British Journal of Plastic Surgery (2005) **58**, 541–546

ELSEVIER

BJPS
An International Journal of Surgical Reconstruction
www.bjps.com

The use of thoracodorsal nerve transfer in restoration of irreparable C5 and C6 spinal nerve lesions

M.M. Samardzic*, D.M. Grujicic, L.G. Rasulic, B.R. Milicic

Institute of Neurosurgery, Clinical Center of Serbia, Visegradska 26, 11000 Belgrade, Serbia and Montenegro

Received 21 June 2003; accepted 17 December 2003

KEYWORDS
Axillary nerve; Brachial plexus injury; Musculocutaneous nerve; Nerve transfer; Thoracodorsal nerve

Summary There are only a few reports on the use of thoracodorsal nerve (TDN) transfer to the musculocutaneous or axillary nerves in cases of directly irreparable brachial plexus injuries. In this study, we analysed outcome and time-course of recovery in correlation with recipient nerves and type of nerve transfer (isolated or in combination with other collateral branches) for 27 patients with transfer to the musculocutaneous or axillary nerves. Using this nerve as donor, we obtained useful functional recovery in all 12 cases for the musculocutaneous nerve, and in 14 (93.3%) of 15 nerve transfers for the axillary nerve.

Although, we found no significant statistical difference between analysed patients according to the percentage of recoveries and mean values, we established a better quality and shorter time of recovery for the musculocutaneous nerve. According to obtained results, we consider that transfer may be a valuable method in reconstruction after directly irreparable C5 and C6 spinal nerve lesions.

The type of donor nerve is an important prognostic factor in nerve transfers for directly irreparable brachial plexus lesions. In cases of upper brachial plexus palsy one of the possibilities is the use of the thoracodorsal nerve (TDN) since this remains functional in majority of the C5–C6 lesions. This method of nerve transfer was introduced by Foerster in 1929, as reported by Narakas.[1] He employed the nerves to the latissimus dorsi or subscapular muscles when repairing lesions of the axillary nerve. Thereafter, the TDN transfer has been reported rarely and with limited number of cases.[1–4] We used this type of nerve transfer to upper arm nerves during last 20 years.[5,6]

The purpose of this study is to elucidate characteristics and to determine the value of the TDN transfer through an analysis of our surgical results.

Patients and methods

Patient population

In this study, we analysed a series of 27 patients

*Corresponding author. Tel.: +381-11-361-5582; fax: +381-11-361-5577.
E-mail address: gruj@infosky.net

S0007-1226/$ - see front matter © 2004 The British Association of Plastic Surgeons. Published by Elsevier Ltd. All rights reserved.
doi:10.1016/j.bjps.2003.12.027

with upper brachial plexus palsy due to traction injuries who were operated on since January 1980. The age of these patients ranged from 9 to 46 years (mean 27.4 years), with 21 patients (77.7%) aged up to 40 years. In all cases, the supraspinatus, deltoid, and biceps muscles were paralysed. Using clinical, electrodiagnostic (electromyography of the proximal arm and cervical paraspinal muscles, and somatosensory evoked potentials for the musculocutaneous, radial, and median nerves) and radiological (cervical myelography, computed tomography-myelography and magnetic resonance imaging) tests, we diagnosed a variety of injury patterns to the C5, C6 and sometimes C7 spinal nerve roots or spinal nerves.

Indications for nerve transfer included preoperatively documented avulsion of the C5 and/or C6 spinal roots or intraoperatively demonstrated peripheral spinal nerve injuries, for which we were not able to determine the severity of structural changes in the proximal spinal nerve stumps precisely. Surgical procedures were done between 2 and 12 months after the injuries and 25 (91.4%) patients were operated within 6 months after injuries.

Surgery

The extent of surgical exploration was adapted to the reliability of preoperative diagnosis, as we described previously.[5] The functional status of donor and recipient nerves was evaluated using direct electrical nerve stimulation. The choice of the recipient nerve for the TDN transfer was based predominantly on the possibility for direct nerve anastomosis with this nerve or with the other donors.

For these 27 patients, we performed 12 reinnervations of the musculocutaneous and 15 reinnervations of the axillary nerve using the TDN as donor. These procedures were in all cases a part of complex brachial plexus reconstruction that included other types of nerve transfer (medial pectoral, intercostal, spinal accessory nerves) or nerve grafting (Table 1). In nine nerve transfers, we combined the thoracodorsal with intercostal, long thoracic or subscapular nerves. The main reason for combined nerve transfer was completion of the suture line in cases with recipient nerves of considerably larger diameter.

Microsurgical procedure

The TDN was usually joined directly to the recipient nerves in 26 patients. In one case with an extensive peripheral lesion to the musculocutaneous nerve, we used an 8 cm long nerve graft. The neurorrhaphies were performed using standard microsurgical procedure (Fig. 1). The epifascicular epineurium of the recipient nerves was removed in order to reduce their diameter and any fibrosis on the suture line. The sutures were introduced through the epineurium of the TDN and through interfascicular tissue or perineurium of some fascicles of the recipient nerves. Individual anastomoses were completed with two sutures on the upper side of the nerve or with a circumferential suture using four to five stitches around the nerve. In some cases the suturing technique was combined with fibrin glue.

Grading of surgical results

The results of the TDN transfer were analysed using modification of the grading system which we used in our previous report[5] as follows: (1) *Bad* denotes no movement or weightless movement. (2) *Fair* denotes movement against gravity with the ability to hold position, active abduction up to 45°, and full range elbow flexion up to 90°. (3) *Good* denotes movement against resistance with ability to repeat movements in succession, active abduction over 45°, and full range elbow flexion. (4) *Excellent* denotes near normal function. Fair, good and excellent results were considered to represent recovery. The quality of recovery was estimated according to the relation between excellent and good vs. fair results. The follow-up period was at least 2 years.

Table 1 Summary of 27 nerve transfers using thoracodorsal nerve as donor

Donor nerve	Recipient nerve		Total
	Musculocutaneous	Axillary	
Thoracodorsal	8	10	18
Thoracodorsal and intercostal	2	2	4
Thoracodorsal and subscapular or long thoracic	2	3[a]	5
Total	12	15	27

[a] One case combined with long thoracic nerve.