Anterior Cervical Discectomy and Fusion to Treat Double Crush Syndrome: Is Subsequent Peripheral Nerve Decompression Necessary?

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INTRODUCTION: Double crush syndrome involves two distinct compressive lesions along the course of a single peripheral nerve. Frequently, patients with compressive neuropathies at the wrist and elbow may experience exacerbated pain, numbness, and weakness from concomitant cervical radiculopathy. Surgical management aims to provide decompression at either or both proximal and distal sites, however a comparison of single versus dual treatment remains lacking. The purpose of this study was to compare postoperative outcomes of anterior cervical discectomy and fusion (ACDF) with and without subsequent peripheral nerve decompression in patients with double crush syndrome.

METHODS: This study retrospectively evaluated patients with double crush lesions of the cervical spine and upper extremity, presenting with concomitant diagnoses of cervical radiculopathy and either carpal or cubital tunnel syndrome. Two cohorts were identified and matched by age and gender: patients treated with ACDF alone versus patients treated with both ACDF and a subsequent peripheral nerve decompression via either a carpal or cubital tunnel release. Patients were excluded if pregnant or indicated for revision, trauma, oncologic, or infectious etiologies. All procedures were performed at a single institution between 2004 and 2020, with minimum 1-year follow up after the final procedure. Postoperative symptom severity, examination findings, patient-reported outcomes, and subsequent reoperations were compared between cohorts via independent t-test for continuous variables and Fisher's exact test for categorical variables.

RESULTS: A total of 130 patients were included for analysis (N = 66 receiving ACDF alone, N = 64 receiving ACDF with subsequent peripheral nerve decompression). No significant differences were observed between groups in baseline rates of diabetes, rheumatoid arthritis, end-stage renal disease, smoking history, or Workers' Compensation status. Patients receiving ACDF with subsequent peripheral nerve decompression experienced a significantly longer duration of preoperative radicular/peripheral symptoms (29.2 months vs. 18.3 months, **P < 0.001**). At latest follow up, patients receiving ACDF alone exhibited significantly greater frequencies of persistent numbness (42.4% vs. 17.2%, **P = 0.002**), signs of nerve irritability via positive provocative Phalen's/Tinel tests (21.2% vs. 4.7%, **P = 0.016**), and reduced 2-point discrimination (20.3% vs. 12.1%, **P < 0.001**), compared to patients receiving both procedures. No significant differences in muscle weakness or pathologic reflexes were observed. Patients receiving ACDF with subsequent peripheral nerve decompression reported substantially greater improvements in VAS Neck Pain (-5.6 vs. -3.8, **P < 0.001**), VAS Arm Pain (-4.7 vs. -3.4, **P < 0.001**), and NDI (-17.4 vs. -6.8, **P < 0.001**) scores compared to patients receiving ACDF alone, despite comparable baseline scores. Subsequent cervical or upper extremity reoperation rates were similar between cohorts (17.2% vs. 27.3%, **P = 0.167**).

DISCUSSION AND CONCLUSION: In patients with double crush neuropathies, isolated decompression at the cervical spine may be insufficient. Comprehensive treatment of both proximal and distal lesions provided superior resolution of pain, disability, and persistent sensory deficits. Tailored treatment of double crush syndrome requires careful collaboration between hand and spine surgeons.

Table 1. Comparison of clinical outcomes at baseline and latest follow-up according to treatment strategy utilized.

	ACDF Alone			ACDF with Subsequent Peripheral Nerve Decompression		
	Total Patients, N	66		**Total Patients, N**	64	
	With Carpal Tunnel Syndrome, N (%)	44 (67%)		**With Carpal Tunnel Release, N (%)**	45 (70%)	
	Baseline	**Latest Follow-Up**	**P-value**	**Baseline**	**Latest Follow-Up**	**P-value**
Numbness (%)	84.8%	42.4%	**<0.001**	79.7%	17.2%	**<0.001**
Nerve Irritability Signs (%)	47.0%	21.2%	**0.002**	45.3%	4.7%	**<0.001**
Reduced 2-point Discrimination (%)	18.2%	12.1%	0.331	37.5%	20.3%	**0.032**
Pathologic Reflexes (%)	34.8%	3.0%	**<0.001**	15.6%	0%	**<0.001**
Muscle Weakness (%)	4.5%	1.5%	**<0.001**	7.8%	1.6%	0.075
VAS Neck Pain	6.52	2.89	**<0.001**	7.03	1.41	**<0.001**
VAS Arm Pain	6.10	2.56	**<0.001**	7.18	2.45	**<0.001**
Neck Disability Index (NDI)	44.4	37.6	.086	55.2	37.7	**<0.001**