

Corporate Medical Policy

Magnetoencephalography/Magnetic Source Imaging

File Name: magnetoencephalography_magnetic_source_imaging
Origination: 3/2002
Last CAP Review: 5/2020
Next CAP Review: 5/2021
Last Review: 5/2020

Description of Procedure or Service

Magnetoencephalography (MEG) is a noninvasive functional imaging technique that records weak magnetic forces. When this information is superimposed on an anatomic image of the brain, typically a magnetic resonance imaging (MRI) scan the image is referred to as magnetic source imaging (MSI). MSI has been used to localize epileptic foci and to identify "eloquent" areas of the brain for neurosurgical planning. The primary advantage of MSI is that, while conductivity and thus measurement of electrical activity as recorded by electroencephalogram is altered by the surrounding brain structures, magnetic fields are not. Therefore, MSI permits a high-resolution image.

Detection of weak magnetic fields requires gradiometer detection coils coupled to a superconducting quantum interference device, which requires a specialized room shielded from other magnetic sources. Mathematical modeling programs based on idealized assumptions are then used to translate detected signals into functional images. In its early evolution, clinical applications were limited by the use of only 1 detection coil requiring lengthy imaging times, which, because of body movement, also were difficult to match with the MRI. However, more recently, the technique has evolved to multiple detection coils in an array that can provide data more efficiently over a wide extracranial region.

One clinical application 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. 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. 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 is localization of epileptic foci, particularly for screening of surgical candidates and surgical planning. In a small subset of patients, extended electrocorticography or stereotactic electroencephalography 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.

*****Note: This Medical Policy is complex and technical. For questions concerning the technical language and/or specific clinical indications for its use, please consult your physician.**

Policy

Magnetoencephalography/Magnetic Source Imaging

BCBSNC will provide coverage for Magnetoencephalography/Magnetic Source Imaging when it is determined to be medically necessary because the medical criteria and guidelines shown below have been met.

Benefits Application

This medical policy relates only to the services or supplies described herein. Please refer to the Member's Benefit Booklet for availability of benefits. Member's benefits may vary according to benefit design; therefore member benefit language should be reviewed before applying the terms of this medical policy.

When Magnetoencephalography/Magnetic Source Imaging is covered

Magnetoencephalography/magnetic source imaging as part of the preoperative evaluation of patients with drug-resistant epilepsy may be considered **medically necessary** when standard techniques, such as magnetic resonance imaging and electroencephalogram, do not provide satisfactory localization of epileptic lesion(s).

Magnetoencephalography/magnetic source imaging for the purpose of determining the laterality of language function, as a substitute for the Wada test, in patients being prepared for surgery for epilepsy, brain tumors, and other indications requiring brain resection, may be considered **medically necessary**.

When Magnetoencephalography/Magnetic Source Imaging is not covered

Magnetoencephalography and magnetic source imaging are considered investigational for all other indications. BCBSA does not provide coverage for investigational services or procedures.

Policy Guidelines

For individuals who have drug-resistant epilepsy and are being evaluated for possible resective surgery who receive MEG/MSI, the evidence for MEG/MSI as an adjunct to standard clinical workup includes various types of case series. Relevant outcomes are test accuracy and functional outcomes. Published evidence on MEG is suboptimal, with no clinical trials demonstrating clinical utility. Literature on diagnostic accuracy has methodologic limitations, primarily selection and ascertainment bias. Studies of functional outcomes do not fully account for the effects of MEG, because subjects who received MEG were not fully accounted for in the studies. The evidence is insufficient to determine the effects of the technology on health outcomes.

For individuals who have brain lesions and a planned brain resection who receive MEG/MSI, the evidence for MEG/MSI for localization of eloquent function areas includes comparative studies. Relevant outcomes include test accuracy and functional outcomes. Available studies have reported that this test has high concordance with the Wada test, which is currently the main alternative to localize eloquent functions. Management is changed in some patients based on MEG testing, but it has not been demonstrated that these changes lead to improved outcomes. The evidence is insufficient to determine the effects of the technology on health outcomes.

Billing/Coding/Physician Documentation Information

This policy may apply to the following codes. Inclusion of a code in this section does not guarantee that it will be reimbursed. For further information on reimbursement guidelines, please see Administrative Policies on the Blue Cross Blue Shield of North Carolina web site at www.bcbsnc.com. They are listed in the Category Search on the Medical Policy search page.

Applicable service codes: 95965, 95966, 95967, S8035

Magnetoencephalography/Magnetic Source Imaging

BCBSNC may request medical records for determination of medical necessity. When medical records are requested, letters of support and/or explanation are often useful, but are not sufficient documentation unless all specific information needed to make a medical necessity determination is included.

Medical Term Definitions

Wada Test

Unilateral internal carotid injection of amobarbital to determine the laterality of speech; injection on the dominant side causes transient aphasia or mutism; used prior to surgical treatment of epilepsy

Scientific Background and Reference Sources

BCBSA Medical Policy Reference Manual, 2/15/2002; 6.01.21.

Specialty Matched Consultant Advisory Panel - 8/2002

BCBSA Medical Policy Reference Manual [Electronic Version]. 6.01.21, 7/17/03

BCBSA TEC Assessment [Electronic Version]. August 2003.

Specialty Matched Consultant Advisory Panel - 7/2004

BCBSA Medical Policy Reference Manual [Electronic Version]. 6.01.21, 8/17/05

Baumgartner C & Patariaia E (2006). Revisiting the role of magnetoencephalography in epilepsy. *Current Opinion in Neurology*, 19:181-186.

Knowlton RC, Elgavish R, Howell J, Blount J, Burneo JG, Faught E, et al. (May 2006). Magnetic source imaging versus intracranial electroencephalogram in epilepsy surgery: a prospective study. *Annals of Neurology*, 59:835-842.

Papanicolaou AC, Patariaia E, Billingsley-Marshall R, Castillo EM, Wheless JW, Swank P, et al. (August 2005). Toward the substitution of invasive electroencephalography in epilepsy surgery. *Journal of Clinical Neurophysiology*. 22:231-237.

Ontario Ministry of Health, Medical Advisory Secretariat (MAS). Ontario Health Technology Advisory Committee (OHTAC). Recommendation Functional Brain Imaging. Toronto, ON: MAS; January 25, 2007. Retrieved 2/19/08 from

http://www.health.gov.on.ca/english/providers/program/ohtac/tech/reviews/pdf/rev_fbi_012507.pdf

BCBSA Medical Policy Reference Manual [Electronic Version]. 6.01.21, 12/12/06

BCBSA 2008 TEC Special Report. Magnetoencephalography and Magnetic Source Imaging for the Purpose of Presurgical Localization of Epileptic Lesions-A Challenge for Technology Evaluation.

BCBSA Medical Policy Reference Manual [Electronic Version]. 6.01.21, 12/11/08

BCBSA Medical Policy Reference Manual [Electronic Version]. 6.01.21, 12/10/09

BCBSA Medical Policy Reference Manual [Electronic Version]. 6.01.21, 01/13./11

BCBSA Medical Policy Reference Manual [Electronic Version]. 6.01.21, 5/12/11

Specialty Matched Consultant Advisory Panel 6/2012

BCBSA Medical Policy Reference Manual [Electronic Version]. 6.01.21, 9/13/12

Specialty Matched Consultant Advisory Panel 7/2013

BCBSA Medical Policy Reference Manual [Electronic Version]. 6.01.21, 10/10/13

Specialty Matched Consultant Advisory Panel 7/2014

BCBSA Medical Policy Reference Manual [Electronic Version]. 6.01.21, 10/9/14

Magnetoencephalography/Magnetic Source Imaging

Specialty Matched Consultant Advisory Panel- 6/2015

BCBSA Medical Policy Reference Manual [Electronic Version]. 6.01.21, 12/10/15

BCBSA Medical Policy Reference Manual [Electronic Version]. 6.01.21, 9/14/2017

BCBSA Medical Policy Reference Manual [Electronic Version]. 6.01.21, 9/13/2018

BCBSA Medical Policy Reference Manual [Electronic Version]. 6.01.21, 9/12/2019

Specialty Matched Consultant Advisory Panel 5/2020

Bagic A, Funke ME, Ebersole J. American Clinical MEG Society (ACMEGS) position statement: the value of magnetoencephalography (MEG)/magnetic source imaging (MSI) in noninvasive presurgical evaluation of patients with medically intractable localization-related epilepsy. *J Clin Neurophysiol.* Aug 2009;26(4):290-293. PMID 19602984

Bagic AI, Knowlton RC, Rose DF, et al. American Clinical Magnetoencephalography Society Clinical Practice Guideline 1: recording and analysis of spontaneous cerebral activity. *J Clin Neurophysiol.* Aug 2011;28(4):348- 354. PMID 21811121

Burgess RC, Funke ME, Bowyer SM, et al. American Clinical Magnetoencephalography Society Clinical Practice Guideline 2: presurgical functional brain mapping using magnetic evoked fields. *J Clin Neurophysiol.* Aug 2011;28(4):355-361. PMID 21811122

Policy Implementation/Update Information

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| 3/02 | Original policy issued. |
| 9/02 | Specialty Matched Consultant Advisory Panel - 8/2002 |
| 1/03 | Code S8035 added to Billing/Coding section. System coding changes. |
| 5/04 | Benefits Application and Billing/Coding sections updated for consistency. |
| 8/26/04 | Specialty Matched Consultant Advisory Panel review 7/15/2004 with no changes to policy criteria. References added. |
| 6/5/06 | Rationale added to Policy Guidelines to support Investigational status. Policy number added to Key Words. References updated. Specialty Matched Consultant Advisory Panel 5/3/2006 with no changes to policy coverage criteria. |
| 6/16/08 | References updated. Specialty Matched Consultant Advisory Panel review 5/15/08. No change in policy statement. (adn) |
| 3/30/09 | Description of procedure expanded for clarity. Policy statement changed: magnetoencephalography/Magnetic Source Imaging is covered when the medical necessity criteria are met. Statement in the When MEG/MSI is Covered section changed to read, "Magnetoencephalography may be considered medically necessary for the purpose of determining the laterality of language function, as a substitute for the Wada test, in patients undergoing diagnostic workup for evaluation of surgery for epilepsy, brain tumors, and other indications requiring brain resection." Statement in the When MEG/MSI is Not Covered revised to read, "MEG and MSI are considered investigational for all other indications, including localization of seizure focus for patients undergoing evaluation for surgical treatment of intractable seizures." References updated. (adn) |
| 6/22/10 | Policy Number(s) removed (amw) |
| 9/28/10 | Statement in the When MEG/MSI is Covered section reworded for clarity: Magnetoencephalography may be considered medically necessary for the purpose of determining to determine the laterality of language function, as a substitute for the Wada test, in patients undergoing diagnostic workup for evaluation of surgery for epilepsy and for localization of eloquent and sensorimotor areas prior to surgery for epilepsy, brain |

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- tumors, and other indications requiring brain resection. Specialty Matched Consultant Advisory Panel review 8/25/10. Draft accepted as written. (adn)
- 7/19/11 Specialty Matched Consultant Advisory Panel review 6/29/11. Policy accepted as written. (adn)
- 8/30/11 Description section revised. The statement in the When MEG/MSI Is Covered section was revised to read: Magnetoencephalography/magnetic source imaging may be considered medically necessary as a substitute for the Wada test for the purpose of determining the laterality of language function in patients being prepared for surgery for epilepsy, brain tumors, and other indications requiring brain resection. Magnetoencephalography/magnetic source imaging as part of the preoperative evaluation of patients with intractable epilepsy (seizures refractory to medical therapy) may be considered medically necessary when standard techniques, such as MRI and EEG do not provide satisfactory localization of the epileptic lesions(s). The statement in the When MEG/MSI Is Not Covered section was revised to read: Magnetoencephalography and magnetic source imaging are considered investigational for all other indications. BCBSA does not provide coverage for investigational services or procedures. Coverage rationale in the Policy Guidelines section updated. (adn)
- 7/10/12 Specialty Matched Consultant Advisory Panel review 6/20/12. (sk)
- 11/13/12 Reference added. No change to Policy guideline. (sk)
- 7/30/13 Specialty Matched Consultant Advisory Panel review 7/17/13. No change to Policy statement. (sk)
- 11/26/13 Reference added. No change to Policy statement. (sk)
- 8/12/14 Specialty Matched Consultant Advisory Panel review 7/29/14. No change to Policy statement. (sk)
- 11/11/14 Reference added. No change to policy statement. (lpr)
- 7/28/15 Specialty Matched Consultant Advisory Panel review 6/24/2015. No change to policy statement. (lpr)
- 2/29/16 Updated Description and Policy Guidelines sections. Reference added. No change to policy statement. (lpr)
- 7/26/16 Specialty Matched Consultant Advisory Panel review 6/29/2016. No change to policy statement. (an)
- 6/30/17 Specialty Matched Consultant Advisory Panel review 5/26/2017. No change to policy statement. (an)
- 11/10/17 In the coverage statement, the word “intractable” deleted and replace with “drug-resistant” epilepsy. Policy Guidelines updated. Reference added. (an)
- 6/29/18 Specialty Matched Consultant Advisory Panel review 5/23/2018. No change to policy statement. (an)
- 6/11/19 Updated Description section. Revised wording in Covered/Not Covered section, but intent of policy is unchanged. Reference added. Specialty Matched Consultant Advisory Panel review 5/15/2019. (an)
- 6/9/20 References added. Specialty Matched Consultant Advisory Panel review 5/20/2020. No change to policy statement. (eel)

Medical policy is not an authorization, certification, explanation of benefits or a contract. Benefits and eligibility are determined before medical guidelines and payment guidelines are applied. Benefits are determined by the group contract and subscriber certificate that is in effect at the time services are rendered. This document is solely provided for informational

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purposes only and is based on research of current medical literature and review of common medical practices in the treatment and diagnosis of disease. Medical practices and knowledge are constantly changing and BCBSNC reserves the right to review and revise its medical policies periodically.