Kidney and Ureters Trauma

Dept Of Surgery

Introduction

- Injuries to the kidney from external trauma are the most common
- Blunt renal injuries most often come from motor vehicle accidents, falls from heights and assaults
- Penetrating renal injuries most often come from gunshot and stab wounds
- Upper abdomen, flank, and lower chest are entry sites commonly resulting in renal injury

- History
- Physical examination
- In polytrauma, rapid resuscitation should be under way.
- Immobilization of the cervical spine
- The abdomen, chest, and back must be examined
- Fractures of the lower ribs and upper lumbar and lower thoracic vertebrae are associated with renal injuries

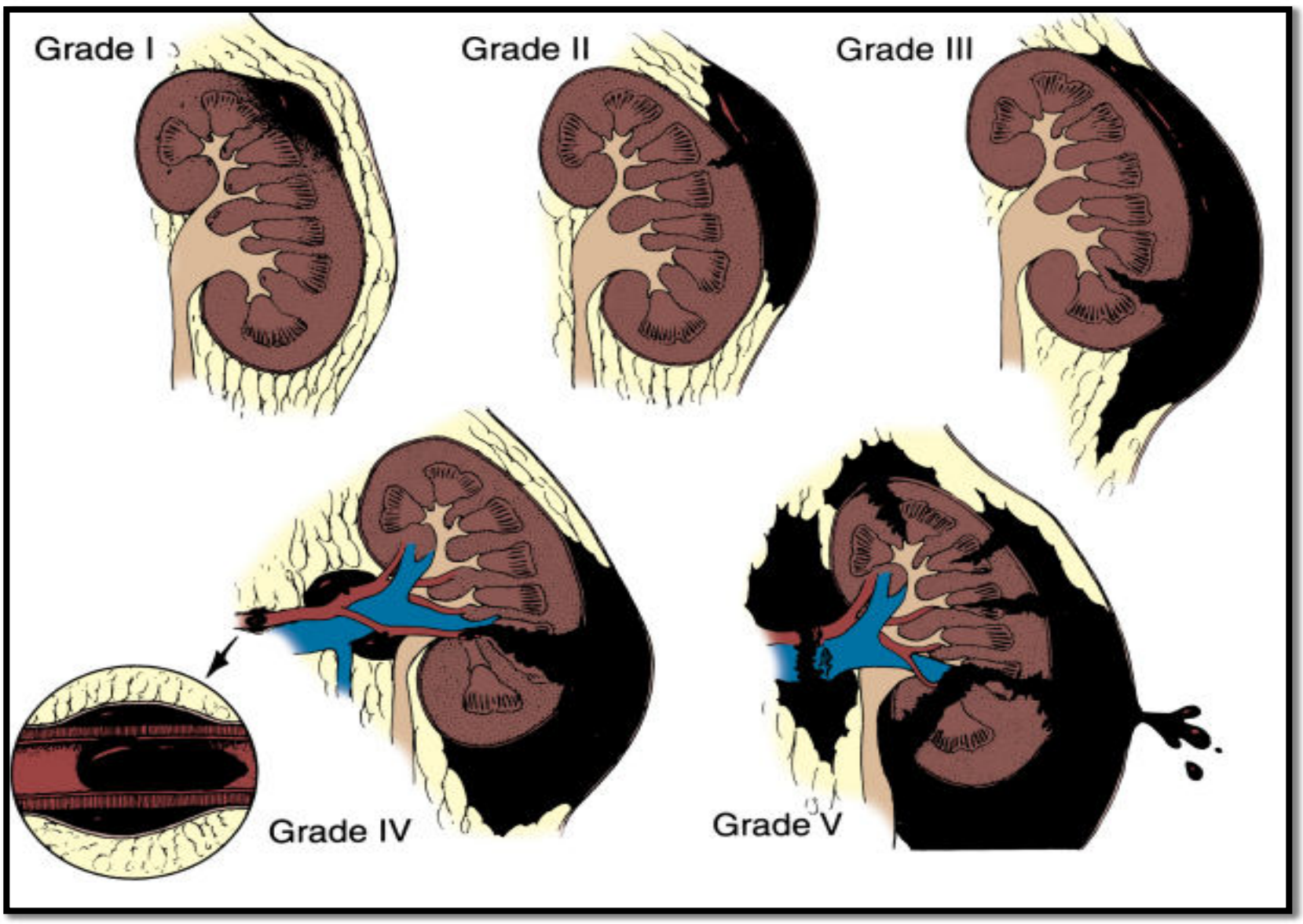
Clinical manifestation

Hematuria:

- Best indicator of traumatic urinary system injury
- Presence of microscopic (>5 red blood cells/high-power field [RBCs/HPF] or positive dipstick finding) or gross hematuria is characteristic
- Degree of hematuria and the severity of the renal injury do not correlate consistently

Classification

Grade [†]	Type	Description
I	Contusion	Microscopic or gross hematuria, urologic studies normal
	Hematoma	Subcapsular, nonexpanding without parenchymal laceration
II	Hematoma	Nonexpanding perirenal hematoma confined to renal retroperitoneum
	Laceration	<1 cm parenchymal depth of renal cortex without urinary extravasation
III	Laceration	>1 cm parenchymal depth of renal cortex without collecting system rupture or urinary extravasation
IV	Laceration	Parenchymal laceration extending through renal cortex, medulla, and collecting system
	Vascular	Main renal artery or vein injury with contained hemorrhage
V	Laceration	Completely shattered kidney
	Vascular	Avulsion of renal hilum, devascularizing the kidney



Indications for Renal Imaging

All blunt trauma patients with:

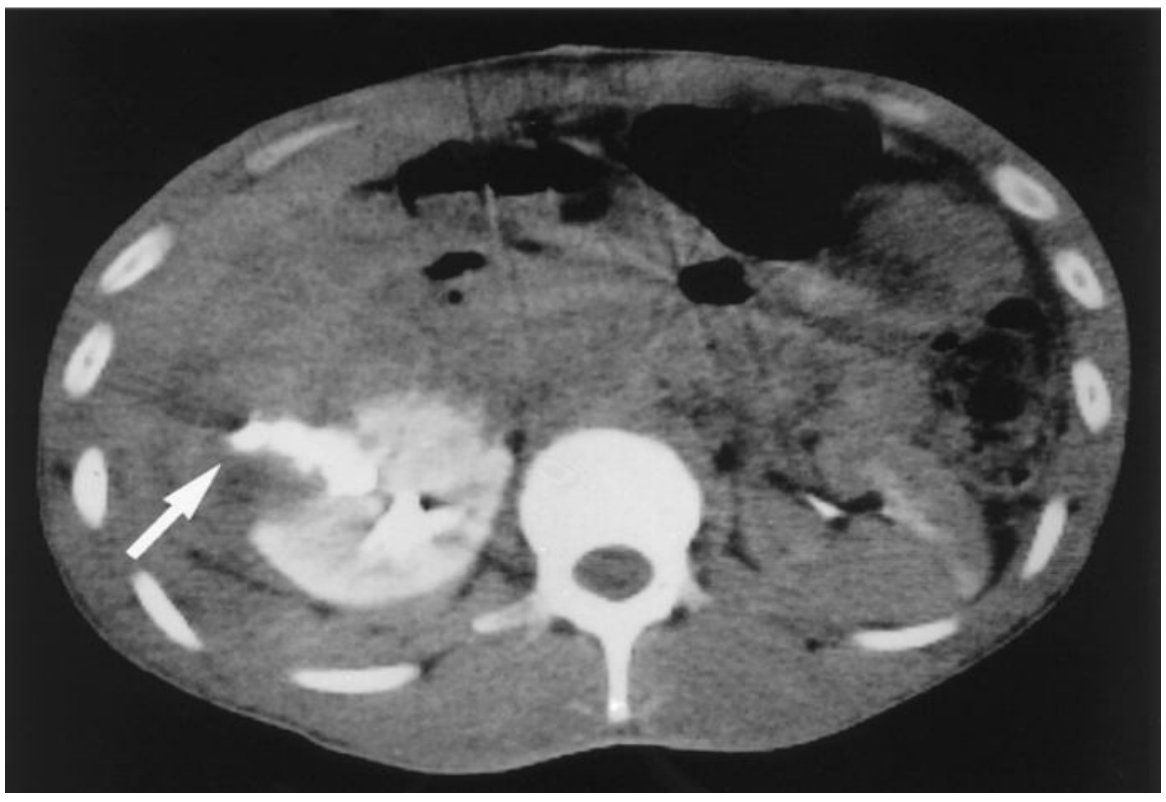
- Gross hematuria
- Microscopic hematuria and shock

Should undergo renal imaging usually CT with intravenous contrast

Penetrating injuries with any degree of hematuria should be imaged

Imaging Studies

Contrast -enhanced CT



Right renal stab wound (grade IV), demonstrating extensive urinary extravasation and large retroperitoneal hematoma

Findings on CT that suggest major injury are:

- **Medial hematoma:** vascular injury
- **Medial urinary extravasation:** renal pelvis or ureteropelvic junction avulsion injury
- **Lack of contrast enhancement of the parenchyma:** arterial injury

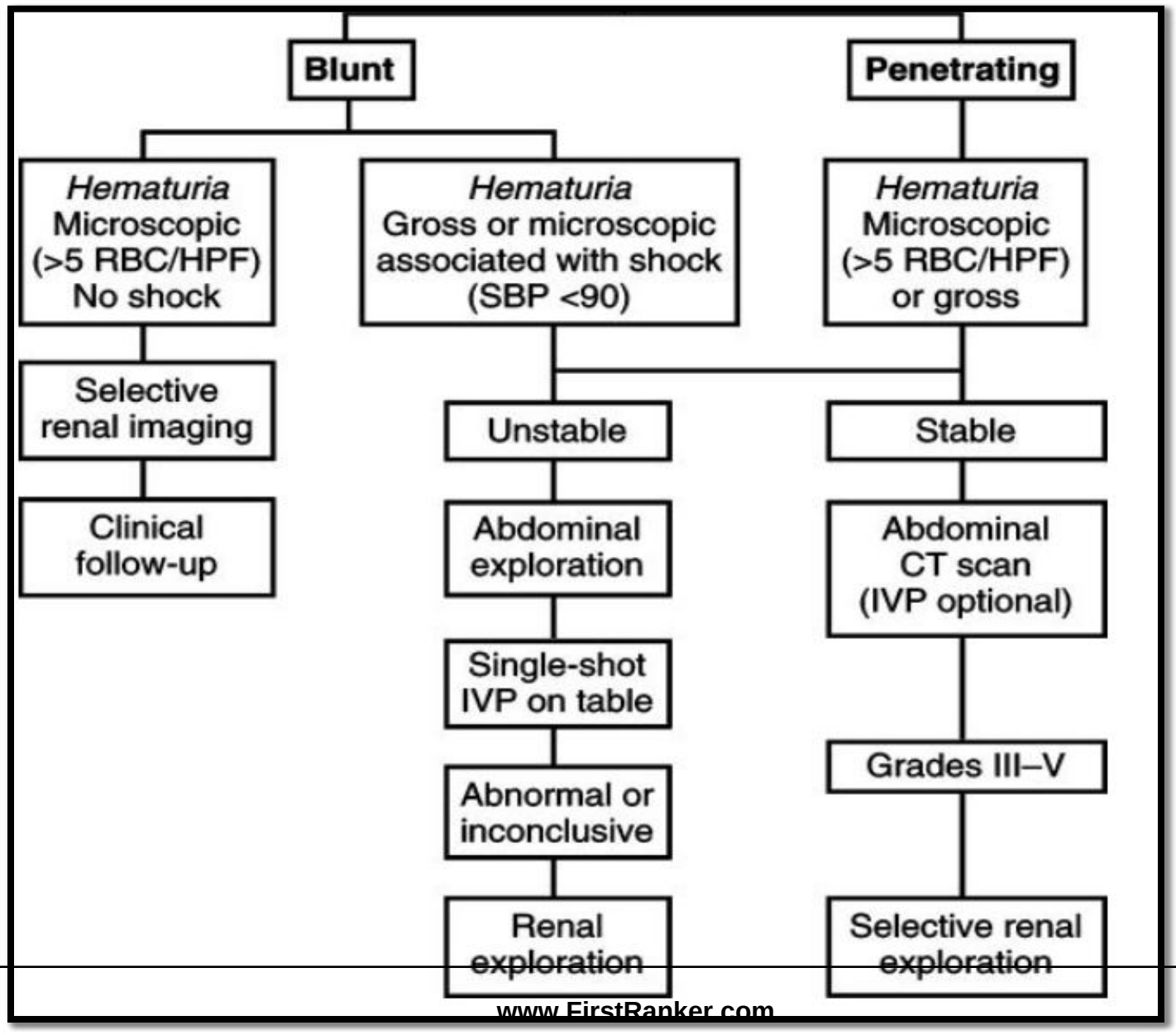
Excretory urography

- **“single-shot” intraoperative IVP**

Non operative Management

- Significant injuries (grades II to V) are found in only 5.4% of renal trauma cases
- Hemodynamically stable patient with an injury well staged by CT can usually be managed without renal exploration
- 98% of blunt renal injuries can be managed non operatively
- Grade IV and V injuries more often require surgical exploration

Trauma



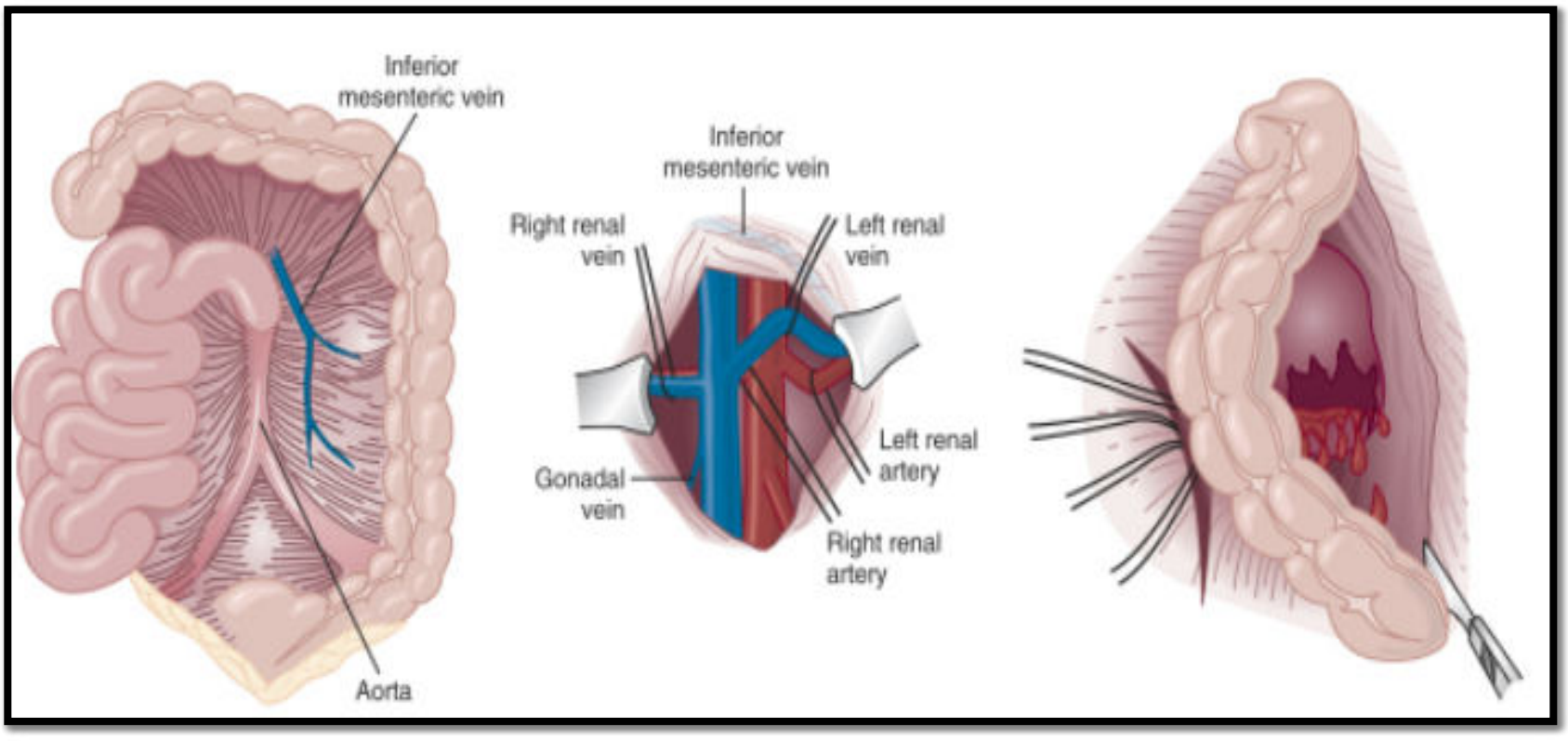
Operative Management

- **Absolute indications**
  - Persistent renal bleeding
  - Expanding perirenal hematoma
  - Pulsatile perirenal hematoma
- **Relative indications**
  - **Urinary extravasation**
  - **nonviable tissue**
  - **delayed diagnosis of arterial injury**
  - **incomplete staging**
  - **segmental arterial injury**

Renal Exploration

Surgical exploration of the acutely injured kidney is best done by a transabdominal approach which allows complete inspection of intra-abdominal organs and bowel

Obtaining early vascular control before opening Gerota's fascia can decrease renal loss



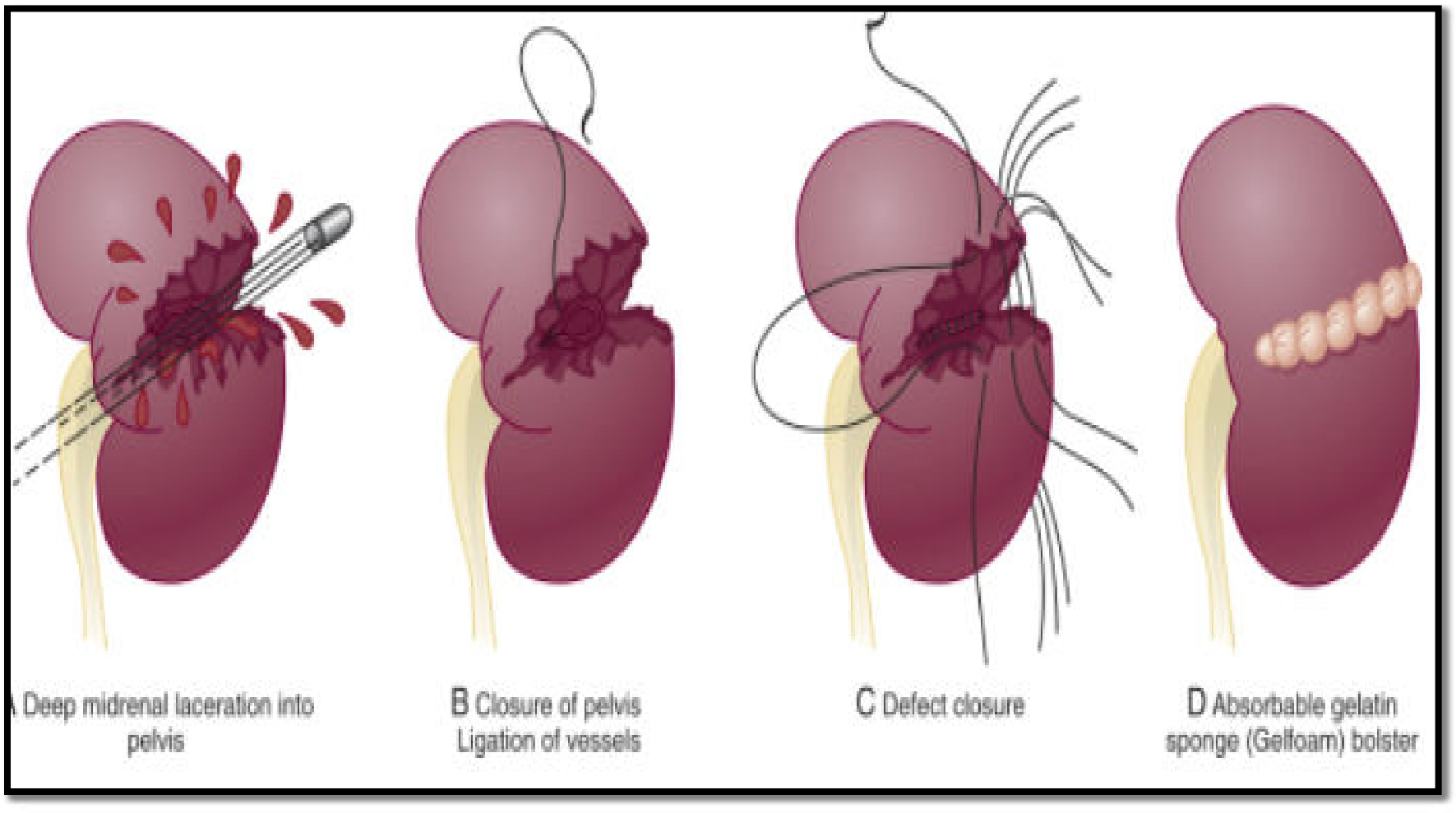
Surgical approach to the renal vessels and kidney

Renal Reconstruction

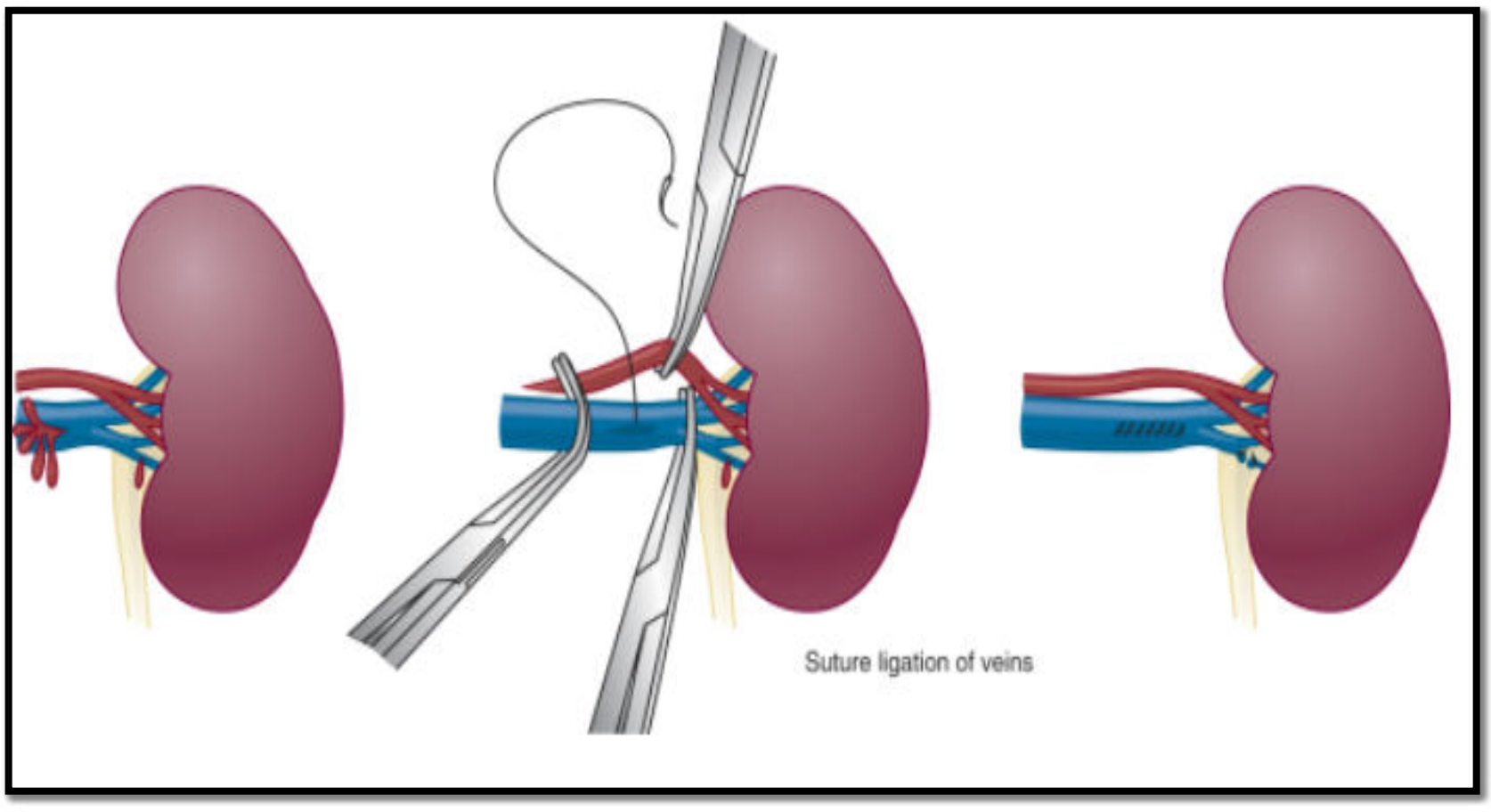
Principles of renal reconstruction after trauma include:

- Complete renal exposure
- Debridement of nonviable tissue
- Hemostasis by individual suture ligation of bleeding vessels
  watertight closure of the collecting system
- Coverage or approximation of the parenchymal defect

Renorrhaphy



Renovascular Injuries



- Segmental renal arterial injuries result in ischemic infarction to a segment of the kidney
- **These should be observed non operatively when diagnosed unless associated with a parenchymal laceration**

- Injuries to the main renal vein require repair with fine vascular suture (5-0)

- Segmental venous injuries are best managed by ligation of the vessel

Indications for Nephrectomy

- **Unstable patient with low body temperature and poor coagulation**

- **Extensive renal injuries**

Complications

- Urinoma
- Perinephric infection
- Renal loss
- Delayed renal bleeding
- Hypertension

Ureteral Injuries

- Ureteral injuries after external violence are rare
- Occurs in < 4% of cases of penetrating trauma and < 1% of cases of blunt trauma
- Significant associated injuries
- Degree of mortality approaches one third

American Association for the Surgery of Trauma Organ Injury Severity Scale for the Ureter

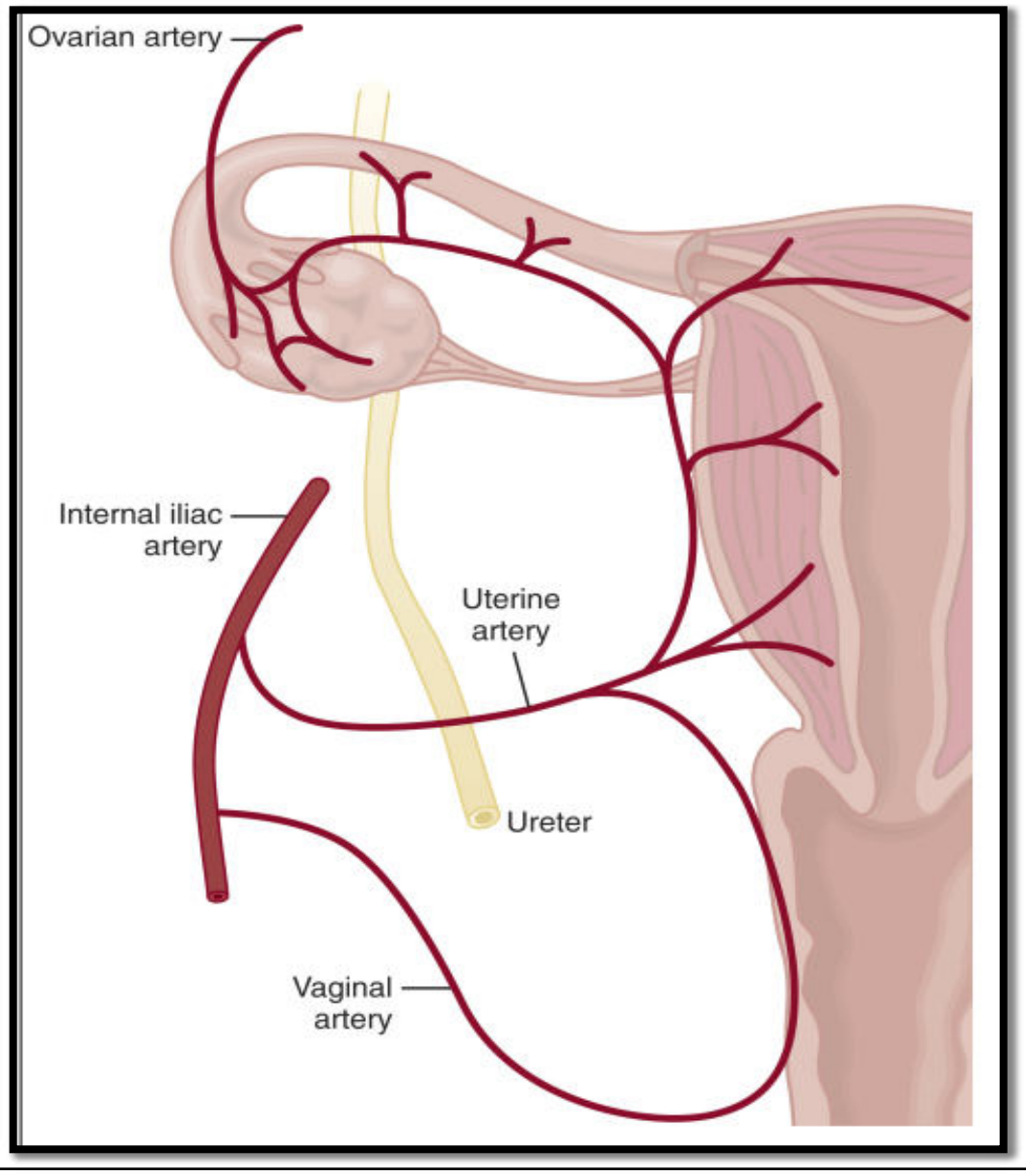
Grade [†]	Type	Description
I	Hematoma	Contusion or hematoma without devascularization
II	Laceration	<50% transection
III	Laceration	≥50% transection
IV	Laceration	Complete transection with <2 cm devascularization
V	Laceration	Avulsion with >2 cm devascularization

Surgical Injury

- Hysterectomy (54%)
- Colorectal surgery (14%)
- Pelvic surgery such as ovarian tumor removal and transabdominal urethropexy (8%)
- Abdominal vascular surgery (6%)

(St Lezin and Stoller, 1991)

- In open operation at least one third of ureteral injuries are recognized immediately
- Fewer injuries to the ureter are immediately identified after laparoscopy
- Avoidance of ureteral injury is predicated on intimate knowledge of its location



Ureteroscopic Injury

Factors associated with higher complication rates during ureteroscopy

- Surgery times
- Treatment of renal calculi
- Surgeon inexperience
- Previous irradiation

Diagnosis

Incidence of Hematuria

- 25% to 45% cases of ureteral injury after violence do not demonstrate even microscopic hematuria

Intraoperative Recognition

Imaging Studies

- Excretory Urography

Excretory urography demonstrating extravasation in the upper right ureter

- Computed Tomography

- Retrograde Ureterography
  - To delineate the extent of ureteral injury seen on CT scan or IVP if further clinical information is needed.
  - Most commonly used to diagnose missed ureteral injuries, as it allows the simultaneous placement of a ureteral stent if possible

- Antegrade Ureterography

Management

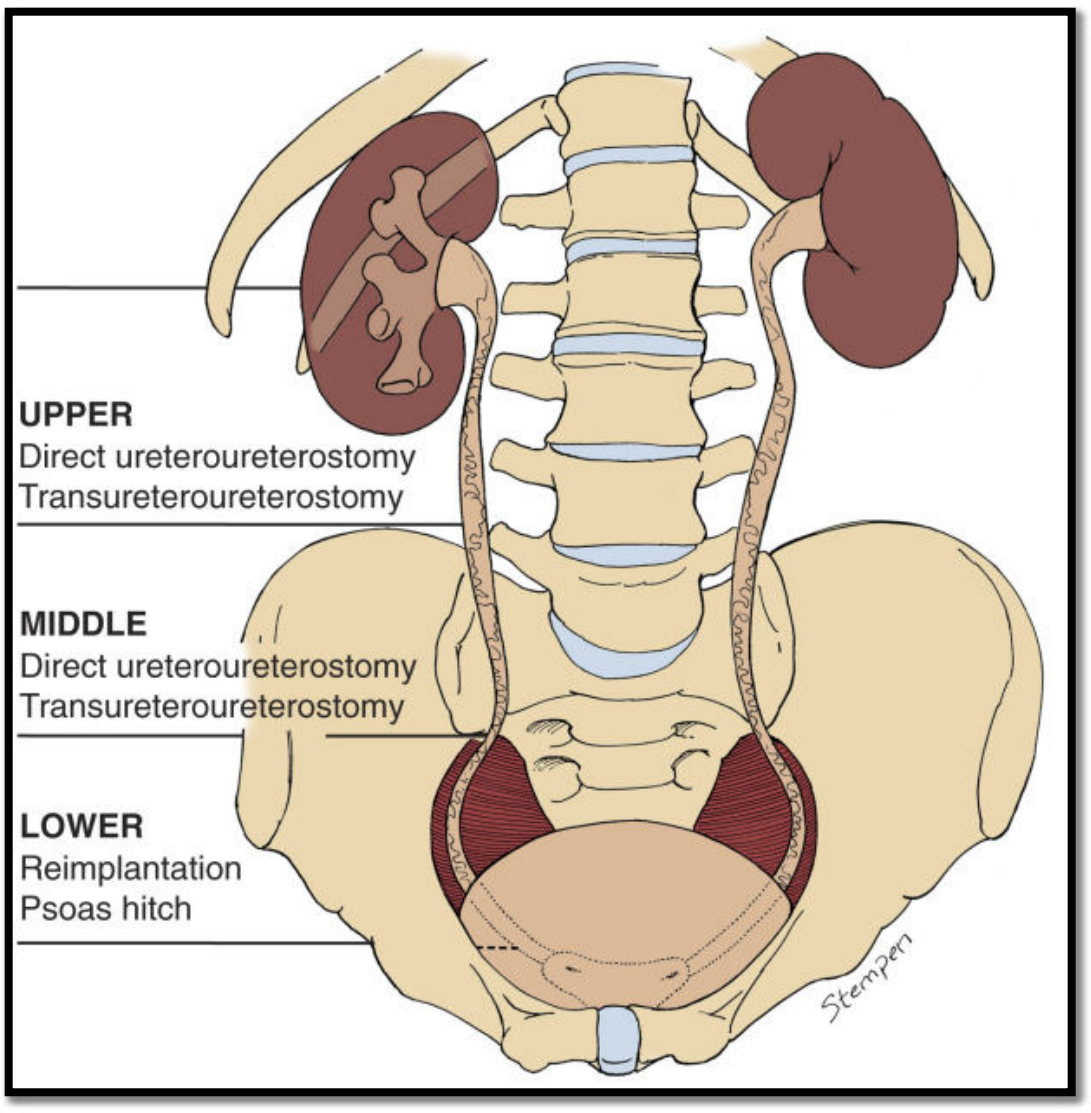
External Trauma

- **Contusion**
  - Ureteroureterostomy

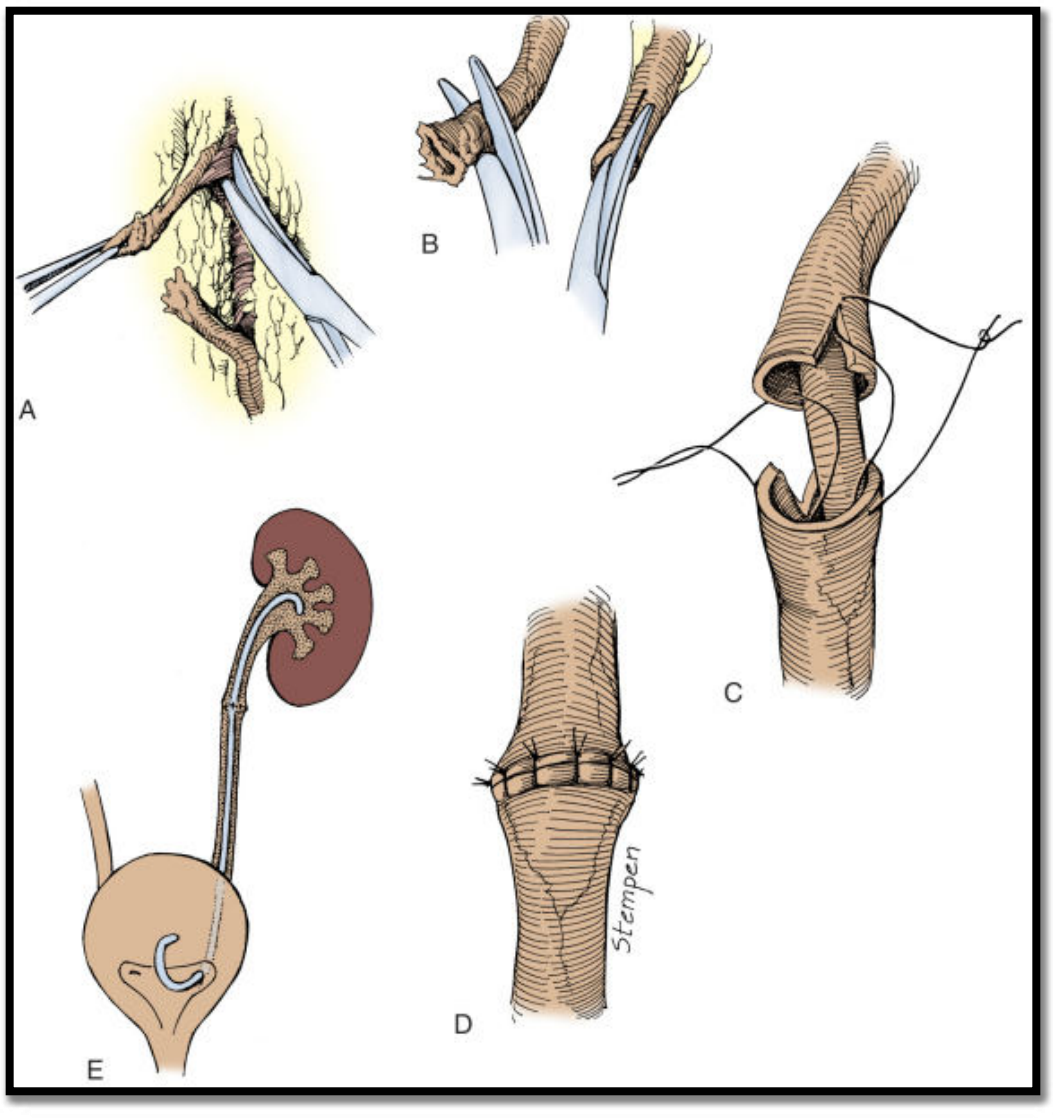
    Severe/large areas of contusion treated with excision of the damaged area and ureteroureterostomy

  - Internal Stenting

    Minor ureteral contusions can be treated with stent placement



Management options for ureteral injuries at different levels



Technique of ureteroureterostomy after traumatic disruption

- **Upper Ureteral Injuries**
  - Ureteroureterostomy
  - Auto transplantation
  - Bowel Interposition
- **Mid ureteral Injuries**
  - Ureteroureterostomy: Transureteroureterostomy

  Bringing the injured ureter across the midline and anastomosing it end to side into the uninjured ureter

- **Lower Ureteral Injuries**
  - Ureteroneocystostomy
  - Psoas Bladder Hitch (high success rate : 95% to 100%)
  - Boari Flap **(if long ureteral defects)**

- **Partial Transection**

  Principle of primary repair involve spatulated, watertight closure under optical magnification, with interrupted or running 5-0 or 6-0 absorbable monofilament

- **Surgical Injury**
  - Ligation
    - removal of the ligature
    - observation of ureter for viability
    - If viability is in question, ureteroureterostomy or ureteral reimplantation should be performed
  - Transection
    - Immediate Recognition

      ureteroureterostomy

      omental wrapping of the repair

    - Delayed Recognition

      stent placement