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Neuroscience 2013

Presentation Abstract

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Presentation Title: Quantifying metal distributions using synchrotron x-ray fluorescence imaging of hippocampal resected in human epilepsy surgery

Location: Halls B-H

Presentation time: Tuesday, Nov 12, 2013, 8:00 AM - 9:00 AM

Topic: ++C.08.l. Human Studies

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Abstract: Changes in metals such as zinc have been observed in brains following seizures. The modulation of brain metal levels have also been known to initiate seizures. The precise interaction of endogenous metals and seizures, however, is not well understood and studies have been limited in their ability to study the co-occurrence of metals within the same epileptic structures. Previously we have demonstrated the use of synchrotron x-ray fluorescence imaging (SXRF) to characterize multiple metal distributions at multiple spatial scales in human cortical tissue (n = 17) recovered after minimally invasive epilepsy surgery. In this study, we examine the distribution and co-localization of elements within hippocampal regions of seizure foci, removed during surgery. Resected hippocampal tissue from surgical cases of patients with intractable mesial temporal lobe epilepsy (MTLE) were imaged using rapid-scanning SXRF and microprobe imaging (beamlines 10-2 and 2-3) at the Stanford Synchrotron Radiation Lightsource (n=7). Complete XRF spectra were captured for each pixel, allowing for whole image construction of any non-windowed element. Using SXRF imaging we were able to ascertain co-localized metals and perform quantitative analysis on a suite of elements. SXRF imaging showed definitive structure of the molecular and pyramidal cell layers of the hippocampus with a number of metals including iron and zinc. Large iron depositions were observed in several subjects with sclerotic hippocampal tissue. Analysis is underway to determine the iron species, an indication of the physiological process or potential indications of pathological damage to brain structure. These imaging studies of local circuitry thus help identify the role of brain metals in epilepsy while increasing our understanding of healthy brain structures from the perspective of endogenous brain chemistry.

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MAPPING

SEIZURE

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