TITLE: Magnetic Resonance Spectroscopic Imaging for Prostate Disease Detection: Clinical and Cost-Effectiveness, and Guidelines

DATE: 07 February 2014

RESEARCH QUESTIONS

1. What is the clinical effectiveness of magnetic resonance spectroscopic imaging versus ultrasound-guided transrectal biopsy for prostate disease diagnosis in men 50 years of age and older?

2. What are the harms associated with the use of magnetic resonance spectroscopic imaging for prostate disease detection?

3. What is the cost-effectiveness of magnetic resonance spectroscopic imaging versus ultrasound-guided transrectal biopsy for prostate disease diagnosis in men 50 years of age and older?

4. What are the guidelines associated with magnetic resonance spectroscopic imaging for prostate disease detection in men 50 years of age and older?

KEY MESSAGE

One health technology assessment, two systematic reviews, one randomized controlled trial, five non-randomized studies, and two evidence-based guidelines were identified regarding magnetic resonance spectroscopic imaging compared with ultrasound-guided transrectal biopsy for prostate disease diagnosis.

METHODS

A limited literature search was conducted on key resources including PubMed, The Cochrane Library (2014, Issue 1), University of York Centre for Reviews and Dissemination (CRD) databases, Canadian and major international health technology agencies, as well as a focused Internet search. No filters were applied to limit the retrieval by study type. Where possible, retrieval was limited to the human population. The search was also limited to English language.

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documents published between Jan 1, 2009 and Jan 27, 2014. Internet links were provided, where available.

The summary of findings was prepared from the abstracts of the relevant information. Please note that data contained in abstracts may not always be an accurate reflection of the data contained within the full article.

RESULTS

Rapid Response reports are organized so that the higher quality evidence is presented first. Therefore, health technology assessment reports, systematic reviews, and meta-analyses are presented first. These are followed by randomized controlled trials, non-randomized studies, economic evaluations, and evidence-based guidelines.

One health technology assessment (HTA), two systematic reviews, one randomized controlled trial (RCT), five non-randomized studies, and two evidence-based guidelines were identified regarding magnetic resonance spectroscopic imaging (MRSI) compared with ultrasound-guided transrectal biopsy for prostate disease diagnosis. No economic studies were identified. Additional references of potential interest are provided in the appendix.

OVERALL SUMMARY OF FINDINGS

An HTA, published in 2009, considered MRSI to be safe when guidelines for its use were followed. The section of the report on MRSI for prostate cancer based its findings on 13 small studies. The conclusion from these studies was that MRSI combined with magnetic resonance imaging (MRI) could be useful when testing low-risk patients; the main advantage being a greater specificity when identifying lesions as benign or non-malignant. This same conclusion was reached by a systematic review, also published in 2009, which included 16 studies (581 patients) for meta-analysis. A recent systematic review (2013) that included 51 studies assessing MRSI, enhanced MRI, and dynamic contrast-enhanced MRI (DCE-MRI) concluded that MRSI had higher sensitivity and specificity than T2-MRI. The authors stated that more prospective studies were needed for determining the cost-effectiveness of MRSI. None of the abstracts for these three assessments specified age of the included participants.

One RCT and five non-randomized studies were identified; the details and conclusions of these studies are provided in Table 1.

<table>
<thead>
<tr>
<th>Author, Year; Study type</th>
<th>Stated Objective</th>
<th>No. of patients (n); Age</th>
<th>Stated Conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sciarra et al., 2010; RCT</td>
<td>Prospectively analyze MRSI and DCEMR in detecting prostate tumor foci in patients with high PSA levels and prior negative TRUS-guided biopsy</td>
<td>n = 180; Age: NR</td>
<td>The combined technologies showed potential for guiding a biopsy to cancer foci, in these patients</td>
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<tr>
<td>Ferda et al., 2013; Prospective non-randomized study</td>
<td>Assess the role of multiparametric 3T (3T MRI): the combination of T2-weighted images, diffusion-weighted images, MRSI, and...</td>
<td>n = 164; Age: NR</td>
<td>Routine use of 3T MRI for patients with elevated PSA should reduce the number of biopsies and improve detection</td>
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Table 1: Summary of Clinical Trials

<table>
<thead>
<tr>
<th>Author, Year; Study type</th>
<th>Stated Objective</th>
<th>No. of patients (n); Age</th>
<th>Stated Conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ganie et al., 2013; Prospective non-randomized study</td>
<td>Assess the efficacy of endorectal coil MRI and MRSI in patients with elevated PSA and negative TRUS-guided biopsy</td>
<td>n = 87; Age: NR</td>
<td>Early diagnosis and localization of prostatic carcinoma was improved with the combined technologies in these patients</td>
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<tr>
<td>Javali et al., 2013; Retrospective non-randomized study</td>
<td>Assess the ability of MRSI to improve detection of prostate cancer in patients with elevated PSA and normal digital rectal examination</td>
<td>n = 278; Age: NR</td>
<td>MRSI-directed TRUS biopsy showed increased rates of prostate cancer detection compared with standard TRUS biopsy for these patients</td>
</tr>
<tr>
<td>Lunacek et al., 2013; Retrospective non-randomized study</td>
<td>Assess the ability of MRT, MRSI, and DW-MRI to detect prostate cancer in patients with elevated PSA and negative biopsies</td>
<td>n = 67; 25 pathology sections analyzed Age: mean 66 years</td>
<td>MRI and MRSI were accurate in locating tumours in 20 of 25 cases</td>
</tr>
<tr>
<td>Franiel et al., 2011; Prospective non-randomized study</td>
<td>Investigate the incremental value of multiparametric MRI compared with standard T2-weighted imaging for biopsies</td>
<td>n = 54; Age: NR</td>
<td>Combination of T2-weighted imaging with 3 multiparametric techniques locates all identifiable prostate cancers; DW imaging with MRSI or contrast-enhanced MR imaging misses 6%</td>
</tr>
</tbody>
</table>

DCEMR = dynamic-contrast enhancement magnetic resonance; DW = diffusion-weighted; MRI = magnetic resonance imaging; MRSI = magnetic resonance spectroscopy imaging; MRT = magnetic resonance tomography; NR = not reported; PSA = prostate-specific antigen; TRUS = transrectal ultrasound-guided biopsy

One guideline, produced by the European Association of Urology (EAU) Guidelines Group for Prostate Cancer in 2013, recommends the use of TRUS-guided systemic biopsy for the diagnosis of prostate cancer, and recommends MRI for the staging of prostatic cancer (MRSI not specifically mentioned). The second guideline, produced by the American College of Radiology in 2012, states that MRSI improves accuracy of cancer detection, but does not indicate if MRSI is recommended for routine use in prostate cancer detection.
REFERENCES SUMMARIZED

Health Technology Assessments


Systematic Reviews and Meta-analyses


Randomized Controlled Trials


Non-Randomized Studies


Economic Evaluations
No literature identified.

Guidelines and Recommendations

    Section 7.4 Guidelines for the diagnosis and staging of PCa

    See: Sections on Magnetic Resonance Imaging, Magnetic Resonance Spectroscopy and Multiparametric Magnetic Resonance Imaging of the Prostate

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APPENDIX – FURTHER INFORMATION:

Non-Randomized Studies – MRSI and Non-MRI Combination Technologies


Non-Randomized Studies – No Pre-MRSI Biopsy Comparator


Guidelines and Recommendations – Consensus Guidelines


Review Articles


Additional References

