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Chronic urinary retention in men: How we define it, and how does it affect treatment outcome

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Urinary retention describes a bladder that does not empty completely or does not empty at all. Historically, urinary retention has been classified as either acute or chronic the latter is generally classified as high pressure or low pressure according to the bladder filling pressure on urodynamic. A MEDLINE® search for articles written in English and published before January 2010 was done using a list of terms related to urinary retention: 'urinary retention', 'chronic urinary retention' and 'PVR'. Chronic urinary retention (CUR) is defined by the International Continence Society as 'a non-painful bladder, which remains palpable or percussable after the patient has passed urine'. Abrams was the first to choose a residual urine volume >300 mL to define CUR as he considered it the minimum volume at which the bladder becomes palpable suprapubically. The UK National Institute for Health and Clinical Excellence lower urinary tract symptoms (LUTS) guidelines define CUR as a postvoid residual urine volume (PVR) of >1000 mL. No studies have specifically addressed the problem of quantifying the minimum amount of urine present in the bladder to define CUR. Nor did we find any publications objectively assessing at what amount of urine a bladder can be palpable. The ability to feel a bladder may rely on variables (i.e. medical skills and patient habitus). There is a marked variability of PVR, so the test should be repeated to improve precision. As defining CUR is difficult, structured management is challenging. Nearly all prospective trials exclude men with CUR from analysis, possibly anticipating a poor outcome and a high risk of complications. However, men with CUR are a clinically important group, comprising up to 25% of men undergoing transurethral resection of the prostate. Definition of CUR is imprecise and arbitrary. Most studies seem to describe the condition as either a PVR of >300 mL in men who are voiding, or >1000 mL in men who are unable to void. This confusion leads to an inability to design and interpret studies; indeed most prospective trials simply exclude these patients. There is a clear need for internationally accepted definitions of retention to allow both treatment and reporting of outcomes in men with LUTS, and for such definitions to be used by all investigators in future trials.

What's known on the subject? and What does the study add?
Chronic urinary retention (CUR) is a poorly defined entity, as the key element of definition, significant postvoid residual urine volume (PVR), has not a worldwide and moreover evidenced-based definition. There is no agreement on which is the threshold value to define a significant PVR and different society produced guidelines with different thresholds ranging from 300 mL to 1000 mL. Diagnosis is difficult, and management has not been defined yet. There is a lack of studies on the best management of these patients, as this group of patients has always been considered at high risk of failure. Only one study compares conservative with the surgical management but it is not a randomised controlled trail.

This review offers a systematic appraisal of the most recent publications on CUR. It indicates the absence of a real worldwide agreed definition, as the two keys element of it are not satisfactorily defined yet: significant PVR, is suffering from a lack of evidenced-based definition, and percussable or palpable bladder is a very nebulous concept as it is not a criteria of certainty as different individual variables affect it. This has an important effect on management which is not structured. Most of the trials involving benign prostatic hyperplasia treatments (either medical or surgical) tend to exclude this group of patients, which is a clinically important group, comprising up to a quarter of men undergoing TURP in the UK.

KEYWORDS

urinary retention, LUTS, PVR, male

INTRODUCTION

The term 'urinary retention' may describe a bladder that empties incompletely or not at all. Urologists commonly subdivide retention episodes by any or all of the following:

- Ability of patient to release any urine (complete or partial).
- Duration (acute or chronic).
- Symptoms (painful or silent).
- Mechanism (obstructive or non-obstructive).
- Urodynamic findings (high or low pressure).

However, in clinical practice the term 'chronic retention' is often used to describe a constellation of the above descriptions,

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and is frequently used in research and clinical studies, despite no standardisation of its definition.

Urinary retention is objectively measured as the volume of either the postvoid residual urine volume (PVR) or the bladder in men who cannot urinate. There is no actual numerical value or relative increase in the volume of PVR that has been universally accepted or adopted into current practice.

The condition of urinary retention is often associated with LUTS, urinary infections and bladder stones. Elevated intravesical pressures may lead to hydronephrosis and renal failure.

MATERIALS AND METHODS

A MEDLINE® search for articles written in English and published before January 2010 was done using a list of terms related to urinary retention: 'urinary retention', 'chronic urinary retention' and 'PVR'. Articles not directly relevant to urinary retention or PVR in males without neurological bladder dysfunction were excluded. We then used the bibliographies of these sources to expand our search.

DEFINITION

Historically, urinary retention has been classified as either acute or chronic. Acute urinary retention (AUR) is characterised by a sudden onset, often painful and usually requiring intervention to relieve symptoms. The ICS defines AUR as 'a painful, palpable or percussable bladder, when the patient is unable to pass any urine' [1]. Although AUR is usually painful, pain may not be a presenting feature, e.g. when due to prolapsed intervertebral disc or after regional anaesthesia. The retention volume should be significantly greater than the expected normal bladder capacity, although again this is not standardised. Trigger factors, e.g. surgery, UTI, excessive fluid intake or medications, can induce precipitated AUR.

Chronic urinary retention (CUR) is defined by the ICS as 'a non-painful bladder, which remains palpable or percussable after the patient has passed urine' [1]. Such patients may be incontinent. The term CUR excludes transient voiding difficulty, e.g. after surgery for stress incontinence, and implies a significant residual urine; a minimum figure of 300 mL has been previously mentioned [1].

Despite these definitions, there is little evidence to support the objective ability to diagnose either AUR or CUR by physical examination without imaging.

CUR may occur in diverse patient populations, including patients with detrusor underactivity, detrusor hyperactivity with impaired contractility or neurogenic bladder conditions and of BOO.

Abrams *et al.* [2] were the first to choose a PVR of >300 mL to define CUR, considering it the minimum volume at which the bladder becomes palpable suprapubically; this seems a widely accepted, although unvalidated, definition of CUR.

However, while some investigators have defined CUR as a PVR of >300 mL [3], others have defined it as >400 mL [4], or have given it no definite number at all [5]. Most authors still seem to use a PVR of 300 mL as a definition for CUR in men who are not in total retention, even in those works investigating the outcomes of surgery. The UK National Institute for Health and Clinical Excellence (NICE) LUTS guidelines define CUR as PVR of >1000 mL.

There is considerable confusion!

DIAGNOSIS OF CUR

No studies have specifically addressed the problem of quantifying the minimum amount of urine present in the bladder to define CUR. Nor did we find any publications objectively assessing at what amount of urine a bladder can be palpable. The ability to feel a bladder may rely on variables including medical skills and patient habitus: in the obese patient neither percussion or palpation may determine if the bladder is full or empty. Furthermore Abrams *et al.* [2], in their work, wrote that they 'gained the impression, that patients with low-pressure filling had bladders that were difficult to define on abdominal palpation, whereas patients with high-pressure filling had tense, readily palpated bladders'. Intuitively percussion is unlikely to differentiate from intra-abdominal or pelvic sold masses (as attested to by anecdotes of attempted suprapubic catheterisation of pelvic tumours.) Thus, while a standard approach, transabdominal bladder examination has little or no evidence to support its use in diagnosis.

The AURO Guidelines on BPH [6] define as pathological a PVR of 'more than one third of total bladder capacity', but with evidence level IV. The European Association of Urology, AUA and NICE guidelines on LUTS do not define threshold values for pathological PVR, and the NICE guidelines do not suggest PVR assessment in the initial evaluation of male LUTS.

There is no consistent evidence that PVR is directly related to the degree of bother, nor there is an association between PVR maximum urinary flow rate (Q_{max}). A high PVR has been linked to prostate volume [7], and to the degree of intravesical prostatic protrusion [8].

Rule *et al.* [9] have shown that PVR increases with age. In a random sample of community dwelling men (529 men aged 40–79 years) followed with a sonographic PVR and voided volume every 2 years for up to 12 years (median five examinations), the median annual change (slope) for PVR was +2.2% ($P = 0.03$) and for voided volume was −2.1% ($P < 0.01$). There was considerable variability in PVR slopes. A rapid increase in PVR slope (greater than 80th percentile) was more likely in men with a baseline IPSS of >7 (age-adjusted odds ratio 1.6, 95% CI 1.0–2.5). There was less variability in voided volume slopes. Rapidly deteriorating PVR was more likely in elderly men and in those with a baseline PVR of >50 mL. The authors concluded that although it is highly variable, there is progressive bladder dysfunction in community dwelling men as they age. In addition, signs and symptoms attributed to BPH were modest predictors of the development of bladder dysfunction.

There is a marked intra-individual variability of PVR, so the test should be repeated to improve precision, particularly if the first PVR is significant and suggests a change in the treatment plan.

Dunsmuir *et al.* [10] showed great PVR variation in repeated measurement. They

measured the pre- and post-micturiction volume in 40 volunteers awaiting TURP. Residual volumes ranged from 48 to 690 mL. One-third of the patients showed fairly constant PVRs (variation <120 mL) but two-thirds showed a wide variation (150–670 mL). There was wide variation between individuals (57%; CI 93–252 mL) and within individuals (42%; CI 55–228 mL). The group showing the most conserved range of PVR (a variation in range of <120 mL) were analysed separately and showed small to moderate PVRs (mean PVR ≈100 mL). Even in this group, the intra-individual variation was significant (55–188 mL). At larger PVRs, the intra-measure variability increased, a common feature of many biological measurements. This suggests that an isolated measurement of PVR is likely to be a poor diagnostic test.

CLASSIFICATION

CUR is generally classified as:

1. high pressure
2. low pressure

This classification was introduced by Abrams *et al.* [2] and it is based on urodynamic findings in patients with a PVR of >300 mL. In this study, patients were described as high or low pressure based on bladder pressure filling; those with a bladder end filling pressure of <25 cmH_2O were described as 'low pressure', while those with higher end filling pressures were classified as 'high pressure'. In two groups the mean (range) pressure increases on filling were respectively 11 (0–25) cmH_2O and 82 (40–148) cmH_2O, with highly variable but insignificant differences in total bladder volume or PVR. There was a statistical association between enuresis and high-pressure bladder filling. The two groups also tended to have different symptoms, the low-pressure group complaining of hesitancy, slow stream, and a feeling of incomplete emptying, while the high-pressure group also complained of urgency. An association between upper urinary tract dilatation and high pressure CUR was noted.

The main clinical impact of this work is that around half the men with CUR have increased serum creatinine or upper urinary tract dilatation, it seems generally accepted that this is more common in high-pressure CUR [11].

The development of bladder wall thickening with trabeculations from smooth muscle hypertrophy and connective tissue infiltrates appears responsible for increased bladder pressures in men with high-pressure CUR [12]. Increased bladder pressure can lead to functional obstruction at the vesico-ureteric junction or VUR. Of men with CUR those with a lower bladder capacity have worse renal function [13].

MANAGEMENT

As CUR is poorly defined, structured management is challenging. Very few studies have tried to define best practice. Nearly all prospective trials exclude men with CUR from analysis, possibly anticipating a poor outcome and a high risk of complications [14]. Despite this exclusion, men with CUR are a clinically important group, comprising up to a quarter of men undergoing TURP [15]. In particular there is still a debate about the best management and the right timing: which if any surgery, when to operate, and is preoperative urodynamic evaluation mandatory?

Of the limited data available, most studies suggest surgery is the treatment of choice to avoid permanent indwelling or intermittent catheterisation.

The CLasP study [16] showed that low power laser coagulation therapy (30 W 980 nm Bard Urolase™) and TURP were effective for relieving LUTS, improving Q_{max} and health-related quality of life (HRQL), and decreasing PVR. Resection was better than laser therapy according to all primary outcomes and significantly better for overall success, with 91% of the men who underwent resection achieving a successful or very successful outcome compared with 63% of those who received laser therapy. However, laser cases involved significantly fewer treatment complications and a significantly shorter hospital stay. None of the patients included had had urodynamic evaluation before surgery. Later laser cohort studies with more effective generators and techniques show outcomes similar to TURP, but prospective comparative studies tend exclude patients in retention.

Some authors argue that in CUR, in particular with low-pressure retention, there is detrusor underactivity (DUA). It has been suggested that surgery is no better than catheterization for outcomes, but exposes patients to surgical and anaesthetic risks, without real benefits. In a retrospective series Thomas *et al.* [17] traced all neurologically intact men aged >18 years at presentation, with a diagnosis of DUA. In all, 224 men were initially diagnosed with DUA; 87 (39%) of these died in the interim and 22 had a TURP, with a mean follow-up after surgery of 11.3 years. There were no reductions in any symptoms. There was a small but significant reduction in the BOO index, but this did not translate into an improved flow rate. Comparison with 58 age-matched patients with DUA who remained untreated showed no significant advantage of surgical intervention in the long-term; on the contrary, there was more CUR in those who had had surgery. They concluded there were no long-term symptomatic or urodynamic gains from TURP in men shown to have DUA, but this study did not actually address the specific problem of CUR.

Djavan *et al.* [18] on the contrary, showed that patients with urinary retention, aged ≥ 80 years, with a retention volume of >1500 m, no evidence of instability and maximal detrusor pressure of <28 cmH_2O, are at high risk of treatment failure. He suggested that the detrusor may recover in patients younger than 80 years after surgery, suggesting that prostatectomy should still be performed in this group even if preoperative urodynamics suggest an unfavourable outcome.

Monoski *et al.* [19] evaluated the utility of preoperative urodynamics as a predictor of surgery outcome in catheterised men, and found that impaired detrusor contractility (IDC) and detrusor overactivity (DO) helped to predict outcome. Even though almost all men improved their voiding function and HRQL after surgery, those patients without DO or IDC had most improvement. This was particularly evident 1 month postoperatively when considering the IPSS for patients with and without DO and the IPSS, Q_{max}, and PVR in patients with and without IDC. However, despite the increased risk of re-operation in this group, most men (63%) gained significant benefit. Therefore, preoperative IDC is not a contraindication to performing surgery.

Conservative management, in particular clean intermittent self-catheterisation (CISC),

can be used as an adjuvant to transurethral surgery.

Ghalayini *et al.* [4] performed one of the very few randomised trials in patients with retention. Included were 41 men scheduled for TURP with LUTS, an IPSS of >7, BPE and a persistent PVR of >300 mL. The patients were randomised into two treatment groups; the first had TURP after stabilising renal function (usually by indwelling catheterisation), and the second was taught CISC. Men in both groups were reviewed at 3 and 6 months. Of the 41 patients, 17 were randomised to immediate TURP and 24 to CISC. There was a significant improvement in IPSS and HRQL at 6 months in both groups ($P < 0.001$). In the CISC group, there was a significant improvement in voiding and end-filling pressures, indicating recovery of bladder function ($P < 0.001$ for each). The study emphasises the usefulness of CISC in ensuring the recovery of bladder function in men with CUR. Both CISC and immediate TURP were effective for relieving LUTS and resulted in a better HRQL.

Many studies suggest that patients in CUR will benefit from disobstructive surgery, whether with TURP or laser prostatectomy, even if the results in terms of IPSS, HRQL, Q_{max} and PVR may be inferior compared with those not in retention. Surgery may be more effective in patients with high-pressure CUR than those with low-pressure CUR, with high-pressure filling patients achieving good bladder emptying by normal detrusor contraction [2].

In summary, urodynamics are optional: although they help predict postoperative symptoms, even men with poor detrusor function will usually void well after surgery. Primary CISC is an interesting and under-researched alternative.

CONCLUSIONS

In men with LUTS, high PVRs increase the risk of developing renal failure and a complete inability to void. In men with an inability to void, a very high PVR may reduce the chance of a good symptom response to surgery but does not predict failure to void without a catheter.

However, the definition of CUR is imprecise and arbitrary. Most studies seem to describe the condition as either a PVR of >300 mL in men who are voiding, or >1000 mL in men who are unable to void. The place of ultrasound, abdominal palpation and catheterisation in diagnosis remain poorly defined. This confusion leads to an inability to design and interpret studies; indeed most prospective trials simply exclude these patients.

There is a clear need for standardised internationally accepted definitions of retention to allow both treatment and reporting of outcomes in men with LUTS, and for such definitions to be used by all investigators in future trials.

CONFLICT OF INTEREST

None declared.

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Abbreviations: **PVR**, postvoid residual urine volume; **(A)(C)UR**, (acute) (chronic) urinary retention; **NICE**, National Institute for Health and Clinical Excellence; **Q_{max}**, maximum urinary flow rate; **HRQL**, health-related quality of life; **DUA**, detrusor underactivity; **IDC**, impaired detrusor contractility; **DO**, detrusor overactivity; **CISC**, clean intermittent self-catheterisation.

EDITORIAL COMMENT

CHRONIC URINARY RETENTION IN MEN: CAN WE DEFINE IT, AND DOES IT AFFECT TREATMENT OUTCOME

The subject of chronic urinary retention (CUR) is of interest, as there is not even evidence that we need such a definition and we could probably live with the current definitions of acute urinary retention (AUR) and postvoid residual urine volume (PVR). The fine threshold between elevated PVR and CUR is unclear and is not necessarily linked to the presence of complications. Terminology is of utmost importance both in practice and research. The lack of a good definition of CUR makes epidemiological studies impossible. The current ICS definition: 'a non-painful bladder, which remains palpable or percussable after the patient has passed urine. Such patients may be incontinent'. Is a remnant from a pre-ultrasound era and should probably be reconsidered.

We certainly need a consensus on 'acute urinary retention' because this is a condition that present in Emergency Rooms. We know how to define PVR, although we do not have a clear threshold beyond which the condition becomes problematic and it is associated with an increased risk of complications in the non-neurogenic adult male. From a clinical standpoint, we need to understand which patients may benefit from endoscopic relief of BOO and clinical studies suggest that an elevated PVR with a weak detrusor is associated with an increased risk of poor outcome after TURP. The clinical issue is in detrusor function, something that we usually quantify in terms of pressure rather than in the amount of work the muscle is able to perform. What we really need is a clinical translation of 'bladder decompensation', that is a measure in terms of muscle contractility. In patients with an elevated PVR, the clinical question is whether the detrusor muscle still functions or not. In cases of good contractility, surgery will restore normal voiding dynamics, in cases of a very week detrusor relief of BOO may not improve voiding function. From a teleological standpoint, AUR is a protective condition. In patients with benign prostatic obstruction, AUR may occur when the detrusor is still able to produce elevated pressure values, although these may be lower than those required to open the bladder neck and initiate voiding.

The mini review from Negro and Muir is of interest because it raises an important issue and hopefully will foster discussion on it.

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