Editorial Commentary

Radiation-free ureteroscopy: risky business or a safe alternative?

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In its early years, ureteroscopy (URS) was regarded by many as an experimental and controversial procedure. However, over four decades later, it has become the most widely performed surgical intervention for urolithiasis worldwide. Nonetheless, there are elements of how it is performed that continue to generate disagreement and have led to widely varying practice patterns. One such example is the role of fluoroscopy. For a long time, it was universally accepted that it should be a mandatory component of URS. However, increasing awareness of the harmful effects of ionising radiation has sparked renewed discussions and prompted reconsideration of its routine use (1). There is now a consensus regarding that its use should be applied judiciously and the principles of 'as low as reasonably achievable' (ALARA) have become widely accepted. Multiple author groups have described methods that can facilitate this, including reducing use of a UAS (2).

However, the concept of radiation free or completely fluoroless URS has further challenged this approach (3). Arguably, however, the adoption of fluoroless URS has been very limited, owing to a lack of scientific evidence to support it. Moreover, the available literature has predominantly been limited to single-surgeon retrospective series (4).

The recent multi-centre randomised trial reported by Chung *et al.* may therefore be the awaited catalyst to change this (5). Across five centres, 140 adult patients with unilateral renal stones measuring under 2 cm were prospectively randomised to either standard URS with radiation or radiation-free URS. Stone free rate (SFR) at one month follow-up with computed tomography (CT) was determined as the primary outcome of interest. Success in terms of stone free status was classified as asymptomatic residual fragments ≤3 mm. The final results showed no difference between standard and radiation-free URS in terms of SFR (78% *vs.* 80%, P=0.8). Patients in the radiation-free group avoided a median exposure dose of 0.71 mGy.

In terms of safety, there was no difference in the proportion of ureteral injuries recorded, irrespective of grade. Based on their study findings, the Chung *et al.* conclude the non-inferior status of radiation free URS compared to conventional practice involving fluoroscopy.

Even before one interprets the findings and certain technicalities of how the study was done, the authors should be congratulated for the feat of successfully executing such a study across multiple sites.

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On the surface, the findings are certainly very promising in favour of the prognosis for radiation free URS. The study is likely to play a central role in future discussions on radiation use during URS. However, there are elements of the study that should be carefully considered when drawing conclusions. Firstly, certain terms and conditions were applied during the study process. While 140 patients were randomised, several patients were excluded during the procedure if a ureteral stricture was identified. Patients in the radiation free group then did undergo an intra-operative retrograde pyelogram using fluoroscopy and were then not included in the final analysis. Strictly speaking therefore, it can be questioned whether a truly randomised study of standard versus radiation-free URS has actually been performed. This is a clear limitation and renders the results less generalisable.

Arguably, the described procedure for ureteral stent insertion, in which the semi-rigid ureteroscope was re-inserted alongside the wire, could be considered cumbersome, particularly when the benefit is limited to avoiding just 10 seconds of fluoroscopy or 0.71 mGy. For reference, the radiation dose from a standard non-contrast CT is approximately 4.5–5 mGy. The total radiation a patient is exposed to in the operating theatre is likely much less compared to the cumulative exposure from serial CTs that they may undergo. Prioritising improved stewardship in the responsible use of CTs for follow-up imaging, particularly in recurrent stone formers, is arguably more critical. While the radiation-free group had a shorter median operative time of five minutes (45 *vs.* 50 minutes), this was not of statistical significance and arguably, holds limited clinical significance as well.

Chung *et al.* built on their results by voicing that an advantage of radiation-free URS is that no radiation protection is needed to be worn by staff during the operation. However, their results seem to remind us that even if not planning to use any fluoroscopy, one cannot rule out needing it completely. It is unclear in this study, whether the operating staff were already wearing protective equipment in case they needed to perform a pyelogram as mentioned earlier, or if they not wearing it and had to pause, put on the equipment and then scrubbed in again. If the latter is the case, it would add a lot of unnecessary time to the procedure. Of note, current European guidelines state the availability of equipment, such as a C-arm, in the operating room is considered a 'must' (6).

While it is not stated that patients with anatomical anomalies were excluded, it is reasonable to assume that individuals with conditions such as urinary diversions did not make up any of the study sample. An extra caveat to the conclusions would therefore be that these findings apply to the index patient.

For while radiation-free URS may not become the standard of care in the foreseeable future, the study by Chung *et al.* serves as a valuable reminder for all surgeons to consciously prioritise minimising radiation exposure during procedures.

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