

Reflex Anuria Secondary to Unilateral Ureteric Obstruction by Urolithiasis: is it a Gender Specific Phenomenon?

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Abstract

Introduction: Acute renal failure (ARF) can manifest secondary to urinary tract obstruction. In a small number of patients ARF can occur with unilateral ureteric obstruction in the presence of normal contralateral kidney function. This phenomenon is known as reflex anuria. We present a case series of 20 patients with ARF secondary to reflex anuria following unilateral urinary tract obstruction caused by ureteric calculi.

Material and methods: We reviewed data at our hospital which is a tertiary stone referral centre for our region. Data was collected prospectively over a fifteen-month period from August 2010 until November 2011 for all patients presenting with renal colic

Results: Eighty-seven male patients and seventeen female patients presented to our department with acute colic secondary to a unilateral ureteric stone.

All patients who displayed reflex anuria were male. No female patients developed this condition

Keywords: Reflex anuria; Ureteric stone

Introduction

Acute renal failure (ARF) can manifest secondary to urinary tract obstruction. The outflow tracts of both kidneys must be obstructed to cause ARF, unless pre existing renal dysfunction is present in which case the obstruction may involve only a single kidney [1]. In a small number of patients ARF can occur with unilateral ureteric obstruction in the presence of normal contralateral kidney function. This phenomenon is known as reflex anuria.

Reflex anuria is a rare condition that has been described almost always after surgical procedures and manipulation of bladder or the ureter [2]. A smaller number of case reports describe its occurrence following pelvic surgery and colorectal procedures where the ureter may have been manipulated during the operation [3]. It has also been described in situations when there is unilateral ureteric obstruction, where the contralateral kidney was expected to retain its normal function [4].

Singh et al. [5] proposed certain diagnostic criteria to base a diagnosis of reflex anuria. It requires:

- A normal contralateral kidney. Renal function returns to normal soon after the disease causing the non-functional kidney has been treated.
- Subsequent investigation of the normal contralateral kidney shows that a pathological process is unlikely to have caused its loss of function.
- Surgical intervention to the contralateral 'shutdown' kidney does not result in the return of function in either of the kidneys.

We performed a prospective review of patients admitted to a large university hospital with unilateral ureteric obstruction to ascertain if there was presence of reflex anuria. We present a case series of 20 patients with ARF secondary to reflex anuria following unilateral urinary tract obstruction caused by ureteric calculi.

Materials and Methods

We reviewed data at our hospital which is a tertiary stone referral centre for our region. Data was collected prospectively over a fifteen-

month period from August 2010 until November 2011 for all patients presenting with renal colic. Data was recorded for patient sex, age, past medical history, drug history, stone size, radiological findings, renal function and intervention.

Results

Eighty-seven male patients and seventeen female patients presented to our department with acute colic secondary to a unilateral ureteric stone. In total twenty patients with unilateral ureteric stones and reflex anuria was identified over a 15-month period from August 2010 until November 2011. All patients who displayed reflex anuria were male. No female patients developed this condition. All had a normal contralateral kidney confirmed radiologically and no prior history of urolithiasis. Mean age was 46.3 years (range 25-71 years). Mean stone diameter was 6.5 mm (range 2 mm-18 mm). Mean baseline creatinine was 90 $\mu\text{mol/L}$ (range 72-133 $\mu\text{mol/L}$). Mean creatinine on admission with renal colic was 130 $\mu\text{mol/L}$ (range 87-229 $\mu\text{mol/L}$). Mean maximum creatinine during admission was 167 $\mu\text{mol/L}$ (range 138-255 $\mu\text{mol/L}$) and on discharge 126 $\mu\text{mol/L}$ (range 78-184 $\mu\text{mol/L}$). There was no obvious association between the severity of hydronephrosis in the obstructed system and the creatinine level. Fourteen patients had insertion of a ureteric stent for relief of obstruction, pain or renal failure. These patients went on to have elective ureteroscopy and stone fragmentation. One patient had a nephrostomy inserted. Two patients were discharged without acute intervention and returned for elective stone fragmentation and three passed their stones with medical expulsive therapy. None of the patients had been given NSAIDs or any nephrotoxic medication prior to admission to implicate them as a possible cause for renal failure.

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Discussion

The exact incidence of reflex anuria secondary to unilateral ureteric obstruction is difficult to quantify as it is a rare entity with very few case reports [4,6]. It may be more common than previously thought looking at the number of cases diagnosed in our centre. Varying mechanisms have been proposed to explain reflex anuria. Those that support the concept of reflex anuria have proposed two mechanisms. The first is that it results from a neurovascular reflex causing profound arteriolar vasoconstriction and bilateral ureteric spasm secondary to unilateral ureteric or renal parenchymal damage. The uretero-renal or reno-renal reflexes are examples of the neurovascular mechanism. This is supported by the case of reflex anuria resulting from unilateral chemoembolization of a renal tumour [7]. The uretero-renal reflex suggests that injury to one ureter can cause bilateral or contralateral renal arteriolar vasoconstriction. Several experimental studies have supported this neurovascular hypothesis. Di Salvo and Fell [8] demonstrated cessation of renal blood flow using pulsatile renal nerve stimulation. While Francisco et al. [9] conducted the most analytical investigation using a canine model to show a 20% decrease in contralateral renal blood flow with unilateral ureteric obstruction. The second mechanism to explain reflex anuria is that ureteric spasm or arteriolar intra-renal spasm can occur as a consequence of pain within the urinary tract [6].

In our case series all patients were male with a normal contralateral kidney on CT scan. No female patients developed reflex anuria during the reviewed fifteen-month period. This has not been commented on in the literature prior to this study. The reasons for this are unclear. One possible explanation for reflex anuria, secondary to obstructing urolithiasis, not occurring in women is possibly due to the vasodilatory effect of progesterone which may contribute to ureteric dilatation facilitating stone passage [10,11].

Additionally all patients identified had no prior history of urolithiasis, this suggests that reflex anuria may only occur upon the first episode of stone formation where the stone causes unilateral ureteric obstruction. Stone size and the degree of hydronephrosis had no obvious correlation with the rise in creatinine seen in all cases. This implies that the degree of obstruction is unlikely to be related to the degree of renal failure in this patient group.

The indications for acute intervention include pain, obstruction, sepsis or renal failure. The majority of the patients we treated were managed acutely with insertion of ureteric stent for one of these

reasons. Five patients were managed conservatively in the acute setting and their renal function improved. They returned for elective stone fragmentation or passed their stones with medical expulsive therapy. Patients who had conservative management had stones ranging from 2 mm to 7 mm in diameter. It is important we appreciate the concept of reflex anuria as some patients with smaller stones can be managed conservatively with medical expulsive treatment as the renal failure is reversible and the patient would be spared the risks of a general anaesthetic and a surgical procedure.

Conclusion

Our findings suggest reflex anuria associated with unilateral ureteric calculi only occurs in male patients who have no prior history of urolithiasis. However further studies with larger numbers of patients need to be undertaken to appreciate its incidence and gender specificity. It is important to appreciate the concept of reflex anuria as in select cases operative intervention can be avoided and renal function will normalise with conservative management.

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