

### 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, hydro-ureter).

### Clinical Aspects

#### ▶ Typical presentation

Painless hematuria.

#### ▶ Treatment options

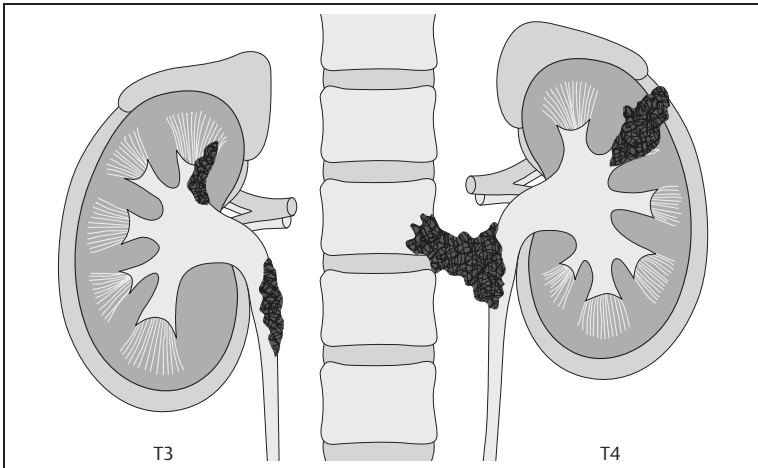
*Curative*: Radical resection (nephroureterectomy with partial bladder resection) • *Palliative*: Radiotherapy, chemotherapy.

#### ▶ 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.



**Fig. 2.17** T3/T4 stages of urothelial carcinoma of the renal pelvis and ureter. T3 tumors extend beyond the muscularis propria and invade the peripelvic/periureteral tissue or renal parenchyma. T4 tumors invade perirenal fat or contiguous organs.

### Differential Diagnosis

#### Renal cell carcinoma

- Hypervascular tumor
- Predominantly intraparenchymal
- Tumor may extend into the renal vein
- No urinary obstruction

#### Renal tuberculosis

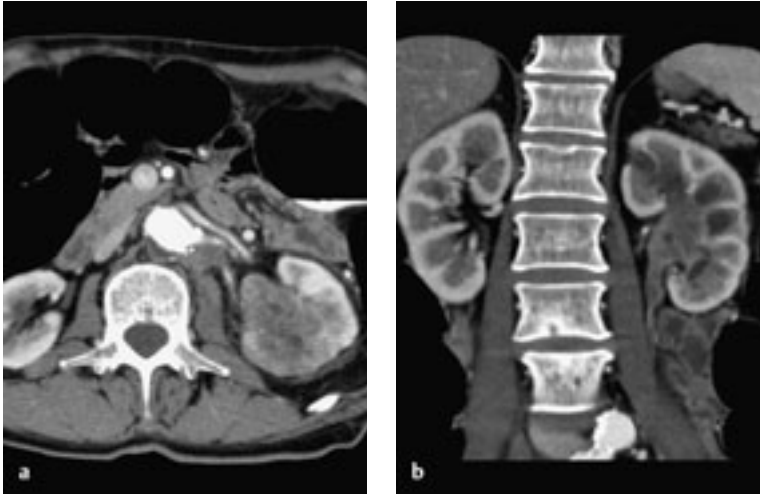
- Bizarre morphology
- Calcifications

#### 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

- Browne RF et al. Transitional cell carcinoma of the upper urinary tract: spectrum of imaging findings. *Radiographics* 2005; 25: 1609–1627
- Caoili 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.

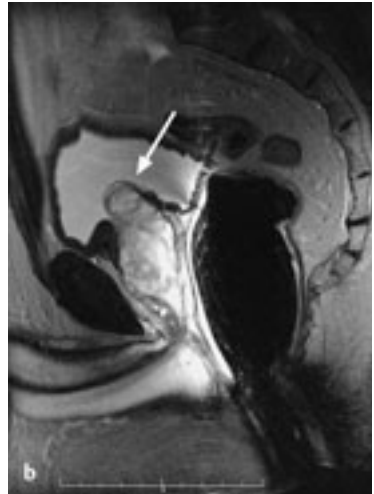
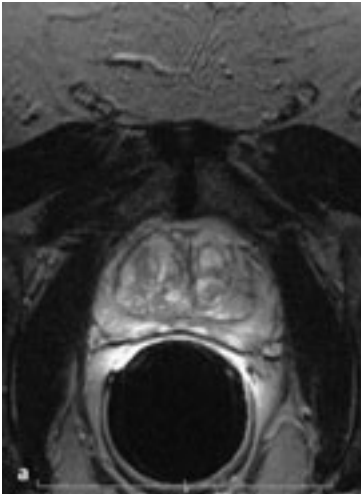
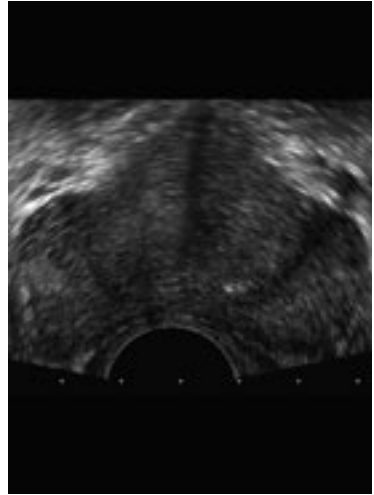
### ► Course and prognosis

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. 3.18 a, 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**

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<i>Prostate cancer</i>	<ul style="list-style-type: none"><li>– Mainly in the peripheral zone of the prostate</li><li>– Less bulbous</li><li>– Biopsy to resolve inconclusive findings</li></ul>
<i>Bladder tumor</i>	<ul style="list-style-type: none"><li>– Different morphologic appearance</li><li>– Arises from the bladder</li></ul>
<i>Prostatic utricle cyst</i>	<ul style="list-style-type: none"><li>– Midline cystic lesion, located posterior and superior to the verumontanum, confined to the prostate or extends posteriorly beyond the prostate</li></ul>

### **Tips and Pitfalls**

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BPH may be mistaken for prostate cancer.

### **Selected References**

Nicolas V et al. Prostata. In: Freyschmidt J, Nicolas V, Heywang-Köbrunner SH (eds). Handbuch diagnostische Radiologie. Heidelberg: Springer; 2004

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