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Subject: Magnetoencephalography/Magnetic Source Imaging

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DESCRIPTION:

Magnetoencephalography (MEG) is a noninvasive functional imaging technique in which the weak magnetic forces associated with the electrical activity of the brain are recorded externally. The recorded data are analyzed to provide an estimated location of the electrical activity. This information can be superimposed on an anatomic image of the brain, typically a magnetic resonance imaging (MRI) scan, to produce a functional/anatomic image of the brain, referred to as magnetic source imaging (MSI). This technique has been studied for identifying "eloquent" areas of the brain for neurosurgical planning and for use in localization of epileptic foci.

Using mathematical modeling, the recorded data from MEG are analyzed to provide an estimated location of the electrical activity. This information can be superimposed on an anatomic image of the brain, typically a magnetic resonance imaging (MRI) scan, to produce a functional/anatomic image of the brain, referred to as magnetic source imaging or MSI. The primary advantage of MSI is that while the conductivity and thus the measurement of electrical activity as recorded by the electroencephalogram (EEG) is altered by surrounding brain structures, the magnetic fields are not. Therefore, MSI permits a high-resolution image.

One clinical application of MEG is localization of the pre- and postcentral gyri as a guide to surgical planning in patients scheduled to undergo neurosurgery for epilepsy, brain neoplasms, arteriovenous malformations, or other brain disorders. These gyri contain the "eloquent" sensorimotor areas of the brain, the preservation of which is considered critical during any type of brain surgery. In normal situations, these areas can be identified anatomically by MRI, but frequently the anatomy is distorted by

underlying disease processes. In addition, the location of the eloquent functions is variable, even among healthy patients. Therefore, localization of the eloquent cortex often requires such intraoperative invasive functional techniques as cortical stimulation with the patient under local anesthesia or somatosensory-evoked responses on electrocorticography (ECoG). While these techniques can be done at the same time as the planned resection, they are cumbersome and can add up to 45 minutes of anesthesia time. Furthermore, sometimes these techniques can be limited by the small surgical field. A preoperative test, which is often used to localize the eloquent hemisphere, is the Wada test. MEG/MSI has been proposed as a substitute for the Wada test.

Another related clinical application of MEG is localization of epileptic foci, particularly for screening of surgical candidates and surgical planning. Alternative techniques include MRI, positron emission tomography (PET), or single photon emission computed tomography (SPECT) scanning. Anatomic imaging (i.e., MRI) is effective when epilepsy is associated with a mass lesion, such as a tumor, vascular malformation, or hippocampal atrophy. If an anatomic abnormality is not detected, patients may undergo a PET scan. In a small subset of patients, extended ECoG or stereotactic electroencephalography EEG (SEEG) with implanted electrodes is considered the gold standard for localizing epileptogenic foci. MEG/MSI has principally been investigated as a supplement to or an alternative to invasive monitoring.

POSITION STATEMENT:

Magnetoencephalography/magnetic source imaging **meets the definition of medical necessity** for the purpose of determining the laterality of language function, as a substitute for the Wada test, in members undergoing diagnostic workup for evaluation of surgery for epilepsy, brain tumors, and other indications requiring brain resection.

Magnetoencephalography/magnetic source imaging as part of the preoperative evaluation of members with drug-resistant epilepsy **meets the definition of medically necessary** when standard techniques, such as magnetic resonance imaging (MRI) and electroencephalography (EEG), do not provide satisfactory localization of epileptic lesion(s).

Magnetoencephalography/magnetic source imaging is considered **experimental or investigational** for all other indications. The evidence is insufficient to determine magnetoencephalography/magnetic source imaging on health outcomes.

BILLING/CODING INFORMATION:

CPT Coding:

95965	Magnetoencephalography (MEG), recording and analysis; for spontaneous brain magnetic activity (e.g. Epileptic cerebral cortex localization)
95966	Magnetoencephalography (MEG), recording and analysis; for evoked magnetic fields, single modality (e.g., sensory, motor, language, or visual cortex localization)

95967	Magnetoencephalography (MEG), recording and analysis; for evoked magnetic fields, each additional modality (e.g., sensory, motor, language, or visual cortex localization) (List separately in addition to code for primary procedure)
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HCPCS Coding:

S8035	Magnetic source imaging
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REIMBURSEMENT INFORMATION:

Refer to section entitled [POSITION STATEMENT](#).

PROGRAM EXCEPTIONS:

Federal Employee Program (FEP): Follow FEP guidelines.

State Account Organization (SAO): Follow SAO guidelines.

Medicare Advantage products:

No National Coverage Determination (NCD) and/or Local Coverage Determination (LCD) were found at the time of the last guideline reviewed date.

DEFINITIONS:

No guideline specific definitions apply.

RELATED GUIDELINES:

None applicable.

OTHER:

None applicable.

REFERENCES:

1. Albert GW, Ibrahim GM, Otsubo H et al. Magnetoencephalography-guided resection of epileptogenic foci in children. *Journal of Neurosurgery Pediatrics*. 2014 Nov;14(5):532-537.
2. American Academy of Neurology Magnetoencephalography (MEG) Policy, 05/08/09.
3. Blue Cross Blue Shield Association Tec Special Report: MEG and MSI for the Purpose of Presurgical Localization of Epileptic Lesions-A Challenge for Technology Evaluation, Volume 23, No. 8 January 2008.
4. Blue Cross Blue Shield Association Technology Evaluation Center (TEC): "MEG and MSI: Presurgical Localization of Epileptic Lesions and Presurgical Function Mapping. TEC Assessments, Volume 18, No. 6, 2003.
5. Blue Cross Blue Shield Magnetoencephalography/Magnetic Source Imaging Medical Policy 6.01.21, 09/17.

6. Bouet R, Jung J, Delpuech C et al. Toward source volume estimation of interictal spikes in focal epilepsy using magnetoencephalography. *Neuroimage* 2011.
7. Knowlton RC, Razdan SN, Limdi N et al. Effect of epilepsy magnetic source imaging on intracranial electrode placement. *Annals of Neurology* 2009; 65(6):716-723.
8. Knowlton RC, Elgavish RA, Bartolucci A, Ojha B, Limdi N, Blount J, Burneo JG, Ver Hoef L, Paige L, Faught E, Kankirawatana P, Riley K, Kuzniecky R. Functional imaging: II. Prediction of epilepsy surgery outcome. *Ann Neurol.* 2008 Jul; 64(1): 35-41.
9. Knowlton RC, Elgavish RA, Limdi N, Bartolucci A, Ojha B, Blount J, Burneo JG, Ver Hoef L, Paige L, Faught E, Kankirawatana P, Riley K, Kuzniecky R. Functional imaging: I. Relative predictive value of intracranial electroencephalography. *Ann Neurol.* 2008 Jul; 64(1): 25-34.
10. Schneider F, Irene Wang Z, Alexopoulos AV et al. Magnetic source imaging and ictal SPECT in MRI-negative neocortical epilepsies: additional value and comparison with intracranial EEG. *Epilepsia.* 2013 Feb;54(2):359-369.
11. Simos PG, Fletcher JM, Sarkari S et al. Altering the brain circuits for reading through intervention: a magnetic source imaging study. *Neuropsychology* 2007; 21(4): 485-496.
12. Sutherling WW, Mamelak AN, Thyerlei D et al. Influence of magnetic source imaging for planning intracranial EEG in epilepsy. *Neurology* 2008; 71(13): 990-996.
13. Tarapore PE, Tate MC, Findlay AM et al. Preoperative multimodal motor mapping: a comparison of magnetoencephalography imaging, navigated transcranial magnetic stimulation, and direct cortical stimulation. *Journal of Neurosurgery.* 2012 Aug;117(2):354-362.
14. Vates GE, Lawton MT, Wilson CB et al. Magnetic source imaging demonstrates altered cortical distribution of function in patients with arteriovenous malformations. *Neurosurgery* 2002; 51(3): 614-623; discussion 623-627.
15. Verrotti A, Pizzella V, Trotta D et al. Magnetoencephalography in pediatric neurology and in epileptic syndromes. *Pediatric Neurology* 2003 Apr; 28(4): 253-261.
16. Widjaja E, Shamma A, Vali R et al. FDG-PET and magnetoencephalography in presurgical work up of children with localization-related nonlesional epilepsy. *Epilepsia.* 2013 Apr;54(4):691-699.

COMMITTEE APPROVAL:

This Medical Coverage Guideline (MCG) was approved by the Florida Blue Medical Policy & Coverage Committee on 07/26/18.

GUIDELINE UPDATE INFORMATION:

09/01/01	Medical Coverage Guideline Reformatted.
01/01/02	HCPCS update with coding changes.
03/15/02	Revision of guideline added Program Exception for Medicare and More.
04/15/03	Review of guideline; no change in coverage statement.
04/15/04	Review and revision of guideline; consisting of updated references and no change in investigational statement.

04/15/05	Review and revision of guideline consisting of updated references.
04/15/06	Review and revision of guideline consisting of updated references.
04/15/07	Review and revision of guideline consisting of updated references.
06/15/07	Reformatted guideline.
03/15/08	Review and revision of guideline consisting of updated references.
03/15/09	Review and revision of guideline consisting of updated references.
03/15/10	Scheduled review. No change in position statement (experimental or investigational). Updated description and references. Deleted related Internet links.
12/15/11	Updated description and position statement; add medical necessity statement for intractable epilepsy. Revised experimental or investigational position statement. Updated references.
05/11/14	Revision: Program Exceptions section updated.
08/15/18	Review; revised position statement. Updated references.