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High trifurcation of the ulnar nerve with the volar sensory branch entering the hand superficial and radial to the Guyon's canal: A case report

Mohammad M. Al-Qattan[a,b,*], Abdulhadi Alqahtani[a,b], Adnan Al-Zahrani[a,b]

[a] Division of Plastic Surgery, King Saud University, Riyadh, Saudi Arabia
[b] Division of Orthopedics, National (Care) Hospital, Riyadh, Saudi Arabia

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ABSTRACT

INTRODUCTION: Trifurcation of the ulnar nerve proximal to the Guyon's canal is rare. In these cases, the main trunk of the nerve divides few cm proximal to the canal into 3 branches: a deep motor branch and two superficial volar sensory branches (the common digital nerve of the 4th web and the ulnar digital nerve of the little finger). All 3 branches then enter the Guyon's canal.
PRESENTATION OF A CASE: We report on a rare case of high trifurcation of the ulnar nerve in the mid-forearm. The ulnar nerve divided into 3 branches: an ulnar dorsal sensory branch, an intermediate motor branch, and a radial volar sensory branch. The dorsal sensory branch entered the dorsal aspect of the forearm. The motor branch entered the Guyon's canal. The radial volar sensory branch did not enter the Guyon's canal, coursing superficial and radial to the canal to enter the hand.
DISCUSSION: The clinical implications of this very rare branching pattern of ulnar nerve are discussed along with a review of previously reported branching patterns of the nerve in the forearm.
CONCLUSION: Our case of high trifurcation of the ulnar nerve is unusual with no similar cases in the literature. This branching pattern is associated with an abnormal course of the volar sensory branch; marking it relevant in clinical practice.

1. Introduction

Normally, the ulnar nerve enters the forearm passing between the two heads of flexor carpi ulnaris muscle. About 10 cm proximal to the wrist, the nerve gives off its dorsal sensory branch which enters the dorso-ulnar aspect of the distal forearm to supply sensation to the skin of the dorso-ulnar aspect of the hand as well as the dorsal aspects of the little and ring fingers. The main trunk of the ulnar nerve continues under the flexor carpi ulnaris muscle (accompanied by the ulnar artery) to enter the Guyon's canal. Within the canal, the nerve normally bifurcates into a superficial sensory branch (which gives off the common digital nerve of the 4th web and the ulnar digital nerve to the little finger) and a deep motor branch. This bifurcation within the canal occurs in about 80% of cases. In 10% of cases, the nerve trifurcates within the canal (one deep motor branch and two superficial sensory branches: the common digital nerve of the 4th web and the ulnar digital nerve of the little finger). In the remaining 10% of cases, other rare branching patterns of the ulnar nerve are seen in the forearm.

Trifurcation of the ulnar nerve proximal to the Guyon's canal is an rare anomaly and usually occurs few cm proximal to the canal. In these cases, the nerve divides into a deep motor branch and two superficial sensory branches (the common digital nerve of the 4th web and the ulnar digital nerve of the little finger) [1–3]. All three branches then enter the Guyon's canal.

In this report we describe a case with "high" trifurcation of the ulnar nerve in the mid-forearm into a dorsal sensory branch, a motor branch and a volar sensory branch. The dorsal sensory branch entered the dorsal aspect of the forearm. The motor branch entered the Guyon's canal. The volar sensory branch passed subcutaneously, superficial and radial to the Guyon's canal to enter the hand and supply the volar aspect of the little and ring fingers. This form of high ulnar nerve trifurcation has never been reported and has clinical implications. The work has been reported in line with the SCARE criteria [4].

2. Presentation of case

A 24-year old right-handed male was handling young lambs and sustained a puncture wound from the horn of a lamb to the ulnar aspect of the left forearm (about 2 cm proximal to the wrist crease). The patient noted a slow-growing swelling at the trauma site. He

* Correspondence to: PO Box 18097, Riyadh, 11415, Saudi Arabia.
E-mail address: moqattan@hotmail.com (M.M. Al-Qattan).

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Fig. 1. The puncture wound and the area of sensory abnormality.

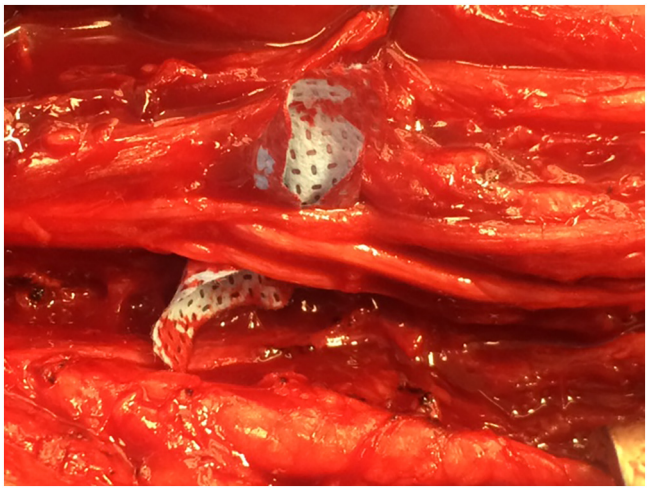

Fig. 3. Close-up of the trifurcation in the mid forearm.

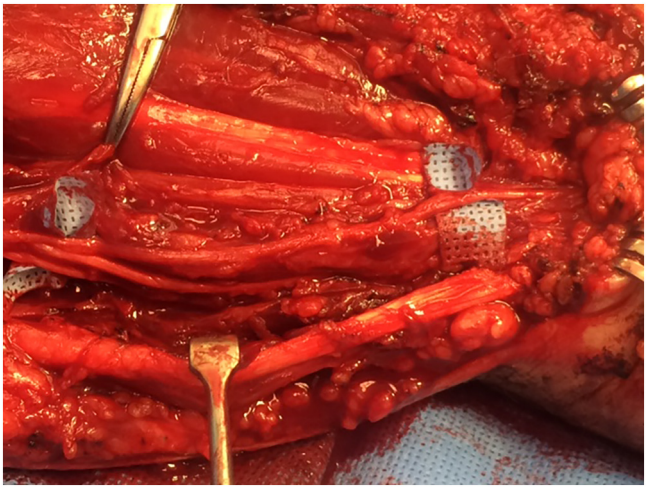

Fig. 2. The blue back-ground in the mid-forearm is showing the high trifurcation of the ulnar nerve. Note that the most radial branch is gradually diverging away from the main trunk of the ulnar nerve to enter the hand subcutaneously, superficial and radial to the Guyon's canal. This branch is seen distally under a blue back-ground.

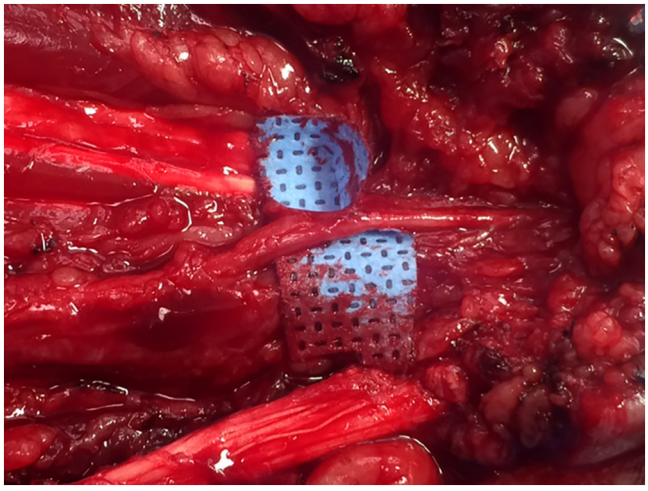

Fig. 4. Close-up of the volar sensory branch just proximal to the wrist.

presented to us late that night because he started feeling numbness along the distribution of the ulnar nerve (volar aspect of the ring finger and the ulnar aspect of the little finger) (Fig. 1). Examination confirmed the presence of distal forearm swelling and a decrease in sensation in the volar aspect of the little finger (The pulp had a static 2-point discrimination of 5 mm compared to 4 mm in the contralateral little finger). There was also decreased sensation on the ulnar aspect of the ring finger and the skin of the hypothenar area. Examination of the hand intrinsic muscle function was unremarkable.

The patient was admitted, given intravenous cephalosporin, the hand was elevated, and the patient was prepared for surgery in the morning. A repeat pre-operative examination showed a tense forearm and moderate pain on passive extension of the fingers; suggestive of early compartment syndrome. Fasciotomy of the forearm was done along with evacuation of the hematoma. There was injury to a branch of the ulnar artery and that branch was ligated. During the fasciotomy, a high trifurcation of the ulnar nerve in the mid-forearm (14 cm proximal to the wrist crease) was noted (Fig. 2–4). The most ulnar branch was the dorsal sensory branch and it entered the dorso-ulnar aspect of the forearm about 4 cm distal to its origin from the ulnar nerve. The intermediate branch was the motor branch and it was accompanied by the ulnar artery; and eventually entering the Guyon's canal. Intraoperative nerve stimulation of this branch showed contraction of the intrinsic muscles. The Guyon's canal was not explored; but the branch to the abductor digiti minimi (as per intra-operative nerve stimulation) arose from the motor division at the entrance of the canal. The radial division was the volar sensory branch. The branch gradually diverged from the motor branch to enter the hand subcutaneously, superficial and radial to the Guyon's canal. Intraoperative nerve stimulation of this branch did not result in muscle contraction. Pulling on the branch at the wrist crease resulted in visible movements under the skin at the 4th web space, the ulnar aspect of the little finger, and the hypothenar skin. This confirmed that it is the volar sensory division of the ulnar nerve. The fasciotomy wound was left open and then partially closed two days later (Fig. 5). The remaining distal open area was covered with a meshed split- thickness skin graft (Fig. 6).

There were no post-operative complications. At final follow-up two months later, there was full range of the digits and wrist. There was no subjective numbness or weakness of the hand. Objectively, the static 2-point discrimination of the pulp of the little finger returned back to normal (4 mm). A dynamometer was used to assess the grip strength of the hands, and this showed 33 kg on left compared to 36 kg on the right. A pinch gauge was used to assess pinch strength which showed 20 kg on the left compared to