EVIDENSIA
SPECIALISTDJURSJUKHUSET
STRÖMSHOLM

RENAL SURGERY

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ANATOMY

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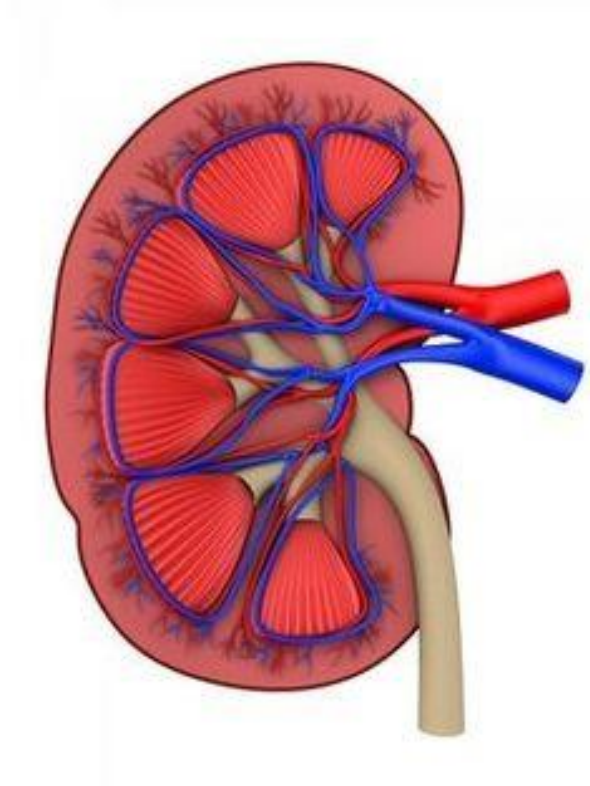
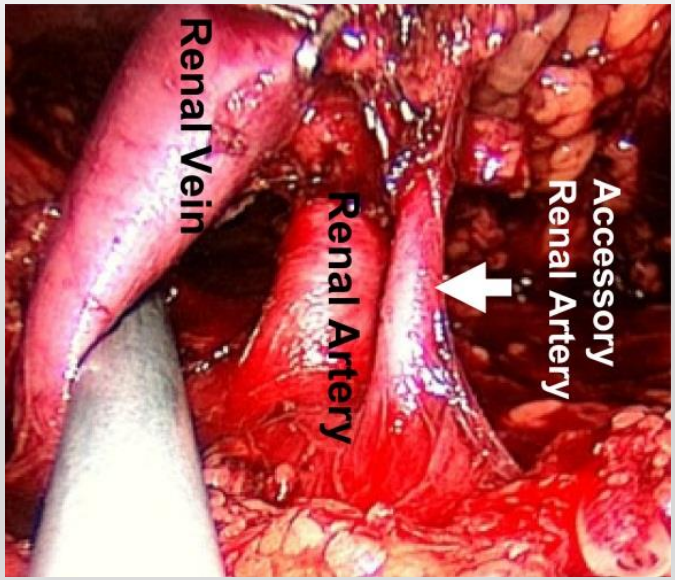
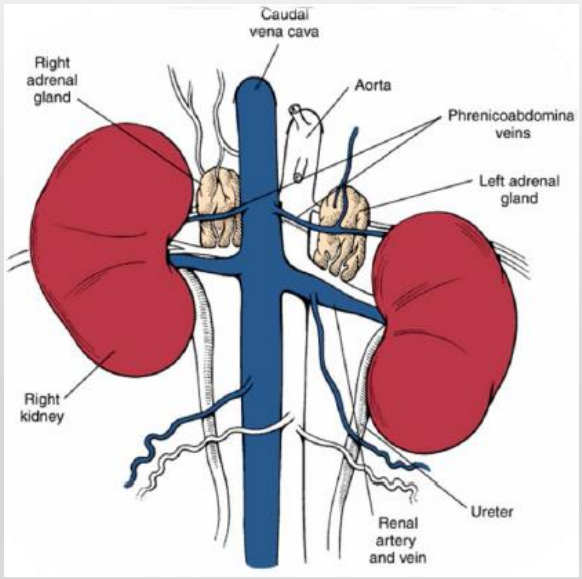
- The left kidney is generally more mobile than the right
- The kidney is covered by a thin fibrous capsule
- The kidney is divided into
  - Outer cortex (glomeruli and adjacent structures)
  - Inner medulla
  - Renal pelvis



- Nerves, lymphatics and vessels enter at the hilus
- The vein is located ventrally and the artery dorsally
  - 13% of dogs and 10% of cats have multiple renal arteries
  - Small ”capsular” arteries may enter the kidney from the capsular surface
  - The left renal vein also recieves blood from the left ovarian or testicular veins





PHYSIOLOGY

- The kidneys recieve ≈25% of cardiac output
- Normal urine production varies between 20-45 mL/kg/day

PERIOPERATIVE MANAGEMENT

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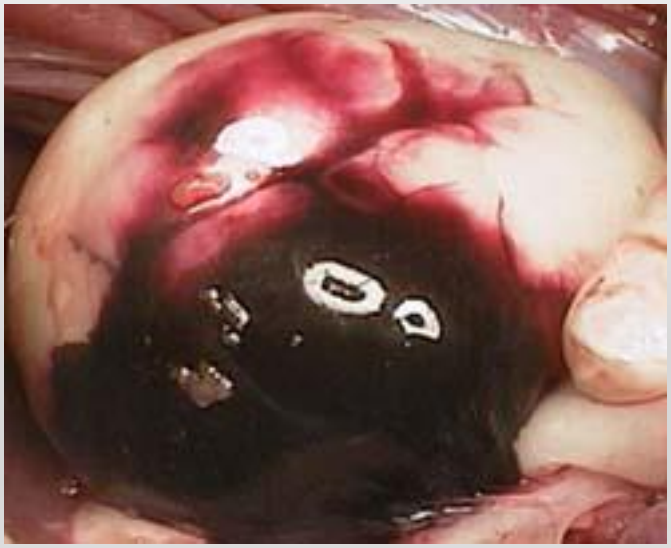
- Surgery is indicated for
  - Unresponsive pyelonephritis
  - Perinephric abscesses or cysts
  - Unilateral renal neoplasia
  - Severe renal trauma
  - Severe irreversible hydronephrosis due to ureteral conditions



Preoperative Considerations

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- Uremia, anemia, coagulopathies, hypoproteinemia, electrolyte and blood pressure imbalances should be corrected before anaesthesia

- Maintenance of renal perfusion is critical perioperatively
- Hypotensive and nephrotoxic drugs should be avoided

- Anaesthesia
  - premedication with anticholinergic drugs and opioids
  - Induction with propofol or inhalatant agent delivered by mask
  - Maintenance with isoflurane or sevoflurane

Postoperative care

- Intravenous fluids to maintain renal perfusion
- Analgesia with opioids
- Monitor urine output and anemia

RENAL BIOPSY

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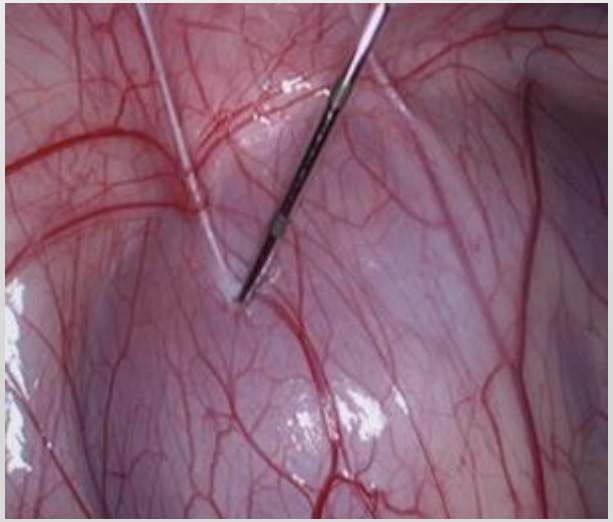
- Indicated for
  - Neoplasia
  - Nephrotic syndromes
  - Renal cortical disease, eg protein-losing glomerulopathy
  - Acute progressive renal failure

- Contraindications
  - Uncontrolled coagulopathy
  - Uncontrolled hypotension
  - Large/multiple renal abscesses or cysts
  - Extensive pyelonephritis
  - Ureteral obstruction
  - Severe hydronephrosis



- 5-6 glomeruli needed for diagnosis
- Incisional biopsy via open approach
- Needle instruments
  - Laparoscopically
  - Percutaneously
  - Laparotomy

Incisional (wedge) biopsy

- Elevate the kidney from the sublumbar fossa
- Reflect the kidney ventromedially
- Identify and occlud the renal artery
  - Occlusion time should be less than 20 minutes
- Make a crescent-shaped 5-10 mm long and 5 mm deep incision into the renal cortex
- Close the defect with simple interrupted or cruciate sutures
  - 3-0 to 4-0 absorbable monofilament suture on a taper needle

Complications

- Minor complications
  - Hematuria
  - Hydronephrosis secondary to obstruction by blood clots
  - Renal infarction
  - Damage to renal vasculature
  - Infection
  - Cyst or intrarenal hematoma formation
  - Renal fibrosis
  - Formation of intrarenal arterivenous fistulas
  - Perirenal hematomas
- Major complications
  - Severe hemorrhage

- Similar rates noted for incisional and needle techniques

- Complication rates higher with
  - Thrombocytopenia
  - Prolonged clotting times
  - Serum creatinine above 5 mg/dl /442 µmol/L
  - Animals older than 4 years of age
  - Animals weighing less than 5 kg

NEPHROTOMY

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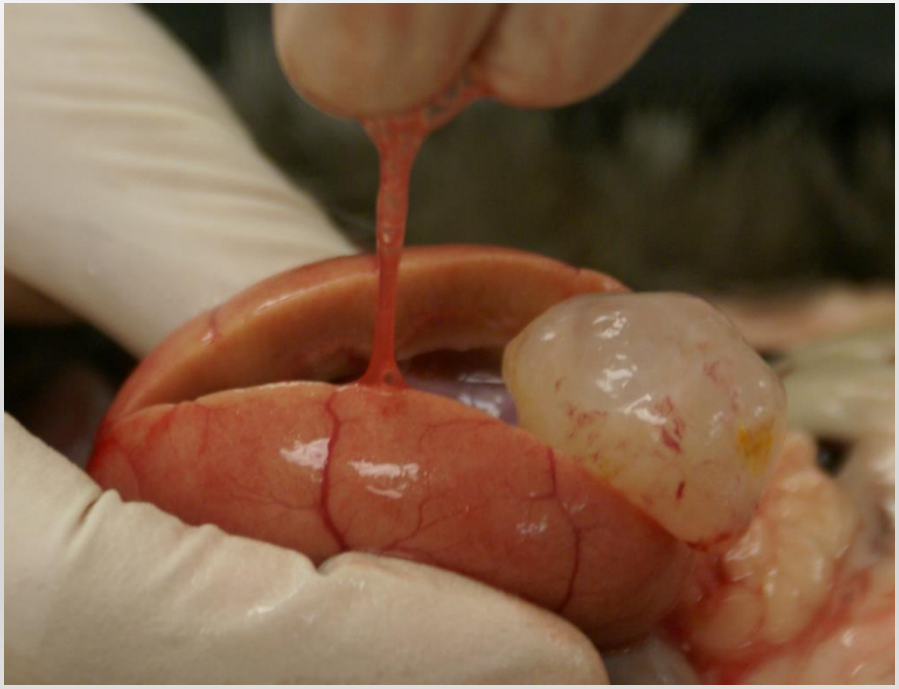
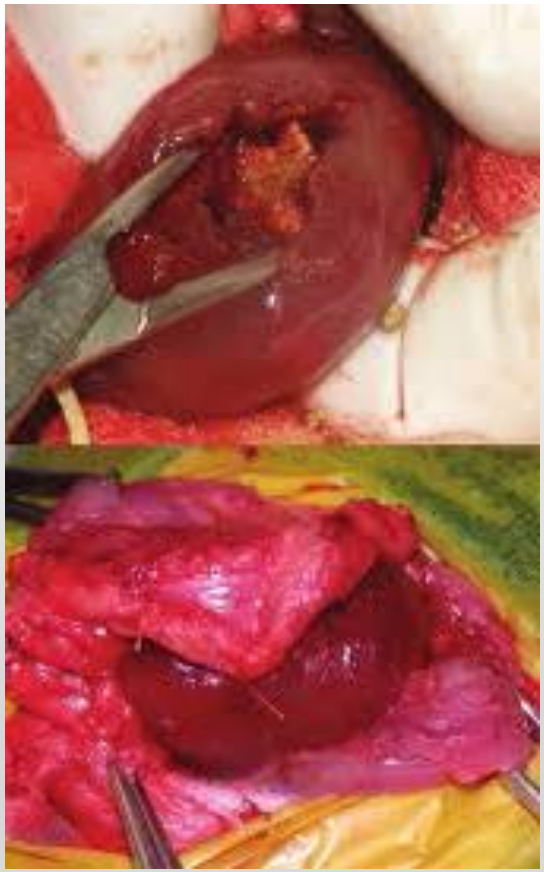
- Indications
  - Biopsy
  - Obstruction of the renal pelvis
  - Chronic infections
  - Persistent hematuria
  - Persistent hydronephrosis



- Elevate the kidney from the sublumbar fossa
- Temporary occlud the renal blood flow
- Incise the kidney in the midline through the renal capsule
- Either sharply incise (bisectional) or bluntly separate (intersegmental) the parenchyma
- Explorate the renal pelvis
- Pass a catheter down the ureter to the bladder
- Close the kidney
  - Direct compression by digital pressure for 1-5 minutes
  - Close the capsule with continuous suture (fine monofilament absorbable material)

  or
  - Close with horizontal mattress sutures though the capsule and partial thickness of the cortex
- Replace the kidney in the fossa and secure if needed



Effect of nephrotomy on renal function

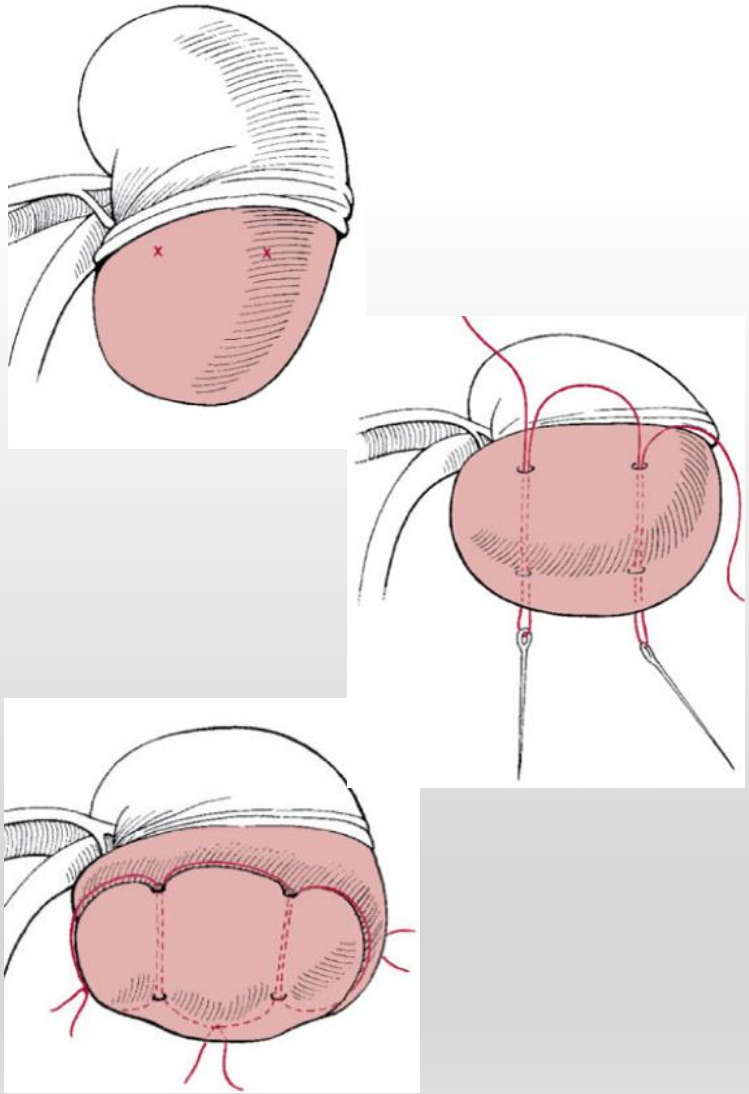
- Suture closure → 40-53% decrease in GFR 21 days postop
- Sutureless closure → minimal reduction of GFR

- No difference in GFR between bisectional and intersegmental nephrotomy

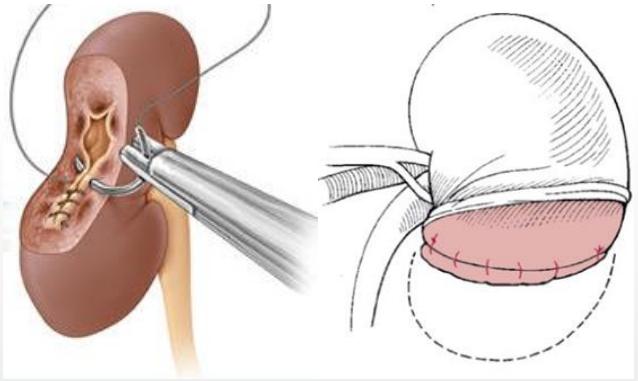
PARTIAL NEPHRECTOMY

- Indicated for
  - Repair of substantial renal damage
  - Resection of neoplasia

- Elevate the kidney from the fossa and temporary occlude the vasculature
- If possible peel the capsule back from the area to be resected
- Pass overlapping mattress sutures through the parenchyma proximal to the tissue to be resected
  - 0 to 1 absorbable suture on straight needles
- Tie the threads in three separate ligatures



- Remove the affected part of the kidney with blunt dissection
  - Suture the collecting system with continuous suture, 4-0 to 6-0 monofilament material
- Close the parenchymal defect with overlapping mattress sutures through the capsule and parenchyma
  - Monofilament absorbable suture on an atraumatic needle
- Close the capsule over the exposed tissues
  - Small-diameter monofilament absorbable suture
- Omentum can be tacked over the exposed surface



Complications

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- Hemorrhage requiring blood transfusion
- Urine leakage
- Urine fistula

NEPHRECTOMY AND NEPHROURETERECTOMY

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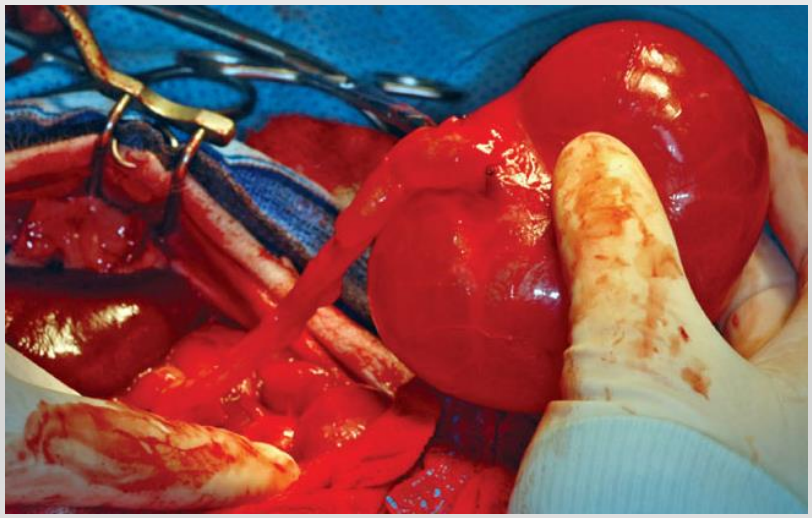
- Indicated for
  - Irreparable trauma
  - Persistent infection
  - Renomegaly
  - Obstructive calculi with persistent hydronephrosis
  - Neoplasia

- The risk of leaving the kidney should be greater than the risk of surgery
- The function of the remaining kidney must be ensured



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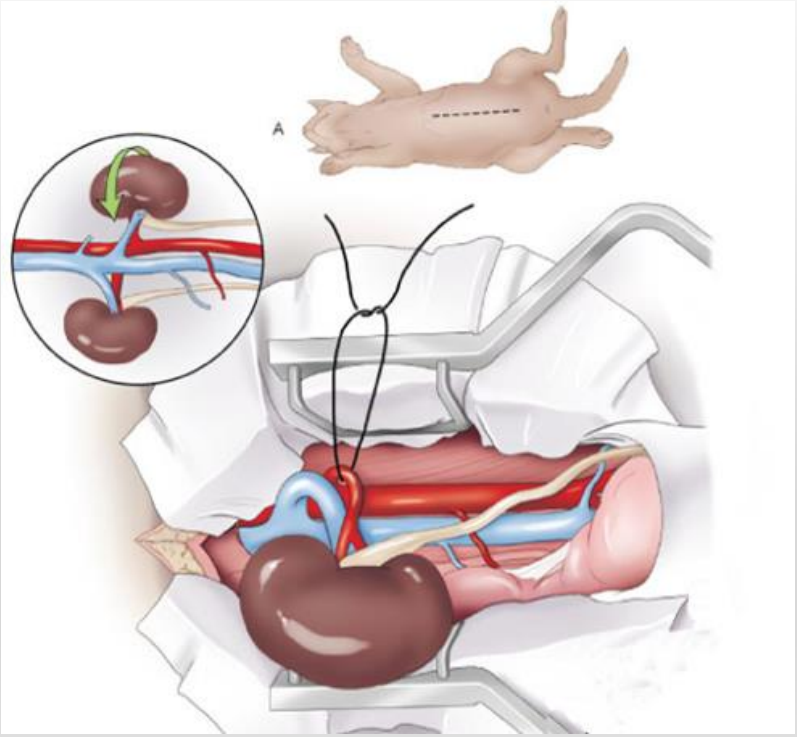
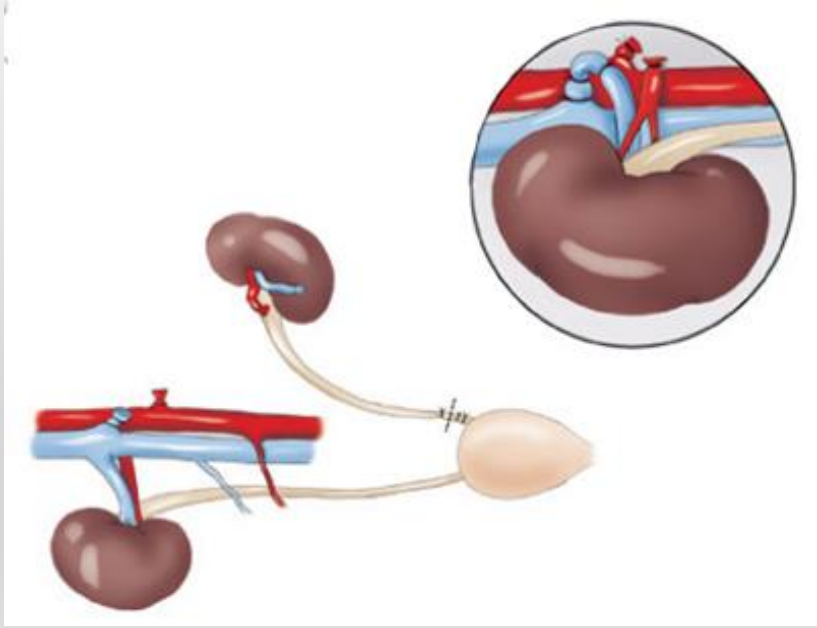
- Evaluate both kidneys intraoperatively
- Elevate the kidney from the fossa and retract it medially
- Separate the perirenal fat to visualize the renal vessels
- Preplace at least three sutures around each vessel
  - Either longlasting absorbable (polydioxanone, polyglyconate) or nonabsorbable suture (silk, nylon, polypropylene)



- Ligate the artery first
- Transect the vessels
- Free the kidney from any remaining attachements
- Dissect the ureter free all the way down to the bladder
- Double-ligate and transect the ureter close to the bladder
- Inspect the renal fossa for hemorrhage



Complications

- Progression of preexisting kidney disease
- Acute renal failure
- Failure to reolve underlying clinical signs
- Inadvertent damage to other abdominal organs

RENAL NEOPLASIA

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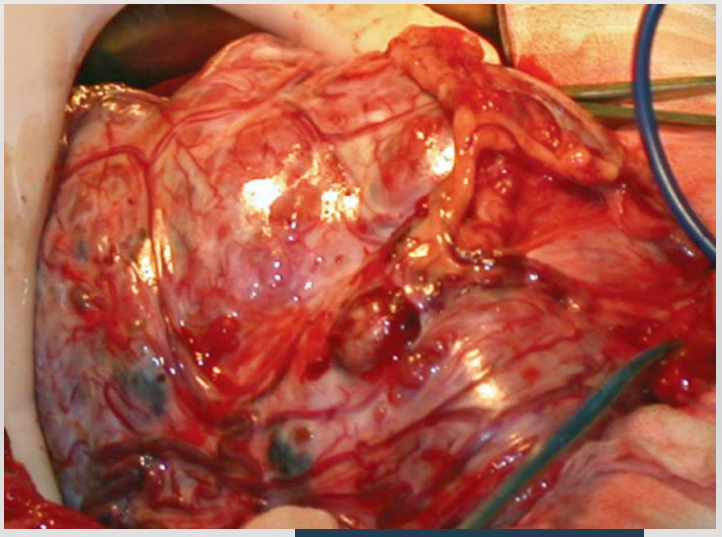
- Primary renal tumours uncommon
- Majority malignant
  - Cats: lymphoma
  - Dogs: renal cell carcinoma, transitional cell carcinoma/papilloma, anaplastic sarcoma/carcinoma, hemangiosarcoma, lymphoma, nephroblastoma
- Unilateral nephrectomy treatment of choice
  - MST 16 months
  - Chemotherapy no significant effect on MST
  - Hemoperitoneum poor prognostic factor
- Partial nephrectomy might be tried



RENAL CALCULI

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- Caused by
  - Organ dysfunction
  - Neoplasia
  - Increased calcium intake
  - Drugs
  - Increased intestinal absorption or impaired renal reabsorption of calcium
  - Excessive skeletal mobilization of calcium

- Treatment indicated when
  - Obstruction that decreases renal function
  - Severe hematuria, pain or UTI
  - Nephroliths increase in size

- Treatment options
  - Nephrotomy
    - Unilateral severe hydronephrosis
    - Nephritis
    - Nonfunctional kidney
  - Lithotripsy
  - Pyelithotomy

ACQUIRED RENAL CYSTS

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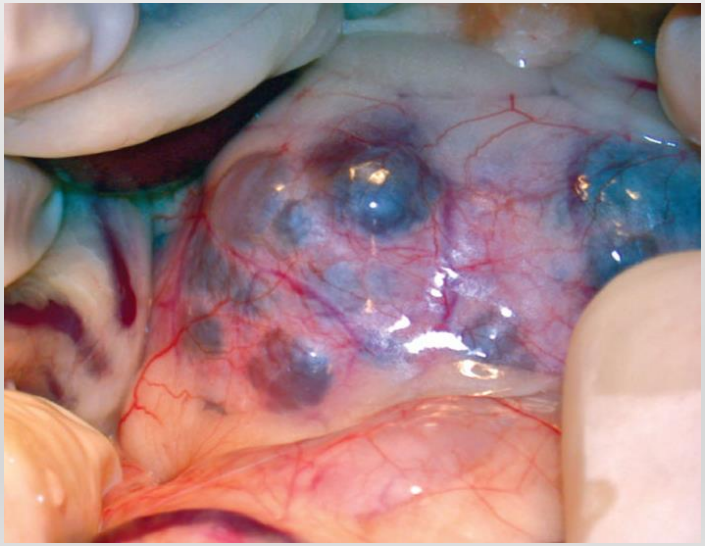
- Secondary to chronic nephropathy
- May be incidental finding

- Percutaneous draining under ultrasound guidence if single
- 95% ethanol instilled for 3 minutes (half of the drained volume)
- 1:10 lidocaine:alcohol solution instilled for 3 minutes (half of drained volume)



PERIRENAL PSEUDOCYSTS

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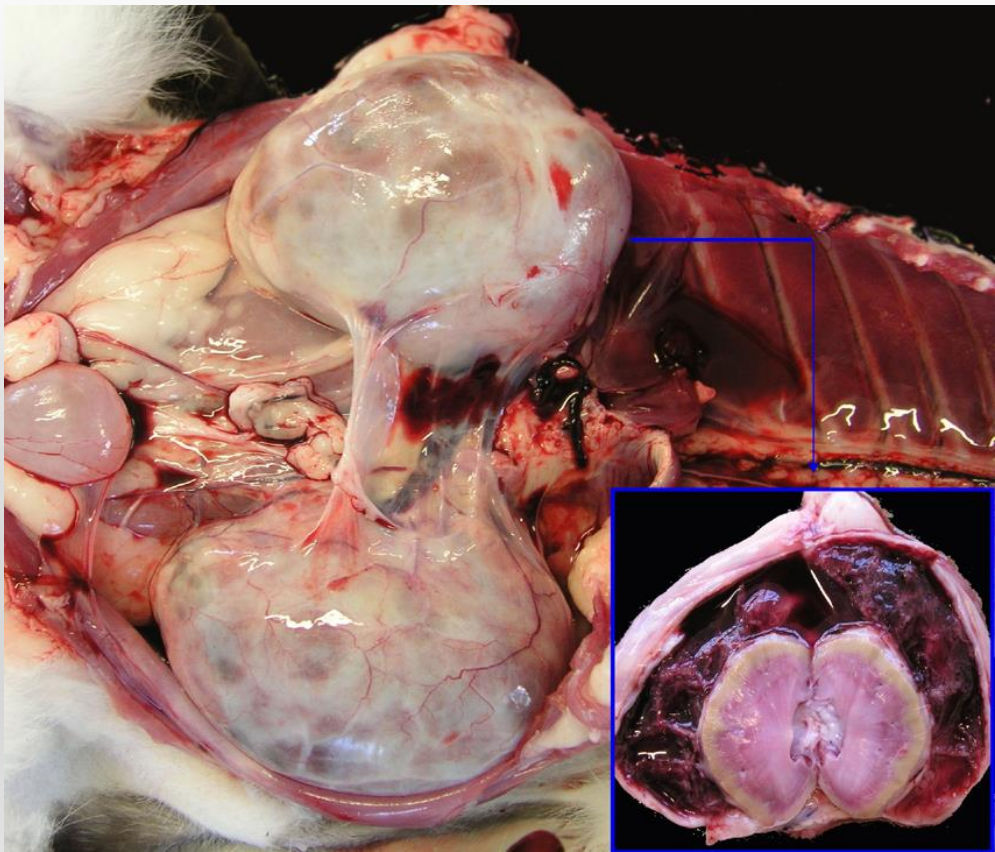
- Unilateral or bilateral fluid accumulation around the kidney
- Mainly seen in cats
- Pathogenesis unknown

- Nephrectomy and resection of cyst treatment of choice
  - Surgical resection of the cyst without nephrectomy does not prevent progression of renal disease

- Poor prognosis



RENAL ABSCESSES

- Rare condition
- Reported in association with
  - Pyelonephritis
  - Nephrolithiasis
  - Renal biospy
  - Diabetes mellitus
  - Hyperadrenocorticism
- Nephrectomy treatment of choice

RENAL TRAUMA

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- Blunt trauma
  - Vehicular accidents
- Sharp penetration
  - Projectiles
  - Bite wounds

- Usual findings anemia w/o azotemia, retroperioneal hemorrhage

- Unilateral nephrectomy treatment of choice

QUESTIONS?

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