**Definition**

Carcinoma arising in the epithelium of the upper urinary tract.

- **Epidemiology**
  Three times more common in men than women • *Peak incidence:* Sixth decade • Annual incidence in Europe and the USA: 20 in 100,000.

- **Etiology**
  Smoking is the single most important risk factor • A genetic disposition has been proposed but its influence seems to be small • Papillary carcinoma is the most common type • Muscle invasion (T2 tumors) is paramount for staging, treatment, and prognosis.

**Imaging Signs**

- **Modality of choice**
  Biphasic CT with CT IVP.

- **Pathognomonic findings**
  Irregular polypoid filling defect in the collecting system.

- **CT and MRI findings**
  Irregular polypoid intraluminal mass with only slight contrast enhancement • The collecting system proximal and distal to the tumor may be enlarged.

- **Intravenous pyelogram findings**
  Isolated or multiple filling defects within the collecting system • Dilatation of a single calix (hydrocalix) or the entire collecting system (hydronephrosis, hydroureter).

**Clinical Aspects**

- **Typical presentation**
  Painless hematuria.

- **Treatment options**
  *Curative:* Radical resection (nephroureterectomy with partial bladder resection) • *Palliative:* Radiotherapy, chemotherapy.

- **Course and prognosis**
  Depend on the T stage • Well-differentiated in situ and T1 tumors have a very good prognosis • Patients with muscle infiltration (T2) have a much poorer prognosis • T3/T4 tumors have a 5-year survival rate of less than 20%.

- **What does the clinician want to know?**
  *Extent:* Panurothelial disease • Severity of urinary obstruction • Tumor stage.
**Differential Diagnosis**

**Renal cell carcinoma**
- Hypervascular tumor
- Predominantly intraparenchymal
- Tumor may extend into the renal vein
- No urinary obstruction

**Renal tuberculosis**
- Bizarre morphology
- Calcifications

**Radiolucent calculus**
- Smooth contour
- No contrast enhancement
- Ureteral spasm distal to the calculus

**Tips and Pitfalls**

*Panurothelial disease*: Imaging must include the lower urinary tract and contralateral collecting system in order not to underestimate tumor extent. A tumor may be missed on IVP unless at least three zonograms are obtained.
Fig. 2.18 a, b  Urothelial carcinoma (T4) of the left kidney extending from the renal pelvis into the proximal ureter.

a  Axial corticomedullary phase CT scan. Inhomogeneous opacification of the tumor, which is seen to extend through the posterior parenchyma into the perinephric fatty tissue.

b  Coronal reconstruction showing dilated calices and extension of the tumor into the proximal ureter.

Selected References


Caoli EM et. al. MDCT urography of upper tract urothelial neoplasms. AJR Am J Roentgenol 2005; 184: 1873–1881
**Definition**

BPH is the adenomatous enlargement of the transitional zone of the prostate. It is a common condition that is considered abnormal when it causes bladder outlet obstruction and voiding problems. BPH is rarely the primary site of prostate cancer.

- **Epidemiology**
  Common in men aged 50 and older. Often progressive enlargement.

**Imaging Signs**

- **Modality of choice**
  Transrectal or transvesical ultrasound.

- **Routine diagnostic workup**
  Digital rectal examination. Transrectal or transvesical ultrasound is the first-line imaging modality. Retrograde urethrogram to rule out further urethral strictures in patients with bladder outlet obstruction.

- **Ultrasound findings**
  Inhomogeneous area of high and low echogenicity in the center of the prostate. Acoustic shadowing indicates calcifications. Limited visualization of prostate zonal anatomy.

- **Intravenous pyelogram findings**
  Protrusion of the enlarged prostate gland at the floor of the bladder. Significant enlargement of the prostate can cause bladder base elevation with "J-ing" or "fish hooking" of the distal ureters.

- **MRI findings**
  Exquisite visualization of the zonal anatomy on T2-weighted images. Well-defined enlarged transitional zone. Usually inhomogeneous with areas of high and low signal intensity. Smooth interface with the peripheral zone.

- **CT findings**
  No visualization of the zonal anatomy. Enlargement of the entire prostate gland. Median lobe protrudes into the floor of the bladder. Prostate cancer cannot be excluded.

**Clinical Aspects**

- **Typical presentation**
  Voiding problems. Reduced urine flow. Often detected in patients undergoing diagnostic assessment for PSA elevation or as an incidental finding on abdominal ultrasound.

- **Treatment options**
  Surgical adenectomy or TURP.

- **Course and prognosis**
  Excellent prognosis. Recurrent BPH is uncommon.

- **What does the clinician want to know?**
  Extent of BPH. Other causes of bladder outlet obstruction (e.g., urethral stricture)? Signs of prostate cancer?
Fig. 3.17  Benign prostatic hyperplasia. Ultrasound.

Fig. 3.18a, b  T2-weighted MRI sequence. Good visualization of the zonal anatomy of the prostate. The transitional zone is markedly enlarged and protrudes into the bladder base.
  a  Axial image.
  b  Sagittal image.
**Differential Diagnosis**

*Prostate cancer*  
- Mainly in the peripheral zone of the prostate  
- Less bulbous  
- Biopsy to resolve inconclusive findings

*Bladder tumor*  
- Different morphologic appearance  
- Arises from the bladder

*Prostatic utricle cyst*  
- Midline cystic lesion, located posterior and superior to the verumontanum, confined to the prostate or extends posteriorly beyond the prostate

**Tips and Pitfalls**

BPH may be mistaken for prostate cancer.

**Selected References**