2115 men aged 40 to 79 years completed the American Urological Association (AUA) Symptom Index at baseline. A subset of these men was more rigorously evaluated with uroflowmetry and TRUS in order to assess BOO and quantify prostate volume, respectively. Episodes of AUR were recorded during follow-up assessments.

The risk of AUR in the Olmsted County Study was 6.8 per 1000 person-years. Risk factors associated with the development of AUR included advanced age, increased severity of LUTS, increased prostate volume, and decreased peak flow rate. Men aged 60 to 69 years with AUA symptom scores of 8 or higher, peak flow rates (Q_{max}) less than 12 mL/s, and prostate volumes greater than 30 mL had a 10.3-times-higher risk of AUR than did men aged 40 to 49 years with AUA symptom scores less than 8, Q_{max} greater than 12 mL/s, and prostate volumes of 30 mL or less.[3]

The placebo arms of the Proscar Long-Term Efficacy and Safety Study (PLESS) and the Medical Therapy of Prostatic Symptoms (MTOPS) trial provide excellent opportunities to examine the natural history of men with established BPH.[4,5] In PLESS, men with BPH were randomized to receive either placebo or finasteride. Of the 1326 men randomized to placebo, AUR developed in 7.2% during the 4 years of active treatment.[4] The incidence of AUR in these patients was 18 per 1000 person-years, which is approximately 3-fold higher than

Table 2
Risk of Acute Urinary Retention (AUR)

Study	No. of Patients	History of BPH	Risk of AUR per 1000 PY
Physicians Health Study*	15,851	No	4.5
Olmsted County Study†	2115	No	6.8
PLESS‡§	1376	Yes	18

*Data from Meigs JB et al. *J Urol.* 1999;162:376-382.[39]
†Data from Jacobsen SJ et al. *J Urol.* 1997;158:481-487.[3]
‡Data from McConnell JD et al. *N Engl J Med.* 1998;338:557-563.[4]
§Placebo arm.
BPH, benign prostatic hyperplasia; PY, person-year; PLESS, Proscar Long-Term Efficacy and Safety Study.

in the Olmsted County Study. Increased prostate volume, serum prostate-specific antigen (PSA) level, and symptom severity were all predictive of AUR.[6] Fourteen percent of men with prostate volumes greater than 57 mL developed AUR. In more than half of these cases, a precipitating event was observed.

In the MTOPS trial, men with BPH were randomized to receive placebo, finasteride, doxazosin, or a combination of doxazosin and finasteride for up to 7 years.[5] The primary objective of the study was to examine the impact of medical therapy on disease progression.[7] Therefore, the placebo group was representative of the natural history of BPH. Mean follow-up at study closure was 4.5 years. The overall risk of AUR was 2%.[7] The risk of AUR development was intimately related to prostate volume and baseline serum PSA level.[8]

Factors Associated With AUR

Medications

The ingestion of prescription and nonprescription medications is a common precipitating cause of AUR. Specifically, cholinergic antagonists and α-adrenergic agonists may precipitate urinary retention by inhibiting detrusor contractility and enhancing bladder outlet resistance, respectively.[9] Therefore, care should be taken when prescribing these drugs for men with underlying BPH. Most medications administered for depression, allergies, Parkinson disease, and overactive bladder have anticholinergic properties.[10] α-Agonists are a common component of over-the-counter cold remedies. Presumably, these drugs should be contraindicated only if there is evidence of BOO or significant impairment of bladder emptying. In many men with lower urinary tract symptoms (LUTS) and an enlarged prostate, there is no evidence of significant BOO.[11] It is unlikely that men with LUTS and no evidence of BOO or impaired bladder emptying will develop AUR if exposed to cholinergic antagonists or α-agonists.

Surgical Intervention

It is well recognized that men who undergo surgical procedures requiring general anesthesia are at risk for AUR.[9] The inhibitory effect of the anesthetic agents on bladder contractility and secondary bladder overdistention likely contribute to the development of AUR. The incidence of AUR following short-acting spinal epidural anesthesia is approximately 0.5% if one excludes rectal and gynecologic surgery and inguinal herniorrhaphies.[12,13] Therefore, anesthesia alone represents a limited risk factor for AUR.

It is well recognized that men who undergo surgical procedures requiring general anesthesia are at risk for AUR.

Urinary catheters are routinely inserted during major surgical procedures both to monitor urine output and to prevent AUR. For example, in patients undergoing joint replacement surgery with no postoperative bladder decompression, AUR occurs in 52% of cases managed with clean intermittent catheterization.[14] Bladder decompression for 18 to 24 hours postoperatively decreases the risk of AUR to 27%.

Finley and colleagues[15] reported incidences of AUR following inguinal herniorrhaphies performed using local anesthesia or spinal general anesthesia of 0.27% and 13%, respectively. Jensen and colleagues[16] recently reported a Medline-based search intended to determine the incidence of AUR following herniorrhaphy. The incidences of AUR following inguinal herniorrhaphies performed under local anesthesia, regional anesthesia, and general anesthesia were 0.37%, 2.4%, and 3.0%, respectively. The investigators concluded that the type of anesthesia significantly influenced the risk of AUR.

An alternative explanation for the low risk of AUR following herniorrhaphies performed under local anesthesia is superior pain control.[17] Age[18,19] and volume of perioperative fluids[19,20] have also been shown to be risk factors for AUR following inguinal herniorrhaphy. Goldman and colleagues[19] reported the incidence of AUR following inguinal herniorrhaphy in men older than 60 years to be 25.5%.

Men who undergo abdominal perineal resection and proctocolectomy also have a high probability of AUR developing postoperatively because of injury to the autonomic innervation of the bladder, which impedes bladder emptying.[21] AUR is more likely to develop in men with coexisting BOO.

Genitourinary Instrumentation

AUR may develop following genitourinary diagnostic procedures, such as cystoscopy, biopsy of the prostate, and ureteroscopy. Historically, cystoscopy was performed using rigid cystoscopes. Rigid cystoscopy precipitated AUR by causing irritation to lower genitourinary tissues and hematuria. In the modern era, flexible cystoscopy has replaced rigid cystoscopy in the office setting, resulting in better patient tolerance, less trauma and irritation, and fewer cases of AUR.

Historically, prostatic biopsies were performed using large Tru-cut needles that were directed into the prostate nodule under digital rectal control.

This technique resulted in significant trauma to the prostate, with secondary pain, swelling, hematoma, and hematuria. Today, prostatic biopsy is performed under TRUS guidance using much smaller biopsy needles, which are more precisely guided into the prostate. AUR is extremely rare following TRUS-guided biopsy.[22]

AUR may develop following ureteroscopy, because the procedure is performed using a general anesthetic and causes bladder irritation. The incidence of AUR has not been reported in large series, as these experiences focus on complications resulting directly from the procedure.

Early Catheter Removal Following Radical Retropubic Prostatectomy

An indwelling urinary catheter is required following radical prostatectomy. Until recently, urinary catheters were typically left indwelling for up to 3 weeks. Lepor and colleagues[23] reported that the urinary catheter is a source of significant bother and limits recovery following radical prostatectomy. In a survey of men who had undergone radical prostatectomy, more than 90% of patients expressed a willingness to undergo cystography in order to facilitate earlier removal of the catheter. Over the past several years, these investigators have attempted to identify the optimal timing for removal of the urinary catheter. In their initial study, gravity cystography was performed in 179 men 7 days following radical prostatectomy.[23] Urinary catheters were removed in all patients who had no evidence of extravasation, unless a large pelvic hematoma was observed. AUR developed in 15% of the patients following removal of the urinary catheter on postoperative day 7.

In a subsequent group of 151 men who underwent radical prostatectomy, cystography was performed on postoperative day 3 or 4.[24] Once again, the catheter was removed if there was no evidence of extravasation or a significant pelvic hematoma. Overall, 76.8% of the catheters were removed on postoperative day 3 or 4. AUR was observed in 19.8% of men following early catheter removal. Two men required additional surgery because of complications attributed to the early catheter removal. Because of the high incidence of AUR and potential complications resulting from the condition, the recommendation was made to remove the catheter on postoperative day 7.

The incidence of AUR following TUMT is related to the amount of energy delivered to the prostate.

Transurethral Microwave Thermotherapy of the Prostate

Because of the risks associated with transurethral prostatectomy, minimally invasive therapies have been developed as alternative strategies to ablate prostatic tissue.[25] Of these strategies, radiofrequency (transurethral needle ablation [TUNA]) and microwave energy (transurethral microwave thermotherapy [TUMT]) have been the most extensively investigated. In general, these minimally invasive techniques are less effective than transurethral prostatectomy but are associated with fewer significant complications. However, a troublesome consequence of these minimally invasive therapies is postprocedure AUR.

The incidence of AUR following TUMT is related to the amount of energy delivered to the prostate. In a prospective randomized study reported by D'Ancona and colleagues,[26] the length of catheterization was 4.1 days following transurethral prostatectomy versus 12.7 days with TUMT. Blute and colleagues[27] reported that, following TUMT, 36% of men required catheterization for urinary retention. The rate of AUR following TUNA ranges from 13.3% to 41.6%.[25]

Prostatic Brachytherapy

The primary advantage of brachytherapy for the treatment of localized prostate cancer is avoidance of surgical intervention. AUR is a recognized complication of brachytherapy. The risk of AUR following brachytherapy appears to vary based on the technique, severity of baseline LUTS, and methodology for assessing outcomes.

D'Amico and colleagues[28] reported a 4% incidence of AUR using real-time, 3-dimensional magnetic resonance imaging–guided prostate brachytherapy. Han and colleagues[29] reported that 32% of men required urinary catheterization following prostate brachytherapy. In this study, the risk of catheterization was determined by a retrospective survey that was completed by 92% of a consecutively treated cohort. The investigators attribute their results to the methodology used to assess outcomes, which minimized underreporting of AUR episodes.[29] Wallner and colleagues[30] reported that the risk of AUR following prostate brachytherapy was dependent on the length of urethra receiving a high dose of radiation. Terk and colleagues[31] reported that the risk of AUR following prostate brachytherapy was directly related to the severity of baseline LUTS: 29% and 2% for men with baseline AUA symptom scores of greater than 20 and less than 10, respectively.

Natural History of AUR

Men who experience an episode of AUR are at higher risk for subse-

quent episodes of AUR, despite a successful trial of voiding immediately following removal of the urinary catheter (TWOC). The likelihood of a second episode of AUR immediately following a TWOC ranges from 38% to 56%, depending on the postvoid residual urine volume (PVR), prostate size, and time interval between catheter insertion and the TWOC.[32-34]

A single episode of AUR is no longer considered an absolute indication for surgical intervention.

This series does not include men who developed AUR following genitourinary instrumentation or interventions.

Klarskov and colleagues[32] reported that, at 1 year, 85% of men had undergone surgical intervention following an episode of AUR. Because of the risk of a second episode of AUR, many men will elect to proceed with surgical intervention. However, a single episode of AUR is no longer considered an absolute indication for surgical intervention; these men may be offered medical therapy and followed carefully, especially if they have a history of LUTS or an enlarged prostate.

Preventing AUR

AUR is associated with significant anxiety, discomfort, and inconvenience. Although catheterization provides immediate relief of the acute event, many men will ultimately have failure of a TWOC.[34] The catheter is uncomfortable, restricts activities, and is a potential source of infection. Therefore, efforts should be made to prevent AUR, especially in men at high risk for the condition.

Men With BPH

The MTOPS trial was designed to determine whether medical therapy prevents the progression of BPH.[5] The 4 end points indicating disease progression were as follows: an increase in symptom score of 4 or more points, an episode of AUR, recurrent urinary tract infection or urosepsis, or hygienically unacceptable urinary incontinence. Doxazosin, finasteride, and combination therapy significantly reduced the risk of overall clinical progression compared with placebo.[7] Combination therapy was significantly more effective than doxazosin alone and finasteride alone at reducing overall clinical progression. Doxazosin alone, finasteride alone, and combination therapy reduced the risk of AUR by 35%, 68%, and 81%, respectively. Finasteride was most effective at reducing AUR in men with prostate volumes greater than 20 mL.[8] Doxazosin significantly reduced the probability of AUR only in men with prostate volumes less than 20 mL.

Overall, the MTOPS study demonstrated that, in men with large prostates, the risk of AUR is quite high and finasteride reduces this risk in a clinically significant manner. Although α-blockers appear to reduce the risk of AUR in men with smaller prostates, the overall clinical benefit is low because of the low baseline risk of AUR in this group. α_1-Blockers are indicated primarily to facilitate a TWOC rather than to prevent the first episode of AUR.

Medications

Because cholinergic antagonists and α-adrenergic agonists are known to precipitate AUR, these agents are contraindicated in men with BPH.[2] It is unclear whether the risk of AUR is related to the severity of LUTS, degree of BOO, or prostate size. Restricting the use of cholinergics and α-agonists in all men with LUTS may be excessive. The severity of LUTS should be evaluated in all men before prescribing cholinergic antagonists or α-agonists. In men with moderate or severe LUTS (AUA symptom score ≥8), a baseline uroflowmetry and assessment of PVR should be performed. In men with modest evidence of BOO or incomplete bladder emptying, these drugs should be prescribed only if there are no alternatives. The peak flow rate and PVR should be measured soon after initiating intervention and routinely thereafter to ensure that chronic urinary retention is not developing.

The severity of LUTS should be evaluated in all men before prescribing cholinergic antagonists or α-agonists.

Surgical Procedures

There are many factors that contribute to the development of AUR following surgery, including the direct effects of anesthetic agents on the bladder, bladder overdistention during the procedure, immobilization after the procedure, pain, and patient age and sex. Older men with BPH who undergo orthopedic, inguinal, or colorectal surgery are at greatest risk for postoperative AUR. The overwhelming majority of inguinal herniorrhaphies are performed as elective outpatient procedures without intraoperative catheterization. Therefore, limiting the perioperative volume of fluids and controlling pain are reasonable measures to reduce postoperative AUR.[17,18] Local anesthesia may be preferred because of its superior pain control.[17]

Table 3
Tamsulosin Reduces the Risk of AUR Following Early Catheter Removal

Tamsulosin	No. of Patients	Incidence of AUR, %
Yes	229	2.6
No	130	10

Data from Patel R et al. *Urology.* 2003;62:287-291.[35]
AUR, acute urinary retention.

α-Blockers appear to have a role in reducing the risk of postoperative AUR in older men. Goldman and colleagues[19] performed a randomized, placebo-controlled trial to determine the role of α-blockers in reducing the risk of AUR after hernioplasty. The study included 102 men older than 60 years who were randomized to receive phenoxybenzamine or to a control group. AUR developed in 26% of men in the control group and 0% of men who received phenoxybenzamine.

It is unclear who should receive prophylactic therapy with α-blockers before a herniorrhaphy. Based on the study reported by Goldman and colleagues,[19] it is reasonable to offer an α-blocker before herniorrhaphy to men older than 60 years. Another option is to recommend α-blockers to all men with moderate to severe urinary symptoms or a large prostate as determined by digital rectal examination. Therefore, evaluating the severity of LUTS and performing a digital rectal examination is advisable before inguinal herniorrhaphy.

Early Catheter Removal Following Radical Retropubic Prostatectomy

Cystographic studies have demonstrated that approximately 80% of men will have a watertight anastomosis 3 or 4 days following a radical prostatectomy.[24] The primary limitation of early catheter removal is the development of AUR. The incidences of AUR following catheter removal at 3 or 4 days and at 7 days are 15%[23] and 19.8%,[24] respectively. These relatively high risks of AUR limit the enthusiasm for and overall benefit of early catheter removal.

Based on observations that α-blockers decrease the risk of AUR in men undergoing herniorrhaphy and increase the likelihood of a successful TWOC, Patel and colleagues[35] investigated the potential efficacy of α-blockers for facilitating early removal of the urinary catheter following radical prostatectomy. A consecutive group of 250 men undergoing radical prostatectomy received tamsulosin, 0.4 mg, 3 days before a cystography planned for postoperative day 8. Tamsulosin was administered for an additional 4 days following the catheter removal. Overall, no extravasation was observed in 93% of cases and catheters were removed in these cases. The incidence of AUR in the men who received tamsulosin was only 2.6% (Table 3). Although this study is limited by the lack of randomization and a placebo control, the apparent significant reduction in the risk of AUR, coupled with the lack of toxicity and negligible cost, supports the use of tamsulosin when catheter removal is attempted earlier than 8 days following a radical prostatectomy.

TUMT

AUR is a recognized complication following TUMT. Djavan and colleagues[36] reported a randomized study evaluating neoadjuvant and adjuvant α-blockade as a strategy to decrease the risk of AUR following TUMT. In this study, 41 men with BPH underwent TUMT with neoadjuvant and adjuvant tamsulosin therapy (0.4 mg daily) and 40 men underwent TUMT alone. Urinary retention 1 week after TUMT was observed in 12% of the TUMT-alone group and 2% of the tamsulosin-treated group. Tamsulosin also had a favorable impact on LUTS during the first 6 weeks of the study. The use of neoadjuvant and adjuvant tamsulosin represents an effective strategy to reduce the risk of catheter dependency following TUMT and provides immediate symptom relief.

Prostatic Brachytherapy

Han and colleagues[29] reported that 32% of men developed AUR following prostatic brachytherapy. Although this represents the highest rate reported in the literature, it was derived from a patient survey. Other series relied on medical records, which likely underreported these events.

Merrick and colleagues[37] reported on the use of α-blockers as a strategy to reduce the rate of AUR following brachytherapy. The use of prophylactic versus therapeutic α-blockers was not randomly assigned. Overall, the patients who received prophylactic α-blockers experienced significantly less LUTS throughout the 18 months of follow-up. The urinary catheters were removed successfully on the day of implantation in 98.5% of men in the prophylactic group, whereas 4.0% of men in the therapeutic group required self-catheterization for more than 3 days. The authors do not state whether the catheters were routinely removed on the day of implantation in the therapeutic group. The benefit of prophylactic α-blockers for reducing AUR following brachytherapy is equivocal. Nevertheless, the com-

Table 4
Reducing the Risk of AUR

- α-Blockers
  - In patients with moderate or severe LUTS undergoing elective inguinal or pelvic surgical intervention
  - Before a trial without a catheter following an episode of AUR
  - Before transurethral microwave thermotherapy
  - Before attempts at early removal of urinary catheter following radical retropubic prostatectomy
  - Consider before prostate brachytherapy
- 5-α-reductase inhibitors
  - In patients with large prostates and LUTS

AUR, acute urinary retention; LUTS, lower urinary tract symptoms.

pelling beneficial effect of α-blockers on LUTS justifies their prophylactic use in patients undergoing prostatic brachytherapy.

Preventing a Second Episode of AUR

There is a high probability that men will experience a second episode of AUR immediately following a TWOC.[32-34] The overwhelming majority of men who have a second episode of AUR will ultimately receive surgical intervention.[32]

The largest randomized study reported to date examining the role of α-blockers in preventing a second episode of AUR was conducted in the United Kingdom (H.L., personal communication, 2004). Of the 149 subjects enrolled, 70 received tamsulosin, 0.4 mg, and 74 received placebo for 3 to 7 days before a TWOC. Recatheterization was required in 70% of the subjects who received placebo and 40% of those who received tamsulosin ($\alpha = .011$). This study suggests that tamsulosin increases the likelihood of a successful TWOC. Despite a successful TWOC, these men are at risk for a subsequent episode of AUR. In men with large prostates, it would be reasonable to prescribe both an α-blocker and a 5-α-reductase inhibitor to maximize the prevention of subsequent episodes of AUR.

In another randomized, placebo-controlled study, subjects who received alfuzosin had a significantly greater likelihood of a successful TWOC than those who received placebo.[38] After adjusting for age, however, the difference in TWOC success was no longer significant.

Conclusion

AUR is an uncomfortable, inconvenient, and potentially life-threatening event. Several factors have been identified that are associated with or precipitate AUR. There is evidence that the development of AUR can be prevented in some of these situations (Table 4). Specifically, there is evidence supporting the use of prophylactic α-blockers to prevent postoperative AUR in men undergoing herniorrhaphy or TUMT. In addition, α-blockers can facilitate catheter removal following episodes of spontaneous AUR, as well as early attempts at catheter removal following radical prostatectomy. Men with enlarged prostates are at considerable risk for AUR. This risk can be significantly reduced using 5-α-reductase inhibitors. ■

Main Points

- Acute urinary retention (AUR) is a potentially life-threatening condition characterized by a sudden inability to urinate associated with severe discomfort in the suprapubic area. Among men with benign prostatic hyperplasia (BPH), large prostate volume and high serum prostate-specific antigen levels are predictive of AUR.
- Data from the Medical Therapy of Prostatic Symptoms trial, which evaluated the effects of doxazosin and finasteride on BPH progression, show that both agents can reduce the incidence of AUR. Finasteride does so most significantly in men with enlarged prostates, who are at high risk for AUR; doxazosin is effective in men with prostate volumes less than 20 mL.
- AUR has been known to occur following genitourinary diagnostic procedures such as cystoscopy and biopsy of the prostate; however, newer less traumatic methods, including flexible cytoscopy and transrectal ultrasound guidance during biopsy, have made the occurrence of AUR less likely.
- Minimally invasive procedures for ablation of prostatic tissue, such as transurethral microwave thermotherapy, can lead to AUR. The use of neoadjuvant and adjuvant α-blockade is effective in reducing this risk and in affording quick symptom relief.
- The ability of α-blockers to reduce post-procedure lower urinary tract symptoms justifies their prophylactic use in patients undergoing prostatic brachytherapy.

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