

4B: Short Arm Cast Technique

1. Fracture Types in Upper Extremity

2. Overview

3. Set Up and Application

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Short Arm Casting Technique

Orthopedic casting remains a cornerstone in the management of various fractures, particularly those that require immobilization to promote healing while maintaining functional alignment. This section provides a detailed analysis of specific fracture types commonly treated with casting, addressing clinically relevant anatomy, epidemiological and etiological considerations, clinical characteristics, diagnostic processes, differential diagnoses, and treatment approaches.

Upon successful completion of these orthopedic modules, students will be able to:

- ✓ Identify the key anatomical structures of the forearm, wrist, and hand that influence short arm cast application.
- ✓ Explain the importance of positioning and alignment in maintaining proper immobilization.
- ✓ Appreciate the properties of fiberglass materials in terms of strength, drying time, and patient comfort.
- ✓ Select the appropriate material based on the patient's condition and clinical needs.
- ✓ Demonstrate how to achieve optimal immobilization, stability, and comfort while applying a short arm cast.
- ✓ Explain how to balance rigidity and flexibility to allow proper healing while minimizing complications.
- ✓ Describe the preparation process for the skin and apply appropriate padding to prevent pressure points and ensure patient comfort.
- ✓ Demonstrate properly mold the cast to maintain functional position and prevent complications.
- ✓ Ensure correct fit and symmetry to maximize immobilization without causing discomfort.
- ✓ Recognize potential issues such as pressure sores, circulation impairment, and thermal injuries from casting materials.
- ✓ Describe routine and considerations for appropriate follow-up care.

Fracture Type(s) for Short Arm Casts

Orthopedic casting remains a cornerstone in the management of various fractures, particularly those that require immobilization to promote healing while maintaining functional alignment. This section provides a detailed analysis of specific fracture types commonly treated with casting, addressing clinically relevant anatomy, epidemiological and etiological considerations, clinical characteristics, diagnostic processes, differential diagnoses, and treatment approaches.

Distal Radius Fractures

- ✓ *Clinically Relevant Anatomy:* The distal radius is the largest bone of the forearm and articulates with the carpal bones to form the wrist joint. This anatomical structure plays a critical role in wrist motion and load transmission from the hand to the forearm. Key anatomical landmarks include the radial styloid, sigmoid notch, and the volar and dorsal surfaces, which are often the sites of fracture involvement. The integrity of the radioulnar and radiocarpal joints is essential for maintaining wrist function (Court-Brown & McQueen, 2016).
- ✓ *Epidemiology / Etiology / Mechanism of Injury:* Distal radius fractures are the most common fractures seen in orthopedic practice, accounting for 18% of all adult fractures. The primary mechanism of injury involves a fall onto an outstretched hand (FOOSH), often occurring in elderly individuals with osteoporotic bone or in young adults exposed to high-energy trauma. Subtypes of distal radius fractures include Colles and Smith fractures, which differ in their mechanism and fracture displacement (Mulders et al., 2019).
- ✓ *Clinical Characteristics/Presentation:* Patients with distal radius fractures typically present with localized pain, swelling, and deformity around the wrist. A Colles fracture, caused by a fall onto an extended hand, presents with the characteristic "dinner fork" deformity, where the distal radius is dorsally displaced. Conversely, a Smith fracture, caused by a fall onto a flexed hand, results in volar displacement of the distal radius, producing a "garden spade" deformity. Both fractures may exhibit tenderness, reduced range of motion, and potential neurovascular compromise.
- ✓ *Fracture Diagnosis Process:* Radiographic imaging is essential for diagnosing distal radius fractures. Standard views include posteroanterior (PA), lateral, and oblique views, which help evaluate radial height, radial inclination, and volar tilt. Advanced imaging techniques, such as CT scans, are useful for assessing intra-articular extension and complex fracture patterns. Colles fractures often demonstrate dorsal angulation and displacement, while Smith fractures show volar angulation and displacement (Bertrand et al., 2018).
- ✓ *Differential Diagnosis/Associated Injuries:* Distal radius fractures can be associated with ulnar styloid fractures, TFCC tears, and ligamentous injuries. Differential diagnoses include scaphoid fractures, lunate dislocations, and carpal instability. It is important to evaluate the patient for concomitant injuries that may require additional intervention.
- ✓ *Treatment / Management Considerations:* The treatment of distal radius fractures depends on the stability and displacement of the fracture. Stable, minimally displaced Colles and Smith fractures are managed with closed reduction and immobilization in a short arm cast. The wrist is positioned in slight flexion and ulnar deviation for Colles fractures, while neutral or slight extension is preferred for Smith fractures. Unstable fractures or those with significant displacement often require surgical fixation to restore anatomical alignment and function (Mulders et al., 2019).

Short Arm Cast: Overview

Application Steps:

1. Patient preparation – skin assessment / examination
2. Begin by applying a stockinette and padding to protect the skin and provide comfort.
3. Position the wrist in relaxed supination.
4. Apply the casting material (fiberglass or plaster) in layers, starting from the distal end and moving proximally.
5. Mold the cast carefully over bony prominences, such as the radial and ulnar styloid processes, to avoid pressure points.
6. Allow the cast to set fully before providing patient education on care and monitoring.



Short Arm Cast (SAC)

Patient Preparation

Preparing a patient's skin prior to the application of an orthopedic fracture cast is crucial to ensure proper hygiene, reduce the risk of infection, and provide a comfortable fit. Here are the general steps to prepare the skin before applying a cast:

- Removing jewelry from the affected limb prior to the application of a fiberglass cast for the upper extremity helps to ensure patient comfort, proper cast fitting, and effective healing while reducing the risk of complications during the treatment and recovery process.
- Clean the skin: Gently clean the area around the fracture site using mild soap and water or an antiseptic solution. This step helps to remove dirt, debris, and bacteria from the skin, reducing the risk of infection.
- Dry the skin: Pat the skin dry with a clean towel or gauze. Make sure the skin is completely dry before proceeding, as moisture can interfere with the adhesion of the cast materials and promote the growth of bacteria.
- Assess the skin: Examine the skin for any signs of infection, open wounds, or skin irritation. If there are any concerns, consult with the healthcare professional responsible for the patient's care.
- Apply a skin barrier (if necessary): In some cases, a skin barrier may be used to protect the skin from irritation or maceration. This could be a moisture barrier cream or spray, which can help prevent skin breakdown caused by prolonged exposure to moisture.
- Trim or shave hair (if necessary): Excessive hair in the cast area can cause discomfort, itching, and difficulty removing the cast later. If the patient has a lot of hair in the area, it may be necessary to trim or shave it before applying the cast. Be sure to get the patient's consent before doing so.
- Position the limb: Properly position the patient's limb in the desired position for casting. This may involve supporting the limb with pillows, bolsters, or other positioning aids to ensure that it remains stable and comfortable during the casting process.
- Once the patient's skin is clean, dry, and properly assessed, you can proceed with applying the stockinette, padding, and casting material according to the healthcare professional's instructions.

Remember, it's essential to consult with a healthcare professional to ensure proper technique and care for the patient's specific needs.

Short Arm Cast (SAC) cont ...

Stockinette Application

Applying stockinette and padding correctly is crucial for patient comfort and protection when applying an orthopedic short arm fracture cast. Here is a step-by-step guide on how to apply both the stockinette and padding:

- **Measure the length:** Measure the patient's arm from the wrist to just below the elbow, and then add a few inches to ensure the stockinette covers the entire area that will be immobilized by the cast. The extra length will also allow you to fold the stockinette over the cast edges later.
- **Cut the stockinette:** Cut the stockinette to the appropriate length, taking care to create a clean, even edge.
- **Apply the stockinette:** Slide the stockinette onto the patient's arm, ensuring it is smooth and wrinkle-free. The stockinette should cover the entire area that will be immobilized, extending from the wrist to just below the elbow. Leave the extra length at both ends for folding over the cast edges later. Refer to corresponding video at the end of this lesson for detail instructions on applying the thumb "Gumby".

Padding Application

- **Begin at the wrist:** Start applying the padding at the distal end of the arm (the wrist). This will provide extra cushioning to the most vulnerable areas.
- **Wrap evenly:** Roll the padding evenly around the arm, overlapping each layer by approximately 50% to ensure even pressure distribution and adequate cushioning.
- **Cover bony prominences:** Make sure to pad bony prominences more generously, such as the wrist and the olecranon (the bony tip of the elbow). This helps to prevent pressure points, skin irritation, and discomfort.
- **Smooth out wrinkles:** As you apply the padding, smooth out any wrinkles or folds to ensure a comfortable fit and prevent pressure points.
- **Progress up the arm:** Continue wrapping the padding up the arm, maintaining even pressure and coverage until just 3-4 finger breadths below the elbow. Ensure the padding extends beyond the area that will be immobilized by the cast. Continue back down the arm overlapping half the previous layer and incorporate the flattening the tire technique, per video instruction.
- **Secure the padding:** Once you reach the desired level of padding, trim the padding material and secure it in place by simply applying light pressure on top layer. Tape or tucking the end under the previous layer is not necessary.

By carefully applying both the stockinette and padding, you create a comfortable and protective layer between the patient's skin and the fiberglass cast material. This helps to minimize the risk of skin irritation, pressure sores, and other complications during the healing process.

Short Arm Cast (SAC) cont ...

Fiberglass Cast Tape Application

Applying the fiberglass cast tape correctly is essential for ensuring a strong, durable, and comfortable orthopedic short arm cast. Here are the steps for effectively applying fiberglass cast tape:

- **Prepare the cast tape:** Open the fiberglass cast tape packages and have them ready for use. Be mindful that exposure to air or moisture will initiate the hardening process of the cast tape.
- **Put on gloves:** Wear gloves to protect your hands from the resin and maintain a clean application.
- **Prepare water:** Fill a basin or container with clean water to activate the polyurethane resin in the fiberglass cast tape. The temperature of the water will affect the working and setting time of the cast, with warmer water speeding up the process and cooler water slowing it down.
- **Dip the fiberglass cast tape:** Take the first roll of fiberglass cast tape and submerge it in the water for a few seconds, ensuring it is fully saturated. Gently squeeze the roll to remove excess water and evenly distribute the resin.
- **Begin at the wrist:** Start applying the fiberglass cast tape at the wrist, which is the distal end of the arm. Hold the roll in one hand and use the other hand to guide and smooth the tape as you wrap it around the limb.
- **Wrap evenly:** Wrap the fiberglass tape evenly around the arm, overlapping each layer by approximately 50% to ensure a strong and stable cast. Maintain an even tension while wrapping to avoid excessive pressure or a loose cast.
- **Cover the padding:** Ensure the fiberglass tape fully covers the underlying padding and stockinette. Be careful not to leave any gaps or exposed padding, as this can compromise the cast's effectiveness.
- **Progress up the arm:** Continue wrapping the fiberglass tape up the arm, maintaining even pressure and coverage until just below the elbow. After your 1-2 turns at top of forearm, fold stockinette back over. You may need to apply a bumper for extra support, per video. Make sure the cast extends from the joint above the injury (3-4 finger breadths below the elbow) to the joint below the injury (the wrist) for proper immobilization.
- **Apply additional layers:** Apply 3-4 layers of fiberglass tape for optimal strength and durability. When adding more layers, change the direction of the wrap to create a crisscross pattern, which increases the stability and rigidity of the cast. Both pinch and a wave as well as the cut technique will be demonstrated on the end of lesson video.
- **Smooth the cast:** While the cast is still wet and malleable, use your hands to gently mold and smooth the fiberglass tape to the contours of the patient's arm. This helps ensure a snug and comfortable fit.
- **Allow the cast to set:** Give the fiberglass cast time to set and harden, which usually takes around 10-15 minutes. Instruct the patient to remain still and avoid moving the affected limb during this time..

By following these steps, you can effectively apply fiberglass cast tape for an orthopedic short arm cast, ensuring a strong, stable, and comfortable cast that promotes healing and patient satisfaction.

Short Arm Cast (SAC) - Removal

Short Arm Cast Removal

Removing a short arm cast with an orthopedic cast cutter requires care and attention to avoid injury. An orthopedic cast cutter, also known as a cast saw, is a specialized tool designed to remove casts by cutting through the hard casting material without injuring the patient's skin. Follow these steps to remove a short arm cast using an orthopedic cast cutter:

- **Prepare the patient and workspace:** Have the patient sit in a comfortable position with their arm supported on a stable surface. Ensure the workspace is well-lit and that you have all the necessary tools, such as the cast cutter, cast spreader, and scissors.
- **Safety measures:** Explain the process to the patient and reassure them that the cast cutter will not harm their skin. The cast cutter works by vibrating at a high frequency, which allows it to cut through the cast material but not the skin. It is normal for the cast cutter to generate some heat and noise during the process, so let the patient know what to expect. Use zip stick if available for additional protection.
- **Begin cutting the cast:** Turn on the cast cutter and start cutting along the length of the cast. Hold the cutter perpendicular to the cast's surface and apply gentle pressure. You can make a cut along the side of the arm, usually following the natural curve between the thumb and the forearm. Be cautious not to press too hard or cut too deep, as this may cause discomfort or injury to the patient.
- **Check for padding:** Periodically stop cutting and check if you've reached the padding layer beneath the cast. The padding will provide an additional layer of protection for the patient's skin.
- **Cut the other side:** Make a similar cut on the opposite side of the cast, ensuring that the two cuts are roughly parallel to one another.
- **Use a cast spreader:** Once both cuts are complete, insert the cast spreader into one of the cuts and gently spread the edges apart. This will help to break any remaining connections between the cast pieces and create enough space to safely remove the cast.
- **Remove the cast:** Carefully lift the cast pieces away from the patient's arm, making sure not to pull or tug on the skin. If needed, use scissors to cut through the padding and stockinette underneath the cast.
- **Inspect the skin:** After the cast is removed, examine the patient's skin for any signs of irritation, infection, or injury. Encourage the patient to gently move their fingers and wrist to regain mobility.

Remember that cast removal should be performed by a healthcare professional or someone trained in cast removal to ensure the safety and well-being of the patient.