

## Ulnar Nerve Injuries - A Tricky Bifurcation

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### Abstract

We present two cases of ulnar nerve injury exemplifying the myriad of penetrating injuries possibly affecting the ulnar nerve. The first case is an isolated injury to the motor branch of the ulnar nerve. This rare injury was initially missed when assessed in the Emergency Department. The diagnosis was performed when the patient failed to perform the motor tests associated with ulnar nerve injury when assessed by a hand surgeon. The finding of isolated severance of the motor branch of the ulnar nerve was corroborated when surgery was performed, and the severed motor branch repaired. The second case we present is of a 26-year-old dairy worker who sustained a degloving injury to the ulnar aspect of his right hand. The degloved flap originated at the distal wrist crease and included both skin and underlying tissues, within them was buried the severed volar ulnar sensory nerve branch which was primarily repaired followed by flap suture. These two cases represent the possible complexity of ulnar nerve injuries and emphasize the importance of a complete and thorough physical diagnosis when assessing even minor injuries to the hand. Incorporating this is a key to orthopedic resident education as we demonstrate here.

**Keywords:** *Ulnar Nerve Injury; Tricky Bifurcation; Gyuon's Canal*

### Introduction

The distal end of the Ulnar nerve bifurcates to superficial sensory branch and deep motor branch in Gyuon's canal. Thus, injuries to this area can result in motor loss or isolated sensory. In this report we are presenting two cases of ulnar nerve injury which illustrating the myriad of penetrating injuries possibly affecting the ulnar nerve. The first case is 24-year-old male who is having the isolated injury to the motor branch of the ulnar nerve. The finding of isolated severance of the motor branch of the ulnar nerve was corroborated and the severed motor branch repaired when surgery was performed. The second case is of a 36-year-old dairy worker who sustained a degloving injury to the ulnar aspect of her right hand. Both skin and underlying tissues included when degloved flap originated at the distal wrist crease, within them buried the severed volar ulnar sensory nerve branch which was primarily repaired followed by flap suture. These two patients submitted to the ER and both were improperly diagnosed. When assessing even minor injuries to the hand the cases represent the emphasize the importance of a complete and thorough physical diagnosis and possible complexity of ulnar nerve injuries.

## Case Reports

**Case 1:** A 24-year-old male fell and was cut by a glass in his right palm. He presented to the emergency room with a 2-3 cm laceration on the volar aspect of the hypothenar area of the hand. Physical examination and exploration of wound was performed, no tendon or nerve injuries were found, and the wound was sutured. 2 weeks after the injury he was examined by a hand surgeon who established positive Froment's, Wartenberg's and Igawa signs. The patient could not adduct his fingers and a minor claw deformity was seen in the fifth finger. Exploration of Guyon's canal (figure 1) exhibited an isolated injury of the deep motor branch of the ulnar nerve, whereas the sensory branches were found unscathed. The nerve was repaired by a tension free primary suture.



*Figure 1*

**Case 2:** A 36-year-old female sustained a degloving injury to the ulnar aspect of her left palm. A physical examination was performed in the Emergency room and the laceration (4-5 cm. long) was explored. No motor or sensory deficits were diagnosed, and the wound was sutured. A week later she was examined by a hand surgeon and lack of sensation in the fifth finger and the ulnar aspect of the 4th finger was noted. Exploration of the ulnar nerve (figure 2) in Guyon's canal showed isolated severance of the superficial sensory branch. The nerve was repaired by a tension free primary suture.



*Figure 2*

### Discussion

Guyon's canal, which is approximately 4 cm long, is a fibro-osseous tunnel that transmits the ulnar neurovascular bundle from the distal forearm to the hand. The ulnar border is comprised of the pisiform bone and abductor digiti minimi muscle belly, the radial border is marked by the hook of Hamate. The canal's floor is formed by the transverse carpal ligament and pisohamate ligament, while the roof is comprised of the superficial volar carpal ligament. The ulnar nerve bifurcates within the canal into the superficial and deep branches. The superficial branch supplies motor innervation to the palmaris brevis muscle and continues as a sensory nerve branching into two digital nerves.

Distal to the pisohamate ligament, the deep motor branch, in conjunction with the deep branch of the ulnar artery, passes between the abductor digiti minimi and the flexor digiti minimi brevis. The motor branch supplies the hypothenar muscles, third and fourth lumbricals and all the interosseous muscles. It ends by supplying the adductor pollicis and the medial head of the flexor pollicis brevis.<sup>1,2,3</sup>

Guyon's canal often is divided into three zones, with zone 1 being the area proximal to the bifurcation of the ulnar nerve. Injury to Zone 1 leads to combined motor and sensory loss. Zone 2 includes only the motor branch after it has bifurcated. Injury to zone 2 leads to isolated loss of motor function. Zone 3, the most distal part of the canal, includes the sensory branch of the ulnar nerve, and injury at the zone 3 level leads to pure sensory loss without any motor loss.<sup>4</sup>

Few easy to perform tests can be done at the Emergency Room setting to evaluate the motor branch. Froment's sign tests the action of the adductor pollicis. The patient is asked to pinch a flat object between his thumb and index fingers against resistance. In a Positive Froment's test the patient will lose grip and will compensate by flexing the the interphalangeal joint of the thumb via action by the [HYPER-LINK "https://en.wikipedia.org/wiki/Flexor\\_pollicis\\_longus"](https://en.wikipedia.org/wiki/Flexor_pollicis_longus) flexor pollicis longus. It should be noted that with paralysis of the muscles supplied by the motor branch, there will be an 80% loss of pinch strength.<sup>5</sup>

The loss of intrinsic muscle function results in an inability to flex at the metacarpal (MCP) joints and extend the interphalangeal (IP) joints. This results in the development of the intrinsic-minus or claw posture of the ring and little fingers, where there is hyperextension at the MCP joints and flexion at the IP joints -Duchenne's sign. Wartenberg's sign is due to a loss of palmar interosseus muscle function that leads to abduction of the little finger, due to the unopposed pull of the extensor digiti minimi.<sup>3</sup> The crisscross finger test (also called the Igawa sign) is performed by elevating the middle finger over the second in order to evaluate the interosseus muscle function.<sup>4</sup>

Isolated damage to the Ulnar nerve within Guyon's canal is a rarely encountered injury in the Emergency room setting and therefore can be easily missed or overlooked.

In the study by Tan & Ting<sup>6</sup> it was shown that not even one complete neurovascular examination was performed and documented in 879 examinations of trauma to the limbs. Documentation of the sensory examination was more frequently complete than the motor or vascular examinations.

Staff experience showed a significant and negative correlation with completeness of the sensory and vascular examination documentation.

### Conclusion

In these 2 cases we emphasize the need of a precise physical examination accompanied by awareness to this type of injury. It will help avoid delayed diagnosis and subsequent damage.

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