

## Alligator Jump Induced Ulnar Nerve Compression Neuropathy in Military Recruits

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### Introduction

Ulnar nerve compressive neuropathy at the wrist is the second most common ulnar neuropathy after compression at the elbow<sup>1</sup>. It is often difficult to diagnose & is missed due to lack of familiarity in the nerve's anatomical course and distribution. The most common causes that involve the ulnar nerve at the wrist are compression from a ganglion, occupational traumatic neuritis, presence of musculotendinous arch and disease of the ulnar artery<sup>2,3</sup>. Ulnar neuropathy also occurs in those who suffer constant or repeated blows to the base of the palm<sup>4</sup>, however papers correlating this are uncommon in literature & none were found specifically in relation to mechanism of injury during military physical training.

We report a series of 4 cases who presented to us within a span of 1 month with a common mode of physical training in form of pushups and pumping exercises also called the alligator jump during military training (Fig 1).



**Fig. 1** Alligator Jump Exercise

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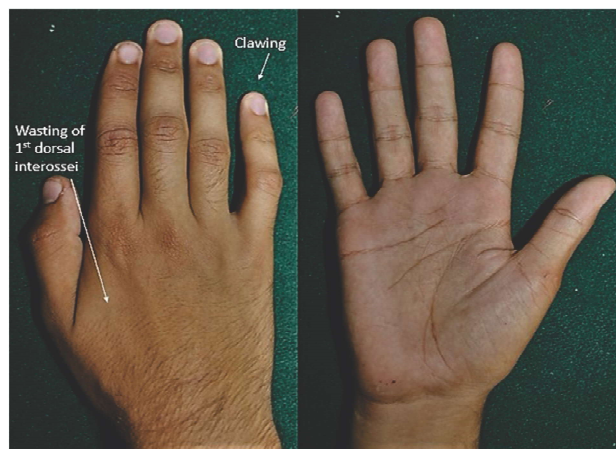
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### Case No.1

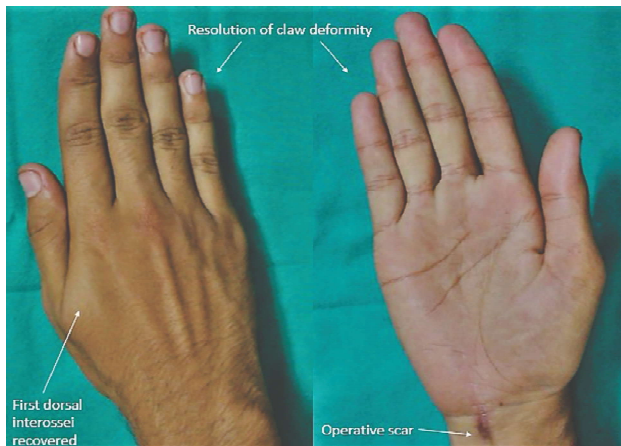
19-year-old right hand dominant individual presented with claw hand deformity and were unable to perform military physical training following unaccustomed exertion in the last 2 weeks. Evaluation revealed clawing of ring and little finger with wasting of intrinsic & first dorsal interossei with hypoesthesia over ring and little finger. Wartenburg's & Froment's sign were positive with weakness in abduction & adduction of fingers. EMG & NCV suggestive of decreased CMAP & axonal injury of right ulnar nerve. MRI suggesting compression of deep branch of ulnar nerve in Guyon's canal. Patient showed no signs of recovery over 6 weeks and therefore underwent release of Guyon's canal. Post op 5 weeks there was resolution of claw deformity and normal sensory and motor function (Fig 2 & 3).

### Case No.2

19-year-old right hand dominant individual presented with weakness of right hand with loss of sensations along the ulnar border for 4 weeks. Patient did not have any history of direct trauma except for undergoing similar military physical training. On clinical examination, outward deviation of little finger, Wartenburg's sign positive, Froment's sign positive, hypoesthesia in distribution of volar sensory branch of



**Fig. 2** Claw Hand with wasting of first dorsal interossei



**Fig. 3** Resolution of claw deformity and recovery of first dorsal interossei.

ulnar nerve, however no sensory deficit in the distribution of dorsal branch. Nerve conduction study for ulnar nerve was normal for motor and sensory. MRI showed relative hyperintensity of ulnar nerve in its entire course from the wrist joints inferiorly extending to both superficial and deep division of the ulnar nerve. Patient underwent release of Guyon's canal and 3 weeks postoperatively showed significant recovery with complete recovery at 8 weeks.

### Case No.3

17-year-old right hand dominant individual presented with progressive weakness of right hand since 10 days & difficulty in doing military training exercises. Patient did not have any history of direct trauma except for undergoing military physical training since a month. Evaluation revealed no clawing or wasting of hand, Wartenburg's sign positive, Froment's sign positive & decrease in adduction & abduction of fingers. No sensory loss over dorsum of hand except for blunting over left little finger tip & no demonstrable Tinel's sign. NCV showed normal ulnar nerve conduction. In view of demonstrable clinical signs of ulnar nerve palsy but no NCV signs, he was managed conservatively and on periodical review showed gradual improvement with complete recovery in 8 weeks.

### Case No. 4

18-year-old right hand dominant individual presented with weakness of grip of right hand with a history of pressure on volar aspect of wrist while doing pushups on hard surface 4 weeks back. Evaluation revealed no obvious deformity or muscle wasting & no hypoesthesia. Abduction and adduction of digits were present, Froment's sign positive, no Wartenburg's sign,

NCV showed reduced amplitude of the conduction of right ulnar nerve. MRI suggestive of hyperintensity of deep branch of right ulnar nerve however no compression or focal lesion was noted in Guyon's canal. Despite neurophysiological and radiological evidence of ulnar neuropathy right side he showed clinical improvement gradually after stopping inciting inactivity and recovered completely over period of 14 weeks.

### Discussion

The ulnar carpal tunnel (Guyon's canal) was first described by Felix Guyon in 1861<sup>5</sup> & Guyon's canal syndrome is an ulnar nerve entrapment at the wrist.

Proximal to the wrist, the dorsal cutaneous nerve branches off to the dorsal hand followed by the palmar cutaneous branch to the proximal palm which do not go through the canal. The ulnar nerve then courses through Guyon's canal, a triangular canal which is bordered medially and proximally by the pisiform bone and laterally and distally by the hook of the hamate, anteriorly by the flexor carpi ulnaris tendinous insertion along with the anterior carpal ligament and posteriorly by the transverse carpal ligament overlying the pisotriquetral joint. In the canal or as it exits under the palmaris brevis muscle, the nerve bifurcates into the superficial sensory branch and the deep motor branch. The superficial branch supplies sensation to only the ulnar surface of the hypothenar eminence, the ulnar half of the fourth digit and the fifth digit. The deep motor branch gives off a branch to the hypothenar muscles, including the Abductor Digiti Minimi, then turns about the hook of the hamate and deviates laterally across the palm to innervate the dorsal interossei, the third and fourth lumbricals, the adductor pollicis, the flexor pollicis brevis, and terminates in the First dorsal interossei<sup>2,3,6</sup>.

The ulnar nerve may be compressed anywhere along its course in Guyon's canal causing sensory deficits, motor deficits, or a combination of both.

Ulnar nerve entrapment at the wrist is still rare occurring with a frequency which is one twentieth of that occurring at the elbow<sup>1</sup>. The most common causes are compression from a ganglion, occupational traumatic neuritis, presence of musculotendinous arch and disease of the ulnar artery<sup>2,7,8</sup>. Shea and McClain<sup>2</sup> listed 19 different lesions causing compression of the ulnar nerve at the wrist and hand; the most frequent cause was ganglion (28.7%). One retrospective study of 31 subjects by Murata et al. found the most common

cause to be idiopathic (45%)<sup>9</sup>. Other important causes to consider include ulnar artery disease, acute trauma or fracture, aberrant muscles, tumors, osteoarthritis, rheumatoid arthritis, joint dislocations, and activities with prolonged wrist extension<sup>2,3,9</sup>. Handlebar palsy is a recently described cause in bicycle and motorcycle riders usually occurring as an isolated deep motor branch lesion<sup>9,10</sup>. An alert regarding risks during military physical training after tug-of-war causing ulnar neuropathy was also mentioned by Seguti et al<sup>11</sup>. The occurrence of ulnar neuropathy at the Guyon's canal due to alligator jumping exercises have not been described in literature and hence its relevance in military training. The timely intervention and closed observation keeps in favorable outcomes.

Our first and second patients, both had clinically features of ulnar neuropathy and on MRI imaging suggestive of compression in Guyon's canal in spite of NCS being normal in second case. Both benefited from release of Guyon's canal. In third case NCS was normal in spite of demonstrable clinical signs & in fourth case NCS showed reduced conduction but no compression at Guyon's canal. Both benefited from conservative management suggesting electrodiagnosis as an important tool for deciding conservative & surgical intervention. The management requires evaluation of the etiological factor. If the syndrome results from mechanical repetitive trauma, the approach is trying to avoid the pressure on the hypothenar eminence as was done for case 3 and 4<sup>2,7</sup>. An initial trial of conservative therapy by immobilization, discontinuance of traumatic with subsequent clinical evaluation and gradual improvement denotes a conservative management to be useful where complete recovery was observed within 6 weeks. Surgical decompression may be indicated in refractory cases<sup>2,7</sup> or where compression in Guyon's canal was observed in MRI as in case 1 and 2 which showed persistent signs of impairment warranting surgical exploration. Complete recovery following release of Guyon's canal confirms the favorable prognosis of this form of compression provided surgical treatment is performed early<sup>12</sup>. The occurrence of ulnar neuropathy at the Guyon's canal due to alligator jumping exercises have not been described in literature and hence its relevance in military training. The timely intervention and closed observation keeps in favorable outcomes.

## Conclusion

Ulnar nerve entrapment at the wrist is uncommon and difficult to diagnose; therefore, it is important to

understand the nerve's anatomical course and distribution to allow for accurate diagnosis by clinical and electrodiagnostic evaluations. The occurrence of ulnar nerve neuropathy in military recruits has served as a warning with regards to the choice & intensity in execution of exercises. The risk of patient under analysis evolving to claw hand on the dominant hand as a sequel and the importance of follow up should not be disregarded since the patient could have been involved with permanent claw hand.

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