Does Triceps Branch Transfer to the Whole of the Axillary Nerve Improve External Rotation in a Selected Group of Upper-Arm Brachial Plexus Patients?

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Abstract

In upper brachial plexus injuries involving the C5–C6 roots, restoring shoulder abduction and external rotation remains a key objective of reconstructive nerve surgery. Conventional transfer of the long head triceps branch of the radial nerve to the anterior branch of the axillary nerve reliably reinnervates the deltoid, but its limitation lies in excluding the posterior axillary branch, leaving the teres minor denervated and often resulting in suboptimal recovery of external rotation.

To address this limitation, we adopted a modified approach in which the long head triceps branch is transferred to the main axillary nerve trunk prior to its bifurcation, enabling simultaneous reinnervation of both anterior and posterior divisions. This technique was selectively applied in patients with C5–C6 injuries showing predominant C5 involvement—characterized by weakness of deltoid, supraspinatus, infraspinatus, and partially biceps, with preservation of C6-dominant radial nerve-innervated muscles such as brachioradialis. Anatomical considerations at the root level suggest that fascicles destined for the radial nerve are more posterior and resilient, making the donor branch a reliable source.

Early clinical outcomes have been favorable. Patients demonstrated robust deltoid recovery comparable to or exceeding that achieved with the traditional technique. Notably, we observed a consistent improvement in active external rotation, suggesting effective reinnervation of the teres minor through inclusion of the posterior axillary branch.

Transfer of the long head triceps branch to the main axillary nerve trunk appears to offer a more comprehensive reconstructive option for selected C5–C6 brachial plexus injuries. This modification enhances shoulder external rotation without compromising the reliability of deltoid reinnervation. Further study is warranted to validate these encouraging early results.

Keywords

- axillary nerve
- brachial plexus injury
- C5–C6 palsy
- deltoid reinnervation
- external rotation recovery
- nerve transfer
- shoulder abduction
- teres minor reinnervation
- triceps branch transfer

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In upper brachial plexus injuries involving the C5-C6 roots, restoration of shoulder abduction and external rotation remains a central goal of reconstructive nerve surgery. Traditionally, transfer of the long head triceps branch of the radial nerve to the anterior branch of the axillary nerve has been a well-established and reliable technique for deltoid reinnervation.[1] This method consistently provides meaningful recovery of shoulder abduction because

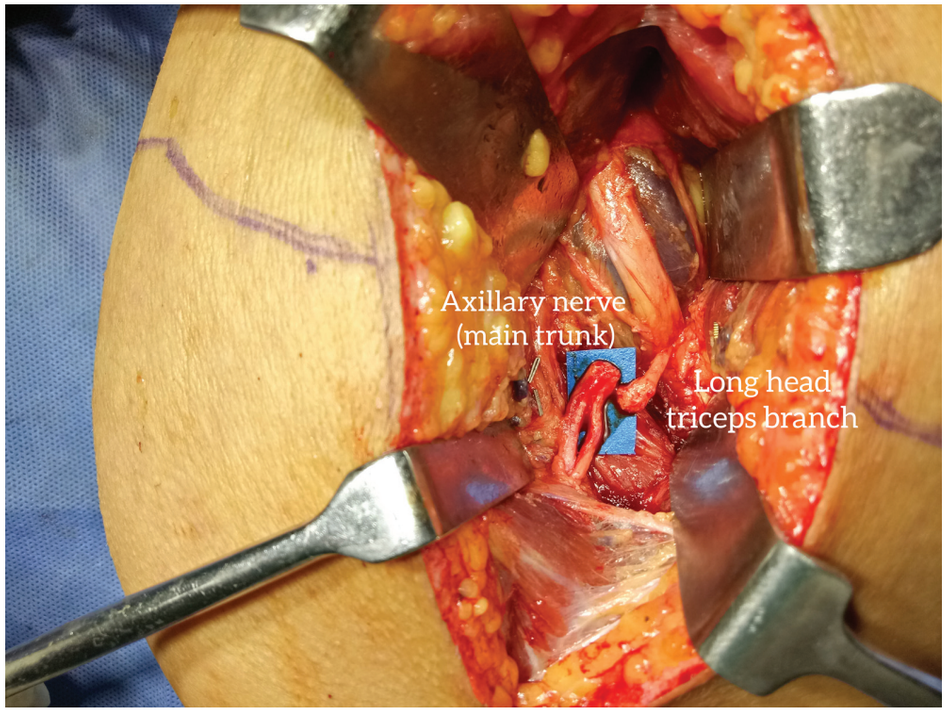

Fig. 1 Depiction of donor nerve (long head triceps branch) and recipient nerve (whole of the axillary nerve with its two terminal branches).

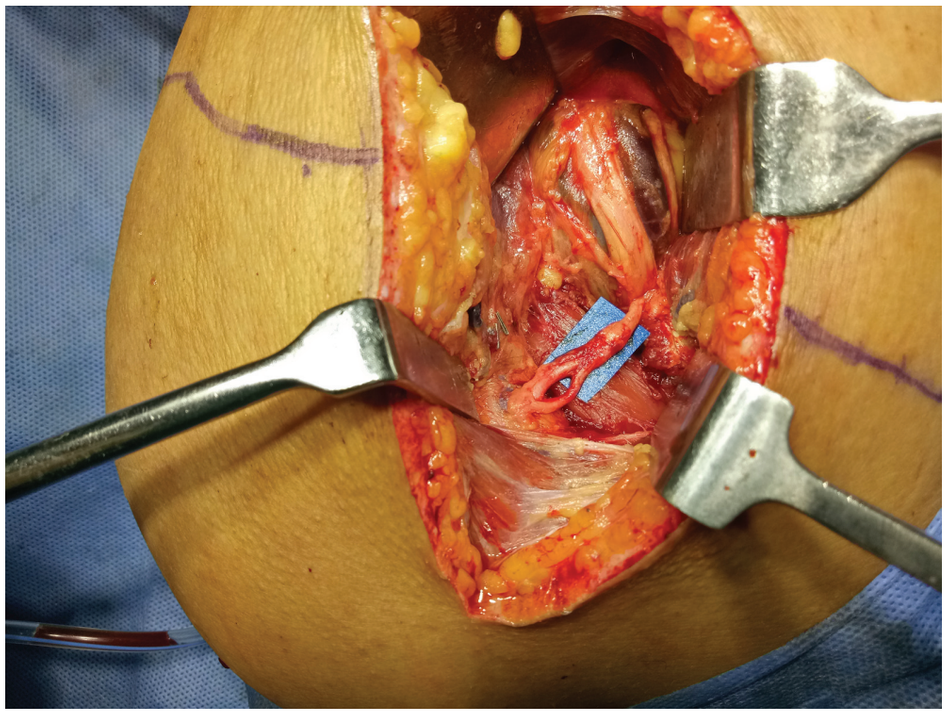

Fig. 2 Donor nerve (long head triceps branch) coapted with the recipient nerve (whole of the axillary nerve proximal to its terminal branches) using 9/0 nylon sutures.

it selectively reinnervates the anterior division responsible for the major functional component of the deltoid.[2] However, a known limitation of this approach is that the posterior branch of the axillary nerve is excluded from the reconstruction. As a result, the teres minor, an important external of the shoulder, does not receive reinnervation, and postoperative recovery of external rotation is often limited.[3]

To address this shortcoming, we have adopted a modified technique in a select group of patients in which the long head triceps branch is transferred to the main axillary nerve trunk before its bifurcation into anterior and posterior branches (►**Figs. 1** and **2**). This strategy theoretically allows simultaneous reinnervation of both the deltoid and the teres minor, thereby expanding functional recovery beyond shoulder abduction alone.

We have used this technique in C5-C6 root injuries selectively affecting C5 more than C6. In these type of injuries the muscles innervated by C5 (deltoid supraspinatus, infraspinatus, biceps partially) are weak while C6 predominant muscles like brachioradialis can remain functional. At root level the fascicles destined for the radial nerve (brachioradialis, wrist extensors) are more posterior and robust, and thus more likely to survive traction.

Our clinical experience with this modification has been encouraging. Patients demonstrated robust return of deltoid strength compared to results observed with the conventional technique. In addition, we noted a consistently better recovery of active external rotation, suggesting more effective reinnervation of the teres minor.

Although further study is warranted, our observations indicate that targeting the main axillary nerve prior to its bifurcation may provide a more comprehensive reconstruction option in selected C5-C6 brachial plexus injuries, offering improved overall shoulder function without compromising the reliability of deltoid reinnervation.

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Conflict of Interest
None declared.

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