Low Motor Ulnar Nerve Palsy Caused by a Traumatic Pseudoaneurysm of the Ulnar Artery

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Introduction

Ulnar tunnel syndrome (UTS) refers to the compression of the ulnar nerve as it courses through Guyon's canal. Entrapment in this canal is a rare, but recognized, form of compression neuropathy of the ulnar nerve. The presence of ganglion has been cited as the most common cause of this syndrome [1–3]. However, many other different causes of UTS have been described in the literature [4–7]. Compression of the ulnar nerve in the hand by a pseudoaneurysm of the ulnar artery has been described after a blunt trauma and as a complication of endoscopic carpal tunnel decompression [8–11].

Low-ulnar nerve palsy is an infrequent complication of ulnar artery pseudoaneurysm. In this report, we describe a compression of the deep branch of the ulnar nerve caused by a pseudoaneurysm of the ulnar artery in a patient with a “minor” penetrating hypotenar injury.

Case Report

A right-handed 27-year-old woman presented with a 1 cm stab wound on the hypotenar eminence of her non-dominant hand. Because neither ulnar nerve nor vascularization of the hand was compromised, no further exploration was performed and the wound was sutured at emergency room.

Three weeks later, the patient complained of weakness and deformity of her left hand. Clinical examination showed low motor ulnar nerve palsy with clawing of the ring and little fingers (Fig. 1), positive Froment's and Wartenberg's signs. Atrophy of the interosseous muscles was also observed (Fig. 2). No deformities were observed at the hypothenar eminence. On contrary, sensibility was not affected with a Weber test of 5 mm. Allen test was negative, and ulnar and radial pulse were positive at the wrist. Neither electrophysiological studies nor imaging studies were performed. Section of the motor branch of the ulnar nerve in zone 2 was suspected as preoperative diagnosis and surgical treatment was proposed to reconstruct the nerve either by suture or nerve graft.

On surgical exploration, a 2-cm mass developing from the ulnar artery was observed just lateral to the hook of the hamate compressing the deep branch of the ulnar nerve (Fig. 3). Resection of the artery mass and direct arterial end-to-end suture was performed with 10-0 Nylon under operative microscope (Fig. 4). Microscopic examination of the mass showed a pseudoaneurysm of the ulnar artery. The postoperative period was uneventful.

Six months after surgery, she had relief of the symptoms of weakness of the interossei muscles and the *adductor pollicis brevis*. Wartenberg's sign and claw deformity have resolved (Fig. 5). Clinical examination also confirmed the patency of the ulnar artery with a negative Allen's test.

Discussion

Traumatic aneurysms are either true or false, depending on the extent of arterial wall damage. True aneurysms are dilatations resulting from partial disruption of the arterial wall and are known to develop after blunt trauma. False aneurysms or pseudoaneurysms (PSA) arise from penetrating trauma, causing a full-thickness tear in the arterial wall, with formation of

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Fig. 1 Claw of the ulnar fingers and intrinsic muscles atrophy

an extra-arterial hematoma. With time, lysis of the portions of the thrombus can result in contained communication between the intra and extravascular spaces, forming a PSA. Traditionally, early surgical repair was recommended for the treatment of almost all the pseudoaneurysms. Surgical management of pseudoaneurysms includes resection with or without a bypass procedure or arterial ligation [12].

Multiple imaging modalities have been used to diagnose PSA including ultrasound, computed tomography, magnetic

Fig. 2 Positive Wartenberg's sign

Fig. 3 Operative view of the ulnar artery pseudoaneurysm

resonance imaging (MRI), and angiography. Ultrasound is a readily available imaging modality, which does not expose the patient to ionizing radiation. Grayscale and color Doppler techniques are utilized. On grayscale, a PSA appears as an anechoic rounded or ovoid structure. Because other fluid collections including cysts, seromas, or hematomas can have this appearance, color Doppler imaging is used to confirm the presence of blood flow within the PSA. Computed Tomography can identify PSA on transverse source images, but the diagnosis may be helped by its ability to perform multiphase imaging with 2D and 3D reconstructions using intravenous contrast. MRI is useful as an adjunct to ultrasound or an alternative to computed tomography in patients with

Fig. 4 Microscopic view of the repaired ulnar artery

Fig. 5 Negative Wartenberg's sign and recovery of the muscle atrophy

contraindication to computed tomography contrast. Sequences obtained are T1-weighted, T2-weighted, and magnetic resonance (MR) angiography images. MR angiography images demonstrate the PSA as a round, focal enhancing structure with intensity similar to that of adjacent arteries.

The medical literature reveals different causes of UTS, including repetitive trauma neuropathies [13], ulnar artery thromboses [14, 15], anomalous muscle bellies or fibrous bands [4, 16], fractures or dislocations of the ulnar side of the wrist [6, 17], rheumatoid tenosynovitis [17], osteoarthritis of the radio-ulnar and carpal joints [13, 18], lipomas [19], giant cell tumors [5], and bipartite hamate [7].

Six different clinical syndromes have been attributed to UTS:

1. A pure motor paresis affecting all ulnar-innervated muscles
2. A pure motor paresis affecting all ulnar-innervated intrinsic muscles except the hypothenar muscles
3. A pure sensory deficit
4. A mixed motor and sensory deficiency syndrome
5. A mixed motor and sensory deficiency syndrome sparing the hypothenar muscles.
6. A pure motor paresis affecting all ulnar-innervated intrinsic muscles and hypothenar muscles except the abductor digiti quinti muscle.

Compression of the ulnar nerve into the ulnar tunnel has been divided in 3 zones by Shea [2] and McClain and Gross and Gelberman [20]. This topographic division is important

because of if compression exists in a single site, predicting the specific site of ulnar nerve compression from the presenting clinical symptoms is a reliable method for diagnosis and treatment [2].

It has been reported that common causes of compression is different in each zone [2, 21]. The most common causes of compression in zones 1 and 2 are ganglions or fractures of the hook of the hamate [1, 6, 22]. On the other side, vascular lesions such as aneurysms or thrombosis of the ulnar artery have been associated with compression into the zone 3 [20]. Uriburu et al. described the Piso-Hamate Syndrome consisting in the compression of the deep motor branch of the ulnar nerve in which the branch of the abductor digiti quinti is spared [16].

We have found three previous cases of pseudoaneurysm in the ulnar tunnel [8], two of them recently published [11, 23]. As in our case, in these three cases, delayed diagnosis of ulnar nerve compression was performed. However, in contrast to our case, all of them had symptoms and signs of arterial pathology. Two had a pulsatile mass and the other had a hematoma. Because of this, they followed a strategy to diagnose the arterial lesion. Ultrasonography, arteriogram and magnetic resonance angiography were performed to confirm and better evaluate the pseudoaneurysm in these cases. Two out of the three cases underwent surgery because the other was lost to follow-up. Although the authors report that symptoms resolved after the surgery, no time of postoperative follow-up was specified.

We present a case of compression of the motor branch of the ulnar nerve in zone 2 caused by a pseudoaneurysm. However, this type of vascular lesion can be found either proximal or distal in the ulnar artery during its course in the ulnar tunnel. According to this, a pseudoaneurysm could compress principally the ulnar nerve in zone 1 or 2 due that zone 3 (sensory branch of the ulnar nerve) is anatomically medial and more distant from the ulnar artery.

Conclusion

According to the present case, we suggest take into account a pseudoaneurysm as a differential diagnosis in case of a patient UTS after a penetrating injury. This can help in the preoperative evaluation and avoid a misguided operative planning.

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