

Methionine's Role in Hyperoxia-Induced Pulmonary Dysplasia

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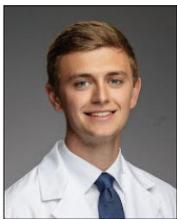
Background/Objective: Following preterm birth in the saccular stage of lung development, 24 weeks gestational age to term, infants are forced to navigate the further development of their lungs with the abnormal environmental influences of oxygen. This disruption of normal development of alveoli is the etiology of bronchopulmonary dysplasia (BPD), which is a chronic pulmonary disease of preterm infants. We hypothesize that this lung dysplasia is based upon the disruption of the role of one of the lung metabolites, Methionine, that is utilized during this period. Specifically, we postulate that Methionine's role in this dysplasia could be used as a rescue of normal lung development if undeterred.

Methods: Endothelial Colony Forming Cells (ECFCs) were utilized to measure angiogenesis in vitro in the presence of a variety of concentrations of Methionine. A WST-1 Assay, Crystal Violet Assay, and Scratch Assays were performed to quantify

the amount of ECFC proliferation and migration in the presence/absence of Methionine. Western blotting analysis was performed to measure the expression of enzymes of the one carbon metabolism pathway. A murine model was utilized to contrast methionine's dietary role lung development in hyperoxia and normal oxygen conditions.

Results: We have seen that the presence of Methionine increases endothelial cell proliferation and migration. We found that the expression of the enzymes in the one carbon metabolism pathway are significantly impacted by the presence of Methionine. Histological studies have further shown Methionine's role as a rescue of hyperoxia induced alveolar dysplasia, identifying Methionine as a crucial metabolite in lung development.

Conclusion and Clinical Implications: Through these studies, we believe that new therapeutic targets are elicited that will guide and improve the ability to improve lung development of a premature infant.



Hazel and Tommy Thompson Cardiac Research Scholarship

Noah Nisen is a third-year medical student, who is currently undecided about his future specialty. Outside of school, he is married and has a 6-month-old daughter.

"The most important takeaway from my summer of research was gaining an appreciation of the translation of the molecular discoveries in the lab and how they are able to impact patient care down the line. I think this was related to me in a unique way in that my research mentor, Dr. Schwarz, is a physician scientist that brought a clinical perspective to what was being done at the lab level. It was enjoyable to be able to learn from her about the role metabolism plays in lung development and how alterations in that could be therapeutic to pathologic processes such as bronchopulmonary dysplasia."

The Effect of Large Femoral Heads and Acetabular Cup Position on PROMs after Modern Posterior Approach THA

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Introduction: Use of large femoral heads (≥ 40 mm) in total hip arthroplasty (THA) decreases postoperative dislocation by increasing impingement-free range of motion, however, may leave patients more susceptible to groin pain. Also, limited data exist for the effect of large femoral heads and acetabular cup position on modern patient-reported outcome measures (PROMs). Therefore, the purpose of this study was to evaluate the effect of large femoral heads (≥ 40 mm) and acetabular cup position on PROMs after primary THA.

Methods: 328 primary THAs performed by a single surgeon were retrospectively reviewed. Acetabular cup inclination and anteversion were measured using Martell Hip Analysis Suite software. Femoral head and acetabular cup sizes were recorded from the electronic medical record. Prospectively collected PROMs (and covariates) related to activity level, satisfaction, and overall hip health were evaluated.

Results: Age, covariates related to PROMs, and acetabular cup position did not differ between ≥ 40 mm and < 40 mm femoral head groups ($p \geq 0.177$). The ≥ 40 mm head group had significantly higher mean BMI and proportion of males ($p \leq 0.022$). UCLA Activity level and satisfaction scores did not differ preoperatively or postoperatively at 4-months or minimum 1-year follow-up between femoral head groups ($p \geq 0.209$). Preoperative HOOS JR scores did not differ by femoral head groups ($p = 0.538$). At 4-months, mean HOOS JR score was significantly higher in the ≥ 40 mm head group compared to the < 40 mm head group ($p = 0.027$); however, both groups achieved similar mean HOOS JR scores by minimum 1-year follow-up ($p = 0.956$). HOOS JR score > 90 and being 'very satisfied or satisfied' correlated with wide ranges and several combinations of acetabular cup inclination and anteversion.

Conclusion: Patients achieved comparable PROMs regardless of femoral head size suggesting large femoral heads may not leave patients susceptible to groin pain in addition to reducing the risk of postoperative dislocation. Excellent patient outcomes correlated with wide ranges of acetabular cup position.



General Excellence Award

Austin Darden is a third-year medical student, who is currently interested in orthopedic surgery. He appreciates that the field offers quick gratification and loves the thought of being able to use his hands to help people gain functionality back.

"The most important takeaway from my research this summer is that no matter how perfect a technology or procedure may seem, there is always room for improvement. I really enjoyed diving deep into my research topic and learning about all the advancements taking place and avenues for future work."