The Effect of Culture Positivity on Clinical Outcomes of Primary Lumbar Fusion

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INTRODUCTION: Occult bacteria have been linked to deep and chronic infections in spine surgery. These organisms are commensal to dermal and deeper tissue layers, including the intervertebral disc and bone. We hypothesize that standard surgical skin preparation nor preoperative antibiotics properly access and eradicate these organisms prior to primary spine surgery. These organisms can potentially adhere to the biofilm surrounding the hardware and limit bone formation. We aim to determine the colonization rate of occult bacteria in the superficial and deep tissue layers of healthy patients undergoing primary instrumented lumbar spine surgery.

METHODS: This is a prospective, consecutive cohort of 54 patients undergoing primary lumbar spine surgery at a single tertiary center. All patients met the inclusion/exclusion criteria which included between the ages of 18 and 80, undergoing a posterior approach with pedicle screw instrumentation with no evidence of a prior or current fracture, trauma, tumor, or an active systemic or local infection. Patients were also excluded if they were immunosuppressed or had received prior surgery at any lumbar level with hardware. All patients received preoperative antibiotics and skin preparation. Culture samples were subsequently obtained from the superficial skin, dermal wound-edge following incision, hypodermis, and the vertebral pedicle prior to instrumentation implantation. Control culture samples were taken from scalpel, tap, and suction prior to incision. The primary outcome was the rate of positive culture samples from the various layers traversed during standard surgical spine exposure. Clinical outcomes of fusion status and revision rate were collected. This study was approved by our institutional review board and ethics review panel.

RESULTS: A total of 525 culture samples were obtained, and samples were positive in 33.3% of patients (18/54). Culture-positive patients had on average 3.1 positive samples per case. Superficial skin samples were positive in 13.0% (n=7), dermal layer samples in 16.7% (n=9), hypodermis samples in 13.0% (n=7), and vertebral samples in 20.4% (n=11) of cases. All control samples taken were culture-negative. C. acnes was the most common organism isolated, in 83.3% of culture-positive cases. Significantly more males were culture-positive than females. Patients with positive cultures were treated with antibiotics. At one year postop, patients in culture-positive group had similar fusion rates to culture-negative groups. However, delayed fusion was observed at a higher rate in the culture-positive group.

DISCUSSION AND CONCLUSION: Occult bacteria was detected in one third of patients undergoing primary instrumented posterior spine surgery. Deep culture samples of the vertebral pedicle were more often positive than dermal layer samples. The data collected supports our hypothesis that occult bacteria persist in the skin and deeper tissue layers regardless of the efforts made by preoperative skin preparation and prophylactic antibiotics. The clinical sequela for culture-positive patients, although addressed perioperatively, was a higher incidence of delayed fusion.