

The Morphology and Functional Significance of the Carpal Tunnel Retinaculum

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Abstract

The carpal tunnel is a narrow passageway in the wrist that allows the median nerve and several tendons to pass from the forearm to the hand. The carpal tunnel retinaculum, also known as the flexor retinaculum, is a thick band of connective tissue that forms the roof of the carpal tunnel. It plays a crucial role in maintaining the stability of the wrist and ensuring the smooth movement of the tendons and nerves that pass through the carpal tunnel.

Keywords: Carpal tunnel retinaculum • Wrist • Carpal bones

Introduction

The carpal tunnel retinaculum is a fibrous band that extends from the pisiform and the hook of the hamate on the ulnar side of the wrist to the scaphoid and trapezium bones on the radial side. It forms a tight arch over the carpal bones and the structures that pass through the carpal tunnel. The retinaculum is composed of two layers: a superficial layer, which is continuous with the palmar aponeurosis, and a deep layer, which is attached to the carpal bones.

The carpal tunnel retinaculum contains several openings, or foramina, through which the tendons of the flexor muscles and the median nerve pass [1]. The largest opening, called the carpal tunnel, is located in the center of the retinaculum and is formed by the concave shape of the carpal bones and the arch of the retinaculum.

Literature Review

The carpal tunnel retinaculum plays a critical role in maintaining the stability of the wrist and ensuring the smooth movement of the tendons and nerves that pass through the carpal tunnel. The retinaculum acts as a pulley system, providing a smooth surface for the tendons to glide over as they move through the carpal tunnel. The retinaculum also helps to distribute the forces exerted by the flexor muscles of the forearm, which attach to the tendons that pass through the carpal tunnel [2]. This helps to prevent excessive pressure on the median nerve, which can lead to carpal tunnel syndrome, a common condition characterized by pain, numbness, and weakness in the hand and wrist.

The carpal tunnel retinaculum, also known as the transverse carpal ligament, is a dense fibrous band of tissue that runs across the wrist. It forms the roof of the carpal tunnel, a narrow passageway between the wrist bones and the flexor tendons that control movement in the fingers and thumb. The carpal

tunnel retinaculum plays a crucial role in maintaining the structural integrity of the wrist and ensuring proper functioning of the hand. Its main function is to prevent the flexor tendons from bowstringing or becoming displaced when the hand and wrist are moved [3]. The retinaculum also helps to maintain the optimal length-tension relationship of the flexor tendons, which is essential for normal hand and finger movements.

Discussion

The carpal tunnel retinaculum is composed of tough, fibrous tissue that is capable of withstanding significant tensile forces. It is anchored to the bones of the wrist on either side of the carpal tunnel, and it forms a complete arch over the flexor tendons. This arrangement provides a stable platform for the tendons to glide over as they move in and out of the carpal tunnel. The carpal tunnel retinaculum can become thickened or inflamed due to repetitive use or injury, a condition known as carpal tunnel syndrome. When the retinaculum becomes compressed, it can put pressure on the median nerve, which runs through the carpal tunnel and controls sensation in the thumb, index, middle, and half of the ring finger. This can cause symptoms such as pain, numbness, and tingling in the hand and fingers. In some cases, surgical release of the carpal tunnel retinaculum may be necessary to relieve pressure on the median nerve and alleviate symptoms of carpal tunnel syndrome [4]. However, the retinaculum is an important structure that plays a vital role in maintaining the function and stability of the wrist and hand, and care must be taken to avoid damaging it during surgery.

Surgical release of the carpal tunnel retinaculum, also known as carpal tunnel release surgery, is a common treatment for carpal tunnel syndrome when conservative measures such as rest, splinting, and physical therapy have failed to provide relief [5].

The procedure involves cutting the carpal tunnel retinaculum to relieve pressure on the median nerve. There are two main types of carpal tunnel release surgery: open release surgery and endoscopic release surgery. Open release surgery is the traditional approach and involves making a small incision in the palm of the hand to access the carpal tunnel. The surgeon then cuts the carpal tunnel retinaculum to relieve pressure on the median nerve. Endoscopic release surgery is a minimally invasive approach that uses a small camera and specialized instruments to cut the carpal tunnel retinaculum through one or two small incisions in the wrist or palm [6]. Both types of surgery typically take less than an hour to perform and can be done on an outpatient basis. Recovery time varies, but most patients can resume light activities within a few days and return to work within a few weeks.

As with any surgery, there are risks involved, including infection, bleeding, nerve damage, and complications related to anesthesia. In rare cases, symptoms may worsen after surgery or recur over time. Therefore, it is

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important to discuss the risks and benefits of carpal tunnel release surgery with a qualified healthcare provider before making a decision.

Conclusion

The carpal tunnel retinaculum is a thick band of connective tissue that forms the roof of the carpal tunnel. Its morphology and function are critical to the stability and mobility of the wrist, as well as the health of the median nerve and the tendons that pass through the carpal tunnel. An understanding of the morphological and functional significance of the carpal tunnel retinaculum is essential for clinicians and researchers in the fields of orthopedics, neurology, and anatomy.

In addition, the carpal tunnel retinaculum provides a barrier that protects the structures within the carpal tunnel from external pressure and trauma. The retinaculum helps to maintain the integrity of the carpal tunnel, preventing the tendons and nerves from becoming compressed or damaged.

Acknowledgement

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Conflict of Interest

None.

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