Alternative double nerve transfers for restoration of shoulder function: Combined thoracodorsal and medial triceps to anterior axillary nerve

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Introduction:

We describe a reliable approach for alternative double nerve transfer of the medial triceps nerve branch and thoracodorsal nerve to the axillary nerve to increase axonal input. We present a review of outcomes for this alternative transfer, including those for both end-to-end and reverse end-to-side nerve transfer.

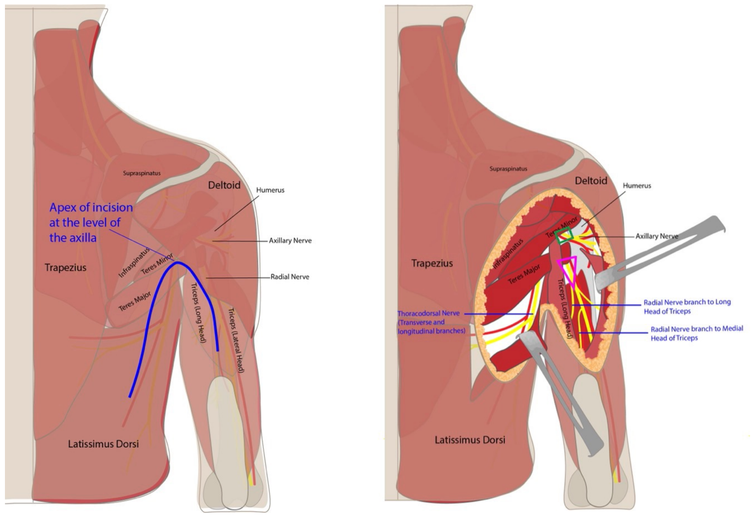

Figure 1. Incision placement (left) and surgical approach (right). As the axillary nerve emerges from the quadrangular space, the posterior axillary branch can be distinguished by finding the posterior sensory nerve branching off.

Methods:

After Institutional Review Board approval, a retrospective review of patients who underwent nerve transfer surgery for improvement of shoulder abduction at Harborview Medical Center and Northwestern Memorial Hospital between 2012 and 2021 was conducted. Subsequently, patients were prospectively contacted to fill out a 30-item DASH questionnaire, with an option to upload a video of their active range of motion.

Results:

Twenty-one patients with twenty-three affected extremities were included in the final analysis. Fifteen patients completed the prospective arm of the study (71% response rate). Seventy-nine percent of patient limbs achieved an MRC-MS of 4 or greater, and measured shoulder abduction AROM was 139.2° (range 29-174°) and 140.9° (range 60-180°) (p = 0.95) for end-to-end and reverse end to side, respectively.

	End to End mean (SD)	Reverse End to Side mean (SD)	p-value
Retrospective Study			
Age	45.0 (13.73) n=8 Range 22-62	58.18 (13.93) n=11 Range 26-73	0.06
Injury to Surgery (Days)	**185.3 (55.55)** n=8 Range 117-296	**267.6 (100.7)** n=11 Range 191-504	**0.04**
Clinic Follow up (Days)	550.3 (242.6) n=8 Range 228-936	489.9 (254.2) n=11 Range 187-876	0.61
PreOp Shoulder Abduction (MRC-MS)	1.75 (1.28) n=8 Range 0-3	1.46 (1.21) n=11 Range 0-4	0.62
PostOp Shoulder Abduction (MRC-MS)	3.75 (0.89) n=8 Range 2-5	3.91 (0.54) n=11 Range 3-5	0.66
Shoulder Abduction Mean difference in MRC-MS	2.0 (1.31) n=8 Range 1-4	2.46 (1.34) n=11 Range 0-5	0.47
% Patients with final MRC-MS ≥ 4	75% (6/8)	82% (9/11)	
Prospective Study			
RedCap Follow up (Days)	906.7 (551.5) n=7 Range 228-1635	1009 (622.8) n=9 Range 320-2208	0.73
Video Measured Shoulder Abduction AROM	139.2 (61.86) n=5 Range 29 – 174	140.9 (45.12) n=8 Range 60-180	0.95
Video Measured Shoulder Flexion AROM	139.3 (33.13) n=5 Range 102 – 174	135.7 (41.74) n=8 Range 80-180	0.89
DASH Score	20.7 (17.90) n=7 Range 2-59	37.78 (30.36) n=9 Range 0-76	0.21
Patients with Double Fascicular Nerve Transfer for elbow flexion	37.5% (3/8)	45% (5/11)	

Table 1. Comparison of outcomes in "Alternative" Double Transfer between end-to-end and reverse end-to-side.

Comparing end-to-end vs. reverse end-to-side neurorrhaphy, outcomes including follow-up, mean post-operative MRC-MS, mean change in MRC-MS, DASH, abduction AROM, and flexion AROM were not statistically different.

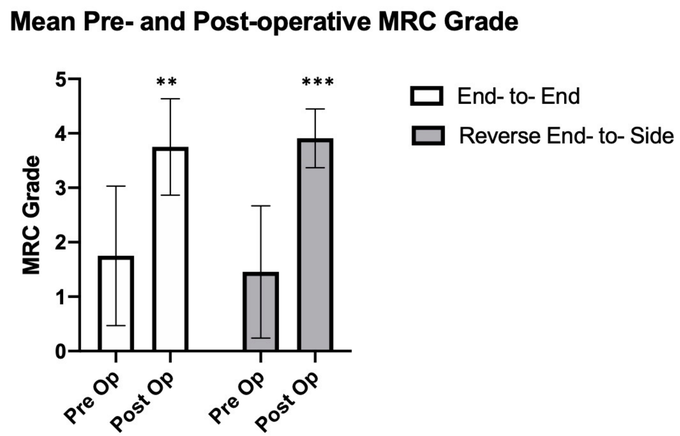

Figure 2. Paired t-test demonstrating significant change in post op MRC-MS compared to preop in both end-to-end vs reverse end-to-side neurorrhaphy. *p<.05, **p<.005, ***p<.0005

Conclusions:

We showed improvements in shoulder abduction by utilizing the thoracodorsal nerve, in addition to the medial triceps branch, to increase the axonal donation to power the axillary nerve, without the sacrifice of the spinal accessory nerve. Further, we demonstrated substantial improvements with reverse end-to-side coaptation when intra-operative stimulation of the axillary nerve revealed some residual function.

Disclosures:

Dr. Ko is on the Scientific Advisory Board of Mesh Suture, Inc. and Checkpoint Surgical, Inc. and a consultant for Integra LifeSciences Corporation.