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Original article

Management of painful scar-tethered cutaneous nerves of the upper limb

Traitement des nerfs douloureux cutanés captifs en tissus cicatriciels du membre supérieur

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ABSTRACT

We report the results of treatment by division and proximal relocation of 44 painful, scar-tethered cutaneous nerves of the upper limb in 22 patients. In all patients, neuropathic pain had developed either following surgery or trauma, but without apparent direct nerve injury. The mean duration of pain symptoms prior to relocation was 17 (range 7–44) months. Adequate treatment involved relocation of 35 nerves at a first operation for each of the 22 patients, with six patients requiring further surgery to relocate 9 nerves. At a minimum follow-up of 6 months, nerve relocation resulted in complete resolution of all forms of pain at the primary site in 21/22 (95%) patients and no pain or hypersensitivity at the final relocation site in 19 of the 22 patients (86%).

Mots clés :
Douleur
Douleur nerveuse
Douleur neuropathique
Nerf cicatriciel
Nerf cutané
Nerve périphérique
Réimplantation proximale des nerfs

RÉSUMÉ

Nous rapportons ici le traitement par section et réimplantation proximale de 44 nerfs cutanés douloureux captifs en tissus cicatriciels du membre supérieur chez 22 patients. Chez tous les patients, la douleur neuropathique s'était développée soit à la suite d'une chirurgie ou d'un traumatisme direct, sans lésion directe du nerf. La durée des symptômes douloureux avant la relocalisation était en moyen de 17 mois (entre 7 et 44 mois). Le traitement adéquat impliquait une première opération de relocalisation proximale des 35 nerfs pour chacun des 22 patients, six patients ayant nécessité une deuxième opération pour relocaliser 9 nerfs. Après au moins six mois, la réimplantation du nerf avait abouti à la disparition complète de toutes les formes de douleur au site primaire chez 21/22 (95 %) des patients et l'absence de douleur ou d'hypersensibilité au dernier site de relocalisation chez 20 des 22 patients (86 %).

1. Introduction

Chronic nerve pain as a result of scar tissue around a nerve "spot-welding" the nerve to the surrounding structures and preventing normal nerve gliding was first reported following irradiation of the brachial plexus and described as 'radiation neuritis'. Scarring, or 'traction', neuritis affecting the median nerve was more recently reported by Hunter [1] and discussed more widely by Jones as one cause of neurogenic pain in other peripheral nerves [2]. We reported treatment of such scar-tethering of the median or ulnar nerve at the wrist in 14 patients [3]. These patients present with the same complaints of pain and hypersensitivity as those with painful end-neuromas, namely, spontaneous aching pain at rest, often continuous but with sharper peaks of severe

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pain, pain on pressure on the skin overlying the injured nerve, pain on movement of joints or tendons adjacent to the injured nerve and hypersensitivity of the skin overlying the damaged nerve.

Among the patients treated surgically for the same complaints of neuropathic pain in our unit have been a number in whom the smaller, but named, cutaneous nerve(s) involved has been in-continuity. Although some of these have had neuromas-in-continuity, some have appeared to have no nerve injury but only scar-tethering of the nerve, leading us to suspect that scar-tethering of the smaller cutaneous nerves of the hand and forearm occurs much more frequently than suspected.

This study was carried out, firstly, to try to verify that nerves without direct nerve injury may suffer neuropathic pain entirely as a result of scar-tethering and, secondly, to report the results of treatment of these by nerve division and relocation.

2. Patients and methods

2.1. Identification of scar-tethered nerves

Review of the clinical and operative notes of patients who underwent nerve relocation for neuropathic pain between January 2006 and August 2014, identified 32 cases involving nerves that had definitely not been injured, either by complete nerve division to form end-neuromas, or by complete or incomplete nerve division, with or without repair to form neuromas-in-continuity. Vision under loupe magnification was the means of determining that the nerve had not been injured: we believe this is realistic as the presenting neurogenic pain in these patients is either due to:

- an end-neuroma;
- a neuroma-in-continuity or;
- a scar-tethered nerve and loop magnification can identify both the precursor injuries leading to, and the associated physical changes of an end-neuroma or a neuroma-in-continuity.

Complete preoperative and postoperative data were available in 22 of these cases. The 22 patients included 13 women and 9 men, with an average age at nerve relocation of 45 (range 23–67) years. They all complained of varying degrees of pain at a specific site on the upper limb and altered sensibility distal to this site. In 12 patients, neuropathic pain developed following an elective surgical procedure to address various pathologies (Table 1). Ten cases occurred following open or closed trauma to the upper limb (Table 2). The sites of pain are detailed in Table 3 and the nerves involved in Table 4. The mean duration of pain symptoms was 17 (range 7–44) months.

Eighteen patients had had previous surgery after injury or electively at the site of subsequent pain. In some cases, particularly those in which the primary surgery was carried out in our own unit, often by the senior author, the operative notes clearly indicated that the operating surgeon, using loupe magnification, identified no injury of the nerve, which subsequently developed neuropathic pain. In other cases treated by the senior surgeon, the elective surgery had avoided contact with the nerve, which later developed neuropathic pain. Under these two circumstances, it is assumed that the nerve would not subsequently have developed a neuroma-in-continuity.

Table 1
Elective surgical procedures giving rise to neuropathic pain.

Primary pathology	*n*
De Quervain's tenosynovitis	3
Osteoarthritis of the basal joint of the thumb	3
Cubital tunnel release of the ulnar nerve	2
Radial wrist ganglion	1
Wrist replacement or fusion	3

In other cases, particularly those in which the primary event was trauma or an operative procedure carried out elsewhere, it was impossible to entirely exclude the possibility of nerve injury from the clinical notes. These cases were not included unless it was obvious at nerve relocation surgery that the nerve had not been injured. At nerve relocation, it was impossible in many cases to exclude nerve injury as the scarring around the nerve was so dense as to make identification of an entirely undamaged nerve after dissection of the surrounding scarring impossible: these cases were also excluded.

2.2. Treatment of scar-tethered nerves by division and relocation

Patients presenting to us with neuropathic distal limb pain typically have a history of previous injury or surgery to a site in the limb. This is followed by severe pain centered at that site, which may have been treated already by a variety of surgical activities. While the degree of each modality of pain may vary, and not all five modalities of pain will be expressed by every patient, typically five modalities of pain can be identified by specific questioning. We have described these previously [4,5] as follows:

- spontaneous aching pain at rest, often continuous;
- spontaneous intermittent sharper peaks of severe pain, occurring with very variable frequency;
- pain on pressure on the skin overlying the injured nerve;

Table 2
Open and closed trauma giving rise to neuropathic pain.

	n
Open injuries	
Lacerations	3
ORIF of a distal radial fracture	1
Intravenous cannulation	1
Tangential shaving of a burn	1
Closed injuries	
Suspected scaphoid fracture	1
Distal radius fracture	1
Metacarpophalangeal joint dislocation	1
Injury to the wrist by a handcuff	1

Table 3
The sites of neuropathic pain.

Site of pain	*n*
Radial aspect of the wrist	13
Ulnar border of the wrist	2
Medial aspect of the proximal forearm	2
Digits distal to the metacarpophalangeal joint	2
Flexor aspect of the wrist	1
Radial + ulnar aspects dorsum of wrist	1
Distal palm	1

Table 4
The nerves identified preoperatively as the cause of the neuropathic pain.

Scar-tethered nerves	*n*
SBRN alone	11
Dorsal branch of ulnar nerve	2
Medial cutaneous nerve of the forearm	2
Digital nerves	2
PBMN	1
SBRN + lateral cutaneous nerve of the forearm	1
SBRN + dorsal branch of the ulnar nerve	1
SRN + lateral + posterior cutaneous nerves of the forearm	1
SBRN + lateral cutaneous nerve of the forearm + PBMN	1

PBMN: palmar branch of the median nerve; SBRN: superficial branch of radial nerve.

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