5.1 Pitfalls and Differential Diagnosis in MRI

5.1.1 General Aspects

There are some benign changes which mimic prostate carcinoma. This chapter strives for depiction of the most important pitfalls and differential diagnoses in a case-related image gallery (Tab. 1).

Entity	Wash In	Wash Out	Perfusion Pattern	ADC	Structure on T2-w	Intensity on T2-w
Normal outer gland	→	Slow	Homogeneous	>1000	Homogeneous	↑↑
Normal inner gland	↑	Slow	Homogeneous	>1000	Homogeneous	→
Adenoma	↑↑	Slow	Circumscribed	>1000	Well defined	↓
Benign hyperplasia	↑	Slow	Inhomogeneous	>1000	Inhomogeneous	→
Diffuse prostatitis	↑	Slow	Inhomogeneous	>1000	Inhomogeneous	→
Focal prostatitis	↑↑	Slow	Circumscribed	>1000	Ill-defined	→
Abscess	↑↑	Slow	Rim enhancement	<1000	Well defined	↑
Prostate carcinoma	↑↑	Fast	Circumscribed	<1000	Ill-defined	↓↓

Table 1: *List of all possible entities causing diffuse or focal anomaly of prostate structure and/or perfusion. Comparison of normal and abnormal tissue considering the different modalities of examination.*

5.1.2 Pitfalls

Central/Periurethral Zone (CZ)

As mentioned earlier in the chapter on "Zonal Anatomy" the central zone extends from the neck of the bladder to the verumontanum and encases the proximal/prostatic part of the urethra, the ductus deferentes and the ejaculatory ducts. The CZ demonstrates a cone-shaped decrease of signal intensity on T2-w, sometimes with decrease on ADC as well (Fig. 1). In contrast to prostate carcinoma, the central zone always shows strict symmetry in the dorsal and cranial parts of the gland (Fig. 2). In case of tumor invasion of the seminal vesicles, the dorsocranial CZ is infiltrated too, showing a distortion of zonal architecture (Fig. 3).

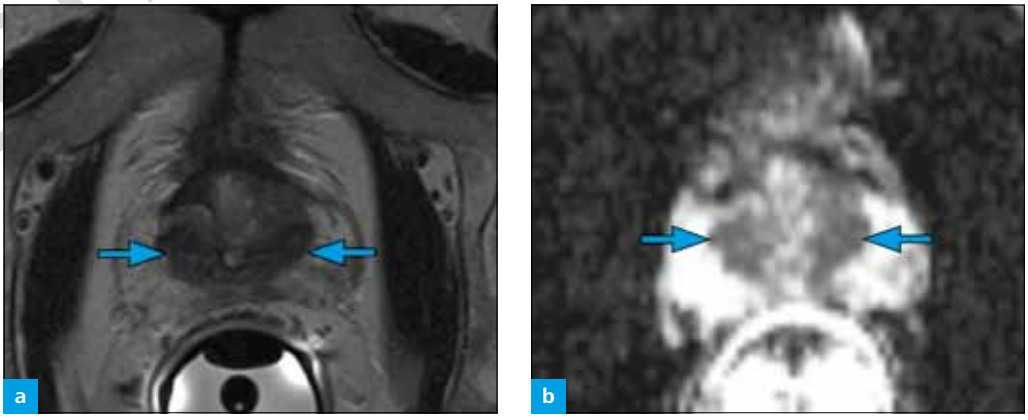

Fig. 1: *T2-w image in (a) axial plane with (b) ADC map. The central zone (arrows in a) demonstrates a cone shaped decrease of signal intensity on T2-w, in this case with decrease on ADC as well (arrows in b). The central zone is located posteriorly in the base of the prostate and reaches anteriorly up to the urethra and ends at the level of the verumontanum.*

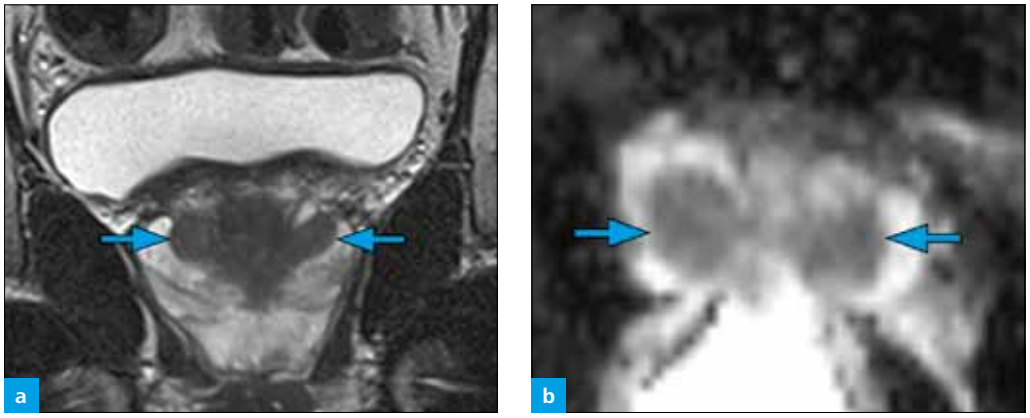

Fig. 2: T2-w image in (a) coronal plane with (b) ADC map. The central zone (arrow in a) is always configured strictly symmetric and, despite a focal ADC decrease (arrow in b), can easily be differentiated from a tumor, which always shows asymmetry.

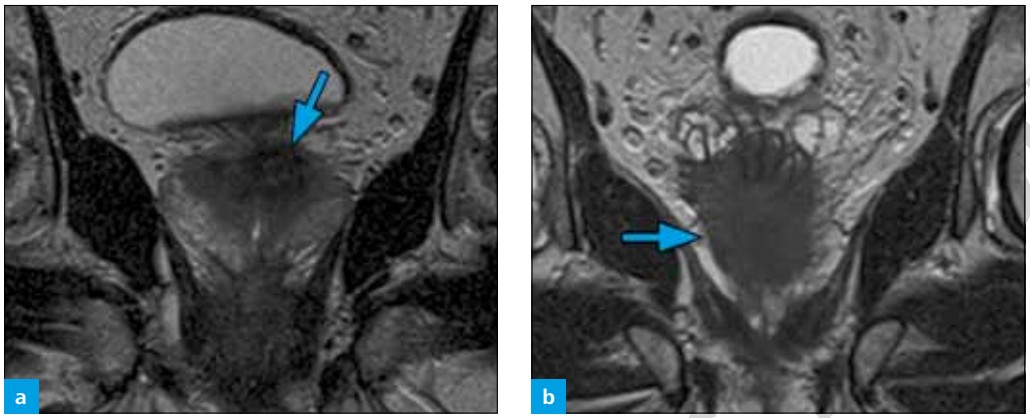

Fig. 3: (a, b) T2-w image in coronal plane. In case of tumor invasion of the seminal vesicles the central zone is infiltrated, displaying a distortion of zonal architecture and bulging of contour (arrows).

Calcification and Fibrosis

Calcification and fibrosis present themselves markedly hypointense in T2-w, also occasionally demonstrating ADC values under 1 000. Generally, they show neither restriction of diffusion nor hypervascularization (Fig. 4). Calcifications show heterogeneous signal intensity on T1.

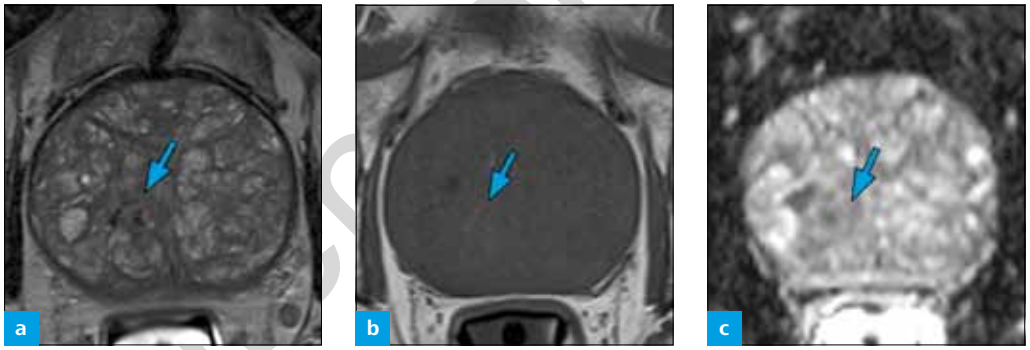

Fig. 4: T2-w image in (a) axial plane with (b) T1-w image and (c) ADC map. Calcifications and fibrosis of the inner gland (arrows) generally lack focal ADC decrease (arrow in c). Calcifications are presented differently in T1-w and T2-w images (arrows in a and b).

Abscess

Abscesses show a focal marked diffusion restriction/disturbance, rim enhancement and slightly elevated signal intensity on T2-w MRI (Fig. 5).

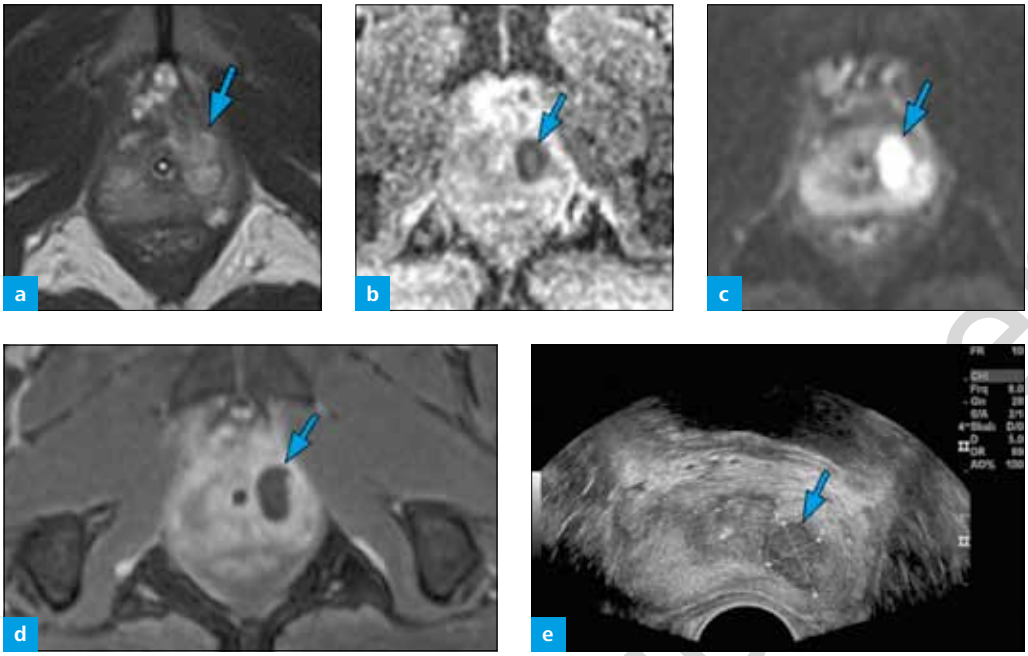

Fig. 5: T2-w image in (a) axial plane with (b) ADC map and (c) DWI, (d) T1-w image with fat saturation after contrast; all without an endorectal coil and (e) B mode TRUS: abscess of the prostate shows a discrete increase of signal intensity in T2-w MRI (arrow in a), a marked decrease on ADC (arrow in b) and a circumscribed restriction of diffusion (arrow in c), rim enhancement within the capsule of the abscess (arrow in d) and a hypoechoic, inhomogeneous structure in B mode TRUS.

Hyperplastic Nodule – Adenoma

Adenomas of the prostate solely occur within the inner gland and show patterns of perfusion similar to carcinomas (Fig. 6). Wash out of contrast agent is slightly delayed with adenomas (type 2 curve; also refer to Chapter 3.1). Sharply delineated calcifications help to differentiate them from most of the carcinomas (Fig. 7). ADC values of benign adenomas are mostly higher than 1 000 (Fig. 8). However, carcinomas can arise in or at the border of a benign nodule which causes a disruption of the nodule's capsule and a focal loss of signal on the ADC map.

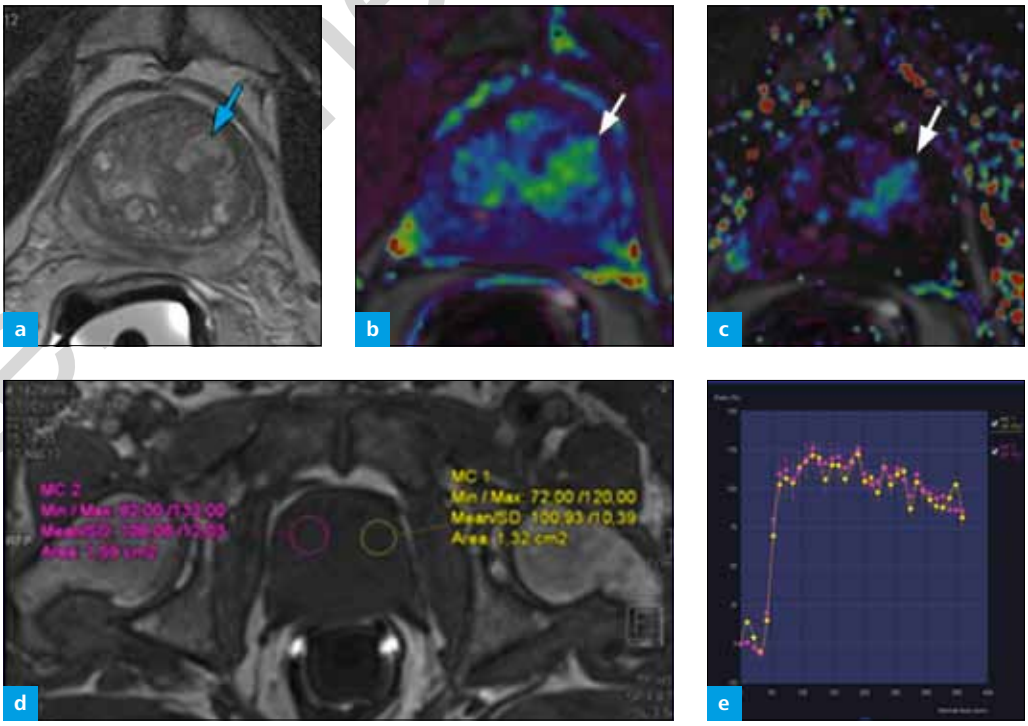

Fig. 6: T2-w image (a) in axial plane with (b) AUC perfusion map and (c) wash out perfusion map as well as (e) SI curve from corresponding ROI (d), all with an endorectal coil: this hyperplastic nodule/adenoma (arrow in a) proven by biopsy shows focal hypervascularization (arrows in b and c) and type 2 SI curves (e) respectively.