Long-Term Outcomes after Spinal Accessory Nerve to Musculocutaneous Nerve Transfer in Brachial Plexus Birth Injuries: A Mean 10-Year Follow-Up

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INTRODUCTION: Brachial plexus birth injuries (BPBI), often caused by traction during delivery, typically show spontaneous upper limb recovery within the first 3 to 12 months of life. However, in cases of persistent deficits, surgical interventions—such as nerve grafting, nerve transfers, and tendon or free functional muscle transfers—may be necessary. The spinal accessory nerve (SAN) has been effectively used in adults for musculocutaneous nerve (MCN) transfers to restore elbow flexion while avoiding the risk of phrenic nerve injury associated with intercostal nerve harvest. Early results in pediatric populations have been promising. This study reports long-term outcomes following SAN-to-MCN nerve transfer for elbow flexion restoration in patients with BPBI.

METHODS: A retrospective single-institution review was conducted on patients who underwent SAN-to-MCN transfer for absent elbow flexion secondary to BPBI. Clinical data—including demographic information, surgical details, and motor recovery—were collected. Patients were excluded if there was less than 2 years of follow-up available. Recovery was assessed using the Active Movement Scale (AMS) and modified British Medical Research Council (mBMRC) grading. Key milestones included time to initial motor recovery (AMS ≥1) and attainment of antigravity motion with at least half the normal range of motion (AMS 6, mBMRC ≥4). Final elbow and trapezius strength were evaluated using mBMRC – a measure only recorded in children older than three years.

RESULTS: Nine patients underwent SAN to MCN nerve transfers due to absent elbow flexion; three patients were excluded due to less than two-year follow-up. Of the final six patients included in the study, mean follow-up was 9.7 years (range, 5.6-17.3) (Table 1). Mean birthweight was 5733 grams (range, 4760-6840). Earliest signs of elbow flexion (AMS ≥1) were documented at a mean of 6 months (range, 4-11) after surgery. Mean time to achieving elbow flexion against gravity (mBMRC ≥ 3) was 18 months (range, 10-35). All patients recovered elbow flexion with an AMS of 6 by a mean of 25 months (range, 15-41) and an mBMRC grade of at least 4 by a mean of 64 months (range, 47-78) after surgery. All patients had achieved a trapezius mBMRC grade of 5 by final follow-up.

DISCUSSION AND CONCLUSION: In this cohort, SAN-to-MCN nerve transfer effectively restored elbow flexion in patients with BPBI without compromising trapezius function. Outcomes remained durable with a decade of follow-up. These findings support the long-term efficacy of SAN as a donor nerve in pediatric brachial plexus reconstruction. Further studies with larger cohorts are needed to confirm generalizability.

Table 1. Patient motor strength based on mBMRC grade and AMS score.*

Patient	Age at Operation (mo)	Sex	Side	Total follow-up (mo)	Final trapezius mBMRC	Final elbow flexion mBMRC	Time to final elbow flexion mBMRC (mo)	Time to mBMRC ≥3 (mo)	Time to AMS ≥1 (mo)	Time to AMS ≥6 (mo)
1	3	F	R	208	5	4+	53	10	4	15
2	3	F	R	67	5	5-	67	11	5	19
3	2	M	R	156	5	4	69	14	7	38
4	2	F	L	78	5	4	78	15	5	16
5	3	M	R	101	5	4	47	35	4	22
6	5	F	L	90	5	4+	67	22	11	41

Activity Movement Scale = AMS. Mo = months. Modified British Medical Research Council = mBMRC.
mBMRC ≥ 3 signifies full active movement against gravity but not resistance.
AMS ≥ 1 signifies flicker or trace of contraction.
AMS ≥ 6 signifies motion more than ½ of full range of motion.
*AMS was used to assess motor strength in children less than 3 years of age. mBMRC was used to assess motor strength in children at least 3 years of age.