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Editorial

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Advancements in minimally invasive urology and uro-technology: current status, evolution and future prospects

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This editorial summarises the special collection on advancements in minimally invasive urology and uro-technology for the TAU journal. There has been a huge surge in the field of minimally invasive urology with technological innovations leading the way. This has been fuelled by a clinical patient-centred demand for better outcomes and helped by collaborative research. There has been wider adoption of newer lasers and robotic systems, the latest developments and availability of minimally invasive surgical techniques (MISTs) for the treatment of benign prostatic hyperplasia (BPH) and huge strides in the field of retrograde intrarenal surgery (RIRS).[1–3] A wider understanding and use of artificial intelligence (AI) in these areas has also helped in improving patient outcomes.[4]

Urethroplasty has traditionally been used for urethral stricture. With the advent of Optilume placitaxel drug-coated balloon (DCB), these strictures can now be treated in a minimally invasive fashion with placitaxel being delivered to the strictured area. The study by VanDyke et al. shows the efficacy of Optilume in the management of recurrent strictures following urethroplasty.[5] Among 122 cases, 27% had a prior urethroplasty. Results were compared between the control group to those with a history of prior urethroplasty, with data showing that patients with a history of urethroplasty achieved similar success rates after treatment with DCB.

The Global Research in Intra-Renal Pressure Collaborative Group presented the current utility, instruments and future directions for intra-renal pressure (IRP) management during ureteroscopy (URS).[6] They present a systematic review of in vivo clinical studies on IRP measurement methodologies during URS done for the management of urolithiasis. They included 17 studies with data showing significant variations in IRP measurement methods, reporting units and irrigation techniques. Elevated IRP above 30 mmHg was associated with increased post-procedural complications, including sepsis. They suggest the use of non-invasive IRP tools for monitoring and focus on multicenter studies for establishing best practices for IRP management, leading to better patient outcomes.

The use of scope and sheath suction in endourology has shown huge success in improving stone-free rate (SFR) and minimising complication rates, especially infectious complications.[7] Gauhar et al use the new direct-in-scope suction technique (DISS) using the GLITZ system during flexible ureteroscopy (fURS) in a prospective multicenter audit. The system itself is a 100 g trigger mounted on the scope handle, with a flow regulating sensor and integrating irrigation and aspiration apparatus, controlled by a finger-trigger suction. Their data on 29 patients showed that the GLITZ system showed a satisfactory performance of 93%, an SFR of 97%, with no reported cases of sepsis.

The use of ureteroscopy and laser stone fragmentation (URSL) has also increased in the paediatric population. Dassanayake et al. on SFR of laser lithotripsy for large paediatric stones, presenting their experience of 15 years from a tertiary endourology paediatric centre.[8] While paediatric URSL is not commonly done for large stones, they included 61 patients with a minimum stone size of 1 cm and a median initial stone burden of 1.7 cm. A holmium laser was used with a combination of fragmentation, dusting and pop-dusting techniques.[9] The mean age was 10 years, and an initial and final SFR was achieved at 64% and 93%, respectively. There were no intra-operative complications, and post-operative complications were noted in five patients (three needing analgesia for pain, Clavien I; and two with suspected UTI needing antibiotics, Clavien II). They show the safety and efficacy of doing URSL in the paediatric age group for large renal stones.

The role of ureteroscopy has evolved with the widespread use of high-powered lasers and the latest development of thulium fibre laser (TFL). It is now widely used in paediatric patients, pregnancy, and large stones and gradually pushing the limits of RIRS.[10] This has been fuelled by the use of smaller 7.5F scopes, with suction technology via the scope and sheath now becoming mainstream increasing the SFR and minimising infectious complications.[11] While technological innovation has helped achieve better outcomes, we also need studies to compare and look at the cost of these treatments and focus on quality of life using patient-reported outcome measures (PROMs).[12]

The use of uro-technology has allowed miniaturisation and helped with personalised medicine.[13] This has been made possible by interdisciplinary collaboration, better research and integration of AI. Ongoing audit and reporting of outcomes will however be needed to ensure the safety and efficacy of these for the patients to receive the best clinical care. As the field continues to evolve, it will be important to carefully evaluate the efficacy, safety and cost of new techniques and technologies to ensure that patients continue to receive the highest quality of care.[14]

Declarations

Ethics approval and consent to participate
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Consent for publication
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