Management of the Stiff Finger: Evidence and Outcomes

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KEYWORDS

• Stiffness • Finger • Contracture • Metacarpophalangeal joint • Proximal interphalangeal joint • Splint • Capsulotomy

KEY POINTS

- The stiff finger is a challenge to treat because it has many different causes and involves several different structures. It is important to prevent this injury.
- Static progressive and dynamic splints have been proved effective as nonoperative interventions to treat the stiff finger.
- Operative intervention is considered when a patient does not respond to a period of nonoperative treatment.
- Capsulotomy and collateral ligament and volar plate releases are the basic surgical techniques to treat metacarpophalangeal (MCP) and proximal interphalangeal (PIP) joint contracture.

INTRODUCTION

Motion of the finger requires bony stability, sensibility, muscle integrity, tendon gliding, and flexible joints. Full range of motion in the finger joints is the precondition of good function of the finger. The term stiff finger refers to a reduction in the range of motion in the finger. Almost all injuries of the fingers can cause finger stiffness, even when the joint is not directly involved in the initial injury. Furthermore, many diseases such as Dupuytren disease,[1] rheumatoid arthritis,[2,3] gout,[4] and diabetes mellitus[5,6] result in loss of motion of the finger. In addition, congenital stiffness of fingers without definite cause had been reported.[7] Although the stiff finger has a similar clinical manifestation to joint contracture, different causative factors contribute to the stiffness. Both bone and soft tissue are what ultimately provide mechanical blocks to motion, resulting in finger stiffness. This article focuses on the soft-tissue causes of the injury by reviewing the anatomy, classification, precautions and nonoperative and operative intervention.

ANATOMY AND CLASSIFICATION

The anatomy of the MCP joint and PIP joint are complicated and intricate. The MCP and PIP joints share some structural similarities but have significant structural differences.[8]

The base of the proximal phalanx and metacarpal head are the bony foundations of the MCP joint. The soft-tissue boundaries of the joint are made up of the articular capsule and ligaments. The collateral ligaments originate from the tubercle of the metacarpal head and run diagonally in a ladder-shape to the base of proximal phalanx. The length of the collateral ligament changes as the joint flexes and extends.[9] The bilateral accessory collateral ligaments (ACLs) originate slightly proximal and volar to the collateral ligaments. The distal fibers of the ACL attach to the edge of the volar plate and flexor sheath. The volar or palmar plate is a fibrocartilaginous structure that constitutes the base of the MCP joint (**Fig. 1**). The extensor and flexor tendons, sagittal band, and lumbrical and interosseous muscles embrace

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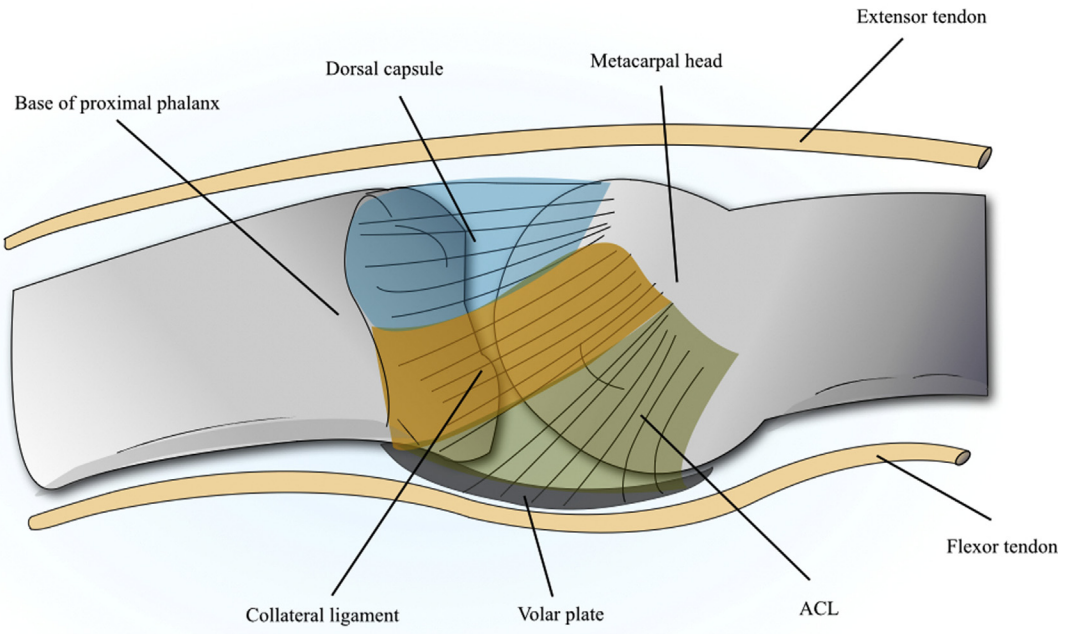

Fig. 1. Anatomy of the MCP joint. The collateral ligaments arise from the metacarpal head to the base of the proximal phalanx. Proximal and volar to the collateral ligament is the accessory collateral ligament (ACL). The volar plate is directly palmar to the joint.

the joint and these ligaments. The MCP joint is a condylar joint that has 2 axes of freedom including flexion/extension and radial/ulnar deviation.[10]

The head of the proximal phalanx and base of the middle phalanx constitute the bony structures of the PIP joint. The PIP joint is a simple hinge joint that can only move along the flexion/extension axis.[11] The origin and insertion of the collateral ligament, ACL, and volar plate are similar to the MCP joint. The dorsal extensor apparatus, flexor tendons, and their sheath embrace the joint (**Fig. 2**). The tension in the collateral ligament changes little as the PIP joint moves.[12] Similar to the MCP joint, the volar plate of the PIP joint is composed of 2 portions: a fibrous and a membranous portion. The volar plates of PIP joints are thinner than at the MCP level for most fingers.[13] On each side of the volar plate, it is reinforced by a checkrein ligament that attaches onto the periosteum of the proximal phalanx (**Fig. 3**).[14] The collateral ligaments and volar plate are composed of a 3-dimensional ligament-box complex that plays a major role in providing the stability of the PIP joint.[14]

The distal interphalangeal (DIP) joint is a hinge joint that is composed of the middle phalanx head and distal phalanx base. The DIP joint has flexion, extension, and hyperextension motion. The capsule is reinforced by the collateral ligaments, volar plate, terminal extensor tendon and flexor digitorum profundus tendon.

Stiff fingers are categorized into flexion and extension deformities according to the fixed posture of the joint. Stiff finger deformities can also be classified into 4 categories according to the involved tissues: (1) skin and fascia-related problems, (2) muscle and tendon injuries or lesions, (3) capsule and ligament of joint contractures, and (4) damage of articular bone. The common causes are listed in **Table 1**. Some structures result in only one type of deformity, but others can initiate either flexion deformities or extension deformities in different conditions. For example, the collateral ligament contracture is a common reason for flexion contracture of the PIP joint, but rarely, the collateral ligament contracture may also cause an extension deformity.

Information from the patient's history may be used to discover the cause of joint stiffness. Examination of joint motion is also helpful for a surgeon to identify whether the musculotendinous structures are involved or the contracture is limited to the capsuloligamentous and articular structures. Decrease in active movement more than in passive movement is more likely to be caused by