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CASE REPORT

Isolated anterior interosseous nerve deficit due to a false aneurysm of the humeral artery: An unusual complication of penetrating arm injury. Case report and literature review



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KEYWORDS

Anterior interosseous nerve;
Median nerve;
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Summary Anterior interosseous nerve (AIN) injuries account for only 1% of all the nerve injuries at the upper limb. We report the case of a 22-year-old male who sustained a penetrating injury to the arm. No neurological deficit was found at the initial evaluation. However, 6 weeks later, he had a motor deficit confined to the territory of the AIN with weakness of the flexor pollicis longus and flexor digitorum longus to the index. He also reported paraesthesia. Tinel's test was positive over the pinpoint wound in the arm, where a painful swelling was felt. Electroneurophysiological testing indicated a deficit of the AIN. Surgical exploration identified a thrombosed false aneurysm of the humeral artery responsible for compression of the median nerve. One month later, the patient had achieved a full recovery. Immediate routine exploration of deep penetrating wounds, although mandatory, may fail to detect any lesions. Close monitoring must be provided subsequently, as gradual nerve compression can result in delayed neurological deficits.

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Introduction

Injuries to the anterior interosseous nerve (AIN) are rare, accounting for only 1% of all the nerve injuries at the upper limb [1,2]. AIN syndrome is usually caused by compression of the nerve at the forearm.

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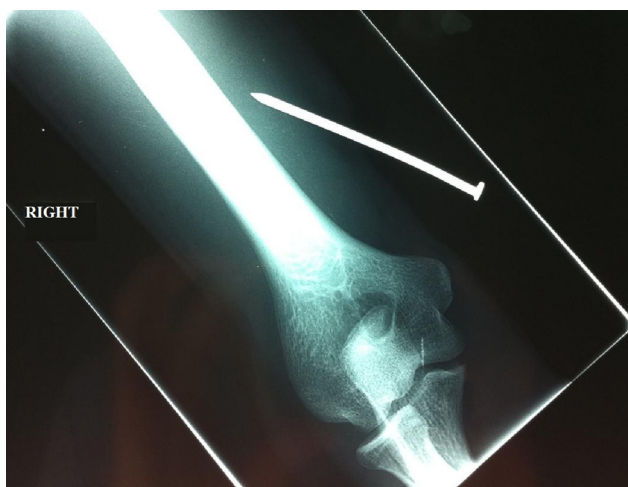


Figure 1 Initial antero-posterior radiograph of the right arm.

We report the first case of AIN syndrome due to gradual nerve compression by a false aneurysm of the humeral artery that manifested as an isolated deficit of the AIN and mimicked secondary neuroma. We found no similar cases in the literature.

Case report

A 22-year-old left-handed carpenter sustained a nailgun injury at the medial aspect of the distal third of the right arm. The physical examination at the emergency room showed normal neurological function and the presence of the distal arterial pulses. The nail was visible on the radiographs but the humerus was intact (Fig. 1). The nail located just under the skin was easily removed with no bleeding. The emergency room physicians inappropriately decided that further surgical exploration of the wound was unnecessary.

Six weeks later, he started experiencing isolated weakness of thumb and index flexion, as well as paresthesia in the thenar eminence. The physical findings indicated an isolated

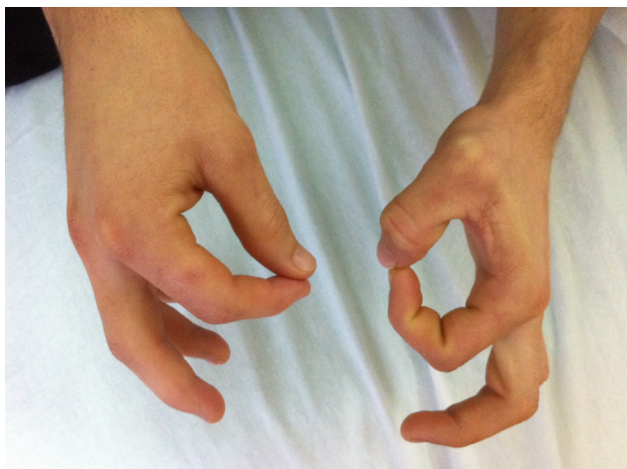


Figure 2 Weakness of flexion of the interphalangeal joint of the thumb and distal interphalangeal joint of the index: when the patient is asked to make the OK sign, a triangle is produced instead of a circle.



Figure 3 Initial view of the prefascial lymph node.

motor deficit in the distribution of the AIN (Fig. 2). Pronation and supination were normal. Tinel's test was positive over the nail entry site, and a tender mass was felt in the medial part of the right arm. Electrophysiological testing confirmed the motor deficit in the distribution of the AIN, with denervation of the flexor pollicis longus and flexor digitorum longus to the index, together with a decrease in sensory potential amplitudes. These findings suggested partial median nerve injury with secondary neuroma formation.

Surgical exploration was performed one week later. An inflammatory lymph node at the nail entry site was removed. The various anatomic structures were identified. A thrombosed false aneurysm developed at the antero-lateral aspect of the artery was found. This aneurysm caused severe compression of the medial part of the median nerve with a visible indentation (Figs. 3–5). The median nerve was continuous by gross examination. The aneurysm was resected and the nerve released.

At last follow-up one month after surgery, the motor deficit had recovered fully. The patient reported resuming his full occupational activities with no limitations, as well as his usual sports activities.

Discussion

Vascular injuries to the upper limb account for 30% to 50% of all the peripheral vascular injuries and are caused by



Figure 4 Indentation on the median nerve.

Table 1 Reported cases of nerve compression due to false-aneurysms of upper limb arteries.

Authors	Journals	Brachial plexus	Axillary nerve	Median nerve	AIN	Ulnar nerve	Radial nerve/PIN	Treatment	Recovery, yes/no and time
Nade S. [9]	<i>Injury</i> 1972					1			
Dharapak C. [10]	<i>Clin Orthop Relat Res</i> 1974						1 PIN		
Habermann E.T. [11]	<i>Bull Hosp Joint Dis</i> 1974			1					
Raju S. [12]	<i>Arch Surg</i> 1981	6						Ex + -BP	2 of 6
Kalisman M. [13]	<i>J Hand Surg Am</i> 1982					1		Ex	Yes
Smith R.J. [14]	<i>J Hand Surg Am</i> 1982					1		Ex	Yes
Carlson C.S. Jr [15]	<i>J Hand Surg Am</i> 1983					1		Ex	Yes
Robbs J.V. [16]	<i>Ann Surg</i> 1984	10		3			2 radial	Ex ± BP	5 of 15
Dunkerton M.C. [17]	<i>J Bone Joint Surg Br</i> 1988	8						Ex ± BP	5 of 8
O'Léary M.R. [18]	<i>Am J Emerg Med</i> 1990	1						Ex + BP	No
Bauer T. [19]	<i>Fortschr Neurol Psychiatr</i> 1992	2						Ex	Yes
Hansky B. [20]	<i>Eur J Cardiothorac Surg</i> 1993	1						Ex + BP	
Illuminati G. [21]	<i>J Cardiovasc Surg</i> 1996				1			Ex	Yes
Weinstein R.N. [22]	<i>J Orthop Trauma</i> 1996						1 PIN	Ex + BP	Yes, 11 months
Emadian S.M. [23]	<i>Am J Emerg Med</i> 1996		1						
Gerrand C.H. [24]	<i>J Hand Surg Br</i> 1997	1						Ex	Yes
Yip K.M. [8]	<i>Postgrad Med J</i> 1997			1				Ex	Yes, 2 days
Tarng D.C. [27]	<i>Am J Kidney Dis</i> 1998	1							
Pfammatter T. [25]	<i>J Trauma</i> 1998	1							
Sauerbier M. [26]	<i>Handchir Mikrochir Plast Chir</i> 1998					1		Ex	Yes, 1 month
Yoshii S. [36]	<i>J Neurosurg Sci</i> 1999					1		Ex	Yes
Loréa P. [28]	<i>J Trauma</i> 2001					1		Ex	Yes
Knabl J.S. [29]	<i>Handchir Mikrochir Plast Chir</i> 2002					1		Ex	Yes
Lazaro-Blazquez D. [30]	<i>Electromyogr Clin Neurophysiol</i> 2004			1					
Flowers G.A. [31]	<i>Arthroscopy</i> 2004	1							
Roganovic Z. [32]	<i>J Neurosurg</i> 2007			5		3	1 radial	Ex + BP	6 of 9
Derom A. [33]	<i>Acta Chir Belg</i> 2008	1						Endo	Yes, 9 months
Pini R. [7]	<i>J Orthop Surg Res</i> 2009				1			Ex	Yes, 4 months
Poonai N. [34]	<i>CJEM</i> 2011					1			
Stocker R.L. [35]	<i>Handchir Mikrochir Plast Chir</i> 2012					1		Ex	Yes
Our patient					1			Ex	Yes

AIN: anterior interosseous nerve; PIN: posterior interosseous nerve; Ex: excision; Ex + BP: excision and bypass; endo: endovascular.

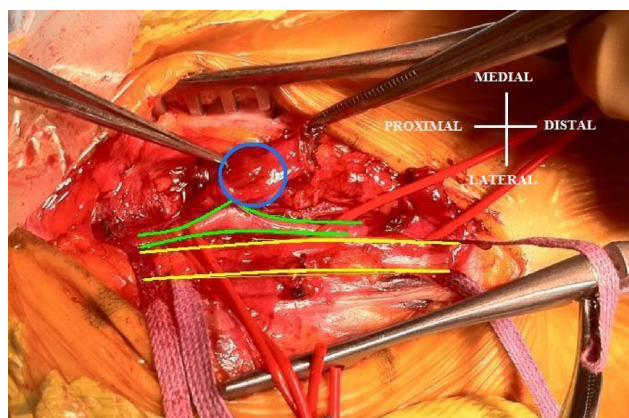


Figure 5 Appearance of the false aneurysm of the humeral artery. Blue circle: false aneurysm; green lines: humeral artery; yellow lines: median nerve.

penetrating trauma in 80% of the cases. Involvement of the radial and ulnar arteries contributes 5% to 30% of these injuries [3].

AIN injuries are rare, contributing only 1% of all the nerve injuries at the upper limb. AIN syndrome is usually due to compression of the nerve at the forearm [4], distal to the cubital fossa, at the bifurcation of the nerve. The deficit may be global or partial. A traumatic AIN syndrome is due to compression by the arch of the flexor digitorum superficialis. Traumatic causes include bullet wounds, nocturnal compression, iatrogenic trauma during immobilisation or puncture, fractures of the humerus and forearm bones, and internal fixation [5,6].

The physical examination suggests the diagnosis by showing weakness of thumb and index flexion due to deficits involving the flexor pollicis longus and flexor digitorum longus to the index. Pronation is not substantially affected as a rule, and isolated AIN injury does not usually cause sensory deficits. Electrophysiological testing confirms the diagnosis.

A false aneurysm is an extremely rare cause of peripheral neurological deficits. Brachial plexus compression has been reported: false aneurysm of the subclavicular or axillary artery can cause a global median nerve or ulnar nerve deficit, and false aneurysm at the forearm can cause an ulnar nerve deficit (Table 1) [3,7–36]. We are aware of only 2 reports of isolated AIN deficit due to false-aneurysms, which were located at the forearm [7]. Doppler ultrasonography can be used as the first-line investigation for blood vessel injury in patients with penetrating limb trauma [7]. The treatment relies on excision of the false aneurysm with or without a vascular bypass. Resolution of the neurological deficit is the rule (Table 1).

Our patient had an isolated deficit of the AIN contingent of the median nerve due to compression at the arm by a delayed thrombosed false aneurysm of the distal humeral artery.

Conclusion

Deep penetrating wounds require routine surgical exploration, even when the physical examination is normal. Nevertheless, there may be no detectable lesions initially.

Close monitoring is mandatory to detect the delayed development of a neurological deficit that may reflect slow nerve compression due to a vascular injury. Such slowly developing vascular injuries may mimic neuroma formation.

Disclosure of interest

The authors declare that they have no conflicts of interest concerning this article.

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