Microsurgical principles related to excision of intraneural ganglion at the elbow

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Abstract We describe the treatment of a ganglion within the ulnar nerve at the elbow and apply the concept that an intraneural ganglion arises from the joint adjacent to the nerve in which the ganglion is located. Successful treatment of nerve compression and prevention of recurrence of the ganglion require disconnection of the nerve from the joint and deflation, not excision, of the ganglion.

Introduction

The treatment of an intraneural ganglion has changed based upon the recognition that the etiology of the ganglion is derived from an adjacent joint: the ganglion does not arise *de novo* from within the nerve. This has been confirmed for the most common of intraneural ganglions, that of the common peroneal nerve at the fibular neck, where the ganglion arises from the articular branch to the proximal tibiofibular joint [10]. Other examples include the tibial nerve in the tarsal tunnel where the ganglion arises from the subtalar joint [11], the suprascapular nerve where the ganglion arises from the glenohumeral joint [9], the sciatic nerve and lumbosacral plexus, where the ganglion arises from the hip joint through a labral tear [12], from the digital nerve where the ganglion arises from an interphalangeal joint [8], the ulnar nerve at the wrist where the ganglion arises from the distal radial–ulnar

joint [7], and also for the ulnar nerve in the condylar groove where the ganglion arises from the posteromedial side of the elbow joint [14]. This concept, the synovial origin of the intraneural ganglion, has profound implications for the treatment of an intraneural ganglion [10].

The synovial theory approach to the surgical treatment of the ulnar nerve at the elbow is exemplified in the following case description of this rare location for an intraneural ganglion with only five having been reported previously [4–6, 15].

Case Report

A 62-year-old man presented with complaints of numbness in the little and ring fingers, progressive weakness in the right hand, and loss of control of right hand movements. His symptoms had been present for about 2 years. There was no history of trauma. On physical examination, there was a 3- by 1-cm palpable mass proximal to the condylar groove along the course of the ulnar nerve. Palpation of the somewhat soft, mobile mass gave paresthesias into the little and ring fingers. There was intrinsic muscle wasting of all ulnar innervated muscles, but not of the median innervated muscles. There was an 8-mm static two-point discrimination of the right little finger compared to 4 mm in the left little finger and 4 mm in the index fingers bilaterally. On the T2-weighted images, the imaging study demonstrated a mass suggestive of a cystic mass (Fig. 1a, b). Electrophysiological measurements were not obtained. The most likely preoperative diagnosis was a schwannoma, although the physical examination suggested a ganglion due to the compressive nature of the mass.

At surgery, an intraneural ganglion of the ulnar nerve was identified (Fig. 2). A connection to the posteromedial elbow joint (Fig. 3) was resected. The cyst was drained, and the superficial covering was removed, preserving the posterior cyst wall in order to minimize risk of injury to the ulnar nerve which was markedly thinned in the regions of compression. A

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Fig. 1 MRI of left elbow mass. **a** Axial section; T2; demonstrates rounded, circumscribed lesion adjacent to the ulnar at elbow. **b**. Sagittal section; T2; demonstrates multilocular appearance of mass, with a connection to the joint (arrow)

submuscular transposition using the musculofascial lengthening technique [2, 3] was used to protect the ulnar nerve and relocate it away from further possible compression (Fig. 4).

Postoperatively, the patient was permitted to move the elbow within the soft dressing, which was removed on the tenth day. The patient began on motor and sensory rehabilitation 2 weeks after surgery. By 3 months postoperatively, static two-point discrimination in the right little finger had improved initially 8 to 6 mm, and pinch and grip strengths had improved preoperatively from 2.6 and 23 kg to 2.9 and 26 kg, respectively. This compared to the pre- and postoperative grip strengths of the opposite hand of 35 kg. A 3-month postoperative magnetic resonance imaging study did not show any evidence of the ganglion.

Discussion

Spinner and colleagues reported on a specimen of an intraneural ulnar cyst in 1810 from the Musée Dupuytren in Paris [13]. That specimen contains a connection to the

posteromedial elbow joint, as does the specimen reported here.

The “unifying theory,” as Spinner defined it in his series of pathophysiologic papers [8–12, 14], considers the initiating event to be a ganglion, forming as usually conceived, within a joint, by pressing and extruding the weakest location. This location can be the entrance/exit point of the articular branch of a nerve. The intracapsular pressure forces the cyst to expand along the easiest route, which is along this nerve branch, permitting the ganglion to enter the nerve. Since the intraneural ganglion is articular in origin, and not neural, and the ganglion does not form from within the nerve, dissection within the nerve is not required to remove the origin of the cyst. Rather, the connection to the joint must be eliminated to prevent recurrent intraneural ganglion formation. This is in contrast to the review by Cobb and Moiel related to the common peroneal nerve at the fibular head. Cyst drainage alone resulted in 30 % recurrence of the cyst but little neural dysfunction, versus cyst excision which resulted in 29 %

Fig. 2 Intraoperative appearance of the intraneural ulnar nerve ganglion. The ganglion is noted in situ. Proximal is to the right

Fig. 3 Blue vessel loop below the nerve encircles the connection from the intraneural ganglion/ulnar nerve to the joint. This connection must be removed to prevent recurrence of the ganglion within the nerve. Proximal is to the right

Fig. 4 The ulnar nerve after “deflation” of the ganglion. Excision of redundant ganglion sheath superficially, but leaving the sheath posteriorly in order to protect the thin fascicles of the compressed ulnar nerve. Proximal is to the right

recurrence of the cyst but with greater neurologic downgrading of peroneal nerve function [1].

The principles to be followed in treating an intraneural ganglion are therefore to drain, not excise, the cyst from the nerve, giving maximum chance to preserve neural function and to disconnect the ganglion from its articular origin, thereby reducing the risk of recurrence of the ganglion.

Statement of Human and Animal Rights No animals were used in this study. With regard to the one person whose surgery is reported here, 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 2008. An informed consent for the surgery was obtained.

Conflict of Interest None of the authors has a conflict of interest to report.

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