A negative ureteroscopy for stone disease: is it acceptable and is it avoidable?

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Urinary tract stone disease and the consequent demand for endoscopic intervention in the upper urinary tract is an increasing phenomenon [1]. Although ureteroscopy is generally considered to be associated with low morbidity [2], risks do exist. Recognised complications include urothelial injury or tear (1.5-1.7%), postoperative fever (1.8%), haematuria (0.1%), ureteric stricture (0.1%), urosepsis (0.1%) and persistent ureteric reflux (0.1%). Ureteric avulsion is among the most serious complications but also remains uncommon (<1%) [2]. The overall complication rate is around 3.5% and mortality is considered extremely rare [2].

Serious complications from general anaesthesia are also rare, but well recognised and documented. A meta-analysis in 2012 described a mortality solely attributable to anaesthesia in developed countries of 34 per million [3], representing a small proportion of the estimates for total perioperative mortality in the 1990s-2000s; 1176 per million [3]. In an age of increasing awareness of risk and litigation in surgical practice, this review questions whether a negative ureteroscopy is acceptable.

A cohort of 20,236 patients undergoing ureteroscopy for stone disease in California between 2010 and 2012 revealed a negative ureteroscopy rate of 6.3% [4]. Female gender was associated with a higher negative ureteroscopy rate (7.6% vs. 5.4% for male patients) as was grade of medical insurance cover (7.9-9.6%). Of interest was the fact that uninsured patients had a lower rate of negative findings at ureteroscopy (3.3%) [4]. There were no associations with age nor ethnicity. However, this study did not address other clinically important factors such as size and location of upper urinary tract stones.

A study of 256 "renal units" which allowed the inclusion of bilateral procedures as two separate episodes of positive or negative ureteroscopy, revealed a negative rate of 9.8% [5]. Patients with stones greater than 10mm and those with staged ureteric procedures were excluded from the analysis. The presence of preoperative pain, hydronephrosis on the initial CT scan, time interval since the CT scan and the use of medical expulsive therapy had no impact on negative ureteroscopy rates. The authors recommended repeat CT imaging in those with both stone size <4mm and absence of clinical evidence for stone passage prior to operative management [5].

A higher negative ureteroscopy rate of 14% (7 out of 51 patients) has been described in an unusual study on pregnant women [6]. Ultrasound alone (23%) and ultrasound plus magnetic resonance urography (20%) gave significantly higher negative ureteroscopy rates than ultrasound plus low dose CT (4.2%) [6]. The higher rates of negative endoscopy in this cohort may reflect both a desire to avoid ionising radiation and pressure from obstetricians to address a difficult clinical episode.

Baumgarten et al. have documented similar rates of spontaneous passage of ureteral stones in patients with indwelling ureteral stents compared to those without indwelling ureteral stents (14% vs. 20%, respectively, P=0.30) [7]. Patients undergoing repeat procedures for incomplete primary stone removal and those with encrusted stents were excluded.

A negative ureteroscopy rate of 14% (17 of 119 patients) was documented in the patients stented for ureteral / renal stones. On bivariate analysis of stented patients both smaller stone size and distal ureteric location were significantly associated with spontaneous passage. Further scrutiny with multivariate logistic regression analysis identified only smaller stone size to be associated with spontaneous stone passage.

Although a stone passage rate of 46% for stones less than 4mm in stented patients was reported, age, sex, laterality of stone, stone number and stent duration were not significantly associated with spontaneous stone passage [7].

A recent series of 167 patients who had been pre-stented for a symptomatic ureteric stone (median stone size 5mm, IQR 3-5.6mm) had their stent removed the day prior to planned intervention [8]. Patients were asked to filter their urine overnight and spontaneous passage of the stone was confirmed by the patient presenting the filtered stone and / or radiologically the following day. Sixty-two percent (103/167) of the stones passed spontaneously after a median stent dwell time of four weeks, of which 57% (59/103) had stone passage before the stent was removed and 43% (44/103) within 24 hours after stent removal. The majority of these stones were less than or equal to 5mm (73%) and were located in the distal ureter (47%), both of which were predictive of spontaneous stone passage on multivariate analysis [8].

This study challenges our current practice and asks the question, "Are we unnecessarily exposing patients to a further invasive procedure when the stone may well have already passed by itself?" This may at least partly be explained by the stone size and position as the majority were small and distal stones.

As highlighted above, only limited data exist on the incidence of a negative ureteroscopy performed with the aim of treating a ureteric stone. In the ideal world and indeed the medico-legal world, a ureteroscopy should be performed for definite pathology and not used as a diagnostic tool.

A plain radiograph on the day of surgery is cheap and readily available with a lower

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radiation dose compared to standard CT KUB (0.15mSv vs. 4.7mSv), but has limited sensitivity and specificity of only 57% and 76%, respectively [9]. CT KUB is considered the gold-standard imaging for diagnosing urinary tract calculi, with a sensitivity of 98% and specificity of 97% [10].

Low-dose CT (<3mSv) has also been shown to be sensitive (99%) and specific (94%) for diagnosing urinary tract calculi [9]. Furthermore, ultra-low dose CT (<1mSv) protocols have been used to assess stone volume in those patients with known urolithiasis. Such protocols are limited by reduction in image quality compared to standard CT KUB and are not, therefore, recommended for obese patients [9]. Further developments may increase the future role for low dose CT in the context of diagnosing and following up urinary tract stones.

Where there is diagnostic uncertainty on CT KUB, a CT urogram may be useful to help define calcification in the line of the ureter. Unfortunately, this imaging modality may fail to opacify the lower ureter in up to 47% of cases, and carries with it an increased radiation burden 14.8mSv [11,12]. In cases of diagnostic uncertainty, a ureteroscopy may be the only remaining option after discussion with the patient about risks and the possibility of a negative diagnosis. A repeat CT KUB close to the date of surgery would allow a clinician to ascertain with reasonable certainty if the stone in question has passed or not.

With the rise in medical litigation and the inevitably increasing risk-averse approach to surgery, repeat CT KUB prior to surgery in selected cases of urolithiasis may become a standard of care. A low dose CT scan close to the day of surgery may help maximise diagnostic yield while minimising radiation exposure in the quest to prevent negative ureteroscopy in both stented and unstented patients.

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