Surgery of the Kidney

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Surgical anatomy

Surgical Diseases of the Kidney

- Hydronephrosis
- Nephrolithiasis
- Renal neoplasia
- Renal injuries

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Hydronephrosis

- **Forms:**
  - congenital (unilateral - bilateral)
  - acquired (unilateral - bilateral)

- **Etiology → ureter-occlusion !**
  (ureter-stricture, -compression, - calculus, - neoplasia, -stenosis)

Ureter-occlusion (experimental)

- **Total obstruction**
  - Intra-ureteral pressure increases within the first 5 hours then decreases until 2 to 24 hours
  - Blood perfusion of the kidney drops to 40% for the first 24 hours then to 20% until the end of 2nd week
  - GFR falls too

- **Post-obstruction regeneration**
  - After 1-week ureter obstruction GFR returns to 65% then to 100% within 5 weeks
  - After 2-week ureter occlusion GFR returns to 46% within 4 months
Hydronephrosis

- **Diagnosis:**
  - generally asymptomatic (unilateral)
  - physical findings: abdominal palpation (rare)
  - laboratory: uremia (bilateral)
  - US (!)
  - X-ray: plain, excretory urography

- **Therapy:** → nephrectomy

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Surgical Diseases of the Kidney

- Hydronephrosis
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Nephrolithiasis

- **Incidence, Aetiology**
  - uncommon
  - breed-predisposition (e.g. dalmatian, bishon)
  - alimentary background (e.g. protein overfeeding)
  - pyelonephritis
  - portovascular anomaly (ammonium urate !)
  - hypercalcemia (malignancies)
  - struvite (Mg(NH₄)PO₄), urate (Dalmatian)
    Ca-phosphate, Ca-oxalate (bishon), silicate

- **Diagnostics**
  - unilaterally asymptomatic
  - anorexia, lethargy
  - „irresponsive” hematuria, proteinuria
  - crystals in the sediment
  - bilaterally: uremia
  - X-ray (plain, contrast)
  - US

Nephrolithiasis

Plain radiography

Excretory urography

Nephrolithiasis

- **Diagnostics**
  - unilaterally asymptomatic
  - „irresponsive” hematuria, proteinuria
  - crystals in the sediment
  - bilaterally: uremia
  - X-ray (plain, contrast)
  - US

Nephrolithiasis

Ultrasonography
Nephrolithiasis

- Therapy
  - Medical
    - dissolution diet + drug (struvite, urate, cystine)
    - lithotripsy (extra- or intracorporeal)
  - Surgical
    - pyelotomy
    - nephrotomy
    - nephrectomy

Nephrolithiasis

Therapy

Medical
  - dissolution diet + drug (struvite, urate, cystine)
  - lithotripsy (extra- or intracorporeal)

Surgical
  - pyelotomy
  - nephrotomy
  - nephrectomy

Nephrolithiasis

Nephrotomy

Nephrolithiasis

Nephrolithiasis

Pyelotomy

Nephrolithiasis

Nephrotomy

Nephrolithiasis

Nephrotomy
Nephrolithiasis
Nephrotomy

Therapy

- Medical
  - dissolution diet+drug (struvite, urate, cystine)
  - lithotripsy (extra- or intracorporeal)

- Surgical
  - pyelotomy
  - nephrotomy
  - nephrectomy
Nephrectomy

Nephrolithiasis

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Renal neoplasia

- **Incidence:**
  - in dogs: 1.7-2% of tumours
  - in cats: 2.5% of tumours
  - benign (adenoma, interstitial tumor)
  - malignant (tubular cell carcinoma; cystadenocarcinoma, TCC, SCC, HSA, LSA/cat, PSA, congenital nephroblastoma)
  - metastasis (LSA/cat, liver, biliary tract)

Renal neoplasia

- **Diagnosis:** → non specific signs
  - anorexia, weight loss
  - polycytemia (in cat)
  - polyuria, polydypsia, haematuria, tumour cells in urine sediment ↑↑↑, uremia
  - US (FNA, biopsy)
  - X-ray (excretory urography)

- **Therapy:**
  - Surgical: nephrectomy (partial;total)
  - Chemotherapy + Local radiotherapy
Renal neoplasia

**US guided kidney biopsy**

- **Diagnosis:** non specific signs
  - anorexia, weight loss
  - polycytemia (in cat)
  - polyuria, polydypsia, haematuria, tumour cells in urine sediment ↑↑↑, uremia
  - US (FNA, biopsy)
  - X-ray (excretory urography)

- **Therapy:**
  - Surgical: nephrectomy (partial; total)
  - Chemotherapy + Local radiotherapy

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Renal neoplasia

**Renal carcinoma - Plain radiography**

- **Diagnosis:** non specific signs
  - anorexia, weight loss
  - polycytemia (in cat)
  - polyuria, polydypsia, haematuria, tumour cells in urine sediment ↑↑↑, uremia
  - US (FNA, biopsy)
  - X-ray (excretory urography)

- **Therapy:**
  - Surgical: nephrectomy (partial; total)
  - Chemotherapy + Local radiotherapy

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Renal neoplasia

**Partial nephrectomy**

- **Diagnosis:** non specific signs
  - anorexia, weight loss
  - polycytemia (in cat)
  - polyuria, polydypsia, haematuria, tumour cells in urine sediment ↑↑↑, uremia
  - US (FNA, biopsy)
  - X-ray (excretory urography)

- **Therapy:**
  - Surgical: nephrectomy (partial; total)
  - Chemotherapy + Local radiotherapy
Renal neoplasia
Renal carcinoma - Plain radiography

Renal neoplasia
Renal carcinoma - Plain radiography

Renal neoplasia
Metastatic renal tumour (from liver biliary carcinoma)

Renal neoplasia

Diagnosis:
- non specific signs
  - anorexia, weight loss
  - polycytemia (in cat)
  - polyuria, polydypsia, haematuria, tumour cells in urine sediment↑↑↑, uremia
  - US (FNA, biopsy)
  - X-ray (excretory urography)

Therapy:
- Surgical: nephrectomy (partial; total)
- Chemotherapy + Local radiotherapy???

Surgical Diseases of the Kidney

- Hydronephrosis
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Renal injuries

Incidence:
- blunt trauma (contusion; hematoma, rupture, laceration, avulsion)
- sharp trauma (stab, shot injury)
Renal injuries

- **Diagnostics:**
  - trauma in history
  - haematuria
  - blood in the peritoneal fluid or in the retroperitoneum
  - X-ray (excretory urography)
  - US
  - exploratory laparatomy

Renal injuries

- **Therapy:**
  - suturing (supf. rupture)
  - hematoma-drainage?
  - nephrectomy (partial; total)

Partial nephrectomy
Renal injuries

- Therapy:
  - suturing (supf. rupture)
  - hematoma-drainage?
  - nephrectomy (partial; total)

Rupture of the kidney

Shot injury

Surgery of the Ureter

Surgical anatomy

- Hydroureter (hydronephros)
- Ectopic ureter
- Ureter-calculus
- Ureter-injuries
Surgical Diseases of the Ureter

- Hydroureter (hydronephros)
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Ectopic ureter

- **Incidence:** Abnormal opening of the ureter (urethra, vagina)
  - uni- or bilateral
  - extra- (cats) or intramural (dogs)
  - associated with other disorders (renal hypoplasia, ureterocele, ureter-dilatation, hydronephrosis etc.)
  - breed predisposition (labrador, golden, husky, west highland white terrier, foxterrier, sky terrier, poodle)

**Diagnosis:**

- urinary incontinence
  - unilateral ectopia: normal urination and incontinence
  - bilateral ectopia: complete and constant incontinence
  - (sometimes signs of urine in males, rarely in females)
- urinary infection
- X-ray: excretory urography + pneumocystography; vaginography
- Cystoscopy

**Types:**

- Intramural or extramural

**Excretory urography**

**Positive contrast vaginography**
**Ectopic ureter**

- **Diagnostics:**
  - urinary incontinence
  - unilateral ectopia: normal urination and incontinence
  - bilateral ectopia: complete and constant incontinence
  - Ø (sometimes signs of urina in males, rarely in females)
  - signs of urinary infection
  - X-ray: excretory urography + pneumo-cystography; vaginography
  - **Cystoscopy**

- **Types:**
  - Intramural or extramural

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**Therapy:**
- trigone reconstruction (intramural)
- „ureteroneocystostomy“ (extramural)
- nephro-ureterectomy (hydroureter-hydronephrosis)
Ectopic ureter

**Therapy:**
- trigone reconstruction (intramural)
- "ureteroneocystostomy" (extramural)
- nephro-ureterectomy (hydroureter-hydronephrosis)
Ectopic ureter

- Therapy:
  - trigone reconstruction (intramural)
  - „ureteroneocystotomy“ (extramural)
  - nephro-ureterectomy (hydroureter-hydronephrosis)

Excretory urography

Ectopic ureter

Nephro-ureterectomy

Surgical Diseases of the Ureter

- Hydroureter (hydronephros)
- Ectopic ureter
- Ureter-calculus
- Ureter-injuries

Ureter-calculus

- ~ associated with nephrolythiasis (50% coincidence)

- Diagnostics:
  - In dogs and cats
  - Struvite, oxalate
  - in unilateral cases: asymptomatic
  - abdominal pain
  - X-ray / excretory urography
  - US
  - consecutive hydroureter/hydronephros
**Ureter-calculus**

- **Excretory urography**

- **Therapy:**
  - ureterotomy
  - ureter-resection / anastomosis
  - nephro-ureterectomy
**Ureter calculus**

Ureter-stenting („pigtail” catheter)

- **Therapy:**
  - ureterotomy
  - ureter-resection / anastomosis
  - nephro-ureterectomy

**Ureter-anastomosis**

- **Therapy:**
  - ureterotomy
  - ureter-resection / anastomosis
  - nephro-ureterectomy

**Ureter-calculus**

Excretory urography
Surgical Diseases of the Ureter

- Hydroureter (hydronephros)
- Ectopic ureter
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- Ureter-injuries

Incidence/Aetiology
- rare
- iatrogenic (OE/OHE)
- blunt abdominal trauma

Diagnosis:
- unilateral or bilateral
- signs may develop days after injury
- abdominal pain
- uremia
- uroperitoneum (diagnostic puncture: Creat↑, K+ ↑)
- uroretroperitoneum
- X-ray: excretory urography (contrast spot)
- US (free fluid)
**Ureter-injuries**

- Torn ureters

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**Ureter-injuries**

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**Ureter-injuries**

- Torn ureters

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**Therapy:**

- ureter resection / anastomosis
- ureteroneocystostomy
- nephro-ureterectomy

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**Ureter-injuries**

- Therapy:
  - ureter resection / anastomosis
  - ureteroneocystostomy
  - nephro-ureterectomy