

# Post-obstructive diuresis: a complication of urinary retention

**P**ost-obstructive diuresis is an important complication of urinary retention, which can lead to dehydration, electrolyte derangement and a fatal outcome if not identified and well managed. It is defined as a polyuric response by the kidneys following the relief of bladder outlet obstruction, resulting in copious amounts of water and salt excretion. This article outlines the risk factors and management principles of post-obstructive diuresis, enabling junior doctors to identify and correctly manage this potentially life-threatening condition.

## Urinary retention

Urinary retention is defined as the inability to completely or partially empty the bladder, and can have neurogenic, myogenic or obstructive causes (Kaplan et al, 2008). Bladder outlet obstruction is the most common cause of urinary retention, and can be the result of a number of pathologies, including an enlarged prostate or a gynaecological tumour (Klahr, 2000). Urinary retention can be divided into acute, chronic and acute on chronic urinary retention, features of which are detailed in *Table 1*.

Classically, patients attending the emergency department with urinary retention (particularly acute and acute on chronic) present with suprapubic pain and a palpable bladder (Mitchell, 1984). Chronic retention has a gradual onset and tends to be asymptomatic – these patients can sometimes present with overflow incontinence, or can be diagnosed incidentally. It is therefore important to have a high index of suspicion. Further investigations may reveal deranged renal function, bilateral hydronephrosis or a large urinary bladder volume. Catheterisation is the most effective treatment for urinary retention, and will provide rapid relief of the patient's pain.

This scenario is frequently encountered by health-care professionals, particularly those in the hospital setting, and the process of

**Table 1. Features of types of urinary retention**

Type of retention	Features
Acute	<ul style="list-style-type: none"> <li>■ Rapid onset</li> <li>■ Presents with suprapubic pain</li> <li>■ Inability to urinate</li> <li>■ Requires intervention to relieve symptoms</li> </ul>
Chronic	<ul style="list-style-type: none"> <li>■ Gradual onset</li> <li>■ No associated pain</li> <li>■ Pass only small amounts of urine</li> <li>■ Defined as a post-residual volume of &gt;300 ml</li> <li>■ May present with renal failure</li> </ul>
Acute on chronic	<ul style="list-style-type: none"> <li>■ Discomfort disproportionate to volume of bladder</li> <li>■ May present after a long period of being unable to urinate (i.e. 2 days)</li> </ul>

*From Kaplan et al (2008)*

diagnosing, investigating and initiating management of urinary retention is within the realm of many a physician (Halbgewachs and Domes, 2015). However, this article focuses on a rare and serious consequence of obstructive urinary retention known as post-obstructive diuresis. It is primarily aimed at junior doctors, who should be aware of post-obstructive diuresis and the basic principles of its management.

## What is post-obstructive diuresis?

Post-obstructive diuresis is a polyuric response by the kidneys in which copious amounts of salt and water are eliminated following the relief of a blockage which had caused bilateral ureteric obstruction (Halbgewachs and Domes, 2015). It should be noted that relieving unilateral ureteric obstruction of a solitary kidney could also lead to post-obstructive diuresis (Schlossberg and Vaughan, 1984).

Post-obstructive diuresis is defined as urine production exceeding 200 ml per hour for two consecutive hours or producing more than 3 litres of urine in 24 hours (Baum et al, 1975). Diuresis is a normal, physiological response to eliminate the excess urinary volume that has accumulated while obstructed, but this should resolve once

homeostasis is achieved (usually within 24 hours). Post-obstructive diuresis becomes pathological when the patient continues to excrete salt and water despite reaching homeostasis, often for longer than 48 hours. This increases a patient's risk of electrolyte imbalances, metabolic acidosis, dehydration, shock and potentially death (Baum et al, 1975). The true incidence of post-obstructive diuresis is unclear, but studies suggest that up to 52% of patients can be affected (Bishop, 1985; Nyman et al, 1997). The varying incidence between studies appears to be partially a result of differing definitions of diuresis.

The pathophysiology of obstructive nephropathy and subsequent post-

**Dr Sayani Khara**, Foundation Year 1 Trainee, Department of Urology, London North West University Healthcare NHS Trust, Harrow

**Dr Tumaj Hashemzahi**, Clinical Fellow, Department of Urology, London North West University Healthcare NHS Trust, Harrow

**Mr Deepak Batura**, Consultant Urological Surgeon, Department of Urology, London North West University Healthcare NHS Trust, Harrow HA1 3UJ

Correspondence to: Mr D Batura ([deepakbatura@gmail.com](mailto:deepakbatura@gmail.com))

## TOP TIPS

- Keep post-obstructive diuresis at the back of your mind when managing patients with urinary retention.
- Monitor for urine production exceeding 200 ml per hour for two consecutive hours or more than 3 litres of urine in 24 hours.
- Monitor electrolyte levels daily.
- Encourage oral rehydration where possible, aiming for 50–75% replacement.

obstructive diuresis is complex and remains unclear. A combination of mechanisms is likely to be contributory, as demonstrated in *Figure 1* (Kim et al, 2001; Chevalier, 2006; Halbgewachs and Domes, 2015).

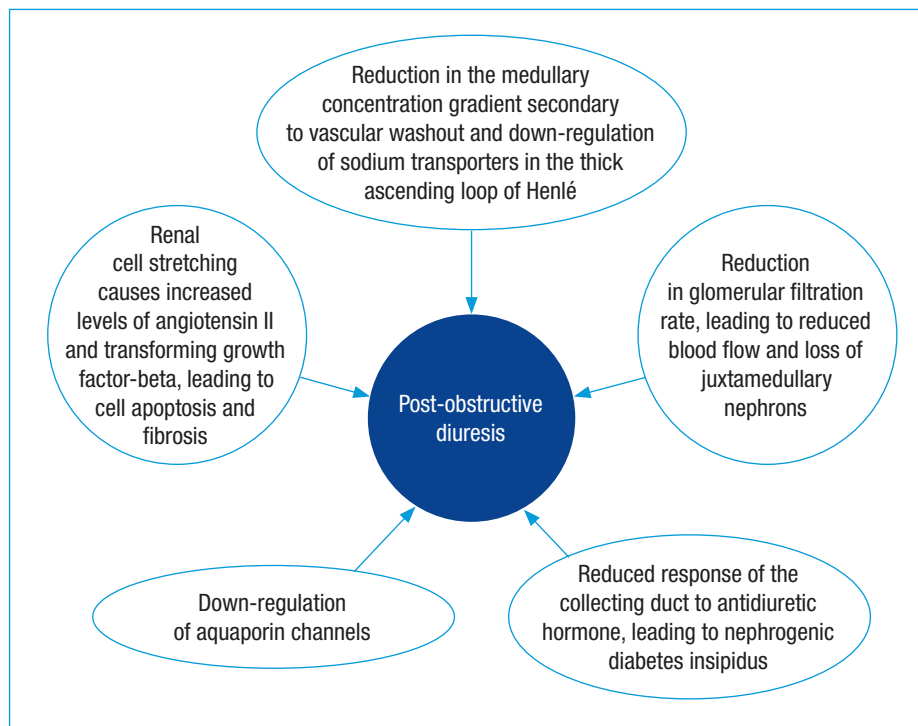
Unfortunately, it is hard to predict which patients will develop post-obstructive diuresis. There are very few identified risk factors, although some studies have identified renal insufficiency, heart failure or evidence of volume overload, dizziness and CNS depression as risk factors for substantial post-obstructive diuresis (Vaughan and Gillenwater, 1973; Gonzalez, 2004). Leslie and Sharma (2019) found post-obstructive diuresis to be more likely following immediate drainage of over 1500 ml from the bladder.

A case series by Hamdi et al (2012) identified higher serum creatinine levels, higher serum bicarbonate levels and urinary retention as predictors of increased incidence of post-obstructive diuresis. Hamdi et al (2012) also demonstrated that in patients with severe post-renal acute kidney injury following obstruction, the occurrence of post-obstructive diuresis indicated that persistence of chronic renal failure was less likely – in other words, the incidence of post-obstructive diuresis predicted renal recovery following post-renal acute kidney injury.

## How is post-obstructive diuresis managed?

A thorough history and examination must be undertaken, as with any presenting complaint. One should identify any red flag symptoms from the patient, and consider any concurrent diagnoses such as acute kidney injury, sepsis or haematuria.

Following this, the starting point for the management of urinary retention is



**Figure 1. Causes of post-obstructive diuresis.**

catheterisation. Initially, slow decompression of the bladder was thought to be beneficial in avoiding complications such as haematuria, hypotension and post-obstructive diuresis. However, immediate, rapid decompression is safe and should be the management plan of choice, providing that the patient is closely monitored (Mitchell, 1984; Nyman et al, 1997; Kalejaiye and Speakman, 2009; Ahmed et al, 2013). Monitoring is particularly important for elderly or hypovolaemic patients (Nyman et al, 1997).

To ensure early recognition of post-obstructive diuresis, it is important to monitor:

- 1–2-hourly monitoring of urine output (Vaughan and Gillenwater, 1973)
- Clinical hydration status. Excessive fluid should be avoided as it can prolong or exacerbate the diuresis (Kalejaiye and Speakman, 2009; Halbgewachs and Domes, 2015). Individuals without cognitive impairment should continue to take hydration orally (Halbgewachs and Domes, 2015).
- Daily weights (Halbgewachs and Domes, 2015)
- Creatinine, urea, magnesium and phosphate levels every 12 hours (Halbgewachs and Domes, 2015)
- Urine osmolality – this can be estimated from the specific gravity. If the urine’s

specific gravity is  $\geq 1.02$ , the kidneys are concentrating urine and diuresis is resolving. If the urine’s specific gravity is  $\leq 1.01$ , the kidneys are not concentrating urine, which is likely to indicate pathological post-obstructive diuresis (Leslie and Sharma, 2019)

- Lying and standing blood pressure (Foster et al, 1990).

An ultrasound of the urinary tract should be undertaken if there is electrolyte derangement, and concurrent urinary tract infection should be identified and treated as per local antimicrobial usage guidelines. Additionally, a review of the patient’s drug chart is recommended – alterations to a patient’s regular medication might be beneficial in the acute setting (i.e. any nephrotoxic agents, diuretics, anti-hypertensives) (Foster et al, 1990).

Serum and urine osmolality will guide fluid replacement therapy, but oral fluid replacement is preferable where possible. Halbgewachs and Domes (2015) recommend that 75% of the previous 1-hour urine output is replaced during physiological post-obstructive diuresis, until euvolaemia is reached. If pathological post-obstructive diuresis develops, diuresis will continue despite euvolaemia – fluid replacement will be required, but the amount and type of intravenous fluid should be determined

based on electrolyte levels and clinical hydration status (Halbgewachs and Domes, 2015).

If worsening renal function or acid–base derangement is observed despite conservative measures, involvement of a nephrologist and/or intensivist may be necessary. In cases of prolonged or refractory diuresis, dialysis may need to be considered.

### Conclusions

Post-obstructive diuresis is an important consequence of urinary retention and decompression. Junior doctors should be aware of the conservative management of diuresis, but escalation may be required if it becomes severe or prolonged. **BJHM**

*Conflict of interest: none.*

Ahmed M, Abubakar A, Lawal A, Bello A, Maitama H, Mbibu H. Rapid and complete decompression of chronic urinary retention: a safe and effective practice. *Trop Doct.* 2013 Jan;43(1):13–16. <https://doi.org/10.1177/0049475512472432>

Baum N, Anhalt M, Carlton CE Jr, Scott R Jr. Post-obstructive diuresis. *J Urol.* 1975 Jul;114(1):53–56. [https://doi.org/10.1016/S0022-5347\(17\)66942-8](https://doi.org/10.1016/S0022-5347(17)66942-8)

Bishop MC. Diuresis and renal functional recovery in chronic retention. *Br J Urol.* 1985 Feb;57(1):1–5. <https://doi.org/10.1111/j.1464-410X.1985.tb08973.x>

Chevalier RL. Specific molecular targeting of renal injury in obstructive nephropathy. *Kidney Int.* 2006 Oct;70(7):1200–1201. <https://doi.org/10.1038/sj.ki.5001815>

Foster MC, Upsdell SM, O'Reilly PH. Urological myths. *BMJ.* 1990 Dec 22;301(6766):1421–1423. <https://doi.org/10.1136/bmj.301.6766.1421>

Gonzalez C. 2004. Pathophysiology, diagnosis, and treatment of the postobstructive diuresis. In: McVary K, ed. *Management of benign prostatic hypertrophy.* New York: Humana Press: 35–45.

Halbgewachs C, Domes T. Postobstructive diuresis: pay close attention to urinary retention. *Can Fam Physician.* 2015 Feb;61(2):137–142.

Hamdi A, Hajage D, Van Glabeke E et al. Severe post-renal acute kidney injury, post-obstructive diuresis and renal recovery. *BJU Int.* 2012 Dec;110(11c):E1027–E1034. <https://doi.org/10.1111/j.1464-410X.2012.11193.x>

Kalejaiye O, Speakman MJ. Management of acute and chronic retention in men. *Eur Urol Suppl.* 2009 Apr;8(6):523–529. <https://doi.org/10.1016/j.eursup.2009.02.002>

Kaplan SA, Wein AJ, Staskin DR, Roehrborn CG, Steers WD. Urinary retention and post-void residual urine in men: separating truth from tradition. *J Urol.* 2008 Jul;180(1):47–54. <https://doi.org/10.1016/j.juro.2008.03.027>

Kim SW, Cho SH, Oh BS, Yeum CH, Choi KC, Ahn KY, Lee J. Diminished renal expression of aquaporin water channels in rats with experimental bilateral ureteral obstruction. *J Am Soc Nephrol.* 2001 Oct;12(10):2019–2028.

Klahr S. Obstructive nephropathy. *Intern Med.* 2000;39(5):355–361. <https://doi.org/10.2169/internalmedicine.39.355>

Leslie SW, Sharma S. 2019. Postobstructive Diuresis. (accessed 7 June 2019) <https://www.ncbi.nlm.nih.gov/books/NBK459387/>

Mitchell JP. Management of chronic urinary retention. *BMJ.* 1984 Sep 01;289(6444):515–516. <https://doi.org/10.1136/bmj.289.6444.515>

Nyman MA, Schwenk NM, Silverstein MD.

### KEY POINTS

- Post-obstructive diuresis is a significant complication of urinary decompression, although its true incidence is unclear at present.
- Pathological post-obstructive diuresis is generally defined as urine production exceeding 200 ml/hour for 2 consecutive hours or more than 3 litres of urine in 24 hours.
- To identify and manage post-obstructive diuresis, a patient's fluid balance and electrolytes should be closely monitored.
- Post-obstructive diuresis is usually self-limiting and can be managed conservatively.
- Involvement of nephrologists and/or intensivists may be required if diuresis is severe and prolonged.

Management of urinary retention: rapid versus gradual decompression and risk of complications. *Mayo Clin Proc.* 1997 Oct;72(10):951–956. [https://doi.org/10.1016/S0025-6196\(11\)63368-5](https://doi.org/10.1016/S0025-6196(11)63368-5)

Schlossberg SM, Vaughan ED Jr. The mechanism of unilateral post-obstructive diuresis. *J Urol.* 1984 Mar;131(3):534–536. [https://doi.org/10.1016/S0022-5347\(17\)50485-1](https://doi.org/10.1016/S0022-5347(17)50485-1)

Vaughan AD Jr, Gillenwater JY. Diagnosis, characterization and management of post-obstructive diuresis. *J Urol.* 1973 Feb;109(2):286–292. [https://doi.org/10.1016/S0022-5347\(17\)60406-3](https://doi.org/10.1016/S0022-5347(17)60406-3)




## The peer-reviewed journal for all kidney care practitioners

**Journal of Kidney Care (JKC)** is the specialist publication dedicated to all members of today's multidisciplinary renal units. Its clinical reviews, research and professional information help to advance the evidence base for nephrology and renal medicine, while encouraging readers' reflective learning and personal development.

### What's included?

- Clinical expertise and best practice guidance
- Focus on care provision and the patient experience
- Professional advice and mentoring from peers

### Three easy ways to subscribe

 [magsubscriptions.com/jkc](https://magsubscriptions.com/jkc)
 0800 137 201
 [subscriptions@markallengroup.com](mailto:subscriptions@markallengroup.com)

Quarterly subscriptions start from £22.00. Annual subscriptions (6 issues) start from £86.00. P&P included for UK-based subscribers.

www.journalofkidneycare.co.uk

journal of kidney care **JKC**  
vol 3 no 3 May 2018

**CLINICAL FOCUS**  
Dialysis patients' perceptions of factors associated with the renal diet  
Rebecca Lynch



day's multidisciplinary renal units

with chronic kidney disease  
Melissa Stegney

in the US: outcomes in practice

or in living organ donation

nt decision aid: a study protocol  
Lynne Russon et al

continue to cross borders