In-continuity neuroma of the median nerve at the elbow

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Abstract Neuromas are a hyperplastic disorganised proliferation of cells that represent an attempt at nerve regeneration after trauma. They can be classified into terminal and in-continuity neuromas; the latter are observed when the nerve stumps are both connected. We present here the case of a 46-year-old male who sustained a deep cut at the volar aspect of the right elbow while repairing a glass. The injury caused partial transection of the median nerve, which was initially unrecognised. After several months, the patient presented pain at the volar aspect of the elbow, worsening with manual compression at the site of previous injury. Ultrasound showed an in-continuity neuroma with a hypoechoic and enlarged median nerve at the site of the sutured wound. The case report shows that ultrasound may be helpful in confirming the clinical diagnosis of neuroma and that it is useful to evaluate the percentage of the area affected by the lesion.

Keywords Ultrasound · Median nerve · Neuroma · Elbow

Riassunto I neuromi rappresentano una iperplastica, disorganizzata, proliferazione di cellule e costituisce un tentativo di rigenerazione del nervo dopo un trauma. Possono essere classificati in terminale e neuromi in continuità; questi ultimi si osservano quando entrambi i monconi sono collegati dal tessuto neoformato. Presentiamo il caso di un uomo di 46 anni che ha subito un taglio profondo alla faccia volare del gomito destro, durante la riparazione di una finestra. Il danno ha causato la resezione parziale del

nervo mediano, inizialmente misconosciuta. Dopo diversi mesi, il paziente presentava dolore alla faccia volare del gomito, con acutizzazione alla compressione manuale nella sede della lesione. L'ecografia ha mostrato un neuroma in continuità con un nervo mediano ipoecogeno e di volume aumentato nella sede della ferita. Il caso presentato dimostra che l'ecografia può essere utile per confermare la diagnosi clinica di neuroma e per valutare la percentuale di superficie interessata dalla lesione.

Introduction

Peripheral nerves are composed of axons (nerve fibres), some of which are surrounded by a myelin sheath and others which are not myelinated, both surrounded by Schwann cells and the endoneurium. Nerve fibres are grouped in fascicles surrounded by the perineurium, and the epineurium surrounds the nerve trunk to form the peripheral nerve sheath [1, 2].

Partial and complete tears may result in post-traumatic neuromas, a hyperplastic disorganised proliferation of cells that represent an attempt at nerve regeneration. They are often clinically palpable as painful small, firm, tender masses [3–5]. Placing and pressing the transducer on the neuroma may often cause local pain and paraesthesia.

Neuromas can be classified as terminal or in-continuity neuromas; terminal neuromas are mostly found at the proximal stump, while in-continuity neuromas are observed when the nerve stumps are both connected [1].

Diagnosis is mainly clinical. Ultrasound can be helpful whenever the clinical exam is not conclusive or other pathologies cannot be excluded, especially in the setting of postsurgical situations. In addition, in the in-continuity

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Fig. 1 Scheme showing median nerve at the elbow. The median nerve at the elbow is superficial, under the lacertus fibrosus and medial with respect to the brachial artery

neuromas, the percentage of the area affected by the lesion can be evaluated.

The median nerve is particularly exposed to trauma in two locations: at the wrist and in the elbow, where it lies on a rather superficial level [6, 7] (Fig. 1).

We present here a case of a post-traumatic in-contiguity neuroma of the median nerve arising at the elbow, which is an uncommon site of presentation for post-traumatic neuroma.

Case report

While repairing a glass, a 46-year-old male worker sustained a deep cut to the right elbow, with extensive skin and subcutaneous tissue involvement. The injury caused partial transection of the median nerve, which was initially unrecognised. Immediate repair of the subcutaneous tissue lesion was performed, with wound closure. After several months, the patient came to our attention, complaining of new-onset burning pain at the volar aspect of the elbow, worsening with manual compression at the site of previous injury.

An ultrasound examination was performed. Ultrasound showed a hypoechoic and enlarged median nerve, at the site of the sutured wound (Fig. 2). Patient history and

Fig. 2 In-contiguity neuroma of the median nerve at the elbow. Axial sonogram, obtained at the elbow 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

clinical and ultrasonographic findings were consistent with traumatic in-contiguity neuroma of the median nerve.

He was referred for surgery; neuroma was excised without any additional procedure with satisfactory result.

Discussion

The neuroma is a hyperplastic disorganised proliferation of neural cells, axons, myelin, Schwann cells and fibroblasts, which forms following trauma of a peripheral nerve that passes beyond the perineurium and infiltrates the perineural connective tissue [1, 2]. Neuromas can be classified into terminal neuroma and neuroma in-contiguity. The terminal neuroma (or amputation neuroma) is most frequently localised at the proximal stump of the nerve and appears as a hypoechoic mass. The neuroma-in-contiguity is characterised by a formation that is similar to terminal neuroma, which connects the two nerve stumps with a variable saving of nervous tissue [1].

The median nerve arises from the medial and lateral cords of the brachial plexus (C6–C8, T1) and courses alongside the brachial artery both in the anterior compartment of the arm and at the elbow, passing through the antecubital fossa deep in relation to the biceps aponeurosis (the lacertus fibrosus) and anterior to the brachialis muscle (Fig. 1). The nerve lies between the humeral (superficial) and ulnar (deep) heads of the pronator teres muscle at the level of the elbow joint and enters the anterior compartment of the forearm by passing beneath the fibrous arch of the heads of the flexor digitorum superficialis muscle. At the elbow and proximal aspect of the forearm, the median

nerve supplies the pronator teres, flexor carpi radialis, palmaris longus, and flexor digitorum superficialis muscles. Within the forearm, the nerve courses between the flexor digitorum superficialis and profundus muscles. The anterior interosseous nerve arises from the median nerve at the level of the humeral head of the pronator teres muscle and travels along the anterior aspect of the interosseous membrane of the forearm between the flexor pollicis longus and the flexor digitorum profundus muscles. The anterior interosseous nerve is a purely motor nerve and supplies the pronator quadratus muscle, flexor pollicis longus muscle, and flexor digitorum profundus muscle for the index and middle fingers. The palmar cutaneous nerve arises from the median nerve approximately 7 cm proximal to the distal wrist crease and supplies skin over the palm and proximal aspect of the thenar eminence.

The median nerve is especially exposed to trauma in two locations: at the wrist, where it is subjected to continuous traumas due to the anatomical complexity of the carpal tunnel, and above the elbow, where it lies on a rather superficial level [6, 7]. At the forearm, it lies in a rather deep position, passing below the flexor digitorum superficialis. To our knowledge, this is the first description of a post-traumatic median nerve neuroma of the volar aspect of the elbow, with its ultrasound features.

Diagnosis of a neuroma is mainly based on history and clinical exam: there is history of amputation, surgery or trauma to the affected limb, the patient refers severe burning pain, often out of proportion to the severity of the injury and lasts longer than expected for the type of injury. There may be associated swelling and muscle weakness. Pain can be elicited with pressure on the wound or the injured site.

Ultrasound may be helpful in confirming the clinical suspicion [4, 5] and it enables the amount of healthy tissue in the neuroma to be determined; moreover, it can help to exclude other conditions, especially in the setting of

postsurgical neuroma. Ultrasonography can show the percentage of the area affected by the tear [8].

Conflict of interest Francesco Alessandrino, C. Pagani and F. Draghi 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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