Fusion Guided Transrectal Prostate biopsy (fTRUS)

Increasing the detection of clinically significant prostate cancer

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Introduction

Prostate cancer is the second most common cancer in UK males, with over 47,000 men diagnosed annually . There is no completely reliable screening test for prostate cancer and diagnosis is complex, with some positive tests finding clinically insignificant cancer.

Development of multi-parametric MRI has made implementation of fusion guided biopsy possible, allowing specific targeting of sinister lesions seen at MRI, with evidence showing improved detection of clinically significant cancer across multiple studies.

Development of fusion technology enables CT and MRI images to be synchronised with real time ultrasound images, allowing real-time direct targeting of suspicious lesions within organs. Fusion imaging is established within our institution, but can it actually aid the detection of clinically significant prostate cancer? This poster outlines the single centre audit carried out in our institution.

Development of an fTRUS Prostate Biopsy Service.

Trust A in 2015 developed a mpMRI and fusion service to improve prostate cancer detection. Unfortunately MRI capacity constraints meant that not all men with suspected prostate cancer could undergo MRI initially and two pathways (pathways A & B) were locally established.

Pathway A saw men under 70 with a PSA of <10 offered a pre-biopsy mpMRI followed by fTRUS biopsy if the mpMRI scan positively identified a lesion with a PI-RADS 4 or 5.

There was significant pressure to increase inclusion criteria for this service but an evaluation was recommended prior to additional resource being funded.

Research question

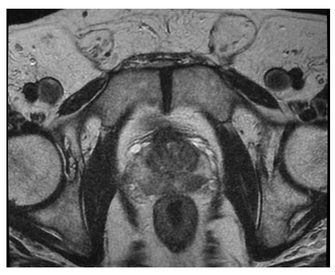
Has the introduction of fTRUS targeted biopsy for patients managed under Pathway A improved the detection rate of significant cancers in those that go on to prostatectomy?

Ethics

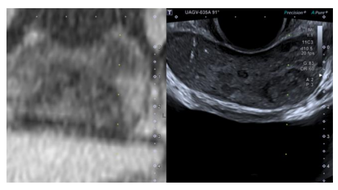
This retrospective evaluation did not require LREC approval. Ethical release was granted by Teesside University and audit approval granted from the Trust

Study Aim

Compare data from a cohort of patients undergoing fTRUS and prostectomy on pathway A (target biopsy cohort) with an equivalent number of men of the same demographic who underwent standard TRUS biopsy and prostatectomy prior to the change of Pathway (Standard Biopsy Cohort) to ascertain that the change in pathway has resulted in an improved detection rate of significant cancers of the prostate.

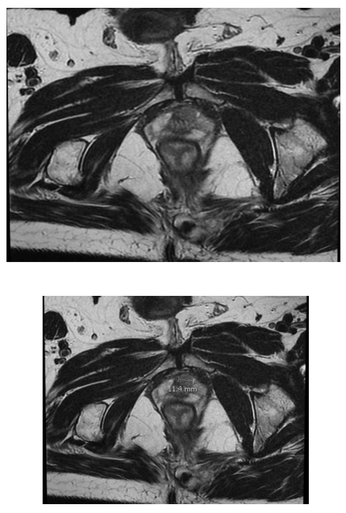


Case 1: PI-RADS 1, LBPZ, 14 mm Gleeson 4 + 5 in target; 3 + 4 in random cores



Methodology

The fTRUS target biopsy sample population comprised 40 men aged ≤70, with a PSA of ≤10. Comparator sample of 40 men of the same demographic who had undergone standard biopsy and prostatectomy prior to the new pathway were selected. Histology data was anonymised. fTrus histology /standard TRUS histology was compared with histology from the prostatectomy. Histology was deemed to be the gold standard. Sensitivity, specificity and diagnostic accuracy were calculated and compared with results from current literature.



Results

Target Biopsy Cohort

- Significant cancer detected in 36 /40 at biopsy in the analysis subjects
- Higher rates of true positives in target samples (fTRUS) than random (TRUS)
- From a total of 31 positive target samples at biopsy identified, 1 was found to be benign at prostatectomy.

Standard Biopsy Cohort

- Significant cancer was again found in 36 of the 40 subjects at biopsy. 6 of these were found with insignificant cancer at prostatectomy.

Gleason scores identified and core numbers.

Table 1 illustrates the number of Gleason grades identified in each target area during biopsy including the benign grade 3+3 (6). The numbers in brackets indicates benign/significant Gleason score

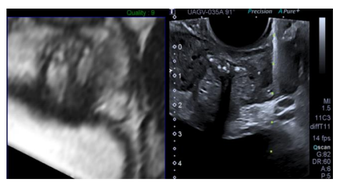
Comparison of target and standard biopsy cohort

- 87% of patients who had a targeted biopsy found to have clinically significant cancer (5% false positive rate, 5% false negative rate)
- 75% of patients who had a standard biopsy approach were found to have clinically significant cancer (15% false positive rate, 8% false negative rate).
- fTRUS = diagnostic accuracy rate of 92% compared to 77% with standard biopsy.

Conclusions

- This study has achieved its aim and confirms that target biopsy following a mpMRI PI-RADS 4 or 5 does result in improved detection rates of significant cancer compared to standard biopsy without mpMRI.
- Overall target biopsy sensitivity and specificity are 95% and 67 % respectively, indicating high cancer detection rate and good ability to indicate when disease is not present
- Sensitivity demonstrated in this study compares well with relevant literature (80-92% sensitivity, 60-81% specificity).

Case 2: PI-RADS 5, LATZ, 11mm Gleeson 4 + 4 in target; 3 + 3 in random cores



Limitations

- Single centre study , small nonrandomised sample size, non-generalizable results. Samples used were adequate in illustrating that pathway A has improved the prostate pathway and results are relevant to practice at a local level.
- Inexperience of the technique may have impacted on target identification accuracy

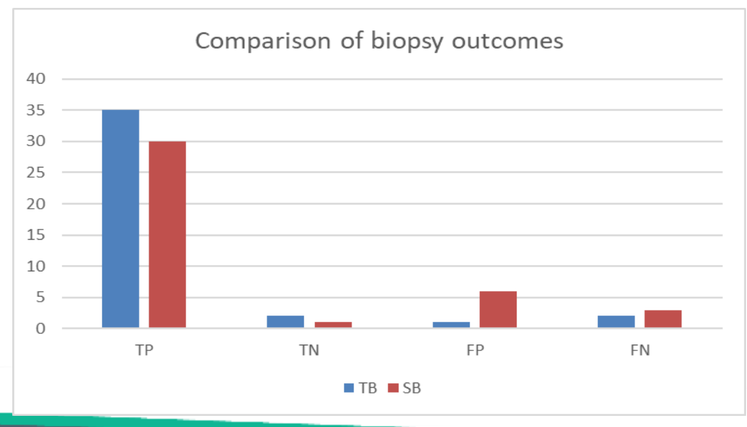
Recommendations

- Pathway A extended to a wider population as MRI capacity improves.
- Evaluate the outcomes of patients on pathway A to see if accuracy has improved with increased experience of mpMRI reporting and technique.

Table 1 & 2: Test validity – Sensitivity and Specificity of target and standard biopsy cohorts

Target Cohort		Prostatectomy		
		+ve	-ve	
Test Result	+ve	35	1	PPV = 97%
	-ve	2	2	NPV = 50%
		Sensitivity 95%	**Specificity 67%**	**Accuracy 92 %**

Standard Cohort		Prostatectomy		
		+ve	-ve	
Test Result	+ve	30	6	PPV = 83%
	-ve	3	1	NPV = 25%
		Sensitivity 91%	**Specificity 14%**	**Accuracy 77%**



Graph 1: Comparison of biopsy outcome.
Blue: Target Cohort
Red: Standard biopsy cohort

TP: True Positive
TN: True Negative
FP: False Positive
FN: False Negative

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