umbilical cord glucose/insulin (p=0.114) or neonatal hypoglycemia diagnosis (p=0.674) when controlled for gestational age and infant birthweight. We hypothesize that, with pending analyses, maternal HbA1c and umbilical cord insulin levels will correlate negatively with the rate of neonatal glycemic change, and positively with the level of inflammatory and angiogenic transcription identified in placental and umbilical endothelium. DISCUSSION/SIGNIFICANCE: Characterization of postnatal glucose control is key to prognosis and risk stratification of infants of diabetic mothers. Understanding placental response to glucose, as well as sequela in the fetal endothelium, is also critical to understanding the pathogenesis of neonatal hypoglycemia and other adverse outcomes of diabetic pregnancy.

407

The OGT/O-GlcNAc Axis Regulates Fibrosis Resolution in Idiopathic Pulmonary Fibrosis

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OBJECTIVES/GOALS: Idiopathic pulmonary fibrosis (IPF) is a chronic lung disease characterized by dysregulated collagen accumulation in the lung parenchyma. Our goal is to investigate the role of O-linked N-Acetylglucosamine (O-GlcNAc) transferase (OGT) in pulmonary fibrosis to ultimately discover novel therapies for fibrosis resolution. METHODS/STUDY POPULATION: Lung tissue from IPF and non-IPF donors was subjected to immunohistochemistry (IHC) to assess O-GlcNAc levels. Primary human lung fibroblasts were treated with OGT or O-GlcNAcase (OGA) inhibitors followed by transforming growth factor-beta 1 (TGF-β1) stimulation to assess O-GlcNAc regulation of fibroblast-to-myofibroblast transition (FMT) markers [alpha smooth muscle actin (α-SMA) and type 1 and type 3 collagen (COL1α1, COL3α1)] In Drosophila melanogaster, OGT knockdown (KD)/overexpression (OE) was conditionally induced to assess pericardin, a type IV collagen-like protein, regulation by immunofluorescence. Lastly, a mouse model of bleomycin-induced pulmonary fibrosis was examined following OGT KD and assessed for fibrosis resolution via histology, hydroxyproline assay, and western blotting. RESULTS/ANTICIPATED RESULTS: O-GlcNAc staining was increased in IPF lung tissue compared to non-IPF control lungs. In primary human lung fibroblasts, TGF-α1 administration resulted in increased FMT markers (α-SMA, COL1α1, and COL3α1), which were reduced or increased by OGT or OGA inhibition, respectively. Genetic manipulation in the Drosophila models showed decreased pericardin expression with OGT KD compared to the wild-type, whereas OGT OE increased pericardin compared to control. Additionally, OGT KD in bleomycin treated aged mice resulted in reduced collagen levels at the transcript and protein level and concurrent fibrosis resolution as assessed by Masson's trichrome staining and total hydroxyproline analysis. Collectively, showing OGT/O-GlcNAc regulating collagen in fibrosis resolution. DISCUSSION/SIGNIFICANCE: These data suggest that the OGT/O-GlcNAc axis regulates collagen deposition in pulmonary fibrosis, and we show that O-GlcNAc is implicated in the pathogenesis of IPF. We identified OGT as a therapeutic target to overcome current drug limitations, opening new horizons for biomedical treatment.

409

Automated Prediction of Bone Volume Removed During Cortical Mastoidectomy Using Deep Learning

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OBJECTIVES/GOALS: Patient-specific definition of extent of surgical excision is foundational to the safety offered by computer assisted interventions. Consequently, this study aims to develop a pipeline for automated segmentation of bone removed during cortical mastoidectomy, a technically complex otologic surgery. METHODS/STUDY POPULATION: A simulator, previously developed in our lab, allows fully immersive simulation of mastoidectomy using segmented temporal bones generated from CT data. Using the simulator, one attending surgeon will perform three trials of mastoidectomy on 20 different temporal bones. From the simulator we will obtain data on the volume of bone removed for a specific anatomy, averaged between trials. No new U-net (nnU-net), an open-source three-dimensional segmentation network, will then be trained to predict the volume of bone removed using segmented pre-operative CT imaging. Segmentation accuracy will be evaluated with the Dice coefficient, modified Hausdorff distance (mHD), sensitivity and specificity. RESULTS/ANTICIPATED RESULTS: We expect the mean pairwise Dice coefficient to be high indicating relative similarity of volume removed between trials. Moreover, we predict that following five-fold cross-validation the best model will result in a Dice coefficient, mHD, sensitivity, and specificity indicative of volume removed predictions consistent with surgeon-generated data. Finally, given that network training will penalize overlap of the predicted excised bone segment and previously segmented anatomic structures, we expect that no critical anatomical structures will be marked as tissue removed. DISCUSSION/SIGNIFICANCE: We hope to show that deep learning architectures can accurately predict bone removed during mastoidectomy. These predictions can be used for preoperative planning, as clinical endpoints in surgical simulators, or be used in conjunction with surgical robots, all ultimately improving patient safety.

410

Improving Patient Outcomes through Design of Biodegradable Implants for Long Bone Fractures

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OBJECTIVES/GOALS: Current long bone fracture standard of care uses inert metal intramedullary nails (IMN), 10x stiffer than femur cortex. Consequent "stress-shielding" bone loss sees >5% of patients

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