

Contrast-enhanced imaging with low-molecular-weight agents, specifically the gadolinium chelates, relies on the T1-shortening properties of the contrast agent molecules, perfusion of the tissue under investigation, and the local ability of the contrast agent molecules to extravasate out of the blood vessels into the extracellular space. Tumor tissue often has increased perfusion over healthy tissue, as newly formed blood vessels try to supply the growing tumor with oxygen and nutrients. Moreover, these new blood vessels, lacking refined structure, can be disrupted and leaky. Therefore, tumor tissue can be visualized with T1-weighted MR imaging after contrast agent administration. Because T2-weighted imaging of anatomy alone (Case 93) may not be very specific for the detection and localization of prostate cancer, T1-weighted MR imaging acts as an independent additional marker. In **Fig. 94-1**, the anatomy of the prostate of a 65-year-old patient (PSA level 25 $\mu\text{g/L}$) with biopsy-proven prostate cancer (total Gleason grade 5) is visualized from apex to base with multislice T2-weighted FSE MR imaging at 3 T; voxel size was $0.26 \times 0.26 \times 2.5 \text{ mm}^3$ with a TE of 153 msec, acquisition time 3 mins. In the images of the bottom row, the bladder is visible, and the circular structures just above the coil in the final image are the seminal vesicles. A large lesion is visible in the base on the right side of the prostate, extending into the seminal vesicles (arrows in **Fig. 94-1**). The central gland of the prostate consists of heterogeneous tissue with large differences in intensity. After an intravenous bolus

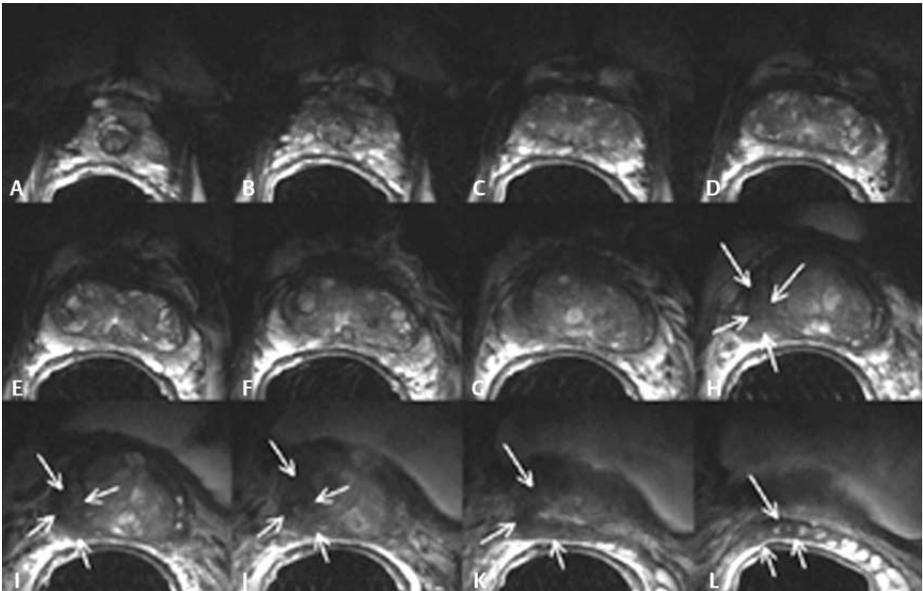


Figure 94-1

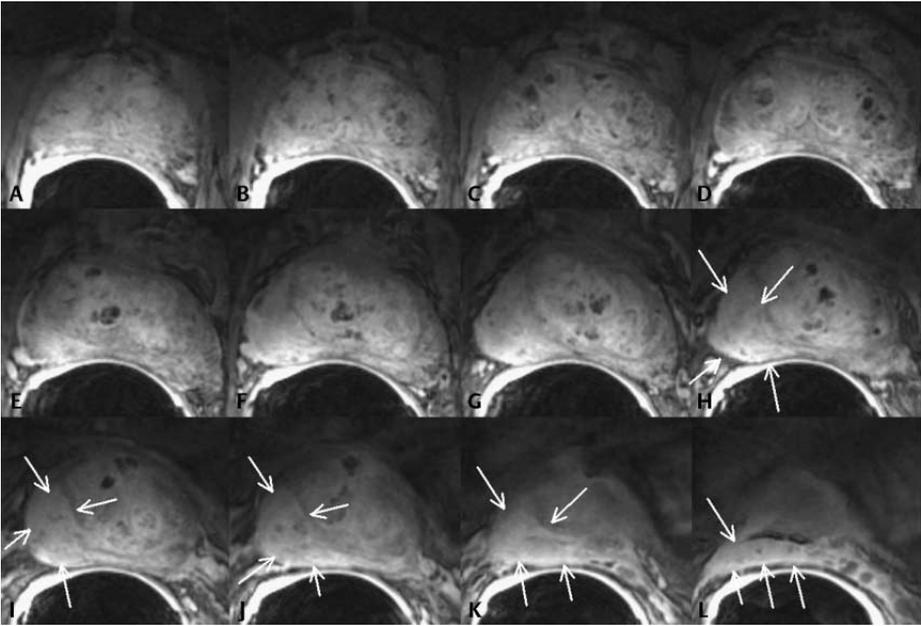


Figure 94-2

injection of paramagnetic gadolinium chelate, the lesion in the base of the prostate in **Fig. 94-1** enhances on T1-weighted imaging. In **Fig. 94-2**, 12 images from a 3D series of 32 images are shown with the enhancing lesion indicated with arrows. A 3D T1-weighted GRE sequence was used with TR 8.6 msec and flip angle 15 degrees; the voxel size was $0.5 \times 0.5 \times 1.5 \text{ mm}^3$ and TE 4 msec. With the TR and flip angle used, intracellular water or, generally, water that is not in contact with the contrast agent will be saturated and therefore hypointense. Water that is in contact with the contrast agent will not, or will only partially be saturated and become hyperintense, enhancing the tissue in which the highest concentrations of contrast agent occur. Especially for inexperienced readers, the addition of contrast-enhanced imaging will add confidence to assigning tumor tissue to lesions on T2-weighted MR imaging that extend beyond the prostate capsule or into the seminal vesicles. As in Case 93, the combination of an endorectal coil and a field strength of 3 T provides the best anatomical detail possible at this moment in prostate MR imaging. An additional advantage of using an endorectal coil in 3D imaging is the fact that the FOV can be made much smaller and dedicated to the prostate, as no signal is measured from tissue at large distances from the balloon, so no wraparound will occur.