



Anatomic study of the intercostal nerve transfer to the suprascapular nerve and a case report

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Introduction

In C5/C6 or C5/C6/C7 root lesions of the brachial plexus, nerve transfer is widely accepted as a reliable method for the restoration of shoulder abduction, external rotation, and elbow flexion. Spinal accessory nerve transfer to the suprascapular nerve is the most acceptable method for shoulder function recovery (Bertelli and Ghizoni, 2007; Rui et al., 2012). To our knowledge, the combination of an accessory nerve lesion and brachial plexus palsy occur quite often in supraclavicular injuries with an upper-type or total palsy of the brachial plexus (Bertelli and Ghizoni, 2011). The concomitant injury rate was about 6–13% in brachial plexus root avulsions (Bertelli and Ghizoni, 2011; Chen, 1998). Our study investigated the anatomical feasibility of transferring the 3rd and 4th intercostal nerves to the suprascapular nerve. We also reported the first case using this technique. This study provided a new donor nerve source for functional recovery of the suprascapular nerve and preserved the accessory nerve for better shoulder stability.

Methods

Anatomical study

Thoracic walls of 30 embalmed human cadaver specimens from the Department of Anatomy, Shanghai Medical School, Fudan University were dissected for this study, of which eight were female and 22 were male cadavers. The age of the specimens ranged from 43 to 77 years with an average of 58 years.



Figure 1. The suprascapular nerve was divided at the level of its origin from the upper trunk. It was then dissected and turned down under the clavicle (*).

Case report

A 41-year-old man had a motorcycle accident 1 month before presentation with paralysis of shoulder abduction and external rotation, elbow flexion, and extension, as well as wrist and finger extension. Furthermore, he could not shrug his right shoulder. Electromyography confirmed a complete lesion of C5-7, and accessory nerves, and a partial lesion of C8, T1, and phrenic nerves. Surgical exploration via a supra-clavicular approach confirmed that C5-7 were avulsed at the root level accompanied with partial lesion of C8/T1. The 3rd and 4th intercostal nerves were coapted to the suprascapular nerve with 10-0 nylon under an operative microscope (Figures 2 and 3). The musculocutaneous nerve was neurotized by the 5th, 6th, and 7th intercostal nerves.



Figure 2. The 3rd and 4th intercostal nerves were coapted to the suprascapular nerve. (A) Supraclavicular approach (B) Deltopectoral approach to coapt the suprascapular nerve to intercostal nerves. (C) midaxillary line to harvest the intercostal nerves. *Coaptation site.

Figure 3. Drawing of the intercostal nerves transfer to the suprascapular nerve under the clavicle via a deltopectoral approach.



Results

Anatomical study

Intercostal nerve	Table1. Statistical analysis of the measurements.		Statistics
	Length of the intercostal nerves, cm (SD)	Distance from the midaxillary line to the middle of the clavicle, D, cm (SD)	
III	10.17 (0.65)	7.67 (0.81)	$t = 13.19, p = 0.00$
IV	11.67 (0.85)	7.72 (0.80)	$t = 7.64, p = 0.00$
V	12.67 (0.88)	12.87 (1.04)	$t = -0.82, p = 0.42$
V*	14.67 (0.88)*	12.87 (1.04)	$t = 7.20, p = 0.00$
VI	12.32 (1.19)	15.83 (1.33)	$t = -10.76, p = 0.00$
VI*	14.32 (1.19)*	15.83 (1.33)	$t = -4.63, p = 0.00$

Case report



Thirty-four months after the operation, the patient gained 30° of shoulder abduction (Figure 4) and 45° of external rotation independently, as well as M3 (MRC) recovery of elbow flexion not independently from shoulder abduction (Figure 5). There was spontaneous improvement in the elbow, wrist, and fingers extension, but none in the accessory nerve. The patient regained near-normal daily life and returned to half-day work

Consulsion

This study has confirmed that the 3rd and 4th intercostal nerves could be good donor nerves with a sound anatomical basis and promising preliminary clinical results, especially for those whose accessory nerve had been injured, these nerves could be a substitute to cope with the dilemma that there are not enough donor nerves for transfer. The preservation of the spinal accessory nerve could provide a better shoulder stability, no obvious impairment of respiratory function. We would like to include the coaptation of the 3rd and 4th intercostal nerves and suprascapular nerve within the framework of the treatment paradigm for upper and total brachial plexus lesion.