In-continuity neuroma of the median nerve after surgical release for carpal tunnel syndrome: case report

R. Depaoli · D. R. Coscia · F. Alessandrino

Received: 26 August 2014 / Accepted: 27 August 2014 / Published online: 20 September 2014
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Abstract Iatrogenic injuries of the median nerve after surgical release for carpal tunnel syndrome resulting in the formation of a neuroma are rare. We present here the case of two patients, one with a bifid median nerve, showing in-continuity neuroma after surgical release for carpal tunnel syndrome. The patients reported persistent post-operative pain and showing symptoms. In both cases, ultrasound showed an in-continuity neuroma with a hypoechoic and enlarged median nerve at the carpal tunnel. The case report shows that ultrasound may be helpful in confirming the clinical diagnosis of neuroma and it is useful for evaluation of the percentage of the area affected by the tear.

Keywords Ultrasound · Median nerve · Neuroma · Carpal tunnel

Riassunto Le lesioni iatrogene del nervo mediano, dopo intervento chirurgico per sindrome del tunnel carpale, determinanti la formazione di un neurinoma sono rare. Nel seguente case report, sono presentati due pazienti, uno dei quali con un nervo mediano bifido, con neuroma-in-continuità formatosi dopo intervento chirurgico per sindrome del tunnel carpale. I pazienti avevano dolore postoperatorio persistente e un peggioramento della sintomatologia con il

passare del tempo. In entrambi i casi, l'ecografia ha mostrato un neuroma-in-continuità con un nervo mediano aumentato in dimensioni ed ipoecogeno a livello del tunnel carpale. Il case report mostra che l'ecografia può essere utile per confermare la diagnosi clinica di neuroma ed è utile per la valutazione della percentuale della superficie interessata dalla lacerazione.

Introduction

Carpal tunnel syndrome is related to compression of the median nerve in the wrist. Its clinical manifestations include pain involving the thumb, the index finger, the middle finger, and the radial side of the ring finger, which worsens with prolonged activity [1].

Both surgical and conservative interventions are utilised for carpal tunnel syndrome, and both treatments have benefits [2]. Patients undergoing surgical release are two times more likely to have normal nerve conduction studies, but may also have complications and side effects. Complications and failures of surgical treatment are reported to occur in 3–25 % of cases. Epineural fibrous fixation and traction neuropathy of the median nerve are the most common complications, beside haematoma, infection, skin necrosis, and intraoperative iatrogenic injuries of the median nerve [3].

The immediate onset of new symptoms after surgery, compared with those that develop weeks or months later, is suggestive of an iatrogenic injury of the median nerve.

After a nerve sustains a partial or complete injury, it possesses an intrinsic reparative capacity. The ensuing proliferation of disorganised axons, myofibroblasts, endothelial cells, and Schwann cells can result in the formation

R. Depaoli
Radiology Unit, Moncucco Hospital, Lugano, Switzerland

D. R. Coscia
Foundation IRCCS, Policlinico San Matteo,
Institute of Radiology, Pavia, Italy

F. Alessandrino (✉)
Foundation IRCCS, Policlinico San Matteo,
Institute of Radiology, University of Pavia, Pavia, Italy
e-mail: pragia@hotmail.com

of a neuroma. Neuromas could be classified into terminal and in-contiguity neuromas; in-contiguity neuromas are observed when the nerve stumps are both connected [4–6].

We present here the case of two patients, one of whom had a bifid median nerve [7], with in-contiguity neuroma after surgical release for carpal tunnel syndrome.

Case report 1

A 42-year-old operating room nurse, who 6 months previously underwent open surgery for right carpal tunnel syndrome, came to our attention complaining of burning pain in the right thumb, index, and middle finger, with immediate onset after surgery. She also presented local pain at the site of surgery. An ultrasound scan was performed showing an in-contiguity neuroma of the median nerve with a hypoechoic and enlarged median nerve (Fig. 1). Placing and pressing the transducer on the neuroma caused local pain and paraesthesia. Therefore, the patient was referred for surgery; neuroma was excised without any additional procedure with satisfactory results.

Case report 2

A 45-year-old male physician with carpal tunnel syndrome underwent open carpal tunnel release surgery. Four months later, the patient was referred to our service for numbness and burning pain at the index and middle finger of the same hand and local pain at the site of surgery, particularly when compressed or impacted. He underwent an ultrasound scan showing a bifid median nerve with an in-contiguity neuroma, with a hypoechoic and enlarged ulnar branch of the median nerve (Fig. 2). The patient refused surgery and his pain was managed with anti-inflammatory drugs, yielding satisfactory results.

Fig. 1 In-contiguity neuroma of the median nerve at the carpal tunnel. Axial sonogram, obtained at the carpal tunnel over the injured portion of the nerve, shows a normal appearance of the posterior fascicles (arrows) and a hypoechoic post-traumatic neuroma (N) affecting the anterior part of the nerve

Fig. 2 In-contiguity neuroma of the median nerve at the carpal tunnel in a patient with a bifid median nerve. Axial sonogram, obtained at the carpal tunnel, shows a bifid median nerve with normal appearance of the radial part of the nerve and a neuroma (N) affecting the ulnar part of the nerve with a normal appearance of the posterior fascicles (arrows)

Discussion

A nerve lesion, either partial or complete, may result in the formation of a neuroma with disorganised proliferation of axons, myofibroblasts, endothelial cells, and Schwann cells, due to an intrinsic reparative capacity of the nerve [4–6].

Diagnosis of neuroma, after surgical release for carpal tunnel syndrome, is based on history and clinical exam: there is history of surgery and the patient refers severe burning pain and the pain can be elicited with pressure on the wound. An important first step is to recognise whether the symptoms are persistent, recurrent, or new. When patients report persistent post-operative pain and increasing symptoms, particularly dysesthesias, and demonstrate thenar dysfunction, median nerve iatrogenic injury should be considered. Common iatrogenic injuries include the palmar cutaneous branch of the median nerve, while injury of the median nerve in the carpal tunnel is unusual [3].

Neuromas can be divided into terminal neuroma and in-contiguity neuroma. The terminal neuroma (or amputation neuroma) is most frequently localised at the proximal stump of the nerve and appears as a hypoechoic mass. The in-contiguity neuroma is characterised by a formation that is similar to terminal neuroma, which connects the two nerve stumps with variable saving of nervous tissue [4].

Neuromas of the palmar cutaneous branch, after surgical release due to carpal tunnel syndrome, are usually terminal neuroma, whereas those of the median nerve are seen in carpal tunnel in-contiguity neuroma. In both cases, these are more frequent in patients with anatomical variants,

bifid median nerve, or palmar cutaneous nerve arising on the ulnar side of the median nerve.

Numerous operative and non-operative therapeutic techniques have been described with varying degrees of efficacy. Medical treatment, antidepressants, oral analgesics, anticonvulsants, and opioids may have some efficacy in the management of neuropathic pain of neuromas; ultrasound guidance can be used to inject neuromas, but neuroma excision is one of the earliest and most useful methods practiced. The chosen method of treatment depends on the location and type of nerve as well as the injury sustained.

Ultrasound may be helpful in confirming the clinical suspicion; moreover, it can help to exclude other conditions [8, 9]. Some patients with severe nerve compression could present with increasing pain from nerve reperfusion, although this is uncommon and enables the amount of healthy tissue in the neuroma to be determined; identification of the percentage of the area affected by the tear is useful for therapy selection.

Conflict of interest All authors declare that they have no conflict of interest.

Informed consent All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000. All patients provided written informed consent to enrolment in the study and to the inclusion in this article of information that could potentially lead to their identification.

Human and animal studies The study was conducted in accordance with all institutional and national guidelines for the care and use of laboratory animals.

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