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ONCOLOGY/RECONSTRUCTION
ORIGINAL ARTICLE

Are magnetic resonance imaging undetectable prostate tumours clinically significant? Results of histopathological analyses

Kristian D. Stensland [a], Karl Coutinho [a], Adele R. Hobbs [a], Lindsay Haines [a], Shemille A. Collingwood [a], Young Suk Kwon [a], Simon J. Hall [a], Maria Katsigeorgis [a], Seyed Behzad Jazayeri [b], David B. Samadi [b,*]

[a] *Department of Urology, Mount Sinai Medical Center, New York, NY, USA*
[b] *Department of Urology, Lenox Hill Hospital, Hofstra Northwell School of Medicine, New York, NY, USA*

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KEYWORDS

MRI;
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Tumour size;
Gleason;
Active surveillance

ABBREVIATIONS

AS, active surveillance;
ASA, American Society of Anesthesiologists;
BMI, body mass index;
RALP, robot-assisted

Abstract ***Objective:*** To investigate whether tumours at threshold values for detection on magnetic resonance imaging (MRI) represent clinically significant tumours or not, and therefore the utility of MRI in active surveillance (AS) protocols.

Patients and methods: A retrospective analysis of a single institution database was performed after Institutional Review Board approval. Between 2010 and 2013, 1633 patients underwent robot-assisted laparoscopic prostatectomy (RALP) at a single institution by a single surgeon. Of these, 1361 had complete clinical data and were included in analysis. Multivariate logistic regression was used to assess histopathological grade compared to tumour size whilst controlling for biopsy Gleason score, prostate-specific antigen level, body mass index, race, and age.

Results: Of 120 tumours <5 mm in size, four were Gleason score 4 + 3. Of 276 tumours of 5–10 mm, 22 (8.1%) were Gleason score 4 + 3 and one (0.2%) was Gleason score 8. On multivariate regression analyses, tumours of <5 mm were much less likely to be high grade (Gleason score $>3+4$) at RALP compared to larger tumours (3.3% vs 25.1%, $P<0.001$), or Gleason score $\geqslant 8$ (0.0% vs 7.6%,

* Corresponding author. Fax: +1 646 692 6744.
E-mail address: samadiroboticinstitute@gmail.com (D.B. Samadi).
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laparoscopic prostatectomy

$P < 0.001$). Size was further shown to significantly correlate with grade on multivariate regression ($P < 0.001$).

Conclusions: Prostate tumours below the detection threshold for MRI (5 mm) most probably represent clinically insignificant tumours, which alone would not necessitate leaving AS in favour of more aggressive therapy. These findings point to a possible role of MRI in modern AS protocols.

Introduction

Prostate cancer is the most common cancer in men worldwide. As detection technologies have improved in recent decades, more patients are diagnosed at early stages of the disease. Prostate cancer has a slow progression course over time, which makes active surveillance (AS) a treatment option for an increasing proportion of patients. AS has been increasingly accepted and adopted in the management of low-risk prostate cancer [1]. With AS cohorts growing rapidly and evidence of excellent outcomes mounting, use of this management option will probably increase greatly in the coming years. Whilst proponents of AS laud the delay to definitive treatment and consequent postponement of treatment-related adverse effects [2], critics of AS aptly acknowledge its reliance on serum biological markers, with confirmation of disease state only through requisite repeated prostate biopsy, with their own comorbid burdens [3]. Further, the relative inaccuracy of prostate biopsy, carrying a reported reclassification risk as high as 38%, with ~27% of patients reportedly upstaged [4,5], strengthens the call for better diagnostic tests to assess and confirm disease state, especially in younger men on AS protocols.

In the absence of a reliable non-invasive test, many clinicians have investigated endorectal MRI as an adjunct to confirmatory prostate biopsy as a means of better staging of prostate cancer [6–8]. Once the diagnosis of prostate cancer is confirmed and a patient is placed on AS, MRI, if accurate, would carry the advantage of being less invasive than repeating prostate biopsy, and be associated with a much lower complication rate, whilst still providing valuable staging information about tumour size, growth, and extension [9,10].

MRI has shown varying accuracy in classifying tumour characteristics; there have been consistent questions about limitations on the resolution of the imaging technique. Some studies conservatively suggest that tumours of < 10 mm are unable to be accurately characterised by MRI, and others support a resolution limit of 5 mm [11–13]. MRI, whilst potentially useful in prostate cancer as it has been for other cancers, has a significantly lower sensitivity for small tumours, which is of significant concern for the presumably low-volume disease that should represent the bulk of patients eligible for AS. In this vein, we sought to explore the pathological characteristics of prostate cancers that would be unreliably characterised by MRI based on their small size, and determine how many, if any, of the tumours below these resolution thresholds represent clinically significant disease.

Patients and methods

Under Institutional Review Board approval, data were extracted on eligible patients from a prospectively maintained database that was analysed retrospectively. In all, 1633 patients diagnosed with prostate cancer underwent robot-assisted laparoscopic prostatectomy (RALP) at a single institution by a single surgeon (DBS) from January 2010 to April 2013. Relevant information about clinical characteristics, histopathology, medication use, comorbidities, and demographics were registered at enrolment.

All RALP specimens were examined and tumour diameters measured by genitourinary pathologists at our institution. Preoperative specimens were re-evaluated by the pathology department for preoperative Gleason score reports. Patients without reports of tumour diameter or preoperative Gleason score were excluded from our study to avoid convolution by different methods of tumour size estimation and Gleason scoring.

Tumours were stratified to diameters above and below both 5 and 10 mm. These threshold sizes are commonly cited as the resolution limits for MRI [11–13]. No preoperative MRI was performed as standard protocol in this study. Univariate variables were compared using chi-squared for categorical and *t*-test or ANOVA for continuous variables, where appropriate. A multivariate logistic regression model was created to assess histopathological grade compared to tumour size, whilst controlling for Gleason score at biopsy, race, body mass index (BMI), PSA level, and age at RALP. All analyses were performed using SPSS version 19 (SPSS IBM, Armonk, NY, USA).