Is DCE-MRI Reliable Following Trans-urethral Resection of the Prostate?

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Abstract
T1-weighted dynamic contrast enhanced MR scanning was performed in 24 patients following TURP and in 54 patients following a TRUS guided biopsy. All patients had histologically proven adenocarcinoma. The effect of surgery on prostate tissue was explored using a two compartment pharmacokinetic model. There was no significant difference in clinical/biochemical parameters between TURP and control groups but TURP resulted in an elevation of maximum enhancement index and distribution volume.

Introduction
Benign prostate hyperplasia (BPH) is a common condition and presents with poor stream, frequency or urinary retention. Trans-urethral resection of prostate (TURP) is frequently performed for relief of symptoms. Curettings obtained at the time of TURP may subsequently lead to a diagnosis of malignancy. This study aims to determine if TURP alters the pharmacokinetic parameters measured by dynamic contrast-enhanced MRI.

Methods
24 patients underwent TURP and a further 54 TRUS-guided prostatic biopsy prior to staging by MRI. All patients had histologically proven adenocarcinoma of prostate. MR scanning was carried out using a 1.5T IGE Echo-speed scanner using a pelvic phased array coil or/and an endorectal coil for signal reception. T2-W FSE images were acquired initially, throughout the entire pelvis to stage extra-prostatic disease. This was followed by T2-weighted thin slice (2.5mm thick; 0mm gap) FSE images acquired axially for intra-glandular tumour localization and slice selection. Prior to dynamic scanning, PD-weighted images were obtained using an FSPGR sequence (TR/TE = 120/2.0ms; flip angle 8°; FOV 20 x 20cm; matrix 256 x 128; slice thickness 7mm/2mm gap). DCE-MRI was then carried out using an FSPGR sequence (same parameter as above except TR = 7.9ms; flip angle 25°) prior to, during and after bolus injection of 0.1mmol/ Gd-DPTA/Kg bodyweight. 35 sequential images were obtained at a temporal resolution of 9 seconds. Regions-of-interest (ROI) were drawn manually on selected slices from each biopsy and scanning was 60 days. PSA value, Gleason grade, tumour stage, maximum diameter and tumour volume were measured by dynamic contrast-enhanced MRI.

Results
The time interval between TURP and MR scanning was a median of 53 days whilst the time interval between TRUS guided biopsy and scanning was 60 days. PSA value, Gleason grade, tumour stage, maximum diameter and tumour volume were similar for the two groups. There were no significant differences between these parameters for the two groups (Table 1). However the maximum enhancement index and contrast distribution volume in tumour and normal PZ in the post TURP group were significantly higher than those determined prior to surgery. A detailed comparison of the two groups is shown in table 2.

Conclusions
Following TURP both maximum enhancement index and distribution volume are elevated in tumour bearing areas, and both reflect the extra vascular/extra-cellular space available for contrast accumulation. The amplitude and exchange rate are unchanged and more accurately represent new vessels formation. Our results show that determination of tumour extent or response to treatment following TURP may be more accurately determined by the later two parameters.

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