

Symptoms, Diagnosis, and Treatments of Stenosing Tenosynovitis

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Abstract. Sports injuries frequently occur to the hand and wrist, and one of the most common illnesses of the hand and wrist is stenosing tenosynovitis. This report concentrated on stenosing tenosynovitis, encompassing hand and wrist anatomy, high-risk groups and activities, diagnosis, conservative treatment, surgery, traditional Chinese treatment, and post-operative precautions. A high prevalence of stenosing tenosynovitis has been linked to specific sports, occupations, lifestyles, genes, illnesses, and females. The most noticeable clinical symptom is a brief blocking of the fingers during flexion, followed by painful snapping during extension. Auxiliary apparatus such as MRI, ultrasound, and goniometer, as well as specific testing for De Quervain tenosynovitis, are the two basic commonly used diagnostic techniques. Conservative treatment, surgery, and traditional Chinese medicine are options for treating stenosing tenosynovitis. Conservative treatment includes orthoses, steroid injections, and NSAIDs. Surgery involves open release and percutaneous procedures, and the major modalities of Chinese medicine are acupuncture and moxibustion, needle knives and massage. After being successfully treated, the prognosis findings could be influenced by lifestyle, psychological changes, environment, and exercise.

Keywords: Diagnosis, Treatments, Stenosing Tenosynovitis.

1. Introduction

Overuse syndrome is the most prevalent cause leading to sports injuries. Serious sports injuries would lead to the end of athletes' careers. For instance, for professional basketball players, severe knee injuries could cause them to terminate their careers prematurely or even be paralyzed.

The hand and wrist are common sites of sports injury. Humans request these two joints a lot in exercises and daily activities. Hand and wrist diseases are complicated and involve carpal tunnel syndrome, Dupuytren disease, etc. Stenosing tenosynovitis is a prevailing hand and wrist disease that bothers thousands of patients. The current research about stenosing tenosynovitis primarily concentrates on the diagnosis and treatment.

This study focuses on stenosing tenosynovitis, including the anatomy of the hand and wrist, the high risky group and activities of stenosing tenosynovitis, diagnosis, conservative treatment, surgery, traditional Chinese treatment, and post-operative precautions.

2. Background

2.1. Description and anatomy

The wrist comprises the distal ends of the radius and ulna, 8 carpal bones, and the proximal bases of the 5 metacarpal bones. Hand and wrist are high-risk areas for injuries, and common injuries include carpal tunnel syndrome, scaphoid fracture, stenosing tenosynovitis, dupuytren disease, and injuries to the digital flexor.



Figure 1. Hand and wrist anatomy

Stenosing tenosynovitis, also known as trigger finger, is a common pathologic condition affecting the hand's digital pulleys and flexion tissues. Thumb and fourth finger are the most frequently afflicted digits; the right hand and dominant hand are more common [1].

De Quervain tenosynovitis is a stenosing tenosynovitis of the initial dorsal segment of the wrist, which is a common pathology [2]. De Quervain tenosynovitis includes the pathological changes in tendons of the abductor pollicis longus (APL) and extensor pollicis brevis (EPB) [1].

2.2. Groups/activities at risk

Specialization in specific sports and workers is a high factor in stenosing tenosynovitis. Some sports activities, including volleyball and table tennis, could be risky factors [3]. Labourers who attend in repeated hand and wrist movements and clumsy positions have a higher risk of stenosing tenosynovitis [4].

In addition, specific genes and underlying diseases such as diabetes are likely linked to stenosing tenosynovitis. Genes, including KLHL1 and POLE2, could be a possible reason for stenosing tenosynovitis [5]. Diabetic individuals have a higher rate of stenosing tenosynovitis incidence, especially among type 2 diabetes patients [6-9]. People with diabetes have stenosing tenosynovitis between 4 and 29 percent and are thought to account for around one-third of all stenosing tenosynovitis cases [6].

Some unhealthy lifestyles would contribute to the overuse of hands and wrists, which leads to injury. The popularity of mobile phones and electronic games is related to De Quervain tenosynovitis among teenagers [10-12]. Furthermore, the gender difference also happens in incidence, as females have a 6 times higher incidence of stenosing tenosynovitis [13-14].

3. Symptoms, examination and diagnosis

3.1. Symptoms

From the patient's subjective description, they state dorsoradial discomfort in the wrist that might occasionally extend below the thumb and up the arm. Pinching is feeble and unreliable, especially when the thumb and fingers are used in conjunction with ulnar wrist flexion. Compression on the afflicted segment, which feels thicker, causes localized discomfort. On rare occasions, a perceptible lump could be experienced moving along the segment with finger flexion and extension [15]. The most important clinical finding is a brief obstruction of the digit during flexion, followed by painful snapping during extension [16-17]. Localized soreness is present around the neck of the metacarpal, and when the digits are moved [15].

The Quinnell classification of grades 0 to IV includes normal movement, local discomfort and history of catching, demonstrated catching with regular active extension, demonstrative locking necessitating passive extension, and immovable flexion deformity [18].

Generally, it is difficult to confirm the stenosing tenosynovitis from the patient's description alone, so some additional tests and diagnostics are necessary.

3.2. Examination and diagnosis

There are two main methods of conventional diagnosis, one through auxiliary instruments and the second is special tests for De Quervain tenosynovitis.

3.2.1 Auxiliary instruments

Auxiliary instruments can accurately determine the severity of the disease and the exact location of the lesion even though they are more expensive.

(1) MRI

Stenosing tenosynovitis patients could observe flexor pollicis longus tendinosis with a noticeable nodule and A1 pulley thickening from MRI, and sometimes an atypically obvious A2 pulley could be imaged. The radiologist's correct assessment can enable therapy to begin and save needless additional testing [19].

(2) Ultrasound

In spite of other factors, stenosing tenosynovitis could be described as over 0.62mm A1 pulley thickness through ultrasound. The A1 pulley of stenosing tenosynovitis on sonoelastography is firmer than that of the nearby ordinary fingers. Stenosing tenosynovitis may be evaluated both statically and dynamically using ultrasound, which is a useful and efficient instrument. Because of this, ultrasound should be thought of as the radiologic modality of the first choice for verifying the stenosing tenosynovitis diagnosis, determining any underlying causes, and directing the proper therapeutic care [16].

(3) Goniometer

A goniometer is a tool that can be utilized to rotate an entity to a certain point or calculate an angle. The limited active range of motion and passive range of motion in the joint is a typical symptom of stenosing tenosynovitis that could be measured by a goniometer. The goniometer is frequently used clinically due to its ease of measurement.

3.2.2 Special tests for De Quervain tenosynovitis

Special tests are most frequently used for clinic diagnosis as these tests are rapid to get the result, cost-effective and easy to accept for patients.

(1) Finkelstein's test

The examiner holds the thumb tightly in one hand and the forearm on the ulnar side in neutral pronation. The patient's thumb is next given powerful traction, pulled longitudinally and in the direction of a small ulnar deviation toward the wrist. Pain can be regarded as a positive sign.

(2) Eichhoff's test

The participant is requested to press the finger into the palm and then grasp the digits over the thumb. While holding the forearm in the same position as the Finkelstein test, the examiner applies passive ulnar deviation to the wrist with one hand. Pain can be regarded as a positive sign.

(3) The wrist hyperflexion and abduction of the thumb (WHAT) test

The patient maintains a total extension and abduction of the thumb as the therapist consistently increases the resistance to abduction while the patient completely extends and abducts their wrist (within their pain limitation). The test is finished when the patient cannot continue exerting pressure against the examiner. The positive sign is indicated by pain when the examiner is subjected to resistance.

4. Treatments

Conservative treatment and surgery are standard therapies for stenosing tenosynovitis. The former involves orthoses, steroid injections, and NSAIDs, and the latter includes the open or percutaneous surgical release. Additionally, traditional Chinese methods are effective in treating stenosing tenosynovitis.

4.1. Conservative treatment

Conservative treatment includes orthoses, steroid injections, hand therapy exercise protocols and NSAIDs. This treatment focuses on relieving inflammation and pain; long-term treatment is required to achieve a cure.

(1) Orthoses

An orthosis could immobilize a single joint in order to avoid triggering. As a result, patients with stenosing tenosynovitis can significantly reduce discomfort and enhance the function of daily activities [13,17-18].

Compared with steroid injection, an orthotic equipment solution might be a better long-term remedy since it aims to stop the stress brought on by flexor tendon motion across the afflicted A1 pulley until the inflammation there subsides [18]. This method is more suitable for patients having single-digit stenosing tenosynovitis.

(2) Steroid injection

The effectiveness of steroid injection varies according to the number of afflicted fingers and the clinical severity of patients [13]. For people with moderate triggering (grades 1 and 2), the steroid injection is an ideal treatment solution, while the success of steroid injection is considerably lower at one month for more serious triggering (grades 3 and 4) or more involved fingers [19].

The research argues that twice steroid injections before surgery is the most economical therapeutic option if needed [20]. A cadaveric study shows that given the high occurrence of a septum between the abductor pollicis longus and extensor pollicis brevis, two distinct injections ought to be performed to effectively inject two chambers, which leads to a higher rate of treatment success [21].

However, the availability of steroid injections could last for 1 week to 1 month [18]. The complications of injection are various, including tendon rupture and complex regional pain syndrome (Type 1) [22].

(3) Non-steroidal anti-inflammatory drugs (NSAIDs)

NSAIDs mainly focus on reducing pain and inflammation and often combine splinting to treat stenosing tenosynovitis in the early stage. NSAIDs are primarily applied to emergencies and acute symptoms. If taking NSAIDs for a long time, they may cause damage to the organs of humans.

4.2. Surgery treatments

Even though conservative treatments have decent outcomes, complications are still reported and they have less effect in the long term. Surgery including open release and percutaneous surgery could fundamentally solve problems and be applied to patients who have tried conservative methods before but the symptoms still exist.

(1) Open release

The open release is the benchmark operation for addressing stenosing tenosynovitis and from 90% to 100% of open A1 pulley releases are confirmed to be successful [13]. This method involves palm-up hyperextension of the metacarpophalangeal joint, which lengthens the A1 pulley and shifts the neurovascular components dorsally. A needle is placed through the skin and onto the A1 pulley after ethyl chloride is sprayed and lidocaine is administered for pain relief. The pulley is then cut both proximally and distally to the injection site using a sweep motion. To a large extent, the open release could improve the quality of patients' daily life and the results after surgery could maintain for a long period. Furthermore, this method is as effective in people with diabetes as in traditional patients [23].

However, the drawbacks of open release ought to be considered as the limited range of motion is reported in the early rehabilitation stage after open release. Other postoperative complications, including scar tissue, stiffness and infection, are potential for patients.

(2) Percutaneous release

Percutaneous release requires the operator to define the tendon's longitudinal axis and to have a thorough understanding of the anatomy of the pulleys [24]. Current combined treatment like the percutaneous ultrasonography-guided thread technique, is an efficient and secure alternative to open release [13].

Due to the experience of catching, phase 1 patients are unsuitable for having a percutaneous release. Additionally, if synovectomy or tenosynovectomy is a concern, such as in rheumatoid patients, this method is inappropriate [24].

In the short term, the proportion of discomfort and scarred development in the open release group was substantially greater than that in the percutaneous release group. Over time, the percutaneous release group experienced more discomfort and repeated triggering than the open release group [25].

4.3. Traditional Chinese treatments

Traditional Chinese treatments base on the theory of Chinese medicine and follow the meridians and acupuncture points to treat diseases.

(1) Acupuncture and moxibustion

Acupuncture is the use of very fine needles that are inserted into specific points of the patient to treat the disease and moxibustion is an easy and painless external therapy. The ability of acupuncture and moxibustion to heal various disorders may operate by increasing local blood flow, improving connective tissue, regulating autonomic nerve activity, and controlling inflammatory responses [26]. Acupuncture has minimal side effects in comparison to other therapies. However, acupuncture and moxibustion generally require a longer course of treatment to achieve better efficacy.

(2) Needle knife

The principle of acupuncture for stenosing tenosynovitis is to open the adherent fascia. The needle knife is inserted vertically under the skin to the lesioned tendon sheath glide level, and successive vertical stabbing cuts are combined with painful peeling for release. For experienced operators with the skillful stabbing and stripping method, patients can obtain better relaxation results. However, due to the smaller size of the needle knife and larger tendon sheath glide, the complete incision is arduous to achieve. As a result, repeated stabbing and stripping methods are familiar to doctors, which leads to injuries to blood vessels and nerve tissues. Recently, with the help of ultrasound and endoscope, the needle knife has become more precise and has fewer side effects [27].

(3) Massage

The massage technique can increase the local pain threshold, eliminate edema, release adhesions between the tendon and tendon sheath, widen the tendon sheath lumen and improve the hypoxic state of the tendon. The operator uses pressing, kneading, flicking, stretching, pulling, and passive movement to treat the affected area. This method is easy to accept for patients, non-invasive, painless, inexpensive, safe, reliable and without any toxic side effects [28].

Traditional Chinese treatments generally require high-level experts to operate, which could get optimal results. With the development of globalization and Western medicine, traditional Chinese treatments would have better healing effects.

4.4. Analysis of treatment hotpots

As can be seen in Table 1 and related literature, the high-frequency treatments of stenosing tenosynovitis in this decade are surgery, orthopedics, medicine general internal.

Table 1. The high-frequency treatments of stenosing tenosynovitis in this decade

Serial number	Keyword	Recorded number	Percentage
1	Surgery	36	43.373%
2	Orthopedics	32	38.554%
3	Medicine General Internal	14	16.867%
4	Integrative Complementary Medicine	4	4.819%
5	Rehabilitation	4	4.819%

4.5. Precautions after healing

After being treated, the lifestyle, psychological change, environment and exercise will influence the following prognostic results. If there is a problem with any of the above conditions, the diseases might recur.

Adjusting the working environment after surgery is crucial for patients returning to previous work. For instance, the application of ergonomic designs might link to the decline of some diseases. The pre-service education from managers about dangerous circumstances and modifications could decrease the potential upper limb injury and subsequent musculoskeletal diseases [4]. At the same time, reducing repetitive hand and wrist movements might decline the recurrence of stenosing tenosynovitis.

Emotional distress from patients is closely related to the prognosis results of de Quervain's tenosynovitis [29-31]. In patients anticipating operative decompression of de Quervain's tenosynovitis, higher pain catastrophizing and more pessimistic views of the condition are linked to baseline discomfort and decreased function. The increased basic awareness of de Quervain's tenosynovitis is highly linked to the return to the workplace faster than those with anxiety and depression. Psychological intervention could reduce the possibility of further surgery and improve the satisfaction of patients after surgery, which is beneficial for both hospitals and patients [32].

5. Conclusion

The fundamental anatomy of the hand and wrist, the high-risk group and behaviours associated with stenosing tenosynovitis, diagnosis, conservative therapy, surgeries, traditional Chinese medicine, and post-operative precautions are all covered in this article.

Some specific sports, professionals, lifestyles, genes, diseases and females are associated with a high incidence of stenosing tenosynovitis. The most significant clinical symptom is a momentary finger blockage during flexion, followed by painful snapping during extension. The Quinnell classification of stenosing tenosynovitis is from grades 0 to IV.

The two primary conventional diagnostic approaches are auxiliary instrumentation, including MRI, ultrasound and goniometer, and specialized testing for De Quervain tenosynovitis.

Conventional therapy for stenosing tenosynovitis includes conservative treatment, surgery, and traditional Chinese medicine. The first one includes orthoses, steroid injections, and NSAIDs. Patients with stenosing tenosynovitis can dramatically lessen pain and improve the functionality of every day activities by utilizing orthoses. Single joint tenosynovitis is suitable to use in orthoses. Grades 1 and 2 patients could apply twice steroid injections to achieve the most effective therapeutic effect. Surgery, including open release and percutaneous procedures, might be used to treat individuals whose symptoms persist despite prior attempts at conservative treatment. Currently, the open release is recognized as the gold standard procedure for treating stenosing tenosynovitis. The current combination therapy, such as the percutaneous ultrasonography-guided thread approach, is a safe and effective alternative to open release. Acupuncture and moxibustion, needle knife and massage are the main methods of Chinese medicine. Its fundamental theory stems from traditional Chinese therapies using acupuncture sites and meridians to cure illnesses. High-level professionals are typically needed to operate them in order to achieve the best results.

When successfully treated, lifestyle choices, psychological adjustments, environmental factors, and exercise will affect the ensuing prognosis outcomes. If any of the aforementioned circumstances are problematic, the illnesses may return.

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