

Retrospective Analysis of Imaging Parameters as Predictors of Irrigation and Debridement Following Posterior Cervical Spine Surgery

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INTRODUCTION

Post-operative Surgical Site Infection (SSI), hematoma, and seroma following spine surgery are the most common complications necessitating unplanned reoperation. Risk factors for reoperation and SSI following spine surgery include BMI, diabetes, smoking, prolonged operative time, chronic steroid use, and increased number of vertebral levels treated. Although BMI is an established risk factor for reoperation, it may not be a perfect predictive tool due to the diversity of fat distribution among individuals. Therefore, it is worth investigating the utilization of posterior spine fat thickness as a predictor of unplanned reoperation rather than BMI. Previous studies have assessed the value of posterior subcutaneous fat measurement at the C5 level in predicting SSI, but there is no data in the literature examining its strength in predicting overall unplanned reoperation relative to other measurement techniques such as total cross-sectional area and maximum soft tissue depth.¹⁻³

METHODS

A retrospective review of patients who underwent posterior cervical spine surgery for degenerative or deformative spinal pathologies at a single institution from 2012-2020 was performed and was approved by the Emory IRB. Patients requiring irrigation and debridement within 90 days following surgery were included in the experimental group and controls were matched based on age, sex, BMI, past medical history, operative time, and estimated incision size. Pre-operative cervical MRI and CT scans were analyzed to obtain measurements for posterior spine soft tissue, subcutaneous fat, and paraspinal muscles. Cross sectional area measurements were taken across the entire incision site and linear measurements were taken at C5 and the point of maximal soft tissue depth. The assumed incision site spanned one-half level above and one-half level below the surgical levels. Statistical analysis was performed using two-sample t-test analysis.

RESULTS

Fourteen patients met inclusion criteria and were added for review and an additional fifteen patients were selected as controls. Two-sample t-test analysis indicated a statistically significant difference between C5 subcutaneous fat in the reoperation group compared to the control group ($p=0.0350$), with a 37.4% difference in linear measurements between the two groups. Other soft tissue measurement techniques such as C5 total soft tissue depth, maximum subcutaneous fat depth, maximum soft tissue depth, total soft tissue area, and total subcutaneous fat area demonstrated less of a difference between the two groups with none indicating statistical significance. In cases with a C5 fat depth of greater than 26mm vs. less than 26mm, the odds ratio for reoperation was 5.

DISCUSSION

Compared to several other measurement techniques, linear distance of subcutaneous fat at the C5 level appears to be the best predictor of subsequent return to the operating room following posterior cervical spine surgery. This C5 subcutaneous fat depth in our data was a better predictor of unplanned irrigation and debridement than BMI or even total area of subcutaneous fat beneath the incision. Furthermore, subcutaneous fat depth at C5 greater than 26mm was associated with an increased odds ratio of unplanned irrigation and debridement. Limitations of this study include a relatively small sample size, single institution analysis, and retrospective analysis.

SIGNIFICANCE/CLINICAL RELEVANCE

Assessing the linear distance of subcutaneous fat at the C5 level can be a helpful tool in predicting postoperative risk of complications and reoperation following posterior cervical spine surgery. Utilizing this measurement can prove beneficial in guiding surgical planning and decision-making.

