Traumatic Peripheral Nerve Injuries in Pediatric Patients Treated with Allograft Repair

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INTRODUCTION: Traumatic peripheral nerve injury (PNI) can result in functional impairment or lifelong disability. The standard of care has remained autologous nerve grafting, although conduits and allografts have shown comparable outcomes while eliminating donor site morbidity. Nerve allografts have demonstrated good sensory and motor recovery in adults with no maximum gap length to date. Investigations of nerve allograft reconstruction in pediatrics thus far have focused on brachial plexus injuries and maxillofacial sensory nerves with promising results. Research on PNIs, treatments, and outcomes in pediatrics is lacking. Our study investigates epidemiology and outcomes of traumatic PNIs repaired with processed nerve allograft.

METHODS: This is a prospective, Institutional Review Board approved, single center, observational study of all pediatric patients who underwent nerve allograft reconstruction between September 2011 and July 2021.

RESULTS: We identified 26 allograft nerve repairs in 20 patients. Patients were 13.3±5.5 years old (range: 1.5-17) and 14 (70%) were male. The most common mechanisms of injury were motor vehicle accident (n=6, 30%), sharp laceration, machinery, and blast injury (n=4, 20% each). Common concomitant injuries included tendinous (n=17, 65%), fracture (n=12, 46%), and arterial injury (n=4, 15%). The distribution of injured nerves was digital (n=10, 38%), ulnar (n=8, 31%), median (n=5, 19%), and one (4%) radial, musculocutaneous, and superficial peroneal nerve each. The recipient site was either sensory (n=14, 54%) or mixed (n=12, 46%). The average gap length was 32.3±24.0mm (range: 4-87). Coaptation was achieved with isolated epineural repair (n=8, 31%) or connector assisted (n=18, 69%). Time to repair was 24 hours (n=16, 62%), within 8 days (n=6, 23%), one month (n=2, 8%), six months (n=1, 4%), and one year (n=1, 4%). Average follow up was 9.5±9.0 months (range: 1.6-42.8). At final follow up, 6 patients (23%) were using their extremity normally without issue but were unable to participate in Semmes-Weinstein monofilament (SW) testing, 10 patients (38%) had normal sensation to SW, 6 (23%) had protective sensation, 3 (12%) had sensation to deep pressure, and 1 (4%) had no sensation but a positive Tinel's sign. There were 6 patients (23%) that demonstrated atrophy or clawing while 8 (31%) reported no limitations with daily activity. In this timeframe, there were no infections or complications.

DISCUSSION AND CONCLUSION:

Allograft nerve reconstruction is a viable option for treatment of traumatic peripheral nerve injuries in pediatrics with little risk and alleviates donor site morbidity associated with autograft. We look forward to bringing these patients back into clinic to investigate more objective findings.