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Long Arm Splinting

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Introduction

Long arm splints are used in a variety of settings for immobilization of both bony and soft tissue injuries to the upper extremities. This type of splint provides immobilization to the elbow and the wrist. As a result, elbow flexion and extension and wrist flexion, extension, forearm supination/pronation can be restricted. Long arm splints are often the initial form of immobilization placed on an injured limb to accommodate soft tissue swelling before more definitive treatment with a cast or surgical fixation.

Anatomy

Long arm splints should fit each patient's anatomy appropriately, without excessive pressure or laxity at any given location of the device. Materials used should contour bony prominences and care should be taken to mold the splint in the desired position of immobilization.

Indications

Long arm splints have a variety of indications:

- Distal humerus fractures
- Olecranon fractures
- Radial head fracture (although a simple sling is preferred in most settings)
- Capitellum fractures (if significant swelling present)
- Elbow fracture/dislocations (after the appropriate reduction is achieved)
    - Monteggia fracture/dislocations -- the monteggia eponym implies a proximal ulna fracture with an associated radial head dislocation
        - A useful eponym for emergency medicine personnel is the term "MUGR" (pronounced "MUGGER")
            - **Monteggia** (involves a fractured) **Ulna** (proximal based injury in reference to the forearm, also "proximal" given its orientation in the actual eponym)
            - **Galeazzi** (involves a fracture) **Radius** (distally-based injury in reference to the forearm, also "distal" given its orientation in the actual eponym)
- Soft tissue injuries
    - In most clinical situations, a simple sling provides enough patient comfort/immobilization

- collateral ligament injuries/UCL injuries

Equipment

A well functioning long arm splint requires care when obtaining the appropriate supplies. The practitioner can choose between plaster and fiberglass for splinting material. The benefit of plaster as a splint medium is that it conforms more precisely to the patient's anatomy; however, it lacks fatigue strength compared to fiberglass. On the other hand, fiberglass is more durable with higher fatigue resistance; however, it is more difficult to mold and does not mold to a patient's anatomy as closely. Also, fiberglass application often requires the tighter application of a compressive dressing which can cause discomfort to patients if it is not loosened. Of note, fiberglass provides a more consistent appearance on X-Ray than plaster, making fractures potentially easier to visualize.

Personnel

To efficiently assemble a long arm cast, the practitioner should recruit the help of at least one other person. Have an assistant hold the patient's extremity in the desired position of immobilization while the splint is being created and molded. This can help with accurate placement of materials and minimize impingement of structures that could otherwise need to be adjusted after splint application (e.g., anterior cubital fossa).

Preparation

Preparation of a long arm cast involves several steps. The practitioner may decide on the width of plaster or fiberglass to use that best fits the patient's anatomy. For adults, this often translates to 3-inch diameter sugar tong and 3 to 4-inch posterior mold material. For pediatrics, 2-inch sugar tong and posterior mold often work well. For plaster and fiberglass, the length of the sugar tong and posterior splint should be pre-measured. With plaster, eight to 10 layers are often used. For fiberglass, most splinting materials come pre-fabricated. Synthetic or cotton web roll should be obtained for padding. Optionally, stockinette can be used for patient comfort as a base layer before splinting. The final overwrap typically is performed with an elastic bandage.

Technique

1. With the patient adequately positioned, start building the splint, unrolling the web roll beginning at the wrist and extending past the elbow to the upper arm. The number of layers is determined by the amount of expected swelling, but many splints will use two to four layers. Care should be taken to accurately define the distal borders of the splint to allow for free motion of the thumb and metacarpal phalangeal joints. At the elbow, web roll must be carefully applied to ensure adequate padding of the olecranon. Frequently, the practitioner can tear pieces of web roll to lay on the posterior aspect of the elbow to provide padding without overbulking the antecubital fossa. Web roll should be extended proximally, often to within the proximal one-third of the humerus. Also of note, it is important to lay on web roll with 50% overlap to maintain even padding without irregularities, which can be a source of irritation. To achieve this, anatomy which is more cone-like than cylindrical (e.g., forearm) may require interrupting wraps rather than continuous circumferential layers.
2. Next, the prepared plaster or fiberglass sugar tong is dunked in cold water and applied around the elbow to the dorsal and volar aspects of the wrist. Care should be taken to stop the material approximately 1 cm short of the distal web roll to allow for an adequate bumper for soft tissues in the hand and to not restrict metacarpal phalangeal joint motion. The sugar tong is overwrapped with one layer of web roll to prevent circumferential immobilization once the posterior mold is applied, which would not allow for expansion.
3. Next, a posterior mold is applied from distal to proximal. Again, accurate distal placement is critical to allow for unrestricted motion in joints not requiring immobilization (e.g., metacarpal phalangeal joints). The posterior mold is overwrapped with one layer of web roll to prevent adherence to the next layer.

4. Finally, an elastic bandage is wrapped over the splint materials beginning distally and ending proximally. Care is taken to create a natural space for the thumb.

If fiberglass is used, the same techniques can be used, but web roll is not required for overwrapping as long as the fiberglass comes in a synthetic sheath. Additionally, it can increase patient comfort to cut a small margin of fiberglass back from the synthetic wrapping to create a soft end to the splint material. Once the materials are accurately and efficiently applied, the splint is molded to the desired shape to promote continued reduction of the injured structures. Once the fiberglass or plaster hardens, the patient should be instructed on splint care.

Complications

As with any splinting technique, there are a few possible complications.

- Improperly padded splints can lead to skin breakdown.
- Splints that are wrapped too tight can lead to patient discomfort and possibly decrease perfusion to the extremity.
- During the curing process, splinting materials give off heat in an exothermic reaction. This heat can cause patient discomfort.
- Plaster can cause skin irritation if it makes direct contact with skin.
- Over-padded splints can become too loose and inadequately immobilize an injury.
- Splints that are over aggressively molded can cause skin breakdown at the point of maximal pressure.

Clinical Significance

Long arm splints are a valuable tool in the treatment of a variety of upper extremity injuries. This form of splinting can provide excellent immobilization while allowing for swelling that often accompanies acute injuries. Typically, a long arm splint is the initial form of immobilization. It typically is removed, and patients are transitioned into more definitive immobilization such as a cast. The practitioner needs to take time to become familiar with the materials and techniques needed to make a well padded and molded splint that properly positions a patient to maintain a reduction and allow for soft tissue swelling.

Questions

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