



## Localized Volkmann Contracture: The Role of Tendon Lengthening for Early Treatment

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### Abstract

Volkmann contracture is a complication of upper limb trauma that results from compartment syndrome, posing serious motor and sensory limitations to patients. According to Tsuge, it can be divided in three degrees based on its severity. The mild type we will discuss in our clinical report, affects flexor digitorum profundus muscle. The authors report the case of a 40-year old male that suffered a compressive trauma to the forearm resulting in severe ring and little fingers flexion contractures, resistant to conservative treatment. At 9 months, patient was proposed to Guyon release and tendon lengthening at myotendinous junction with contraction and functional improvement. The mild type of Volkmann's contracture might be overlooked and can be very disabling, that need accurate diagnosis and management.

**Keywords:** Tenotomy; Ischemic Contracture; Ulnar Nerve Compression Syndromes

### Introduction

Volkmann contracture is a complication of upper limb trauma that results from compartment syndrome, posing serious motor and sensory limitations to patients [1,2]. It is a complication of neglected or inadequately treated acute compartment syndrome [2-5]. The main aspect found is the established tissue ischemia and necrosis, muscle and joint contractures and myoneural impairments. [1-7] Muscle ischemia establishes within 6-12 hours and nerve ischemia after 12 hours [1-4,6]. Mostly occurs in the middle third of the forearm after high energy trauma [1,6].

Acute compartment syndrome is a condition recognized based on clinical and physical findings of muscle and nerve ischemia, which are the diagnostic keystones. [1] Clinical history is characterized by excessive pain to the injury and appearance, pallor, paresthesia, loss of pulse, paralysis and excessive pain during passive stretching of the finger muscles [1-4,6].

The classic clinical findings for established Volkmann's contracture are elbow flexion, forearm pronation, wrist flexion,

thumb adduction, metacarpophalangeal joint extension, and finger flexion [5].

According to Tsuge, it can be divided in three degrees based on its severity [1,3,5,7]. Mild, or localized Volkmann's contracture, affects flexor digitorum profundus muscle, leading up to 3 fingers flexion contracture, with no or mild loss of sensitivity [1,3,5,7]. Moderate type affects all fingers and wrist, and there are skin lesions and no hand sensitivity. Severe type has all flexors and extensors muscles involved, presenting claw hand with severe loss of sensitivity and function [1,3,5-8].

### Clinical Case

A 40-year-old male presented to our hospital due to constant flexion contracture of his left ring and little fingers. His left forearm had been pressed with a roller 3 months before. The flexion contracture had evolved progressively after the injury, with no improvement during rehabilitation.

On physical exploration, the ring and little fingers demonstrated severe flexion contractures with the wrist in the neutral position, partially reducible with wrist palmar flexion (Figures 1 and 2). There were no abnormal changes of the thumb, index, and long finger motion. On palpation, there was no cord-like induration on the anterior side of the forearm that suggested muscle degeneration and there were no sensory changes of extrinsic or intrinsic muscles. The Quick Disabilities of Arm, Shoulder and Hand score [DASH] was 75.

On magnetic resonance imaging, the intensity aspects of flexor muscle bellies were normal and electromyography did not detect any change in median and ulnar nerves.

At 9 months post trauma, the patient was proposed surgery by a forearm and wrist volar approach (Figure 3). The Guyon Canal was explored and the ulnar nerve was identified and released, although no compression site was found (Figure 4). The flexor digitorum profundus muscle was explored and muscular retraction in ring and little finger muscle belly was noticed. Tendons were lengthened at the myotendinous junction, and flexion contracture was reduced (Figures 5 and 6).

After surgery, a splint was applied with finger extension for 2 weeks. In the next 2 weeks, the patient started finger passive motion with full range of motion, and after 4 weeks started active motion exercises. In 2 months after surgery, the patient presents with full range of motion of ring and little finger had been regained and Quick DASH score was 43 (Figure 7 and 8).



Figure 1



Figure 2



Figure 3



Figure 4



Figure 6



Figure 5



Figure 7

## Discussion

There are different opinions regarding the time for surgical intervention: Seddon recommends only after 3 months, it can occur spontaneous recovery, and Tsuge recommends waiting more than 6 months as function is progressively reestablished due to recovery of the affected muscles [1,4,5,8].



After muscle contracture installation, the choice of treatment depends on its severity [1,3,5-8].

For early localized type Volkmann's contracture, the association of dynamic splinting, physical therapy, and functional rehabilitation association can be efficient [1,5,7]. Tsuge and Ishida defend that, in mild contracture with involvement of 1 or 2 fingers, the muscle degeneration is limited, and recommend dissection or excision of the affected muscle or tendon lengthening or transfers [1,3,5,8].

Moderate contracture usually involves finger and wrist flexors, with median and ulnar nerve sensitivity impairment and intrinsic minus deformities [3,5]. Surgical treatment options are muscle sliding, neurolysis of the median and ulnar nerves and removal of fibrotic muscle [3,5]. In the cases when there is no useful movement of the finger flexors, it is recommended transfer of dorsal wrist extensors to volar and a complete release of the wrist and finger flexors [3,5].

Severe contractures normally require combination of surgery and physiotherapy [1,3]. In multiple tendon involvement, muscle sliding surgery is recommended over multiple tendons lengthening or wrist resection. [5]. In extreme cases, surgical techniques may also consist in excision of the necrotic muscle, carpal resection, bone shortening, and free functioning muscle transfer [3-8].

## Conclusion

This is an important case to remind physicians about existence of compartment syndrome and Volkmann's contracture and how to manage this devastating entity. In this case, we respect the surgery indication of tendon lengthening in combination with dynamic splinting and physical therapy with good results and a happy patient, resuming his daily life activities.

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## Conflict of Interest

The authors declare that there is no conflict of interest.

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