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Investigation of growth at sutural sites in the presence of an external oscillatory mechanical stimulus using a swine model

Cranial sutures are the soft connective tissue that join skull bones. It is understood that a heightened stress/strain state at the suture site induces a biological response through growth and remodeling. This mechanically-driven biological response could be a result of intra-cranial pressure during normal growth or externally applied mechanical loads in procedures such as maxillary expansion. Investigators Owen Addison and Dan Romanyk are currently working in collaboration with Mike Doschak, Kathy Rafferty, and Tracy Popowics to develop a fundamental understanding of how cranial sutures respond to an increased stress/strain state. Collectively, these Investigators worked with Adam Webb and Sergey Gasilov at the CLSI BMIT-ID beamline to image match-stick samples of swine cranial suture sites. Cranial sutures under normal conditions and those that had been exposed to a cyclic mechanical stimulus were studied. The resolution provided through the BMIT-ID beamline allows for the visualization of structural features such as osteocyte lacunae, particularly when implementing phase retrieval. Being able to identify the 3D structure of bone and suture tissue will significantly increase the capacity to quantitatively evaluate structural changes at suture sites in cases of mechanically-driven biological activity.

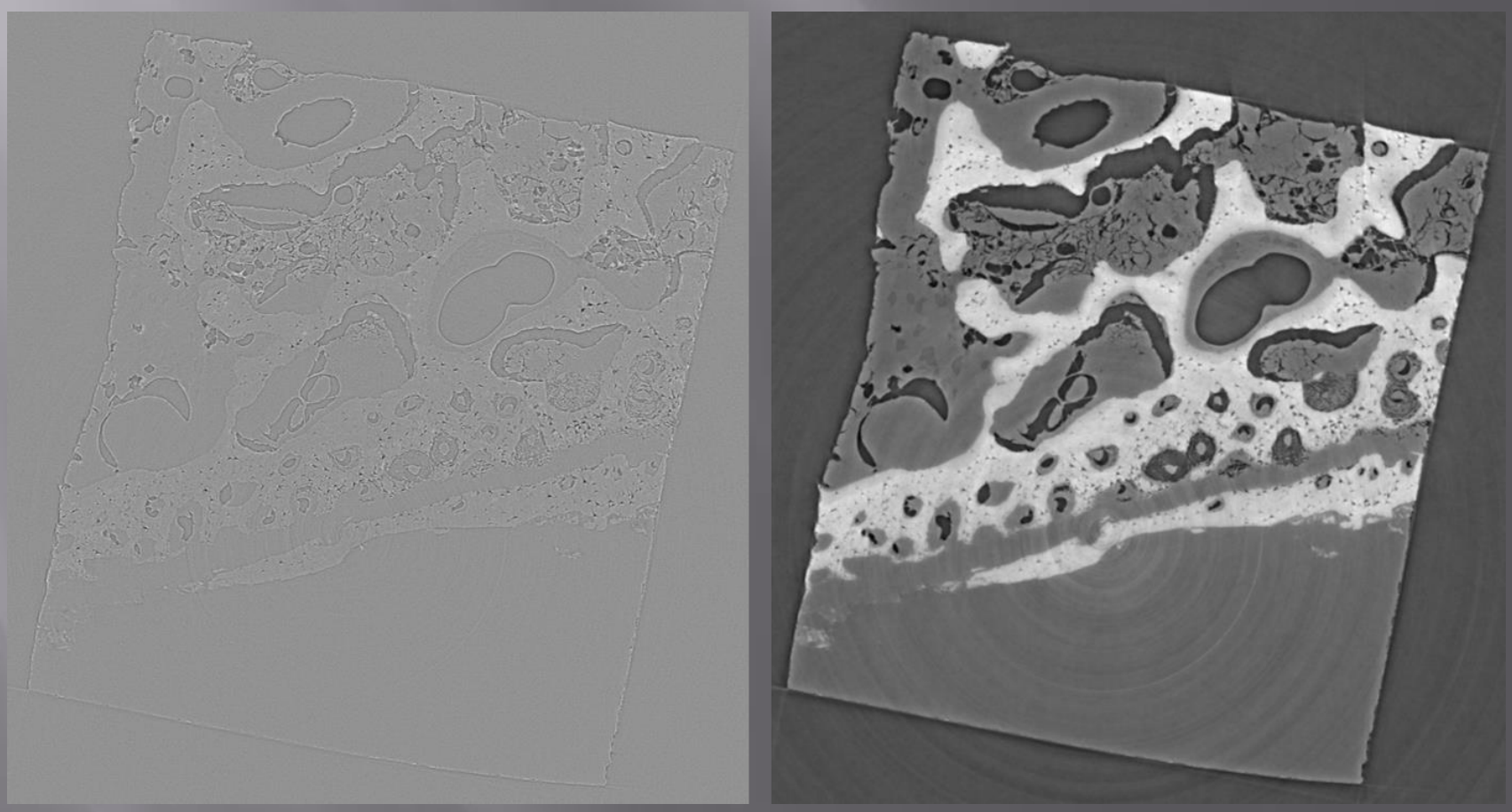

Figure. A representative reconstructed view of a swine cranial suture sample showing the bone surrounding cranial suture tissue. The left image shows the native reconstruction while the right shows the section after phase retrieval with improved distinction between bone and structural features, namely osteocyte lacunae.