The increasing incidence of prostate cancer, which is the most frequently diagnosed malignancy in the western male population [1], poses an increasing burden on healthcare. PSA screening and TRUS-guided biopsy are revealing more and more patients with this disease. As long as prostate cancer is confined to the prostate (that is no extracapsular extension, no seminal vesicle invasion or no metastatic spread to lymph nodes or bones) treatment of the disease has a curative intent. Clinically localized prostate cancer is typically managed by well-established whole gland therapies like radical prostatectomy or radiotherapy (brachytherapy or external beam radiotherapy).

Approximately 30% of patients who underwent radical prostatectomy will develop biochemical recurrent disease [2,3]. Biochemical failure, i.e. a rising serum PSA in the absence of demonstrable metastases, is widely accepted as an appropriate endpoint for defining treatment failure in men with localized prostate cancer. The serum PSA is routinely used to monitor disease recurrence after definitive therapy because biochemical recurrence antedates metastatic disease progression and prostate cancer–specific mortality by an average of 7 and 15 years, respectively [4-6]. Patients with biochemical recurrence after radical prostatectomy have an 88% 10-year overall survival rate compared to a 93% in males without signs of biochemical recurrence [7].

Approximately 25-30% of patients with newly diagnosed prostate cancer undergo EBRT as their definitive treatment [8-10]. Unfortunately, up to 50% of patients develop biochemical failure, presumably due to local recurrence after 5 years [11-15]. Currently, serum PSA increase after radiotherapy is the best indicator of biologically active tumor [16,17]. Whenever such an elevation of serum PSA after nadir has taken place, imaging is required to investigate whether this increase is due to local or systemic recurrent disease. Local recurrence (30%) may be amenable to
salvage therapy, while systemic recurrence may be an indication for systemic
treatment [18-21].

Although T2-weighted MR imaging plays an important role in localizing
prostate cancer in the untreated gland, evaluation of local recurrence in the radiated
prostate gland by T2-weighted MR imaging is limited by treatment-induced
relaxation time changes. Several reports suggest MR spectroscopic imaging, which
detects abnormal metabolism, is accurate in this setting. Other functional MR
techniques, such as diffusion-weighted imaging and dynamic contrast-enhanced MR
imaging yield similar promising results. The ability to detect or exclude local
recurrence within the prostate by multiparametric MR imaging can thus facilitate
salvage treatment, or systemic therapy in patients with presumed local recurrence
based on biochemical failure.

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