Peri-Articular Soft Tissue is Predictive of Operative Difficulty in Anterior-Approach Total Hip Arthroplasty: Development of a Visual Analog Scale

Victoria C. Tappa[1], Michael C. Marinier[1], Caleb A. McCabe[1], Andrew M. Schwartz[1], Jacob M. Elkins[1]
[1]University of Iowa Department of Orthopedics and Rehabilitation, Iowa City, IA
victoria-tappa@uiowa.edu

Disclosures:

INTRODUCTION: The incidence of total hip arthroplasty (THA) cases in adults in the United States is projected to increase in the thousands over the next twenty years. Depending on numerous factors, orthopedic surgeons can elect to replace a damaged hip joint via an anterior approach. Preoperative planning and approach selection for THA requires a surgeon to template and assess a patient's body habitus and osseous anatomy. Component templating is done by analyzing radiographs and patient assessments, which is important for predicting intraoperative challenges. Currently, orthopedic surgeons can use a sliding visual assessment scale to quantify and anticipate pitfalls of anterior approach THA, but it falls short of reliably predicting case difficulty due to the variability and inconsistencies of the sliding scale. Due to a lack of research assessing how certain factors predict case difficulty, it is important to align preoperative and postoperative assessments by comparing surgeons' pre and postoperative assessments of case difficulty. This study aims to accelerate musculoskeletal discovery and improve health by identifying preoperative host element(s) that can aid orthopedic surgeons in reliably predicting the operative difficulty of anterior approach THAs. We hope to identify one or more predictive factors that can be discretely quantified as prognosticators of operative difficulty via developing a visual analog scale. Specialties in medicine, including surgical specialties, have published studies that created difficulty score/assessment scales implemented globally; we recognize the success of these implementations and believe orthopedics has an opportunity to follow suit with the future outcomes of this study.

METHODS: The institutional review board approved this study and the accompanying information sheet as an IRB-exempt study. Two sub-specialty-trained surgeons were given the portion of the form in Image 1 before case preparation and templating. The surgeons were instructed to utilize the patient's radiographs and physical exam to record their perceived assessments of subcutaneous tissue quality, acetabular exposure difficulty, femoral exposure difficulty, bone quality, and overall operative difficulty. Next, the surgeons performed the patient's THA surgery via an anterior approach. The surgeons' "actual" assessment, the postoperative assessment, was recorded on the form portion in Image 2. A research team member was paged 10 minutes before the surgeons' anticipated exit from the OR. Once out of the OR, the surgeons immediately recorded their postoperative assessments. Surgeons were blinded to their preoperative assessment. Each line on the form was 10cm long, and each assessment was recorded to the nearest millimeter, with scaled ranging from "easiest" or "best" to "hardest" or "worst" (see Images 1 and 2) to guide assessment consistency. Results from this pilot study will be used to create a validated visual analog scale to predict case difficulty.

RESULTS SECTION: The current sample size of this study is n=13 anterior hip procedures. The correlation coefficients were computed by correlating preoperative markers to actual intraoperative exposure difficulty and intraoperative difficulty. Perceived (preoperative) average exposure difficulty and actual (postoperative) overall operative difficulty positively correlated at 0.86. Perceived acetabular exposure and postoperative overall operative difficulty positively correlated at 0.95. Preoperative femoral exposure and postoperative overall operative difficulty positively correlated at 0.66. Perceived subcutaneous tissue quality and postoperative average exposure difficulty positively correlated at 0.86.

DISCUSSION: Operative difficulty is one of the perceived downsides of anterior THA, and complications (e.g., superficial wound complications) and difficulty are thought to be positively correlated to intra-operative case difficulty; however, this has not been formally investigated. Additionally, surgeons lack guidance to accurately discuss patient-specific risks of case complexity and postoperative complications following anterior THA. There needs to be more guidance for surgeons to accurately discuss patient-specific risks of postoperative wound complications following anterior THA. Therefore, there is a need to validate a system of accurately predicting intra-operative case difficulty based on preoperative radiographic and physical exams. This study indicated that procedural difficulty can be predicted based on the estimation of peri-articular soft-tissue quality based on lateral radiograph soft-tissue envelope size and physical assessment of anterior thigh tissue. These pilot data will help identify additional preoperative markers of difficulty and ideally result in a validated measure of intra-operative difficulty prediction, which may better inform our patients of postoperative outcomes.

SIGNIFICANCE/CLINICAL RELEVANCE: If this study's aims are achieved, orthopedic surgeons can utilize a visual analog scale to predict operative difficulty in anterior approach THA cases. Implementing standardization to predict case difficulty may improve a surgeon's preparation for difficult cases; these outcomes would be clinically significant because improved predictions of anterior approach THA case difficulty could reduce tissue damage, lead to decreased prevalence of infections, and result in fewer postoperative complications.

Image 1: Preoperative/perceived assessment of case difficulty

Image 2: Postoperative/actual assessment of case difficulty