INLAND EMPIRE HEALTH PLAN

IEHP UM Subcommittee Approved Authorization Guidelines
Magnetic Resonance Spectroscopy

Policy:

Based on the information reviewed, IEHP's UM Subcommittee consider Magnetic Resonance Spectroscopy (MRS) to be investigational and not medically necessary. Although MRS can accurately delineate the chemical composition of the tissue under study and is able to distinguish necrosis from tumor recurrence, it is not superior to any other advanced imaging in the diagnosis of brain tumors. No well-designed, multi-center, controlled clinical trials have demonstrated improved clinical outcomes nor a cost-benefit analysis in patients evaluated with MRS compared to other conventional imaging modalities.

CPT Code Not Covered:

- 76390

Centers for Medicare and Medical Services (2004):

In 2004, Centers for Medicare and Medical Services (CMS) reaffirmed its national non-coverage determination for all indications of MRS with CPT code 76390 after considering it an investigational procedure.

Medical:

Medical has designated MRS with CPT code 76390 as a non-benefit.

Medical Review Criteria Guidelines for Managing Care (Apollo):

MRS is not covered by Medicare and certain health plans due to an investigational status. Clinical validity and reliability as a diagnostic tool is not universally accepted. MRS does not meet TEC or Medicare medical necessity criteria.

American College of Radiology (ACR) considers MRS to be a "proven and useful method for the evaluation, assessment of severity, and follow up of diseases of the brain and other regions of the body. MRS should be performed only for a valid medical reason."

Potential indications for MRS per ACR are: brain tumors, infections, seizures, neurodegenerative diseases, injuries, demyelination disorders, developmental disorders, and metabolic disorders affecting the brain.

Agency for Healthcare Research and Quality (2003):

Tuft's-New England Medical Center Evidence-based Practice Center evaluated the use of MRS in brain tumors for the Agency for Healthcare Research and Quality (AHRQ) (Jordan, 2003). The conclusion stated that "human studies conducted on the use of MRS for brain tumors demonstrate that this non-invasive method is technically feasible and suggest potential benefits for some of the proposed indications. However, there is a paucity of high quality direct evidence demonstrating the impact on diagnostic thinking and therapeutic decision making… In summary, while there are a large number of studies that confirm MRS's technical feasibility, there are very few published studies to evaluate its diagnostic accuracy and whether it can positively affect diagnostic thinking and therapeutic choice. Those studies that do address these areas often have significant design flaws including inadequate sample size, retrospective design and other limitations that could bias the results." (Jordan, 2003)

Aetna Clinical Policy Bulletin Number 0202 (2012):

On April 2012, Aetna stated they consider MRS to be experimental and investigational because of the lack of evidence in the medical literature of its efficacy.

CIGNA Number 0244 (2011):

On November 2011, Cigna reported they deemed MRS as medically necessary for the following indications:

1. Distinguishing recurrent brain tumor from radiation necrosis following radiation treatment of a brain tumor.
2. Evaluation of a brain tumor in a child when additional information is needed to plan treatment.
3. Evaluation of a rare inherited disorder affecting the central nervous system (e.g., mitochondrial encephalopathies [Leigh's disease; mitochondrial myopathy, encephalopathy, lactic acidosis, and stroke (MELAS) syndrome], lysosomal storage disease [Neimann-Pick disease, mucopolysaccharidoses], aminoacidopathies [phenylketonuria, methylmalonic acidemia], galactosemia, cerebral creatine deficiency syndromes, and adrenoleukodystrophy).

Blue Shield California Medical Policy (2012):

MRS with CPT code 76390 is considered investigational for all indications.

Anthem Medical Policy Number RAD.00022:

MRS considered medically necessary when used to:

- Differentiate recurrent or residual brain tumor from post-therapy changes.
- Differentiate brain tumor from other non-tumor diagnoses.

MRS considered investigational and not medically necessary when used to:

- Cerebrovascular injury
- Degenerative diseases
- Dementia
- Epilepsy
- Metabolic and mitochondrial diseases
- Multiple sclerosis- diagnosis and monitoring
- Parkinson's disease

Summary of relevant literature review:

Reference	Purpose	Sample size	Findings	Conclusion
Alam et al., 2011	Describe the spectrum of MRS in focal brain lesions and determine diagnostic accuracy using histopathology as gold standard in differentiating neoplastic and non-neoplastic lesions.	53 subjects with focal brain lesions on MRI.	MRS has sensitivity of 93%, specificity of 70%, PPV of 93%, NPV of 70%, diagnostic accuracy of 89%, and kappa statistic between MRS and MRI of 0.630 (p-value, <0.001)	MRS has a high sensitivity and low specificity making it inadequate as a definitive diagnostic tool. This modality should only be used as an adjunct to conventional imaging and not as a replacement for histopathological evaluation.
Senft et al. 2009	Compare normalized mean and maximum levels of Cho in noninvasive grading of gliomas	63 subjects with suspected WHO grade II or III gliomas. (grade 1 excluded since Cho levels are inconsistent)	ROC curve analysis rendered optimum cutoff value of 2.02 with sensitivity 86% and specificity 77.8%	Cho max influences therapeutic decision making but cannot replace biopsy.
Prat et al., 2009	Retrospective analysis: Identify which advanced imaging is better at distinguishing recurrence from necrosis and identifying tumor upgrading.	26 subjects with histologically proven cerebral glioma.	Predicting presence of high grade gliomas: -PPV: MRP=100%, MRS=91.6%, FDG-PET= 75%, MRI=50% -NPV: MRP=100%, MRS=100%, FDG-PET= 61% Differentiate between glioma and necrosis: -PPV: MRP and MRS=100%, FDG-PET= 66% -NPV: MRP and MRS=100%, FDG-PET= 60%	MRS and MRP are superior to FDG-PET in discriminating recurrence from necrosis. MRI gives a high false positive rate.
Marcus et al, 2006	Increase ability to predict survival by combining info from biological metabolites by MRS.	76 children with brain tumors (WHO I-IV)	Choline +1 Lipid/Lactate was the only independent predictor of survival, better than histopathology.	MRS measurement of biomarkers (cho+L), enhances ability to predict survival in children.

Note: Cho= Choline, WHO= World Health Organization, L= lipid, PPV= positive predictive value, MRP= magnetic resonance perfusion, MRS= magnetic resonance spectroscopy, FDG-PET= 2-(^{18}F) fluoro-2-deoxy-D-glucose positron emission tomography, MRI= magnetic resonance imaging, NPV= negative predictive value

Background:

Magnetic Resonance Spectroscopy is a non-invasive diagnostic test that uses magnetic fields to detect the chemical composition of the tissue under study. MRS measures low molecular weight chemicals within the tissue and provides direct in vivo biochemical information. The primary difference between an MRS and a magnetic resonance imaging (MRI) is that an MRI identifies the anatomic location of a lesion and an MRS compares the chemical composition of a normal tissue with an abnormal tumor tissue.

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Revised:

Bibliography:

1. CMS National Coverage Determination for Magnetic Resonance Spectroscopy (220.2.1). Revised 09/10/2004. Accessed on 05/09/2012 at http://www.cms.gov/medicare-coverage-
2. database/details/ncddetails.aspx?NCDId=287&ncdver=1&NCAId=52&NcaName=Magnetic+Resonance+Spectroscopy+for+Brain+Tumors&IsPopup=y&bc=AAAAAAAAIAAA&
3. Apollo Medical Review Guidelines for Magnetic Resonance Spectroscopy (Pg 910; Eleventh Edition, 2012)
4. Jordan H, Bert R, Chew P, et al. Agency for Healthcare Research and Quality (AHRQ). Magnetic Resonance Spectroscopy for Brain Tumors Technology Assessment. Tufts-New England Medical Center. June 2003. No. 290-02-0022. Rockville, MD. Available at: http://www.cms.hhs.gov/determinationprocess/downloads/id17TA.pdf Accessed on May 21, 2012.
5. Aetna Policy Bulletin: Magnetic Resonance Spectroscopy. Number 0202. Reviewed last 04/18/2012. Accessed on 05/07/2012 at http://www.aetna.com/cpb/medical/data/200_299/0202.html
6. Cigna Medical Coverage Policy. Magnetic Resonance Spectroscopy. Number 0244. Reviewed last 11/15/2010. Accessed on 05/09/2012 at http://www.cigna.com/customer_care/healthcare_professional/coverage_positions/medical/mm_0244_coveragepositioncriteria_magnetic_resonance_spectroscopy.pdf
7. Blue Shield California Medical Policy. Magnetic Resonance Spectroscopy. Last reviewed 10/01/10. Accessed on 06/04/2012 at https://www.bcbsde.com/ProviderPolicies/public_site/6.01.34_Magnetic_Resonance_Spectroscopy.htm
8. Anthem Medical Policy Statement RAD.00022. Magnetic Resonance Spectroscopy. Reviewed last 05/19/2011. Accessed on 05/14/2012 at: http://www.radmd.com/assets/Clinical%20Guidelines//Health%20Plan%20Specific%20Exceptions/Brain%20MRS%20-%20BSC%202012.pdf
9. Alam MS, Sajjad Z, Hafeez, S, Akhter W. Magnetic Resonance Spectroscopy in Focal Brain Lesions. J Pak Med Assoc. 2011; 61:540-543.
10. Senft C, Hattingen E, Pilatus U, Franz K, Schanzer A, Lanfermann H, Seifert V, Gasser T. Diagnostic Value of Proton Magnetic Resonance Spectroscopy in the Noninvasive Grading of Solid Gliomas: Comparison of Maximum and Mean Choline Values. Neurosurgery. 2009;65:908-913.
11. Prat R, Galeano I, Lucas A, Martinez JC, Martin M, Amador R, Reynes G. Relative Value of Magnetic Resonance Spectroscopy, Magnetic Resonance Perfusion, and 2-(^{18}F) fluoro-2-deoxy-D-glucose positron emission tomography for detection of recurrence or grade increase in gliomas. Journal of Clinical Neuroscience. 2010; 17:50-53.

12. Marcus KJ, Astrakas LG, Zurakowski D, Zarifi MK, Mintzopoulos D, Poussaint TY, Anthony DC, Girolami U, Black PM, Tarbell NJ, Tzika AA. Predicting Survival of Children with CNS Tumors Using Proton Magnetic Resonance Spectroscopic Imaging Biomarkers. International Journal of Oncology. 2007; 30: 651-657.