

Surgical Management of Complex Ureteral Injuries in Trauma Settings

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DESCRIPTION

Ureteral injuries in trauma settings are relatively uncommon but carry significant risk if not identified and managed promptly. These injuries may occur due to penetrating trauma such as gunshot or stab wounds, or from blunt mechanisms including high-impact deceleration injuries. In addition, iatrogenic injury during abdominal, pelvic, or gynecological procedures remains a frequent cause in clinical practice. The ureter's retroperitoneal location makes early diagnosis challenging, often leading to delayed recognition and subsequent complications such as urinary leakage, abscess formation, or loss of renal function [1].

Clinical presentation varies depending on the timing and severity of injury. In acute trauma cases, patients may present with abdominal pain, hematuria, or signs of peritonitis if urine extravasation is extensive. However, in many situations, symptoms are subtle or masked by other injuries, particularly in polytrauma patients. This makes a high index of suspicion essential, especially when mechanisms of injury involve the retroperitoneal space or surgical dissection near the ureter [2].

Imaging plays a central role in diagnosis. Contrast-enhanced computed tomography with delayed excretory phases is commonly used to evaluate ureteral continuity and identify urinary leakage. Retrograde pyelography remains one of the most sensitive methods for confirming injury location and extent. Prompt imaging is crucial because delayed diagnosis is associated with increased morbidity and more complex reconstructive requirements [3].

More severe injuries, including complete transection or devascularization, often require surgical reconstruction. The choice of technique depends on the anatomical location. Injuries in the upper ureter may be treated with ureteroureterostomy, where the damaged segment is excised and the healthy ends are reconnected. This approach requires tension-free anastomosis and adequate blood supply to ensure healing [4].

Lower ureteral injuries near the bladder often require reimplantation techniques. Ureteroneocystostomy involves repositioning the ureter into the bladder with creation of a submucosal tunnel to prevent reflux. When tension prevents direct reimplantation, adjunctive procedures such as psoas hitch or Boari flap may be used to bridge the gap between ureter and bladder. These reconstructive methods

allow preservation of renal function even in extensive injuries [5].

In cases involving long-segment loss of ureteral tissue, more complex reconstructive options may be necessary. These include use of bowel segments such as ileal interposition, which replaces the damaged ureter with a segment of intestine. Although effective, this approach carries risks such as metabolic disturbances and mucus production in the urinary tract. Long-term monitoring is essential in these patients [6].

Temporary urinary diversion may be required in unstable patients or when immediate reconstruction is not feasible. Percutaneous nephrostomy provides external drainage of urine from the kidney, allowing stabilization and infection control before definitive repair. This staged approach is often lifesaving in severely injured patients [7,8].

Complications following ureteral repair can include stricture formation, urinary leakage, infection, and impaired renal function. Meticulous surgical technique, ensuring adequate blood supply and tension-free anastomosis, is critical in reducing these risks. Postoperative imaging is typically performed to confirm patency of the repair and ensure proper urinary drainage. Training in reconstructive techniques is particularly important given the variability and complexity of these injuries [9,10].

CONCLUSION

Ureteral injuries in trauma settings require a systematic and adaptable surgical approach. A range of reconstructive options exists, each suited to specific injury patterns and anatomical considerations. Surgeons must be familiar with multiple repair options and be able to adapt intraoperatively based on findings. Experience in both open and minimally invasive approaches enhances flexibility in management. Early recognition, appropriate imaging, and timely surgical repair are key factors in achieving optimal outcomes and preserving renal function.

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