Summer Opportunities in Anatomy Research

Virtual Poster Session
July 16, 2021

12:00 PM CDT Introduction & Welcome

Rachel Menegaz, PhD
SOAR Program Director

12:05 PM Craniofacial Bone Mineral Density at Muscle Attachment Sites in Mice with Osteogenesis Imperfecta (OI)

Lauren Murabito
University of Arkansas

12:15 PM An In Silico Method for Modeling the Nasal Cycle in 3D

Baonhu Tran
University of Texas at Arlington

12:25 PM Student Attitudes Surrounding Active Learning in an Online Anatomy Class

Lauren Mitchell
Kennesaw State University

12:35 PM Musculoskeletal Differences Between Amputated and Non -

Craniofacial Bone Mineral Density at Muscle Attachment Sites in Mice w   ith Osteogenesis Imperfecta

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An In Silico Method for Modeling the Nasal Cycle in 3D
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The nasal cycle refers to the reciprocal pattern of alternating mucosal congestion and decongestion between the left and right nasal passages. As the nasal mucosa plays a major role in respiratory air-conditioning (heat and moisture exchange), it has been hypothesized that the nasal cycle provides a physiological mechanism that permits the congested side of the nose to temporarily recuperate while the opposite, decongested side meets functional demands for heat and moisture transfer. Yet, the inability to anatomically model varying levels of mucosal congestion has greatly limited testing of this hypothesis. Accordingly, the goal of this study was to develop an in silico method for accurately modeling the three-dimensional (3D) anatomy of the nasal airways with variable levels of mucosal congestion. A computed tomography (CT) scan of one male human head was selected for model generation. At the time of the CT scan, this individual displayed marked asymmetry between the left (L) and right (R) passages, with the left passage approximately 90% congested compared to only 10% on the right side (i.e., L/R = 90/10) based on our visual estimations. Using the Amira-Avizo software package, a protocol was then developed to permit controlled congestion and decongestion of the nasal mucosa. Three anatomical models were then rendered: a baseline model reflecting the asymmetrical (L/R = 90/10) airway occlusion at the time of CT; a decongested model completely lacking congestion bilaterally (L/R = 0/0); and a mid-cycle model in which airway occlusion was modeled at 50% on both sides (L/R = 50/50). Surface areas and volumes were collected for the left and right nasal airways of each model to calculate the surface area-to-volume ratios (SA/V), which serves as a measure for airway occlusion. Following theoretical expectations, the decongested model exhibited the lowest SA/V ratio (0.57) reflecting the large amount of airway volume relative to the mucosal surface area. In contrast, the SA/V ra --cien d1.6 (as) (e)21.6 ( )]T3.6 (c)9p1.6 (a

Musculoskeletal Differences Between Amputated and Non- Amputated Lower Limbs

Caitlyn Finnerty[1,2]

Osteogenesis Imperfecta and   The Middle Ear Ossicles

Salam N Harb[1], Lila A Huston[2], Jason M Organ[3], Rachel A Menegaz[2], Lauren A Gonzales[2]

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Introduction: Osteogenesis Imperfecta (OI) is a disease that affects 20,000 people in the US. It is caused by a genetic mutation in one of four genes encoding the three alpha-helices that makeup collagen.
Many of the human body structures and systems involve collagen and bones in some way. In thehead alone, research can be focused on the teeth/dentine, nasal, and skull—the premise of my research focuses on the ears. Current literature on OI and its effects on the ear is scarce, but of the research at present, patients with OI are found to have varying forms of hearing loss, from conducive to sensorineural to mixed, all worsening with age. Furthermore, current research indicates structural abnormalities in the ear of OI patients, including thin, fragile ossicular chain,fixation of a thickened or obliterated footplate, and/or thickened hyper vascularized mucosa. As aforementioned, a gap in knowledge on the topic exists yet current OI research on hearing suggests that there are effects in humans. However, what these effects are have not been investigated in detail or in a large sample size. My study is looking at these affects in a large, neonatal sample of mice bred to have OI in order to document these affects. I hypothesize that there are significant differences between the ear bones in adult mice that are wild type (normal pathology) and those with OI, which would entail impaired hearing with OI.

Method Used: The skulls of 25 adult mice were scanned using high resolution CT technology, 12 with OI, and 13 wild-type mice. The imaging software Fiji was used to isolate only the skull scans that include the middle ear and crop down the skull only to the middle ear. The program 3D Slicer was used to extract 3D su6>60.283 p(p)Td