FEP 6.01.24 Magnetic Resonance Spectroscopy

Effective Date: January 15, 2018

Related Policies: None

Magnetic Resonance Spectroscopy

Description
Magnetic resonance spectroscopy (MRS) is a noninvasive technique that can be used to measure the concentrations of different chemical components within tissues. The technique is based on the same physical principles as magnetic resonance imaging and the detection of energy exchange between external magnetic fields and specific nuclei within atoms.

FDA REGULATORY STATUS
Multiple software packages for performing proton MRS have been cleared for marketing by the U.S. Food and Drug Administration through the 510(k) process since 1993. Single-voxel MRS is available on all modern magnetic resonance scanners. Food and Drug Administration product code: LNH.

POLICY STATEMENT
Magnetic resonance spectroscopy is considered investigational.

BENEFIT APPLICATION
Experimental or investigational procedures, treatments, drugs, or devices are not covered (See General Exclusion Section of brochure).

RATIONALE

Summary of Evidence
For individuals who have brain tumors who receive MRS, the evidence includes a number of small studies and systematic reviews. Relevant outcomes are test accuracy, change in disease status, morbid events, and functional outcomes. Small studies have evaluated detection, characterization, grading, prognosis, and differentiation of tumor recurrence vs necrosis. Most studies included in the meta-analyses were small, retrospective, and used various ratios of MRS spectra. The largest prospective study found that combining MRS with magnetic resonance imaging resulted in a greater percentage of correct diagnoses of pediatric brain tumor type. This report had limited information on the specific MRS spectra associated with the different tumor types. Additional study is needed to define better the spectra associated with tumor characteristics, to evaluate the diagnostic accuracy, and to determine the effect on health outcomes. The evidence is insufficient to determine the effects of the technology on health outcomes.

For individuals who have breast cancer, prostate cancer, dementia, liver disease, or multiple sclerosis who receive MRS, the evidence includes prospective studies on diagnostic accuracy and systematic

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reviews. Relevant outcomes are test accuracy, change in disease status, morbid events, and functional outcomes. A number of studies have examined the use of MRS for localizing prostate cancer for biopsy and for monitoring of patients with prostate cancer. However, the cumulative evidence remains uncertain. Data comparing the diagnostic accuracy of MRS with alternative imaging strategies is limited. A systematic review of MRS to identify dementia concluded that to characterize Alzheimer disease–associated neurochemical changes effectively, future approaches need to analyze interactively multiple quantifiable metabolites from different brain regions. A study of MRS as a noninvasive alternative to liver biopsy indicates that dual-gradient echo magnetic resonance imaging outperforms MRS. Data on use of MRS in multiple sclerosis has indicated that the measure is not sufficiently reliable to predict the future disease course. The evidence is insufficient to determine the effects of the technology on health outcomes.

SUPPLEMENTAL INFORMATION

Practice Guidelines and Position Statements

National Comprehensive Cancer Network
The National Comprehensive Cancer Network’s clinical guidelines on central nervous system cancers (v.1.2016) identifies magnetic resonance spectroscopy (MRS), along with magnetic resonance perfusion or brain amino acid positron emission tomography, as modalities that can be considered to rule out radiation necrosis, as compared with a recurrence of brain tumors. The guidelines also state that MRS may be helpful in grading tumors or assessing response and that the most abnormal area on MRS would be the best target for biopsy. The limitations include tumors near vessels, air spaces, or bone; the extra time required in a magnetic resonance imaging machine; and the limitations occurring with any magnetic resonance imaging, such as the exclusion of patients with implantable devices.

American Association of Neurological Surgeons et al
In 2015, the American Association of Neurological Surgeons and Congress of Neurological Surgeons gave a level III recommendation (level C) for the addition of MRS to anatomic imaging for the management of diffuse low-grade glioma, because the diagnostic accuracy is not well-defined and the role in clinical practice is still being defined.

Congress of Neurological Surgeons
In 2016, the Congress published an evidence-based guideline on preoperative imaging assessment of patients with suspected nonfunctioning pituitary adenomas. The Congress found that although the results were promising, there was insufficient evidence to recommend the use of MRS formally.

American College of Radiology et al
The American College of Radiology, American Society of Neuroradiology, and Society for Pediatric Radiology updated their joint practice parameters on MRS of the central nervous system in 2013. Most of the update addressed the actual performance of MRS, but it also listed 22 possible indications for MRS when magnetic resonance imaging or computed tomography is inadequate for answering specific clinical questions.

American College of Radiology appropriateness criteria for prostate cancer, last reviewed in 2016, stated that MRS cannot yet be considered to provide significant advantages in local staging before treatment.

American College of Radiology appropriateness criteria for imaging for dementia and movement disorders (updated in 2015) considered MRS to be usually inappropriate.
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U.S. Preventive Services Task Force Recommendations

Not applicable.

Medicare National Coverage

There is no national coverage determination (NCD). In the absence of an NCD, coverage decisions are left to the discretion of local Medicare carriers.

REFERENCES

5. Blue Cross and Blue Shield Association Technology Evaluation Center (TEC). Magnetic resonance spectroscopy for evaluation of suspected brain tumor. TEC Assessments. 2003;Volume 18(Tab 1). PMID
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**POLICY HISTORY**

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<thead>
<tr>
<th>Date</th>
<th>Action</th>
<th>Description</th>
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<tbody>
<tr>
<td>June 2012</td>
<td>New Policy</td>
<td>Policy updated with literature search. References 13, 14, 31-33 and 40 added. No change to policy statement.</td>
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<tr>
<td>March 2014</td>
<td>Update Policy</td>
<td>Policy updated with literature review; references 31 and 36 added. Policy statement unchanged.</td>
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<tr>
<td>December 2017</td>
<td>Update Policy</td>
<td>Policy updated with literature review through July 21, 2017; references 1, 12, 36, and 41-42 added; notes 44-45 updated. Policy statement unchanged.</td>
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