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Editorial

The Significance of Intrarenal Pressures during Upper Tract Endourological Procedures and Its Relation to Postoperative Complications

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HIGHLIGHTS

- The safe intrarenal pressures to avoid endourological procedure complications are different in various surgeries. The most cited pressure in the literature is lower than 30cm H_2O.
- In semi-rigid ureteroscopic procedures use of a smaller-size ureteroscope with continuous flow and avoiding of manual pressure system is recommended.
- The IRP and its obvious relation to postoperative complications should be considered an important factor in daily endourology practice.

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ABSTRACT

The safe intrarenal pressures to avoid endourological procedure complications are different in various surgeries, but the most cited pressure in the literature is lower than 30cm H_2O. In semi-rigid ureteroscopic procedures use of a smaller-size ureteroscope with continuous flow and avoiding of manual pressure system is recommended. In RIRS surgery with a suction system, larger UAS, and smaller size fURS are recommended. During the miniaturized PCNL approach use of the suction system is strongly recommended. The use of intraluminal drug administration to relax the ureteral muscle is controversial but may be beneficial. According to the shreds of evidence, the IRP and its obvious relation to postoperative complications should be considered an important factor in daily endourology practice. .

Keywords: Intrarenal Pressures; Postoperative Complications; Endourology

Editorial: Endourological procedures of the upper urinary tract including ureteroscopy (URS), Retrograde intrarenal surgery (RIRS), and percutaneous nephrolithotomy (PCNL) are the primary modalities to the management of renal stones and other pathologies of the urinary tract. During these surgeries, the appropriate irrigation flow and irrigation pressure are essential for better visualization of the urinary tract (1). However, some conditions need more irrigation pressure to better view that may result in increasing intrarenal pressure (IRP), and consequently backflow of fluid including pyelosinous, pyelotubular, pyelointerstitial, pyelolymphatic, and pyelovenous backflow. These backflows may result in complications such as fornix rupture, perinephric fluid collections, and

most importantly complication of urosepsis. The normal IRP in an unobstructed urinary tract system varies from zero to a few H_2O (10-15cm H_2O). The exact range of IRP that can result in pyelovenous backflow and kidney damage is controversial. The minimum pressure that pyelotubular backflow can be reported 13.6cm H_2O and the maximum was 40cm H_2O. The fornix rupture and hemorrhagic complications were reported in IRP more than 80-100cm H_2O (2).

The safe intrarenal pressures to avoid endourological procedure complications are different in various surgeries, but the most cited pressure in the literature is lower than 30cm H_2O. In this editorial, we review the normal and abnormal range of IRPs in different procedures.

During the RIRS multiple factors determine the final IRP. In a review of the literature, using the ureteral access sheath (UAS) (vs. not using UAS), the larger size of the access sheath (12/14 vs. 10/12), and smaller size of flexible ureteroscope (8.7 vs. 9.5Fr), all are influential on decreasing the IRP. Also, during RIRS, tremendously high IRP values are described with forceful roller hand pumps or manual syringe irrigation compared to gravity irrigation or automated pump irrigation systems. The new modern automated design preserves the flow rate at 50–150mL/min, subsequently, the IRP value maintains between 20-40cm H_2O. To sum up, in RIRS surgery the lowest IRP will be achieved by an irrigation/suction pump system, larger UAS (12/14Fr), and miniaturized flexible URS (3, 4).

The continuous flow of a semi-rigid standard ureteroscope can provide a 100 times higher flow capacity while simultaneously preserving IRPs of 15cm H_2O and <20cm H_2O at an irrigation solution. The new design of a smaller semi-rigid ureteroscope (4.8Fr) is an important cause of reducing the IRP. Also, the use of retropulsion devices such as stone cones, anti-retropulsion gel, and coils has a beneficial effect on avoiding the increase in IRP by limiting the flow into the renal pelvis. The use of a new lithotripter system such as Trilogy by EMS-Swiss system that has a suction system can result in lower urinary tract pressure (5, 6).

In standard PCNL (s-PCNL) the determining factors of IRP are the flow rate, size of access sheath, and nephroscope size. By using the standard size of the sheath (28-30Fr) and 26 Fr nephroscope the IRP rarely exceeds 40 cm H_2O. With the introduction of miniaturized PCNL procedures such as mini-PCNL, Ultra-mini PCNL, and recently micro-PCNL the increase in IRP will be evident due to the decreasing size of the access sheaths. In minimally invasive PCNL methods it recommended the use of a suction system and simultaneously the use of a ureteral catheter with large holes resulting in a decrease of the IRP (7, 8).

Another way to reduce the IRP is the use of β2 and β3-adrenergic drugs such as isoproterenol during the surgery to relax the ureteral smooth muscle and consequently, control the IRP. These drugs can be administrated by retrograde (ureteral catheter) or antegrade (percutaneous nephrostomy) (9, 10).

In summary, in URS use of a smaller-size ureteroscope with continuous flow and avoiding of manual pressure system is recommended. In RIRS surgery with a suction system, larger UAS, and smaller size fURS are recommended. During the miniaturized PCNL approach use of the suction system is strongly recommended. The use of intraluminal drug administration to relax the ureteral muscle is controversial but may be beneficial. According to the shreds of evidence, the IRP and its obvious relation to postoperative complications should be considered an important factor in daily endourology practice.

Conclusions

The safe intrarenal pressures to avoid endourological procedure complications are different in various surgeries, but the most cited pressure in the literature is lower than 30cm H_2O. This cut-off should be considered an important factor in daily endourology practice.

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Conflict of interest

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Data availability

None.

Abbreviations

IRP	Increasing intrarenal pressure
PCNL	Percutaneous nephrolithotomy
RIRS	Retrograde intrarenal surgery
UAS	Ureteral access sheath
URS	Ureteroscopy

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