Case report

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A rare case of an intraneural ganglion cyst of the median nerve

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Abstract

Aim of the study: Intraneural ganglion cysts are a relatively uncommon type of ganglion cyst that can affect peripheral nerves. They are particularly rare in the upper limb, and even more so in the median nerve, with the vast majority of them occurring in the peroneal nerves. This paper aims to make the reader aware of this relatively uncommon condition. **Case description:** We report a case of a 41-year-old male who presented with a gradually progressing mass on the volar aspect of the wrist extending to the index finger. The nonspecific presentation as well as the rarity of the condition may make diagnosis challenging. The patient was referred for surgical management under a specialist peripheral nerve hand surgeon. **Conclusions:** Ultrasound and magnetic resonance imaging as well as awareness of the typical imaging features of this entity are crucial in making the correct diagnosis as well as excluding other potential considerations such as neoplasm.

Introduction

Ganglion cysts are the commonest soft tissue lesions of the hand and wrist. They are non-malignant cystic masses that occur in close relation to musculoskeletal structures, usually tendons or joints. Histologically, they comprise of a thin soft tissue capsule, contain mucinous material and do not have a synovial lining[1,2].

Intraneural ganglion cysts (INGC) in the upper limb and, in particular, the median nerve are a rare entity however. These lesions are most commonly identified in the lower limbs, with approximately 60% occurring in the common peroneal nerve, followed by the ulnar nerve (9.0%) and the tibial nerve (4.9%). Its incidence in the median nerve is extremely rare, and only accounts for 0.5% of intraneural ganglion cysts according to a large systemic review conducted by Desy *et al.* [2,3]

Diagnosis on history and examination alone can be challenging, and due to the rarity of the condition, it may be overlooked and in some instances misinterpreted as a neoplastic lesion such as a cystic schwannoma, myxoma or synovial sarcoma[2,4], which can have important implications for management. Magnetic resonance imaging (MRI) and ultrasound are crucial in clearly delineating this entity. This paper aims to make the reader aware of this relatively uncommon condition and the possibility of its rare occurrence in the median nerve, so that this diagnosis may be considered in patients presenting with a cystic lesion in the median nerve.

Anatomy

The median nerve arises from the lateral (C5, C6, C7) and medial cords (C8, T1) of the brachial plexus. It courses lateral to the axillary artery, and in the arm descends between the biceps and triceps brachii muscles alongside and lateral to the brachial artery[5].

It passes through the cubital fossa to enter the forearm, where it descends between the two heads of the pronator teres muscle. It gives off the anterior interosseous nerve in the proximal forearm, and courses towards the wrist between the flexor digitorum superficialis and profundus (FDP) muscles. It provides motor supply to all muscles in the anterior compartment of the forearm (flexor and pronator), except the flexor carpi ulnaris and the ulnar half of flexor digitorum profundus[5].

After giving off the palmar cutaneous branch just proximal to the wrist, which supplies cutaneous innervation to the palm and the skin over the thenar eminence, it enters the carpal tunnel lateral to

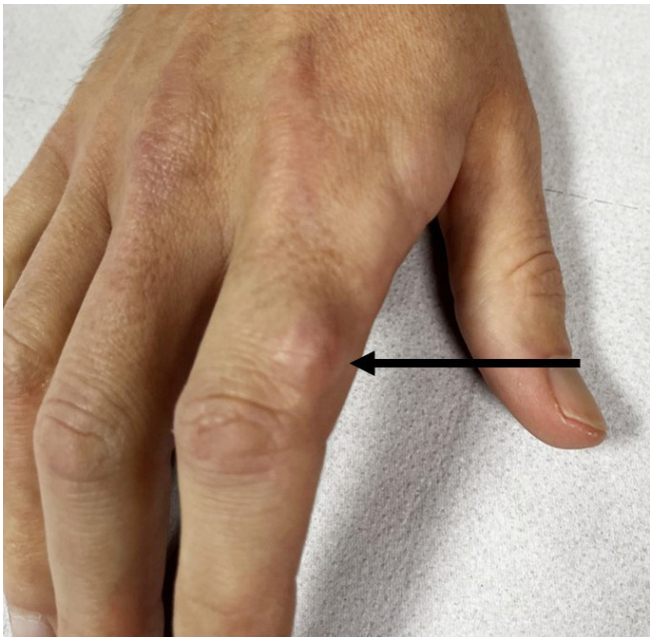

Fig. 1. *Visible swelling on the radial aspect of the index finger (black arrow)*

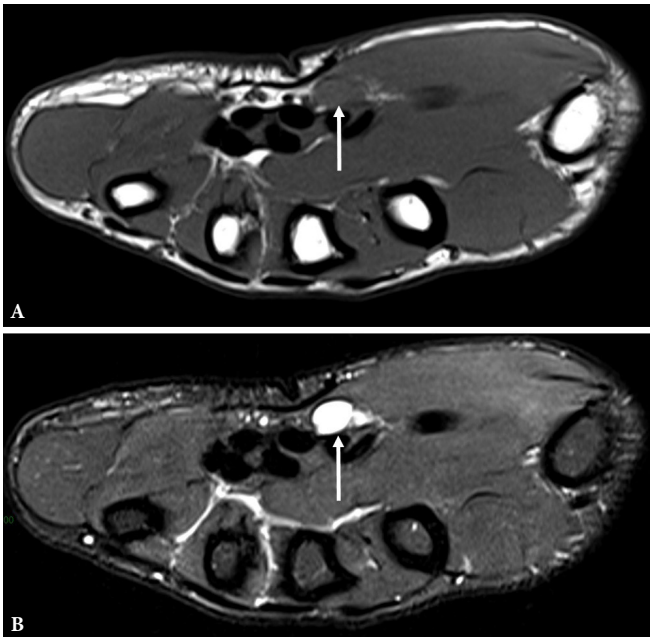

Fig. 2. *Axial PD (***A***) and STIR (***B***) images at the level of the distal carpal tunnel demonstrating cystic structure occupying the median nerve (white arrows). Note the loss of the normal fascicular pattern of the nerve*

the flexor digitorum profundus (FDP) tendon, passing deep to the flexor retinaculum of the wrist. On entering the hand, it gives off several motor and sensory branches. These motor branches comprise the thenar motor branch which supplies the thenar muscles including the abductor pollicis brevis, superficial head of flexor pollicis brevis and opponens pollicis and the two radial lumbricals. The sensory branches comprise the digital cutaneous branches, which provide sensory innervation to the thumb, index, middle fingers and the radial half of the ring finger. The median nerve also gives off several articular branches which provide sensory innervation to the elbow, wrist, carpal and interphalangeal joints[5].

Case report

A 41-year-old right-handed male presented with a progressively increasing swelling on the volar aspect of his right wrist and radial aspect of index finger. The patient stated that it was occasionally tender when rubbed. He did not have any neurological symptoms, and had no history of trauma or previous hand surgery. He was otherwise healthy, with no significant past medical or surgical history. On physical examination, a superficial mobile firm mass on the volar aspect of the right wrist was noted, extending towards the index finger at the level of the metacarpophalangeal joint, with a maximal diameter of approximately 1 cm. There was a visible swelling on the radial aspect of the index finger (Fig. 1). No sensory or motor deficits were noted.

MRI of the right wrist and hand demonstrated a well-circumscribed and elongated multicystic lesion within the median nerve at the level of the pronator quadratus muscle, extending into the carpal tunnel, and into the proper palmar digital nerve on the radial aspect of the index finger along the proximal phalanx just distal to the proximal interphalangeal joint (PIPJ) (Fig. 2). The lesion terminated just radial and deep to the flexor tendon of the index finger at the level of the PIPJ (Fig. 3). The lesion extended over a maximum length of

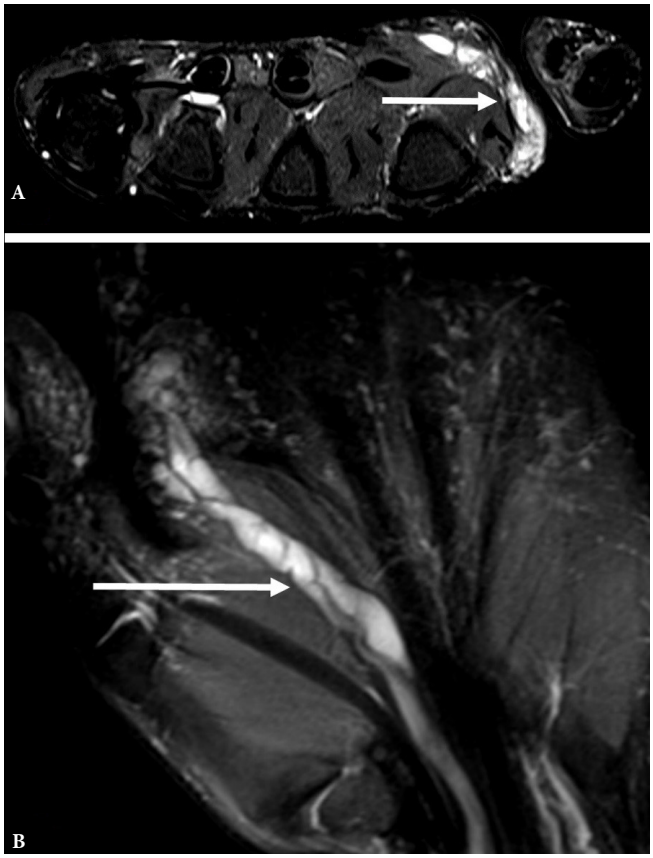

Fig. 3. *Axial STIR image at the level of the metacarpal heads (***A***) and coronal STIR image (***B***) demonstrating cystic structure occupying the median nerve along its course and extending to the radial palmar digital nerve (white arrows). The normal fascicular pattern of the nerve is lost, and the lesion occupies the entire nerve*

15 cm. There was mild denervation oedema of the abductor pollicis brevis at the thenar eminence.

An ultrasound was also performed, which demonstrated a tubular hypoechoic structure involving the length of the median nerve from the wrist through the carpal tunnel, over the thenar eminence and extending to the palmar digital nerve of the index finger (Fig. 4 and Fig. 5). There was no vascularity within this structure on colour Doppler interrogation.

Based on the typical imaging characteristics, a diagnosis of an intraneural ganglion cyst (INGC) was made. The long segment involvement and the imaging features are rather characteristic of this and were not in keeping with a neoplastic process.

Due to the extent of the INGC, aspiration was not performed. As the patient initially presented to a hand surgeon in a small private hospital with limited microsurgical facilities, it was decided the patient should be referred to a hand surgeon with a subspecialist interest in peripheral nerve surgery in a tertiary centre.

Discussion

INGCs are benign mucinous lesions which occur within peripheral nerves, and are a rare presentation of an otherwise common upper limb lesion. The majority of these occur in adults. The diagnosis may be challenging due the rarity of this lesion in this location. They typically involve the epineurium of peripheral nerves, and present as a palpable mass with or without neurological symptoms. On histology, INGCs demonstrate myxoid change, and have a fibrous capsule. They typically occur between the nerve and nerve sheath, which can result in compression of nerve fibres and neurological manifestations[1,2].

Several theories have been described in relation to the pathogenesis of INGCs. The most widely accepted is the theory proposed by Spinner et al., saying that articular degeneration and capsular defect of a neighbouring joint may cause the fluid to track along the epineurium of the nerve and result in the formation of the cyst, which can then extend along the nerve[4,6]. Other theories suggest that they may arise due to myxoid degeneration of the connective tissue surrounding the nerve, be related to trauma and intraneural haemorrhage or even de novo formation from hamartomatous cell rests[7,8].

INGCs have specific imaging appearances, and MRI along with dynamic ultrasound can usually provide a definitive diagnosis. MRI features are similar to ganglion cysts that are seen elsewhere, with high signal on fluid sensitive sequences and low T1 signal relative to skeletal muscle[1,2]. On ultrasound, they would appear as well-defined hypoechoic lesions with or without some internal complexity, and are avascular[3,9]. The diagnosis can also be confirmed by aspiration of straw coloured fluid from the lesion under ultrasound guidance[9]. Communication with an adjacent joint is usually pathognomonic and is seen in the majority of cases (approximately two thirds according to recent studies)[3], however this is not always seen as was the case with this patient.

Management can be challenging and surgical treatment is controversial. Therapeutic options range from conservative management, to cyst resection and nerve resection with or without nerve grafting or nerve transfer[3]. Ultrasound guided aspiration is also used in certain instances, although this is associated with a higher rate of recurrence[9]. Identifying communication with a joint may also have management implications, as addressing the joint communication could potentially negate the need for more aggressive surgical resection[3]. Aspiration was not attempted in this case as this INGC was extensive. Given the crucial areas in the hand supplied by the median nerve, with nerve

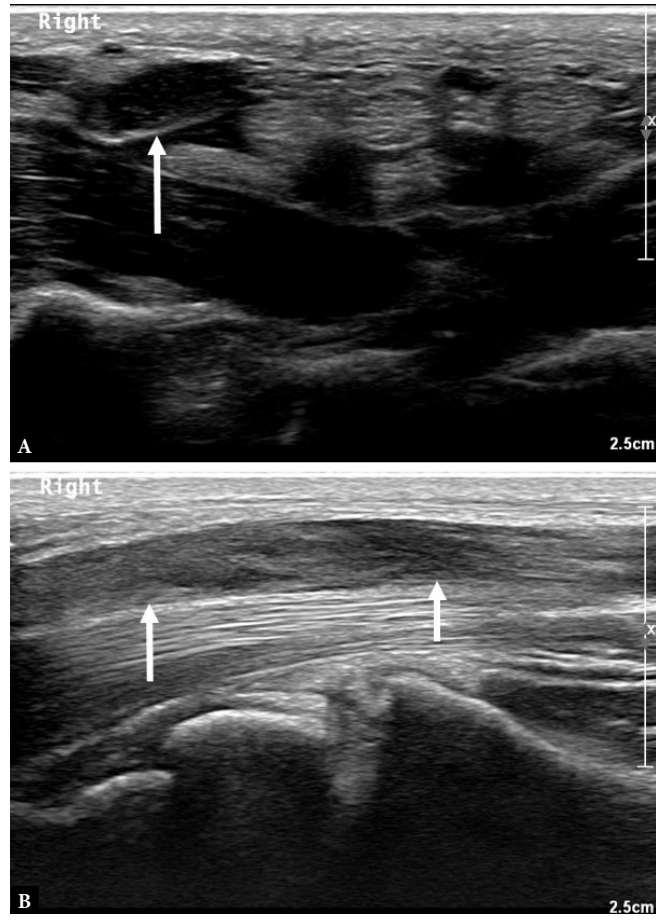

Fig. 4. *Transverse (**A**) and longitudinal (**B**) views of the carpal tunnel demonstrating fusiform enlargement of the median nerve (white arrows) with hypoechoic appearance and loss of the normal fascicular pattern*

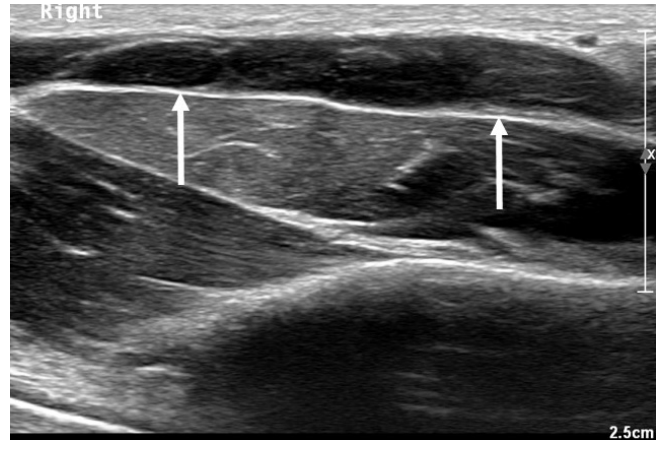

Fig. 5. *Longitudinal image demonstrating extension of the lesion along the distribution of the median nerve over the thenar eminence (white arrows)*

resection potentially resulting in significant loss of motor and sensory function of this patient's dominant hand, the patient was referred to a tertiary centre with access to advanced microsurgery facility.

Conflict of interest

The authors declare that they have no conflicts of interest. Informed consent was obtained from the patient for publication.

Author contributions

Original concept of study: RB, AS. Writing of manuscript: SA. Critical review of manuscript: GP, KI, RB, AS.

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