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2024 Magnetic Resonance (MR) Spectroscopy

Diagnostic Imaging

MRI-Spectroscopy-HH

Last Review Date: 10/28/2024
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Magnetic Resonance (MR) Spectroscopy

NCD 220.2
See also, **NCD 220.2**: Magnetic Resonance Imaging at https://www.cms.gov/medicare-coverage-database/search.aspx *if applicable to individual's healthplan membership*.

MRI General Contraindications

MRI may be contraindicated for **ANY** of the following:

- Safety, related to clinical status (body mass index exceeds MRI capability, intravascular stents within recent 6 weeks)
- Safety, related to implanted devices (aneurysm clips, cochlear implant, insulin pump, spinal cord stimulator)[1]

References: [8] [2] [4]

Preamble: Pediatric Diagnostic Imaging

HealthHelp's clinical guidelines for the Diagnostic Imaging program, are intended to apply to both adults and pediatrics (21 years of age or younger), unless otherwise specified within the criteria.

MR Spectroscopy Guideline

Magnetic resonance spectroscopy (MRS) of the brain is considered medically appropriate when the documentation demonstrates **ANY** of the following:

1. Brain tumors are known and **ANY** of the following:
    a. Biopsy localization guidance
    b. Brain tumor is recurrent, to distinguish from radiation-induced tumor necrosis.
    c. Gliomas, to differentiate from **ANY** of the following:
        i. Demyelination
        ii. Edema

[1]Some implanted devices that were once absolute contraindications to a MRI may now be accepted, including if the specific MRI is able to accommodate the device or the device itself is deemed safe for MRI.

iii. Infection
iv. Low grade from high grade
v. Lymphoma
vi. Metastasis
vii. Necrosis

d. Treatment planning and response

References: [13] [9] [3]

2. Epilepsy for pre-surgical evaluation
Reference: [9]

3. Encephalopathy (eg, hepatic, hypoxic ischemic encephalopathy [HIE], metabolic, toxic), for prognosis evaluation
References: [7] [15]

4. Magnetic resonance imaging (MRI) is non-diagnostic or indeterminate, and therapy evaluation/planning is needed with **ANY** of the following conditions:

A. Alexander disease (ALX, AXD) (eg, ALX, AXD, demyelinogenic leukodystrophy)
B. Globoid cell leukodystrophy (Krabbe disease)
C. Hypomyelination and congenital cataract
D. Megalencephalic leukoencephalopathy with subcortical cysts
E. Metachromatic leukodystrophy (MCL)
F. Mitochondrial disorders (eg, mitochondrial myopathy, encephalopathy, lactic acidosis, stroke-like episode [MELAS], Leigh's syndrome, Kearns-Sayre syndrome)
G. Pelizaeus-Merzbacher disease (PMD)
H. Vanishing White Matter disease (VWM) (eg, leukoencephalopathy with vanishing white matter [VWM], childhood ataxia with CNS hypomyelination [CACH syndrome], CACH/VWM)
I. X-linked adrenoleukodystrophy (X-ALD), (eg, X-ALD, cerebro adrenoleukodystrophy [CALD])

References: [1] [10]

5. Metabolic disorders (eg, Canavan disease, creatine deficiency, Maple Syrup Urine disease, nonketotic hyperglycemia) for diagnosing and monitoring
References: [9] [5]

6. Mitochondrial disorder

Reference: [9]

7. Multiple sclerosis
   Reference: [9]
8. Traumatic brain injury
   References: [9] [6]

MR Spectroscopy Procedure Codes

Table 1. Magnetic Resonance Spectroscopy Associated Procedure Codes

CODE	DESCRIPTION
76390	Magnetic resonance spectroscopy

MR Spectroscopy Summary of Changes

MR Spectroscopy guideline had the following version changes from 2023 to 2024:

- Added the following to keep in line with current research:
  - "Ataxia in a child" indication
  - "Epilepsy" indication
  - Indications under "Brain tumors"
  - "Mitochondrial disorders" indication
  - "Multiple Sclerosis" indication
  - "Traumatic brain injury" indication
- Citations updated per the evidence.
- Mid-cycle update: added Pediatric Preamble and pediatric indications

MR Spectroscopy Definitions

Alexander disease is one of a group of neurological conditions known as the leukodystrophies. Leukodystrophies are disorders that result from abnormalities in myelin, the "white matter" that protects nerve fibers in the brain.
Ataxia is a degenerative disease of the nervous system that causes people to have difficulty coordinating their muscles. This can lead to clumsy, unwieldy, or awkward movements. People with ataxia may also lose muscle control in their arms and legs, which can lead to a lack of balance.

Canavan disease is a neurological disorder in which the brain degenerates into spongy tissue full of small fluid-filled spaces. It is caused by a mutation in the ASPA gene which makes an enzyme called aspartoacylase.

Demyelination is any condition that causes damage to the protective covering (myelin sheath) that surrounds nerve fibers.

Edema an abnormal infiltration and excess accumulation of serous fluid in connective tissue or in a serous cavity.

Epilepsy is a brain disorder that causes repeated seizures. A seizure is a sudden change in behavior caused by a temporary change in the brain's electrical activity.

Encephalopathy is a disease, damage, or malfunction of the brain.

Glioma is a type of tumor that occurs in the brain and spinal cord.

Globoid Cell Leukodystrophy (Krabbe disease) is a rare, inherited metabolic disorder in which harmful amounts of lipids (fatty materials such as oils and waxes) build up in various cells and tissues in the body and destroy brain cells.

Indeterminate findings are inconclusive or insufficient for treatment planning.

Ischemia is a deficient supply of blood to a body part (such as the heart or brain) due to obstruction of the inflow of arterial blood.

Kearns-Sayre syndrome is a rare neuromuscular disorder with onset usually before the age of 20 years. It is the result of abnormalities in the DNA of mitochondria (small rod-like structures found in every cell of the body that produce the energy that drives cellular functions).

Krabbe disease is a rare, inherited metabolic disorder in which harmful amounts of lipids (fatty materials such as oils and waxes) build up in various cells and tissues in the body and destroy brain cells.

Leigh's syndrome is a rare, inherited, neurometabolic disorder that affects the central nervous system. It's characterized by the progressive loss of mental and movement abilities.

Leukodystrophy refers to genetic diseases that predominantly affect the white matter of the central nervous system.

Metastasis is the spread of a disease-producing agency (such as cancer cells) from the initial or primary site of disease to another part of the body.

Magnetic resonance imaging (MRI) is a non-invasive diagnostic technique that produces computerized images of internal body tissues and is based on nuclear magnetic resonance of atoms within the body induced by the application of radio waves.

Magnetic Resonance Spectroscopy (MRS) is an analytical tool that detects radio frequency electromagnetic signals that are produced by the atomic nuclei within molecules. It can be used to obtain in situ concentration measures for certain chemicals in complex samples, such as the living brain.

Maple Syrup Urine disease (MSUD) is a rare but serious inherited condition. It means the body cannot process certain amino acids (the "building blocks" of protein), causing a harmful build-up of substances in the blood and urine.

Megalencephalic leukoencephalopathy with subcortical cysts (MLC) is a condition that affects brain development and function. Individuals with this condition have an enlarged brain (megalencephaly) and an abnormality of the white matter in the brain (leukoencephalopathy).
Metachromatic leukodystrophy is a rare hereditary (genetic) disorder that causes fatty substances (lipids) to build up in cells, particularly in the brain, spinal cord and peripheral nerves. This buildup is caused by a deficiency of an enzyme that helps break down lipids called sulfatides.
Metastasis is the spread of a disease-producing agency (such as cancer cells) from the initial or primary site of disease to another part of the body.
Mitochondria are an organelle found in large numbers in most cells, in which the biochemical processes of respiration and energy production occur. It has a double membrane, the inner layer being folded inward to form layers (cristae)
Myopathy is a general term referring to any disease that affects the muscles that control voluntary movement in the body.
Multiple sclerosis (MS) is a demyelinating disease marked by patches of hardened tissue in the brain or the spinal cord and associated especially with partial or complete paralysis and jerking muscle tremor.
Necrosis is localized death of living tissue.
Non-diagnostic is a result that does not lead to a confirmed diagnosis.
Nonketotic hyperglycinemia is a disorder characterized by abnormally high levels of a molecule called glycine in the body (hyperglycinemia). The excess glycine builds up in tissues and organs, particularly the brain. Affected individuals have serious neurological problems.
Pediatric approximate ages are defined by the US Department of Health (USDH), the Food and Drug Administration (FDA), and the American Academy of Pediatrics (AAP) as the following:

- Infancy, between birth and 2 years of age
- Childhood, from 2 to 12 years of age
- Adolescence, from 12 to 21 years of age, further defined by the AAP into:
    1. Early (ages 11–14 years)
    2. Middle (ages 15–17 years),
    3. Late (ages 18–21 years)
    4. Older ages may be appropriate for children with special healthcare needs.

Pelizaeus-Merzbacher disease is a disorder that affects the brain and spinal cord. It is a type of leukodystrophy and is characterized by problems with coordination, motor skills, and learning. It is caused by an inability to form myelin due to genetic changes in the PLP1 gene.
Vanishing white matter (VWM) disease is an inherited condition caused by a faulty gene. Children with VWM disease have a defective protein that prevents the body from making enough myelin, a white, fatty substance that insulates nerve fibers, protecting them from damage.

X-linked adrenoleukodystrophy (X-ALD) is a genetic disease that affects the nervous system and the adrenal glands (small glands located on top of each kidney). People with this disease often have progressive loss of the fatty covering (myelin) that surrounds the nerves in the brain and spinal cord.

MR Spectroscopy References

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