- Etiology
- Diagnosis
- Classification
- Therapy
- Postoperative Care and Follow-Up
- Complications

Pathophysiology

- The lower GU tract comprises the urinary bladder, urethra, and external genitalia. Bladder injuries mostly occur in blunt trauma.
- Eighty-five percent of these injuries occur with pelvic fractures; 15% occur with penetrating trauma and blunt mechanism without a pelvic fracture

Bladder injuries

- In the child the bladder is an abdominal organ
- When the bladder is distended or the pelvis is fractured, the normal protective influence of the intact pelvic ring is lost, and in fact the shearing force of a pelvic fracture commonly tears the bladder at its moorings.
- A spicule of bone may lacerate the organ, or it may rupture at the dome by a direct blow to the abdomen without bony injury. Conversely, missiles from an outside force,

Cause of Blunt Injuries of the Bladder

- Motor vehicle accident
- Fall
- Crush of bony pelvis
- Abdominal blow

Cause of Penetrating Injuries of the Bladder

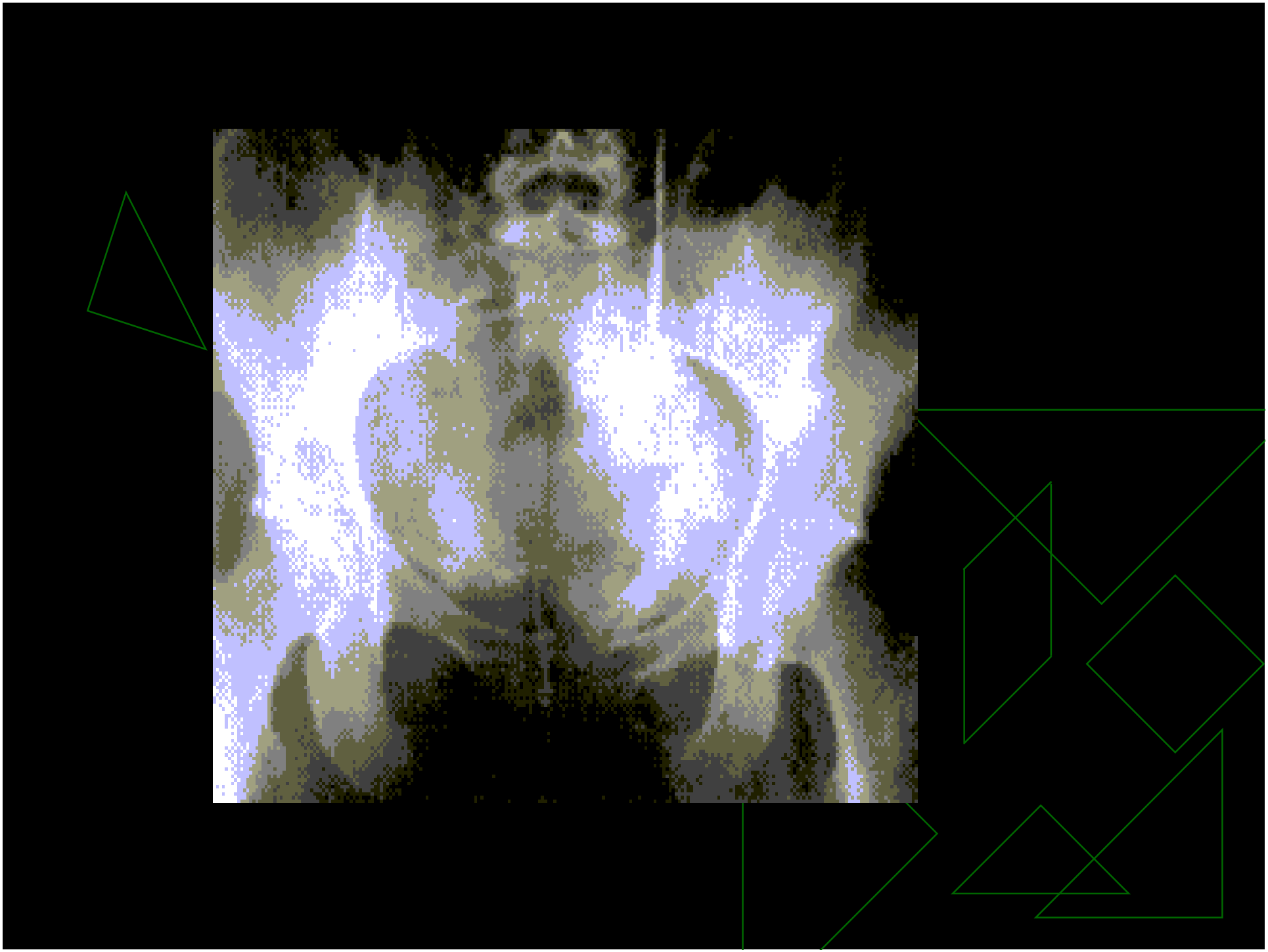
- **Operative injury**
- *Transurethral procedures*
- Resectoscope
- Lithotrite
- Cystoscope
- Urethral instrumentation
- *Gynecologic procedures*
- Abdominal hysterectomy
- Vaginal hysterectomy

Cause of Penetrating Injuries of the Bladder

- Removal of cervical stump
- Salpingo-oophorectomy
- Caesarean section
- *Laparoscopy - Veress needle, trochar*
- Dilatation and curettage
- Suction curettage
- Neovaginal construction
- *Abdominal procedures*
- Herniorrhaphy

Cause of Penetrating Injuries of the Bladder

- Abdominal-perineal resection
- Anterior colon resection
- Neonatal umbilical artery catheterization
- External violence
- Gunshot wound
- Knife wound
- Spike impalement



Cause of Penetrating Injuries of the Bladder

- Internal migration
- Surgical drains
- Penrose
- Saratoga sump
- Foley catheter Intrauterine devices
- Hip prosthesis
- Long-dwelling Foley catheter

Signs and Symptoms

- suprapubic pain
- discomfort of a concomitant fractured pelvis or other organ system injury overshadows the pain from the damaged urinary tract.
- Tenderness in the suprapubic area
- bowel sounds absent, intraperitoneal rupture.
- An isolated bladder rupture rarely causes shock..
- Gross hematuria occurs over 95% of the time, with microscopic hematuria present in the remaining cases

Bladder trauma

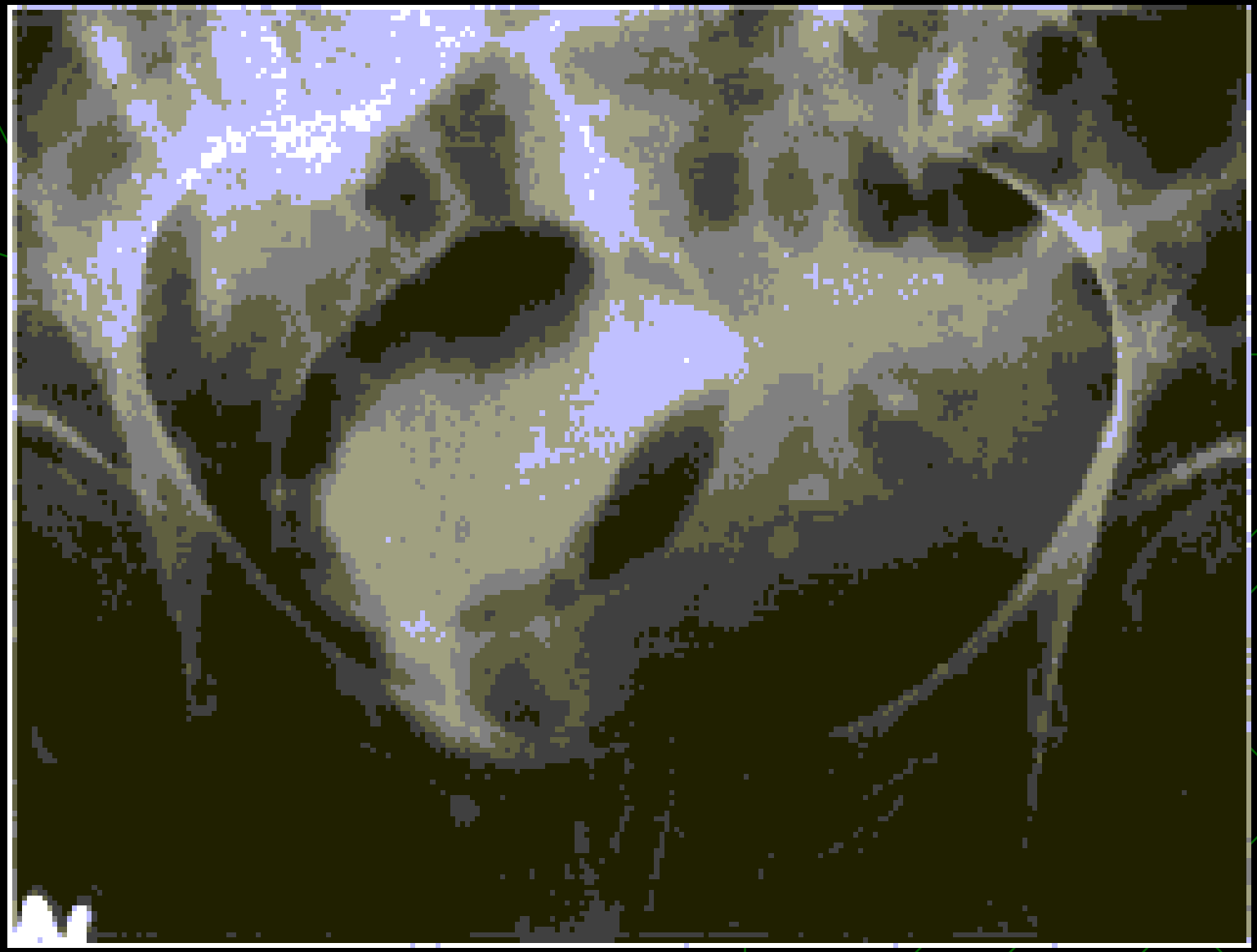
- suprapubic abdominal pain and the ability to void after the injury.
- If the patient cannot provide such information and gross hematuria is present, suspect bladder injury.
- Bruising or edema of the lower abdomen, perineum, or genitalia indicates bladder injury.
- Always suspect urethral and bladder injuries in patients with pelvic fractures and inability to void.
- Inability to retrieve all fluid used to irrigate the bladder through a Foley catheter indicates bladder injury.

Radiographic Examination

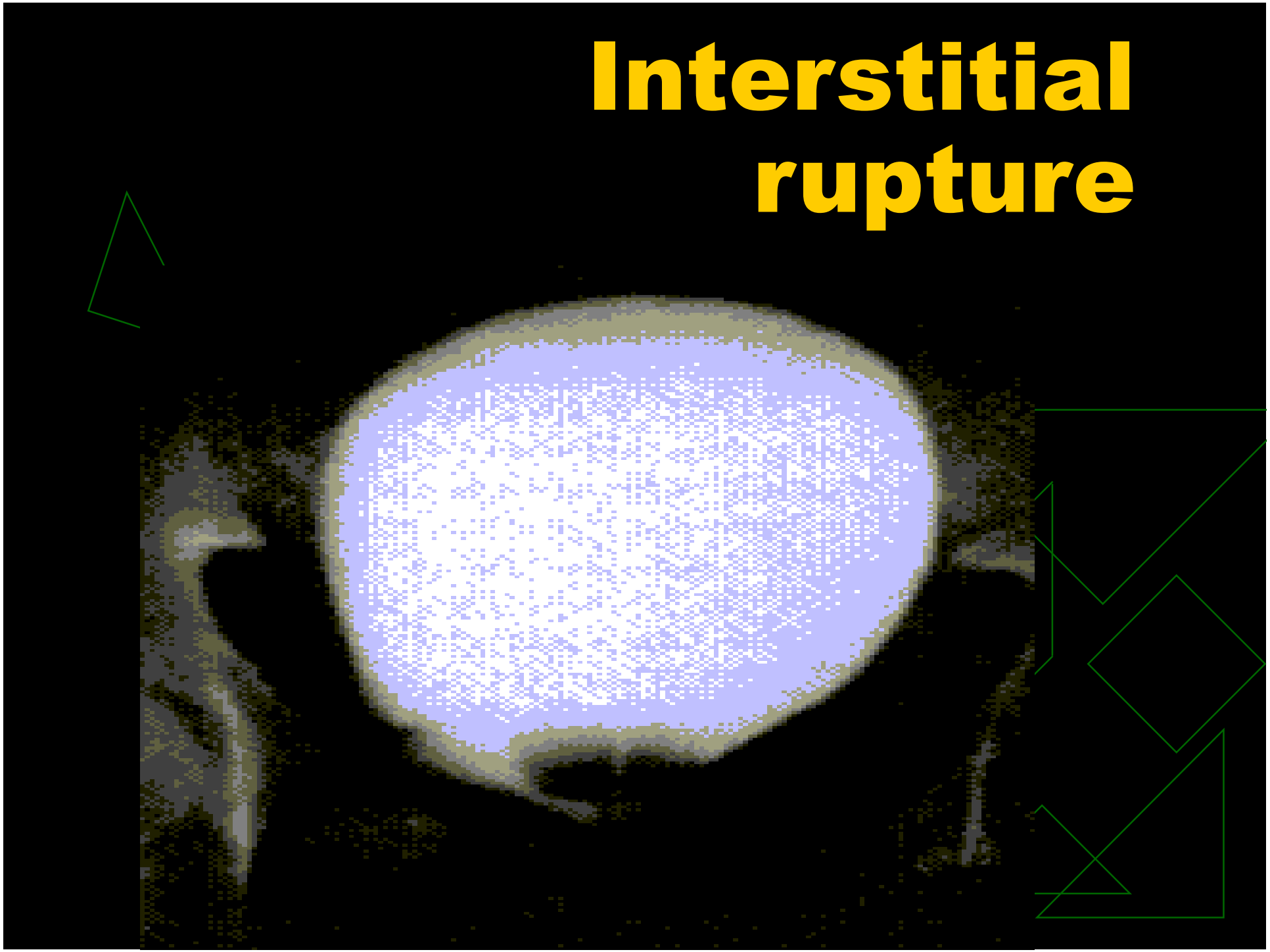
- The static cystogram is the only study that will definitely diagnose a ruptured bladder.
- retrograde urethrogram must be done before attempted urethral catheterization.
- If a ruptured urethra is found, urethral catheterization may be contraindicated and a suprapubic cystotomy performed.

Classification of Bladder Injuries

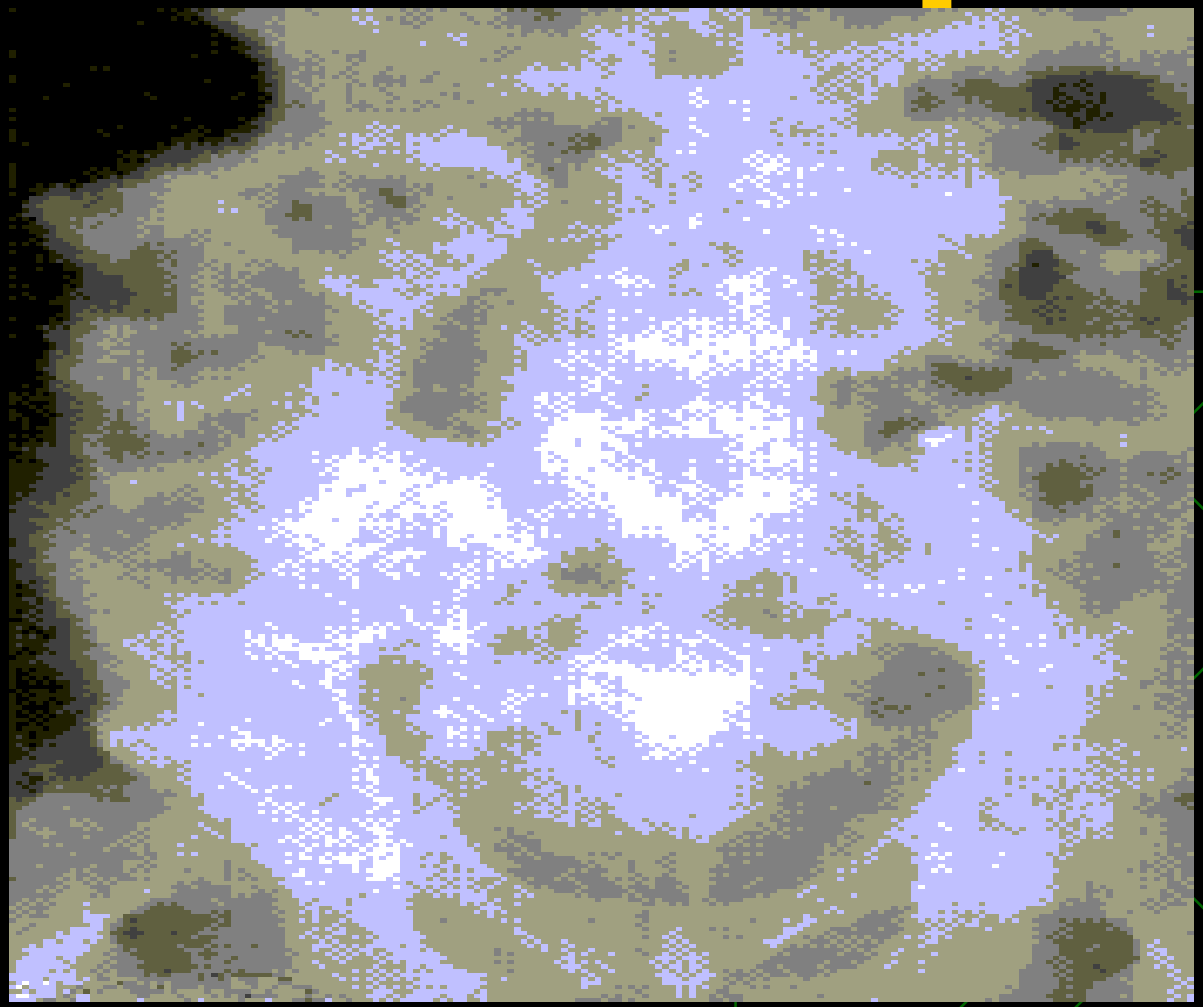
- Blunt trauma
  - Contusion
  - Interstitial rupture
  - Intraperitoneal rupture
  - Extraperitoneal rupture
  - Intraperitoneal and extraperitoneal rupture
- Penetrating trauma



Interstitial rupture



Intraperitoneal rupture



Extraperitoneal rupture

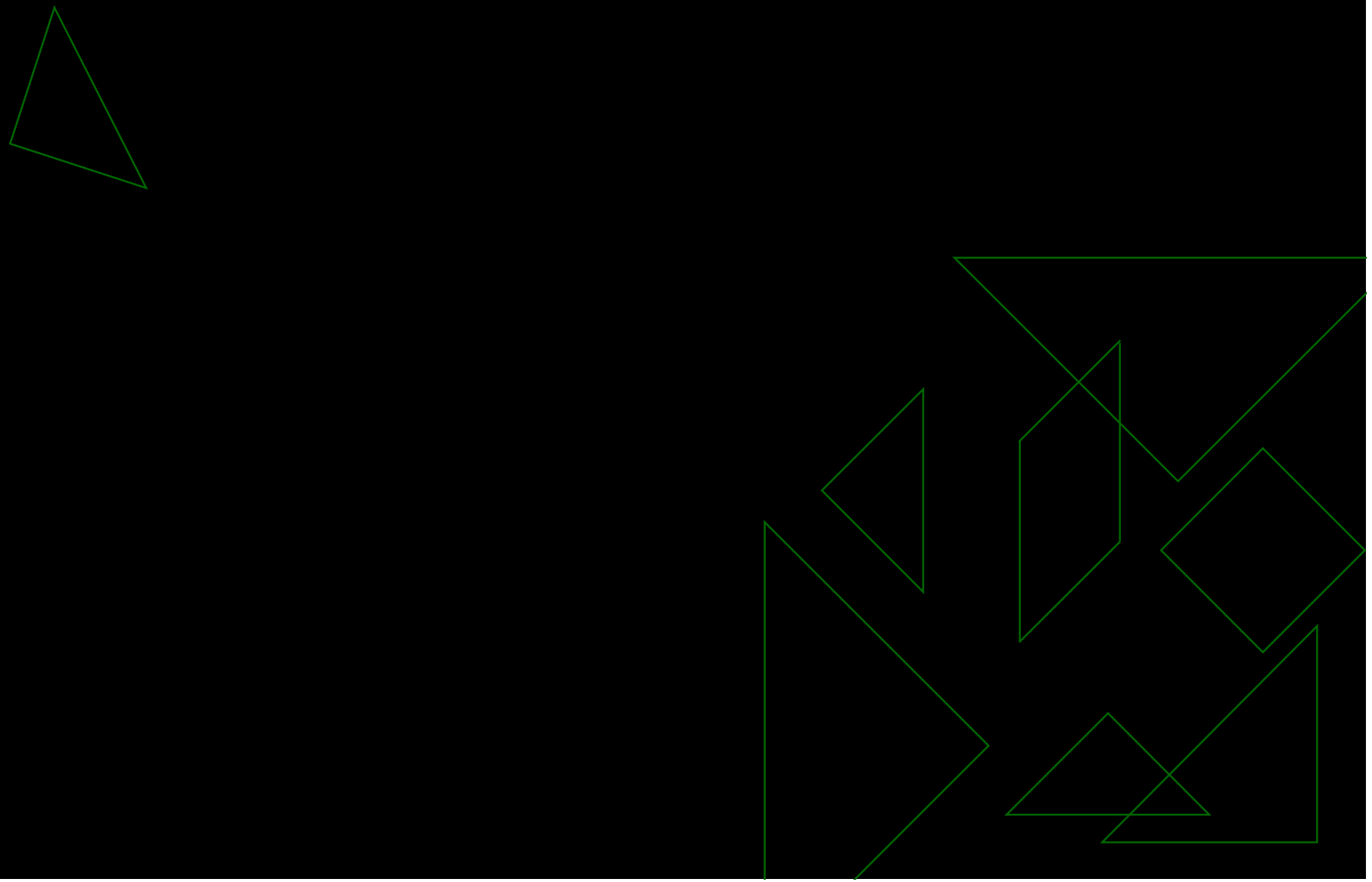
Lab Studies

- Complete blood count (CBC) to obtain a hematocrit and a platelet count
- Prothrombin time (PT) and activated partial thromboplastin time (aPTT) to check for coagulopathy
- Blood type and crossmatch
- Urinalysis to assess for gross hematuria

Imaging Studies

- Plain radiograph of the pelvis to assess presence and extent of bony injury
- Retrograde urethrogram,This is indicated prior to the insertion of a Foley catheter when urethral injury is suspected.
- Urethrography is performed with water-soluble contrast material and preferably under fluoroscopy. If fluoroscopy is unavailable, multiple plain films are obtained with 10-cc injections of contrast material

Therapy



Extraperitoneal rupture

- Perform a cystogram after 7-10 days with adequate bladder drainage and broad-spectrum antibiotics.
  - Remove the catheter if extravasation has resolved. If the extravasation is persistent, surgical intervention is required.
  - Persistent severe hematuria and infection of the pelvic hematoma are contraindications to conservative therapy.
- Surgical repair is performed by opening the dome of the bladder and repairing the laceration from within

Penetrating injuries

- The preferred method is surgical intervention; open the dome of the bladder and perform a full inspection.
  - Use indigo carmine IV injection to help identify distal ureters.
- Penetrating injuries must be surgically explored with debridement and possible orchiectomies

Complications

- uroascites
- Sepsis
- mortality of patients with bladder ruptures is about 12%.
- Injuries to the bladder neck, urethra, and vagina, if not promptly and properly repaired at the time of the injury, may result in incontinence, fistula, or stricture formation.

URETHRAL INJURIES

- (1) the prostatic urethra,
- (2) the membranous urethra,
- (3) the bulbous urethra, and
- (4) the penile, or pendulous, urethra.
- *posterior urethral injuries*-, above and including the urogenital diaphragm,
- *anterior urethral injuries*--those of the bulbous and penile, or pendulous, urethra, below the urogenital diaphragm.

Cause of Posterior urethral injuries

- Fracture of the pelvis
  - Motor vehicle accidents
  - Fall, crush
  - Sporting accidents
- Penetrating injuries
  - External violence
    - Gunshot
    - Stab
  - Urethral instrumentation
    - Resectoscope
    - Sounds
    - Filiforms, followers
- Lateral pelvic blow

Anterior urethral injuries

- Straddle injury
  - Fall
  - Fence, ladder
  - Kick
  - Bicycle
- Penetrating injury
  - Gunshot
  - Machine injury
  - Knife wound

Anterior urethral injuries

- Urethral instrumentation
  - Catheter
  - Cystoscope
  - Sounds Filiforms, followers
  - Self-instrumentation
- Penile surgery
  - Prosthesis placement, erosion
  - Circumcision
- Sexual intercourse
  - Urethral laceration
  - Fracture of the penis

Retrograde cystogram

- Cystography is the most reliable and easily available modality. A water-soluble contrast material is used, and, initially, 250 cc are introduced through the Foley catheter.
- If the patient reports no discomfort, another 150 cc are introduced, and the catheter is clamped.
- Obtain and view anteroposterior and lateral radiographs of the lower abdominal area; obtain identical views after the patient empties his or her bladder. Latter views provide information about posterior extraperitoneal injuries that may not be detected when the bladder is full.

Urethral trauma

- Knowledge of associated injuries that can cause urethral injury is required for diagnosis.
  - A history of inability to void indicates the possibility of urethral trauma.
  - The classic sign is blood at the meatus.
  - Penile or perineal edema and/or hematoma are present in anterior injuries.
  - A distended bladder may be present in posterior injuries, as 65% of posterior injuries are complete transections

Signs and Symptoms

- history of trauma to the perineum
- inability to void,
- Most patients with a ruptured urethra will have blood at the urethral meatus,
- swelling and ecchymosis of the penis, scrotum, and/or perineum.
- If the edema is only in the penis, it is probably contained within Buck's fascia. If it extends to the scrotum, perineum, or anterior abdominal wall, it will be contained by Colles' fascia.

Signs and Symptoms

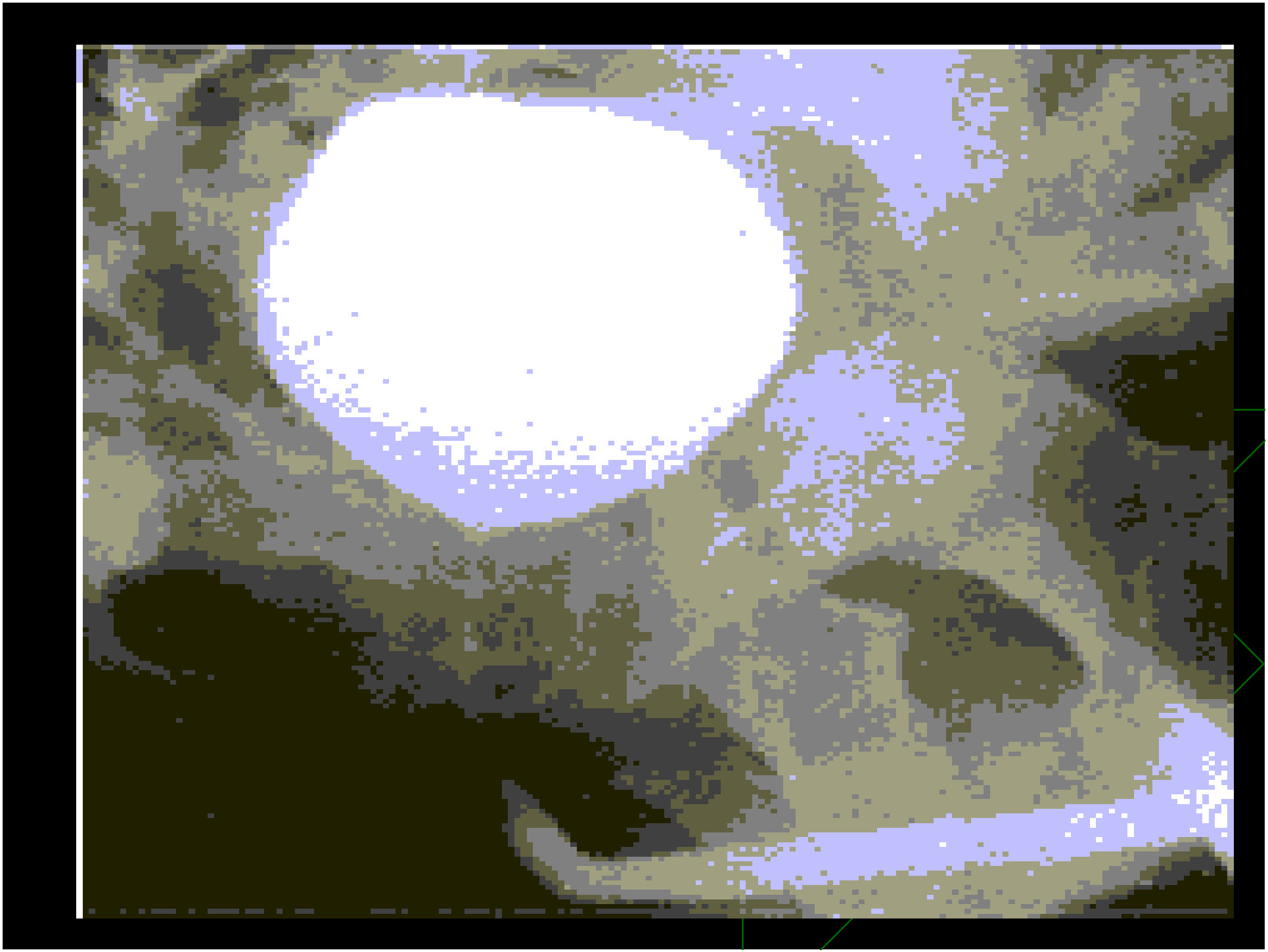
- rectal examination may reveal the prostate to be in a higher position than usual. bone fragment.
- soft, boggy hematoma will be felt where the prostate is normally found.
- If the patient can urinate, he will usually have gross hematuria.

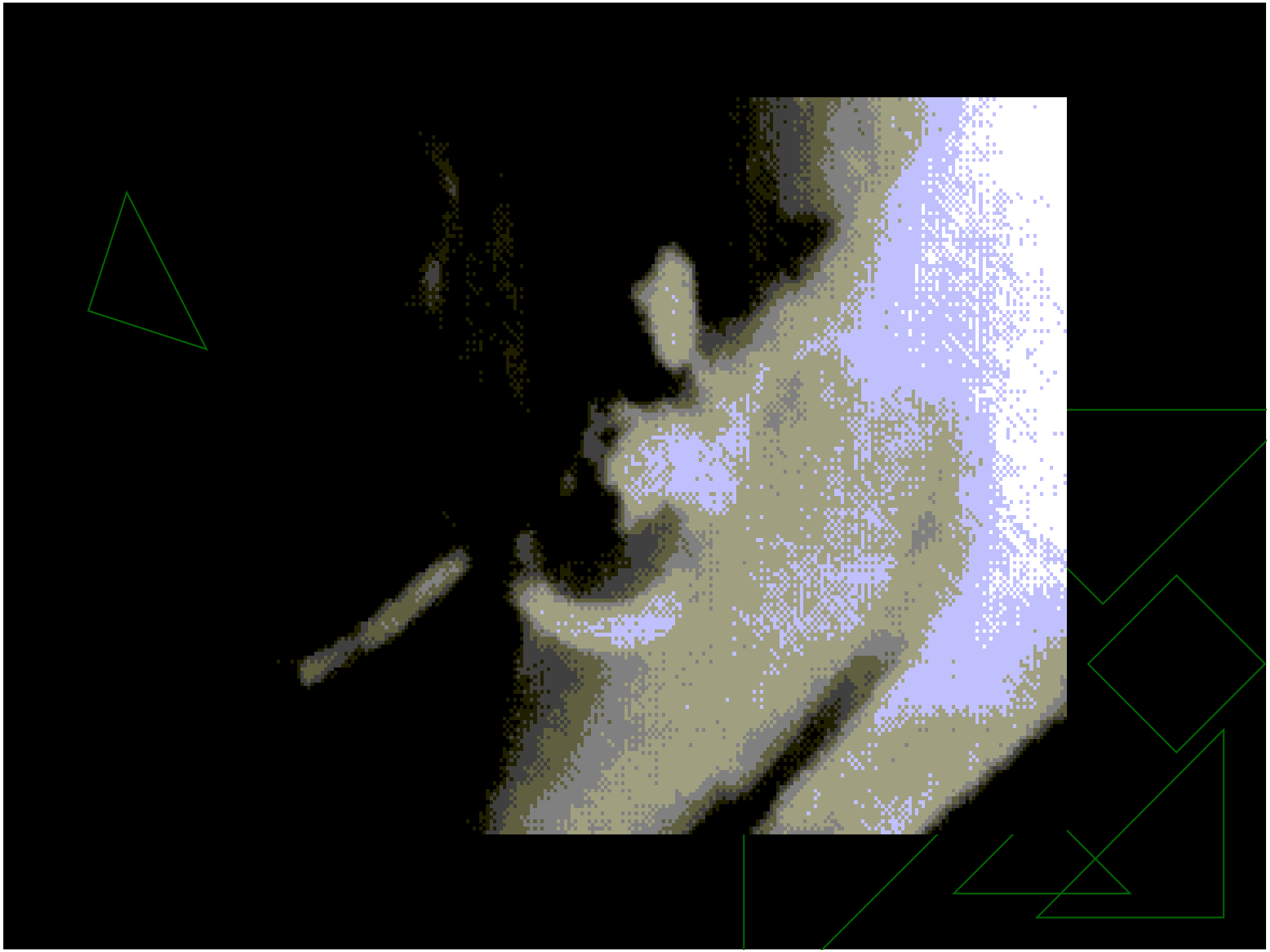
Retrograde cystogram

- Flame-like extravasations (sunburst) superior or lateral to the bladder indicate extraperitoneal rupture.
- Extravasated contrast material throughout the peritoneal cavity, which could outline the bowel and fill the cul-de-sac and the paracolic gutters, indicates intraperitoneal rupture. Pericystic hematomas may be seen on cystograms as compression or displacement of the bladder.
- Gross hematuria without extravasation indicates bladder contusion. Extravasation of contrast material into the bowel lumen or into

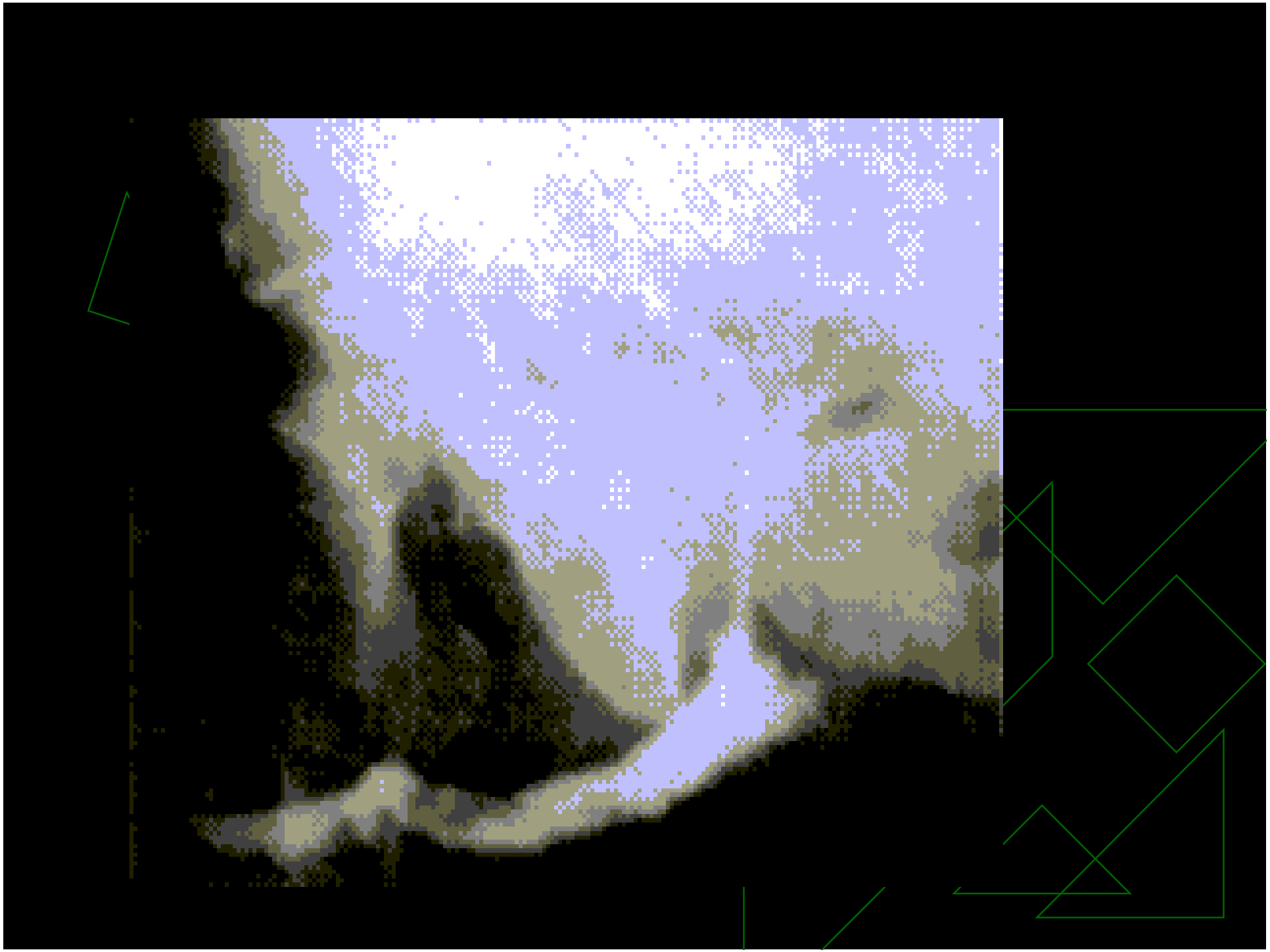
Classification of Urethral Injuries

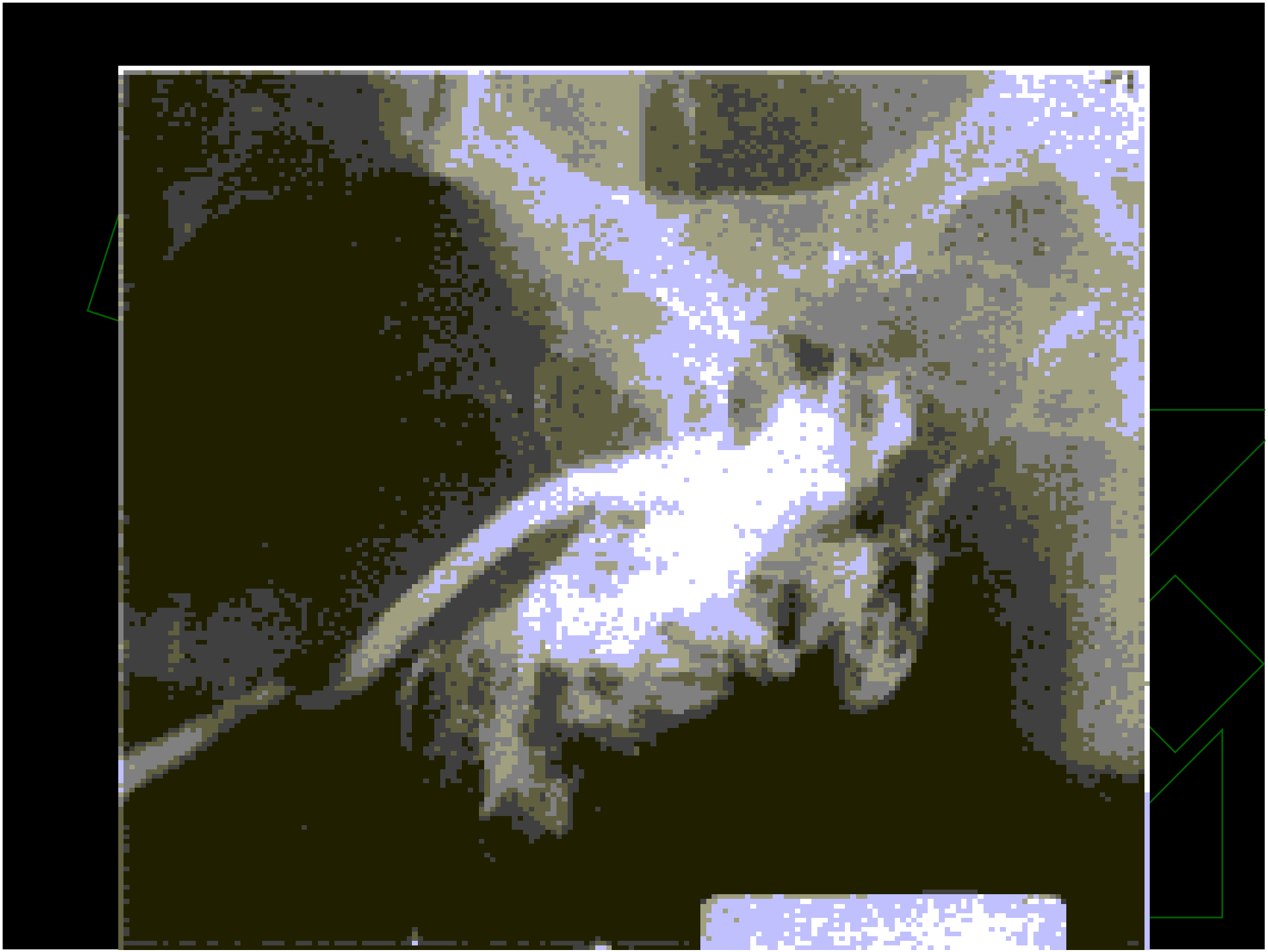
- Posterior urethral injuries
  - Blunt trauma
    - Type I
      - Urethra stretched by pelvic hematoma
    - Type II
      - Prostatomembranous urethral rupture
      - Urogenital diaphragm intact
      - Partial or complete rupture
    - Type III
      - Prostatomembranous urethral rupture
      - Urogenital diaphragm ruptured
      - Bulbous urethra injured
      - Partial or complete rupture
  - Penetrating injury





- Anterior urethral injuries
  - Urethral contusion
  - Partial urethral rupture
  - Complete urethral rupture
  - Penetrating urethral injury





Management of urethral injuries

- Drain the bladder with a suprapubic catheter percutaneously or open to prevent further extravasation.
- Initial urethral repair is not recommended because of risk of hemorrhage, impotence, and infection of pelvic hematoma.
- Commence definitive management of urethral injuries after stabilizing the patient and attending to associated injuries, if present.
- Repair can be performed as immediate primary closure, delayed primary closure (10-14 d), or late primary closure (>3 mo).

EXTERNAL GENITALIA

- **Penis**
- **Superficial Injuries to the Penis**
- suspensory ligament.
- Injuries to the erectile bodies
- Strangulating lesions of the penis
- Accidenral penile strangulation may occur in children or elderly nursing home patients
- Priapism may result after superficial or deep trauma to the penis

- Degloving Injuries of the Penis
- Partial or complete penile amputation'

Penile trauma

- Loss of skin
- Edema
- Angulation
- Level of mutilation
- Viability of mutilated segment

Management of penile injuries

- Depends on severity of trauma and extent of tissue damage
  - Treat penile skin injuries by debridement and split-thickness skin grafting.
- Penile fractures are ruptures of the Buck fascia and the corpus cavernosum that occur when the penis is subjected to trauma during erection.

Testis

- Rupture of the testis is seen with either blunt or penetrating trauma.
- scrotal swe11ing, hematoma, and tenderness,
- Immediate exploration is indicated if the testis is to be salvaged.
- Isotope scans and ultrasonography I
- the injured testis should be irrigated with copious amounts of saline.
- Extruded and necrotic seminefrous tubules are debrieded.

Scrotal trauma

- Edema
- Loss of skin
- Discoloration
- Condition of testes