A Prospective Analysis: Indolent Cutibacterium Acnes Infection in Primary Discectomy Patients

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INTRODUCTION:

Degenerative disc disease (DDD) and low back pain have considerable influence on the healthcare system and productivity in the United States of America. There have been considerable research efforts to define the causes of DDD with recent literature exploring indolent infection as a possible cause. Some literature reports serologic evidence of gram-positive infection in up to 31% of DDD patients with radicular symptoms. Of positive disc cultures, the most common infectious agent is *C. acnes* with animal models suggesting low grade *C. acnes* infection can precipitate and progressively worsen DDD.

METHODS:

This prospective study includes patients who presented to a single orthopaedic spine surgeon for management of their DDD. Patients were enrolled into the study if they had no history of prior spinal surgery and were to be managed surgically via decompression of herniated discs or decompression and fusion of the spine. At time of enrollment patient history, pain scores, and PROMIS-10 patient-reported outcome measure were collected. The intraoperative disc material was immediately processed for culturing in standard fashion based on previously reported literature. General demographic information including age, gender, medical comorbidities, smoking status, and infectious disease information were collected prospectively and retrospectively from chart review. Study data was statistically analyzed by way of Student's t-test, Pearson Chi-Square, and Mann-Whitney U Test for continuous, nominal, and ordinal outcomes respectively. The level of significance for the study was p=0.05.

RESULTS:

Sixty-six patients and 96 levels were included in analysis. The average age of the entire cohort was 51.02 years (± 13.89) with an average BMI of 29.76 (±6.53). In total, 57.4% of the study participants were female with 91.2% of enrolled patients having a CCI of 3 or less. 22.72% of patients had positive cultures. Fourteen of these patients, 20.6%, were positive for C. acnes. Two patients with C. acnes growth had concurrent bacterial growth, one with *Corynebacterium tuberculostearicum*, one with *Propionibacterium granulosum.* One patient, 1.51% of patients, grew isolated *Staphylococcus epidermidis*. The population of patients that grew C. acnes, 14 of 66, were compared against patients who exhibited no bacterial growth, 51 of 66. The following results compare these two groups. There existed no statistically significant difference in Age, BMI, race, smoking history, preoperative steroid usage, duration of preoperative symptoms, preoperative radicular symptoms, preoperative antibiotic use, preoperative history of clinically significant infections, or MODIC score of operative disc levels; p-value ranged from p=0.291 to p=1.000. The distribution of patient sex between groups was near significance, p=0.066, with males demonstrating a higher rate of *C. acnes* growth. Although none of the individual components of the CCI differed significantly between those who grew *C. acnes* and those who did not, the cumulative CCI score was different between the groups with the C. acnes group having a lower distribution of CCI scores, p=0.041. The PROMIS-10 provides a Mental Health Score as well as a Physical Health score. There was no difference between groups regarding the distribution of the Mental Health Score, p=0.841. The distribution between the groups' Physical Health Score is near significance, p=0.069, with the group that grew out C. acnes demonstrating a higher, more functional score. Two pain related variables also neared a statistically significant difference. Average preoperative pain neared a statistical difference, p=0.089, with the C. acnes group reporting a lower distribution of average pain scores. The distribution of constant versus intermittent pain symptomology also neared statistical significance, p=0.058, with those who had *C. acnes* infection more likely to report intermittent rather than constant pain symptoms.

DISCUSSION AND CONCLUSION:

There have been considerable research efforts to define causes of DDD with recent literature suggesting indolent infection from *C. acnes* as a potential source. Our prospective analysis of 66 patients and 96 disc samples demonstrates a sizable prevalence of *C. acnes* in the DDD population at 20.6%. Our study also demonstrates that there may exist a subset of DDD patients whose presentation may favor suspicion for an indolent C. acnes infection. This population may overall be a healthier subset of patients as underscored by the lower CCI of the *C. acnes* patients. Further studies on associated risk factors for infectious DDD and its role in DDD are warranted; this is highlighted by many of the study's variables that neared statistical significance in the *C. acnes* patients such as: male predominance, increased prevalence of intermittent symptomology, lesser average pain severity, and increased overall physical functioning.