

Intrarenal pressure

While necessary to improve visibility during flexible ureteroscopy, fluid irrigation may lead to increased intrarenal pressures (IRP) with potential complications.¹⁻³ IRP in the collecting system cannot be reliably monitored today.

The current recommendation discussed in literature is to maintain IRP as low as possible while maintaining good visibility to prevent complications such as pyelovenous backflow and sepsis.^{1,2}



IRP featured evidence and contemporary views

Need for IRP monitoring

"High [intrapelvic pressure] levels may be achieved during f-URS with on-demand irrigation systems. The impact of these high pressures on the risk of complications and long-term consequences still need to be evaluated adequately."

"...Monitoring [intrapelvic pressure] during f-URS could be of great interest. The high pressures are worrisome and they are difficult to estimate by visual recognition alone."

Doizi S, et al. World J Urol. 2021.

"IRP increase remains a neglected predictor of upper tract endourology complications and its intraoperative monitoring should be taken into consideration."

Tokas T, et al. World J Urol. 2019.

"Devices for monitoring intraluminal pressure during the procedures would be desirable."

Jung H, et al. Springerplus. 2015.

Irrigation pressure and implications

"High levels of IPP may be reached intraoperatively when inflow and outflow are not balanced and may cause pyelovenous backflow as well as rupture of the collecting system, leading to postoperative complications."

Doizi S, et al. World J Urol. 2021.

Ureteral access sheaths help reduce IRP. Increased pressure in the renal pelvis can lead to complications such as pyelovenous backflow, infections and renal damage.⁶

"Taking into account the intraoperative needs of improved visibility and increased irrigation flow (IF) and irrigation pressure (IP), an endourologist must remain cognizant regarding the danger of increments in IRPs..."

Tokas T, et al. Curr Urol Rep. 2021.

Potential complications of increased IRP

"To achieve better visibility during the procedure, IF and IPs have to be increased. Nevertheless, consequent intraoperative increments in IRPs are able to deteriorate any procedure. Yet, only a few endourologists remain cognizant and are aware of normal and pathological IRP values. Furthermore, the impact of increased IRPs in perioperative complications and the ways to prevent them by controlling IRPs remain obscure."

Tokas T, et al. World J Urol. 2019.

Complications of elevated IRP may include pain,^{8,9} renal damage and pathological changes,^{1,8,10} infection,^{1,2,8,11} sepsis,^{1,2,8,11} systemic inflammatory response syndrome (SIRS),^{1,11} fever,^{1,11} fluid absorption and pyelovenous backflow.^{1,8,12-14}

Potential complications of increased IRP (cont.)

<p>Pain</p>	<p>“Reducing intrarenal pressures during ureterorenoscopy may, however, also have important implications with regard to pain, and should be addressed in future research.”</p> <p>Jung H, et al. <i>Springerplus</i>. 2015.</p>
	<p>“Traditionally increased endoluminal pressure is considered the main mechanism causing pain in the upper urinary tract but clinical data are sparse.”</p> <p>Pedersen KV, et al. <i>Urol Res</i>. 2012.</p>
<p>Kidney damage</p>	<p>Animal studies have shown high irrigation pressures result in significant pathological changes of the kidney.^{1,8,10}</p>
<p>Rupture</p>	<p>Pre-clinical studies have shown high levels of IRP due to the injection of fluids can lead to rupture of the collecting system.^{8,10}</p>
<p>Systemic inflammatory response syndrome (SIRS)</p>	<p>Irrigation volume during flexible ureteroscopy has been correlated with the risk of SIRS. A recent study suggests SIRS occurs in 8.1% of cases.¹¹</p>
<p>Fluid absorption</p>	<p>Fluid absorption during retrograde intrarenal surgery (RIRS) is thought to be due to increased intrapelvic pressure.^{12,14}</p> <p>Fluid absorption during ureteroscopy procedures has the potential to lead to serious complications such as sepsis.^{1,2,8}</p>
<p>Other</p>	<p>“Moreover, intrarenal backflow may be responsible for development of a pathological site for stone growth by causing papillary damage, forming, in that way, a vicious circle.”</p> <p>Tokas T, et al. <i>World J Urol</i>. 2019.</p> <p>It is thought that in some cases, high IRP may lead to subcapsular hematomas and potentially life-threatening perirenal bleeding.^{1,15,16}</p>

Role of different factors in complication development: Duration of elevated IRP

One study of 23 URS cases reported that approximately 1mL of irrigation fluid was absorbed per minute of URS time.¹⁷ Additionally, PCNL studies have shown that the volume of fluid absorbed increases with increased procedure time¹⁸ and have also correlated the accumulation of procedure time at elevated IRP and the duration of surgery with postoperative fever.^{19,20}

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