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Success of Junctional Anterior Cervical Discectomy and Fusion with Anterior Plating
Rick A. Davis, MD, Paul R. Gause, MD, Patrick N. Smith, MD, James D. Kang, MD (Pittsburgh, PA)

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INTRODUCTION: Anterior Cervical Fusion (ACF) is a highly successful procedure for treating radicular and myelopathic conditions. The literature supports Anterior Cervical Discectomy and Fusion or Corpectomy as primary procedures for decompressing lesions in the cervical spine. Both procedures provide excellent fusion results with autograft. However, in the setting of junctional disease and a previous fusion the biomechanical environment is considerably different and the ability to achieve a fusion and good clinical outcome may be compromised. Hilibrand et al. reported a 37% nonunion rate for unplated ACDF using iliac crest autograft to treat adjacent level disease. This study reports the long-term radiographic and clinical outcome of 55 patients treated with ACDF adjacent to a previous fusion to determine the effectiveness of plating on fusion rate.

METHODS: From 1998 to 2002 there were 55 patients treated for adjacent segment disease by the senior author after undergoing a previous cervical fusion. All patients had radicular and/or myelopathic symptoms consistent with the radiographic level of segmental degeneration. A pre-operative MRI or CT myelogram was used to confirm the amount of nerve root or spinal cord compression. A standard Smith-Robinson left-sided approach was performed and autologous iliac crest bone harvested and impacted into the disc space which was prepared with curettes and high-speed burr. An Orion plate (Medtronic Sofamor-Danek, Memphis, TN) was placed and the patient remained in a rigid cervical orthosis for three weeks post-operatively. Fusion was assessed by plain radiography. For an x-ray to be fused there had to be no radiolucency at the endplates and less than 2 mm of motion on flexion-extension films. Clinical outcome was assessed using the Robinson criteria.

The average patient age was 53 (range 31-76). The average interval between index and junctional surgery was 86 months (range 12-300 months). All patients had a minimum of 16 months follow-up (range 16-45 months). 13 of 58 patients were smokers. Pre-operatively, there were 28 one level fusions, 16 two level fusions, 9 three level fusions and 2 four level fusions that developed junctional disease. There were 28 one, 22 two, and 5 three level ACDF’s performed. Two orthopedic Spine Fellows independently reviewed all radiographs.
RESULTS: A solid arthrodesis was achieved in 45 of 55 patients (82% union rate). The non-union rate was 18% (10/58 not healed). Nine of the ten non-unions were treated successfully with posterior segmental instrumented fusion (Lateral mass screws plate/rod construct). There is one patient with a mildly symptomatic non-union despite circumferential fusion. Seven of the ten non-unions occurred caudal to the previously fused segment. The non-unions occurred after one level ACDF in 7 patients and in 3 two level ACDF’s. Three of the non-unions occurred in smokers, seven non-unions were in non-smokers. Neither location of non-union, number of levels of discectomy, or smoking was a statistically significant factor. Clinically, good or excellent outcomes were achieved in 37 of 45 patients (82%) with an arthrodesis compared to 6 of 10 patients with a non-union. There were four patients with a poor result, two each in the fused and non-union group. With the small numbers, there was a trend but no statistically significant difference between outcome and fusion.

CONCLUSION: Anterior cervical discectomy and fusion is a highly successful procedure for treating cervical spondylosis. For single level fusion, the recent literature demonstrates nearly similar fusion rates for allograft or autograft and plate. Wang et al. demonstrated a 100% union rate with iliac crest autograft and plate. Kaiser et al. had a 96% fusion rate with fibular allograft and plate in 157 patients. However, arthrodesis adjacent to a previously fused segment presents a distinctly different fusion setting. The increased strain and stress at the adjacent disc space makes achieving a solid fusion challenging. Hilibrand et al. reviewed a series of 38 patients treated for junctional degeneration. The non-union rate was 37% for 24 patients in the ACDF group. 14 patients were treated by corpectomy and had a 100% union rate. Of note, ACDF was performed using autograft iliac crest without instrumentation.

This study evaluated the radiographic outcome of 55 patients undergoing anterior cervical discectomy and fusion using autogenous iliac crest and anterior plating for junctional degeneration. The most significant finding of this study was the low rate of arthrodesis (82%) despite tri-cortical iliac crest grafting and instrumentation. The use of an anterior cervical plate in ACDF for junctional degeneration decreased the union rate to 18% as compared to 37% in the unplated series reported by Hilibrand. More information is needed to determine which group of patients would benefit from a 360° fusion in order to maximize the rate of arthrodesis.