# Correlation of MR imaging guided prostate biopsy determined Gleason Grade and true Gleason Grade in radical prostatectomy specimens

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**Introduction:** The standard to confirm diagnosis of prostate cancer, remains histopathological evaluation of tissue obtained from ultrasound guided prostate core biopsies. Though TRUS-GBs by frequently underestimate true Gleason score on prostatectomy[1]. The Gleason score is an important predictor for the agressiveness, prognosis and choice of treatment for prostate carcinoma. Multimodality MRI has shown to localize prostate cancer with high accuracy[2]. Moreover preliminary results show that MRI can give information about tumor aggressiveness through ADC values on diffusion weighted imaging and choline + creatinine/ citrate ratios on MR spectroscopy [3;4]. Higher accuracy of MRI for localization of prostate cancer has been used for targeting prostate biopsies by means of MRguided biopsy (MRGB) in an MRI bore with MR compatible materials. MRGB has yielded high detection rates[5;6]. A derivable hypothesis is that since prostate biopsy can be targeted through accurate MRGB, MRGB will improve prediction of true Gleason score on prostatectomy. In this study we compared MRGB and TRUS-GBs Gleason scores to the final true Gleason score on prostatectomy.

**Purpose:** To determine the predictive accuracy of 3T MR imaging guided prostate biopsy (MRGB) determined tumor Gleason score (GS) for true GS in prostatectomy specimens. Furthermore to compare these results to a transrectal ultrasound guided biopsy (TRUS-GB) cohort.

**Methods and Materials:** 20 Patients with a minimum of two negative TRUS-GB biopsies were diagnosed with prostate cancer using MRGB. All patients received a 3T MRI incl. T2-weighted, Diffusion Weighted and Dynamic Contrast Enhanced MRI for the detection of tumor suspicious regions (TSRs) followed by biopsy of the TSRs under MR guidance. This was done using an MR compatible biopsy device. Subsequently patients underwent radical prostatectomy. For comparison, 20 consecutive patients who were diagnosed with tumor by a 10-core TRUS-GB scheme and who subsequently also underwent radical prostatectomy, were used. For both groups, the biopsy determined Gleason score (GS) and prostatectomy determined GS were correlated. The two highest GS components within the prostatectomy specimen were defined as the standard for correlation. An exact match was evident if biopsy specimens revealed both the two highest tumor grades and a partial match if biopsy revealed one of the two highest grades. For each diagnostic modality, the positive predictive values (PPV) to predict the highest two GS components in prostatectomy was determined using the sum of the number of matching grades. The Chi-square test was used to test for significance between the two modalities.

**Results:** MRGB had a median duration of 30 min and a median of 3 biopsy cores (range 2-5) were obtained. The prostatectomy determined Gleason Score (GS) distribution of MRGB group was: GS 6 - 9/20; GS 7 - 7/20; GS 8 - 2/20; GS 9 - 2/20, while in the TRUS-GB cohort: GS 6 - 8/20; GS 7 - 4/20; GS 8 - 4/20; GS 9 - 4/20.



Fig.1. Multimodality MRI showing tumor suspicious region in right (patient) ventral central gland.
Depicted in normal T2 weighted MRI (left upper corner), Diffusion weighted MRI (right upper corner), Dynamic Contrast Enhanced MRI (left lower corner). A slice of the prostatectomy specimen confirmed tumor in the right ventral central gland (right lower corner).
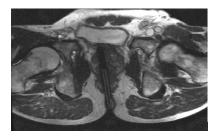


Fig. 2. Transversal MRI of status after MRGB of a prostate lesion. Through the rectum the gadolinium needle sleeve is visible. The needle causes a hypointense artefact in its way through the prostate.
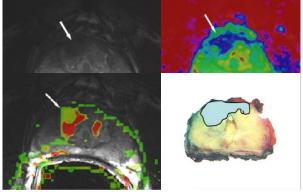
MRGB biopsy determined GS, matched exactly with prostatectomy specimens in 85% (17/20) of patients and partially in 15% (3/20). In the TRUS-GB cohort an exact match was evident in 45% (9/20) of patients a partial match in 50% (10/20) and no match in 5% (1/20). The PPV of MRGB GS was 93% vs. 70% with TRUS-GB. MRGB had a significantly better predictive accuracy for true GG compared to TRUS-GB (p=0.02).

**Conclusion:** MRGB appears to offer improved prediction of true prostatectomy GS compared to TRUS-GB and can therefore aid in improved decision making in treatment Through application of the accuracy of MRI in prostate biopsy in MRGB as well as in MRI-TRUS-fusion, biopsies can be lesion targeted. Eventually through MRGB infinite rounds of extended TRUS-GB and undergrading of prostate cancer can be avoided.

**References**
1 Noguchi M. et al. J Urol 2001;166:104-9;2 Futterer, JJ. Et al. Radiology 2006;24:449-58 ;3 deSouza, N.M. et al. Clin radiol 2008;63:774-82;4 Wang l. et al. Radiology 2008;246:168-76;5 Anastadiasis A.G..Eur Urol 2006;50:738-48;6 Beyersorff D. et al. Radiology 2005;234:576-81.