Correlation between multiparametric MRI findings and radical prostatectomy specimens

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Background

Prostate cancer (PCa) is a significant health issue in Australia

Traditional diagnostic pathway remains flawed

Traditional prostate biopsies are random in nature

Overdiagnosis and overtreatment of indolent disease remains a major concern
Background

Recent studies have suggested single precursor cells driving prostate cancer* - from index tumour

Multiparametric MRI (mpMRI) has the potential to revolutionise prostate cancer diagnosis+

Ongoing research necessary in this area to validate mpMRI’s position in the workup of prostate cancer

Currently no Medicare rebate – application underway


Objectives

We aimed to correlate mpMRI of prostate with radical prostatectomy specimens.

**Primary Outcome**
- Tumour correlation rate between mpMRI and prostatectomy

**Secondary Outcomes**
- Effect on correlation by:
  - grade of disease
  - initial PIRADS score
  - volume of lesion
- Prediction of Extraprostatic Extension
Method

Ethics approved prospective database from Nov 2013 (ongoing)

Men requiring biopsy are offered mpMRI.

No deviation of standard of care
- 24 core transperineal biopsy
- Targeted biopsy if indicated

Men undergoing mpMRI (all with 3-D PIRADS summary diagrams) were correlated with patients undergoing radical prostatectomy (whole mount step-section)

All cases reviewed in conjunction with RO and AR
Demographics
Between November 2013 and March 2015:
725 patients had undergone mpMRI
123 patients identified with initial mpMRI and subsequent radical prostatectomy
- 77 (62.6%) raised PSA and initial assessment
- 34 (27.6%) patients on Active Surveillance
- 12 (9.8%) patients with previous negative biopsies

Mean Age 62.8, (range 41 – 77)
Mean PSA 7.5, (range 1.3 – 41)
All prostatectomies revealed Gleason 7 disease or above
Example Cases
69yo, PSA 7.8, benign DRE – initial referral
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Lesion 1: Anterior Peripheral/Transition zone PIRADS 5, 1/5 ECE
Lesion 2: Left post-lat apex PIRADS 4
69yo, PSA 7.8, benign DRE – initial referral

Index Tumour: 3+4(40%)=7, 5.8cc, extensive EPE
Non Index: 3+4(5%)=7, 0.4cc

Both Index and non index lesion identified
71yo, PSA 10.5, benign DRE – AS Gleason 6 disease
71yo, PSA 10.5, benign DRE - AS Gleason 6 disease

Lesion 1: Right Anterior base to mid, PIRADS 5, 4/5 ECE
71yo, PSA 10.5, benign gland - AS Gleason 6 disease

Index Tumour: 3+4(10%)=7, 6.5cc, extensive ECE

Non-Index: 3+3=6 to 3+4(5%)=7, 1.3cc

Only Index Lesion Identified, non-index lesions not identified
66yo, PSA 19.3, benign DRE – 4 x previous neg TRUS (recent 1y)
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Lesion 1: Ant TZ/PZ mid to base, PIRADS 4, no ECE
66yo, PSA 19.3, benign DRE – 4 x previous neg TRUS (recent 1y)

Index Tumour: 5+4=9, no EPE

No other foci

Index Lesion Identified, no non-index lesions
49yo, PSA 4.5, benign DRE – initial referral
49yo, PSA 4.5, benign DRE – initial referral

Lesion 1: Left anterior PZ mid prostate, PIRADS 5, no ECE
49yo, PSA 4.5, benign DRE – initial referral

Index Tumour: 4+3(20%)=7, 0.5cc
Non-Index: 3+4(20%)=7, 2.0cc

Index tumour not identified, Non-index tumour identified
Results

**Index tumour correlation**
Sensitivity of 79.7%
98/123 index lesions on prostatectomy corresponding with initial mpMRI

**By Grade of disease**
Gleason >8 – 100% (9/9)
Gleason 7 – 78% (89/114)
- 4+3=7: 81.8% (36/44)
- 3+4=7: 75.7% (53/70)

**By Size of lesion**
Size of correlating lesions were median 2.45cc (IQR 1.2-9.2) versus
non-correlating lesions were 1.9cc (IQR 0.8 - 2.2) \( p=0.0143 \)
Results

By initial PIRADS score
- PIRADS 5 – 94.7% (72/76)
- PIRADS 4 – 87.5% (21/24)
- PIRADS 3 – 50% (5/10)

Non-correlating “missed” index tumours
20.3% (25/123) index lesions on prostatectomy not correlating with initial mpMRI

Of these:
- 52% (13/25) PIRADS 2 - NO PIRADS 1

- 68% (17/25) missed lesions were located in peripheral zone
Results

**Extraprostatic Extension**
Of 59 patients with T3 disease:

- 32% (19/59) had no suspicion of extra-prostatic disease on mpMRI
- 40.7% (24/59) had only low suspicion of extra-prostatic disease on mpMRI (ECEscore 1 or 2)
Results

Non-index lesions
90.2% (111/123) patients with non-index lesions in prostatectomy specimen

- 44 with greatest Gleason 3+3
  - 6.8% (3/44) identified on mpMRI

- 64 with greatest Gleason 3+4
  - 28.1% (18/64) identified on mpMRI

- 3 with greatest Gleason 4+3
  - 66.7% (2/3) identified on mpMRI
Conclusions

Supports mpMRI in workup of prostate cancer

Impressive correlation between index tumour in mpMRI vs prostatectomy
- Improves with size of lesion, grade of lesion

mpMRI still misses 20% of Gleason >7 PCa
- should remain an adjunct to traditional diagnostic pathway at this stage

Tumour stage often underestimated

Significant portion of non-index lesions missed, including Gleason 7 disease
Conclusions

We will continue to report our prospective data

Further analysis of all mpMRIs performed including targeted versus non-targeted biopsy
Thank you