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StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2019 Jan-.

Thumb Spica Splinting

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Last Update: February 6, 2019.

Introduction

Hand and wrist injuries afflict a wide range of the adult and pediatric general population groups. Further, they can potentially impact patients of all ages and activity levels. Thus, not only do these injuries occur in high-level, professional athletes, but they can occur secondary to low-energy trauma (e.g., ground level falls in the elderly) during normal daily activities.

Splinting about the wrist, in general, serves a potential role in the initial (or definitive) stabilization of the wrist and periarticular joint injuries. Splinting can be effective as a temporary immobilization measure and provides adequate protection from further soft tissue injury secondary to the structural support when the technique is performed correctly. Acute injuries are akin to this modality as splinting (as opposed to casting) accommodates for the anticipation of swelling.[1]

Thumb spica splinting is an important technique for clinicians and healthcare providers at all levels and specialties given the potential utility it can have for the temporary or definitive immobilization depending on the specific type of injury under consideration.

Anatomy

The wrist joint also referred to as the radiocarpal joint is a condyloid synovial joint of the distal upper limb that connects and serves as a transition point between the forearm and hand. A condyloid joint is a modified ball and socket joint that allows for flexion, extension, abduction, and adduction movements.[2] The joint itself is formed through the articulations between the distal radius and the scaphoid, lunate, and triquetrum.

The proximal articulation forms a concave shape composed of a combination between the distal end of the radius and articular disk. The distal articulation is convex, consisting of the scaphoid, lunate, and triquetrum bones of the proximal hand. Note that the ulna is not part of the wrist joint itself, as it articulates distally via the distal radioulnar joint (DRUJ).[2][3]

The radiocarpal ligament is large, present on the dorsal and palmar surfaces of the wrist, and further connects the radius to distal carpal bones.[4] The distal ulna, however, does not come in contact with carpal bones and is attached to the radius via the radio-ulnar joint. Finally, dense fibrous connective tissue filled with synovial fluid wraps the entire joint itself.[5]

Scaphoid considerations

The position of the scaphoid in reference to the wrist, carpus, and distal articulations is unique compared to its counterpart carpal bones. Serving as the radial border of the proximal carpal row, the scaphoid is almost entirely covered by articular cartilage which allows it to act as an osseous bridge connecting the proximal and distal carpal row articulations.[3][4] Its blood supply coming from the radial artery is provided in a retrograde fashion, leaving the proximal portion of the scaphoid most susceptible to ischemia and avascular necrosis following injury.

Indications

The thumb spica splint is indicated in radially-based hand and wrist injuries. Examples of these injuries include but are not limited to^{[6][7][8][9]}:

- Various types of soft tissue and/or osseous injuries along the thumb/first ray
 - These injuries include osseous injuries (e.g., phalangeal or metacarpal fractures) or soft-tissue based injuries (e.g., thumb ulnar collateral ligament (UCL) injuries)
 - Other injuries include first metacarpal base injuries (i.e., Bennett and Rolando fractures)
 - Degenerative conditions of the thumb (e.g., carpometacarpal thumb osteoarthritis, also commonly referred to as basal joint arthritis)
- Fractures of the carpus
 - Scaphoid fractures
 - Lunate fractures
- De Quervain tenosynovitis
- Carpal tunnel syndrome
 - Not considered standard of care in the management of CTS
 - Cock-up wrist splints are often effective as night-splinting modalities; however, the use of splinting measures in the management of CTS remains controversial
 - Although controversial, some studies report improvement in symptoms in the short-term management of symptoms - some studies have demonstrated a potential clinical benefit in the use of splinting measures for patients with primarily nocturnal symptoms

Contraindications

There are no specific contraindications to thumb spica splinting.

Equipment

Thumb spica splints can be prefabricated or fiberglass.^[8] Pre-fabricated splints are ready to use immediately and need only minor adjustment via velcro straps. For fiberglass splints, necessary materials include:

- Plaster or padded fiberglass
- Plaster wool
- Bucket of water
- Scissors
- Crepe bandage

Personnel

Thumb spica splinting can be done in any traumatic, primary care, or emergency setting by a physician, nurse, or technician. The process is performable by a single operator.

Preparation

Thumb spica splints can extend from the thumb to mid-forearm or from thumb to above the elbow. In the setting of a scaphoid fracture, the use of a long-arm thumb spica splint may lead to shorter unions times in the first 4 to 6 weeks and diminish the shearing forces from the radius and ulna on the scaphoid.[10] However, by the end of splinting treatment, both long and short thumb spica splints will have equal efficacy in treating a scaphoid fracture.[10] A simple short-arm thumb spica splint is appropriate and effective for patients with De Quervain's tenosynovitis and first metacarpal fractures (Bennet and Rolando fractures).[11]

It is vital that the splint allows for balanced function and maximal mobility of the unaffected areas such as the fingers, upper arm, and shoulder. The splint should also allow for maximal sensory perception, and the pressure of the splint should be distributed equally. The splint should not challenge the normal contours of the hand and forearm. If needed, the patient should have adequate analgesia before and alongside the splinting process.

Technique

1. Perform a comprehensive physical examination before splinting
2. Have the patient rest his or her elbow on a table, and the forearm should be in a neutral position
3. The thumb should be in the normal resting anatomic position
4. Measure a 4-inch wide, eight layers thick plaster measured from the tip of the thumb to the proximal forearm
5. Soak plaster in lukewarm water
6. Apply plaster to the radial side of forearm and thumb so that this area is protected from the thumb tip to the mid- to distal-third of the forearm (depending on the specific injury)[12]
7. Ensure no ridges or indentations are created
8. Cover the plaster with a one-layer soft wrap material to interpose between the plaster and the overlying most superficial wrap (e.g., ace wrap)
9. Recheck and document neurovascular exam

Complications

Compartment syndrome is the most consequential complication of splinting[13][14] Patients should receive education regarding the symptoms of compartment syndrome such as worsening pain, numbness, or tingling.[13] Joint stiffness, thermal injuries, pressure sores, bacterial or fungal infection, or dermatitis are other complications.[13] For these reasons, it is vital that splints only be worn for the duration that they are necessary and replaced if complications arise. Signs such as blanching of skin decreased capillary refill, or increased pain at the time of splinting may indicate that the splint is compromising the patient's normal anatomy.

Clinical Significance

Thumb spica splinting has proven to be effective in many different settings for the treatment of thumb, carpal and metacarpal injuries. They are cost-effective, easily learned and taught, and accommodating. Further, splints are simple to manipulate for both the provider and the patient, and they are easy to remove for assessment of the extent and progression of injury throughout the healing process.

At the end of the procedure, the provider should educate the patient on basic splint maintenance, particularly keeping the area clean and dry. Instruct the patient to rest, ice and elevate the affected area in the immediate post-injury period to diminish expected swelling.[6] Generally, follow up is expected within one or two weeks from the time of splinting, but this length can vary on an individual basis.

Enhancing Healthcare Team Outcomes

Managing a wrist or hand injury may be as seemingly straightforward as splinting and necessary follow-up, but there are extrinsic factors involved in the healing process. For this reason, it is important to view the patient holistically. Many times these injuries will keep patients out of work or away from hobbies that bring them joy. There are reports that disability after an injury to the upper extremity highly correlates with depression [15]. For this reason, it's important to obtain a psychological evaluation at the time of the injury and closely monitor the patient throughout the healing process; this can be done through close follow-ups with the patient's primary care provider or via therapy sessions to assess the patient's coping strategies. Early enrollment into a program similar cognitive behavioral therapy programs may improve healing and disability in patients with orthopedic trauma.[16] Working with physical and occupational therapy has been shown to significantly increase strength in the wrist three to four months post-fracture. [17] Further, it is important to take into account cultural and socioeconomic aspects of each patient as close follow up is extremely important to recovery in patients with hand and wrist injuries.

Questions

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Bookshelf ID: NBK538525 PMID: 30860760