NeurologyResidents.Net

NEURO-Imaging

MRS - Spectroscopy

MR Spectroscopy

Overview

MRS is the use of magnetic resonance in quantification of various metabolites (chemical composition) and the study of their distribution in different tissues.

The 3 Main Metabolites
The Good, the Bad & the Ugly

N-Acetyl Aspartate (The Good) - NAA

- Seen at 2.02 PPM
- Marker for neuronal health
- Decreases in situations where neuronal damage or replacement has occurred
- Increase only in one condition: Canavan's disease (defect in breakdown of NAA)

Choline (The Bad) - CHO

- Seen at 3.22 PPM
- Present in the cell membranes of normal brain tissue
- Increases in situations where there is increased number of cells (Tumors) or destruction of cell membranes and release of choline (Infarction or MS), however with the latter the increase will be transient.
- With tumors the increase in choline will be persistent

Lactate and Lipids (The Ugly)

- Lactate is seen at two peaks close to each other at 1.33 PPM
- Lipids are seen at 0.9-1.2 PPM
- Lipids increase in situations with cell destruction (necrosis, inflammation or infection)
- Lactate increases in tissue hypoxia either due to decreased blood supply (infarctions) or increase demand (necrotic tumors)

Other metabolites

Creatine – Cr

- Seen at 3.03 PPM as large peak next to choline
- Decreases in neoplasms, tissue injury, infections or some systemic diseases
- Absent in metastatic tumors (most metastatic tumors don't produce Creatine)

Myoinositol - MI

- Seen at 3.56 PPM
- Myoinositol is found mainly in astrocytes
- Increases in Alzheimer's disease, demyelinating diseases and gliosis
- Decreases in glial tissue destruction as in non-glial tumors, infarction and infection

Metabolite	Seen at	Significance
Lipids	1	Tissue breakdown
Lactate	1.33	Anearobic glycolysis
NAA	2.02	Marker of neuronal health
Glutamate		Excitatory neurotransmitter
Choline	3.22	Marker of cell proliferation
Creatinine	3.03	Marker of cellular energetics
Myo-inositol	3.56	Osmolarity marker – Glial marker