SCIENTIFIC ARTICLE

Posterior Branch of the Axillary Nerve Transfer to the Lateral Triceps Branch for Restoration of Elbow Extension: Case Report

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We report a nerve transfer to the triceps using the posterior branch of the axillary nerve to restore elbow extension in an 18-year-old woman with a C7–T1 injury. Elbow extension strength improved from M0 to M4, whereas deltoid strength was minimally affected. Her Disabilities of the Arm, Shoulder and Hand score improved 14 points. This method may be considered for restoring triceps function in lower pattern brachial plexus injury. *(J Hand Surg 2013;38A:1145–1149. © 2013 Published by Elsevier Inc. on behalf of the American Society for Surgery of the Hand.)*

Key words Axillary nerve, lateral triceps branch, posterior branch, restoration of elbow extension

Paralysis of the triceps may be seen commonly in brachial plexus injuries. Although restoration of elbow flexion, shoulder abduction, and shoulder girdle stabilization are primary goals in brachial plexus injury, elbow extension remains a secondary goal.[1] Restoration of elbow extension is important when considering restoration of prehension with free functioning muscles or tendon transfers.[2,3] Reconstruction of prehension with muscles that cross the elbow anteriorly will result in elbow flexion, and without active elbow extension, prehension is useless.

Nerve transfers to restore elbow extension can include grafting from the ruptured cervical nerve roots and transfers from intercostal nerves, the spinal accessory nerve, and other extraplexal donors. Alternatively, a portion of functioning nerve can be transferred, similar to an Oberlin transfer.

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We report a case of a posterior division of the axillary nerve transfer to the lateral triceps branch to restore elbow extension as a precursor to restoring prehension.

CASE REPORT

An 18-year-old woman, injured in a car accident, was initially evaluated 6 months after injury. Physical examinations, electrodiagnostic studies, and computed tomographic myelogram confirmed a lower brachial plexus injury primarily involving C7, C8, and T1. The patient demonstrated good proximal muscle strength of the shoulder girdle (anterior and middle deltoid M4, posterior deltoid M4, external rotators M4). The patient had absent triceps function associated with antigravity extensor carpi radialis longus and brevis strength. The patient also had absent function of wrist flexors and finger flexors and extensors. With loss of prehension, the surgical plan included restoration of triceps function, followed by either a tendon transfer of the brachialis or a free functioning gracilis muscle to the flexor digitorum profundus. Based on the fact that her deltoid function was clinically near normal, we elected to perform a transfer of the posterior division of the axillary nerve to the lateral triceps branch.

Six months after injury, a longitudinal incision was made over the quadrilateral and triangular spaces. Subcutaneous tissues were elevated, and the posterior as-

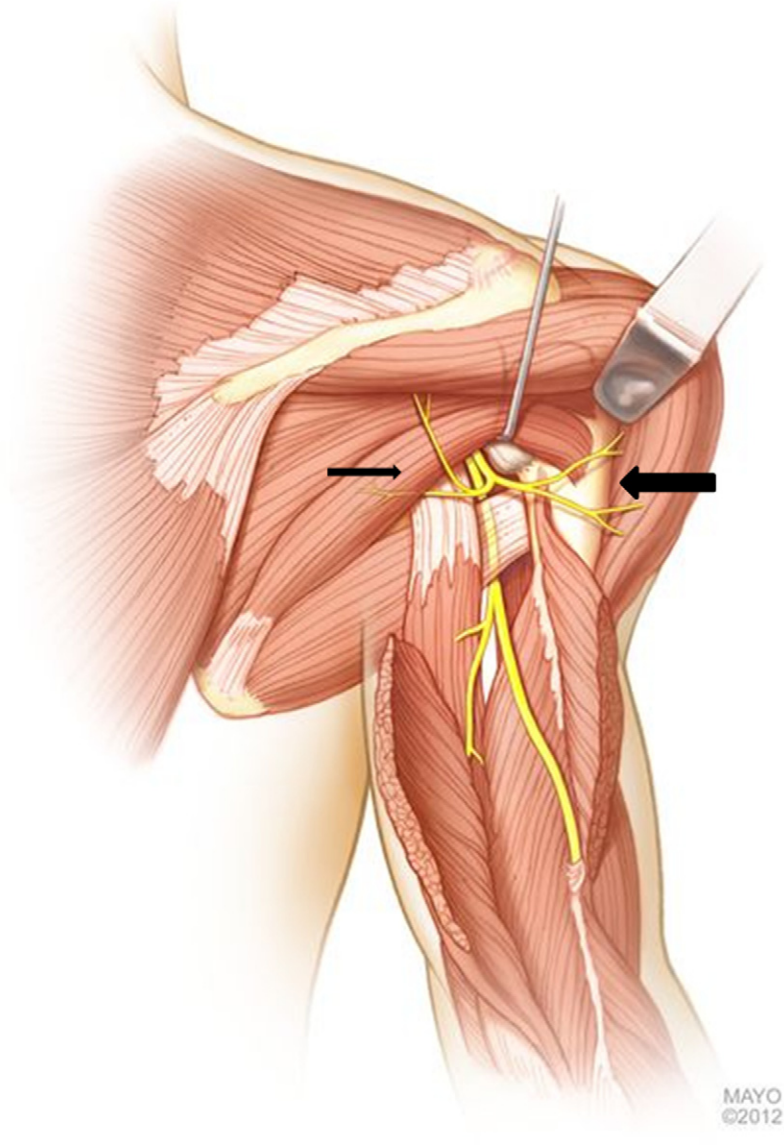

FIGURE 1: Surgical exposure illustration demonstrates the posterior branch of the axillary nerve and the branch to the lateral triceps. The large arrow points to the anterior branch of the axillary nerve innervating the anterior and middle heads of the deltoid. The small arrow points to the posterior branch of the axillary nerve innervating the teres minor and posterior head of the deltoid. (With permission Mayo Foundation, copyright 2012.)

pect of the deltoid was elevated and retracted to identify the sensory branch of the axillary nerve, which was traced back to the quadrilateral space where the posterior branch of the axillary nerve to the posterior deltoid was identified (Fig. 1). Nerve stimulation demonstrated excellent contractility of both the posterior and the anterior deltoid. The proximal aspect of the triceps motor branch was next identified (Fig. 2). Because of considerable size discrepancy between the posterior branch of the axillary nerve and the branch to the lateral triceps, the teres branch of the axillary nerve was also divided and used. Under operative microscope magnification, 9-0 nylon was used to directly coapt the posterior axillary branches to the triceps and the teres minor to the lateral triceps branch (Fig. 3). The patient was placed in a shoulder immobilizer for 3 weeks, and dedicated physical therapy for shoulder and elbow strengthening, active range of motion exercises, and neuromuscular reeducation was initiated at 3 weeks after surgery.

We noted triceps contraction at 6 months, and by 12 months, she had regained M4 triceps strength (all preoperative and postoperative manual muscle testing was performed by the same 3 primary surgeons). No functional deficit followed the posterior branch of the axillary nerve harvest as deltoid strength remained beyond antigravity (anterior and middle deltoid M5, posterior deltoid M4) and external rotation strength remained