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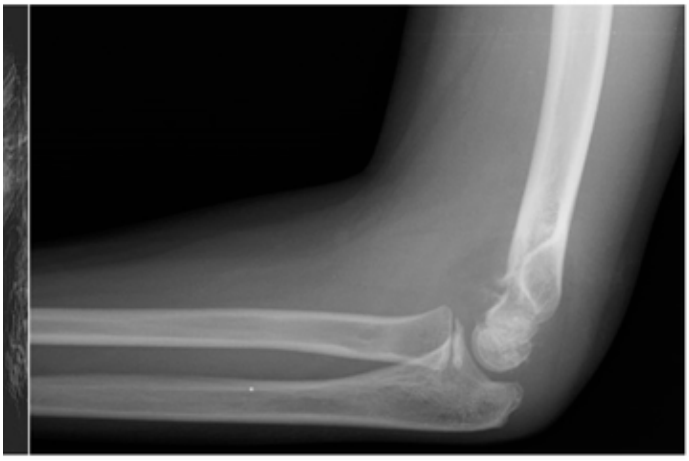
Unit 5: Long Arm Casting Technique

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.

Fracture Type(s) for Long Arm Cast

Supracondylar Humerus Fractures

- *Clinically Relevant Anatomy:* The distal humerus comprises the medial and lateral condyles, the olecranon fossa, and the supracondylar region. The brachial artery and median nerve traverse the cubital fossa near the supracondylar region, making them vulnerable in these fractures.
- *Epidemiological/Etiology/Mechanism of Injury:* Supracondylar fractures account for approximately 60% of elbow fractures in children under 15 years old (Rasool, 2020).
- *Mechanism:* These fractures typically result from a fall on an outstretched hand (FOOSH) with the elbow hyperextended, leading to compression or shear forces on the supracondylar region.
- *Clinical Characteristics/Presentation:* Severe pain, swelling, and deformity at the elbow; Limited or absent elbow flexion/extension., possible neurovascular compromise indicated by pallor, pulselessness, or paresthesia.
- *Fracture Diagnosis Process:* Imaging: Anteroposterior (AP) and lateral radiographs of the elbow are diagnostic. A "posterior fat pad sign" suggests occult fractures.
- *Clinical Tests:* Neurovascular assessment for radial, median, and ulnar nerve function.
- *Differential Diagnosis/Associated Injuries:* Elbow dislocation; Intercondylar fractures
- *Treatment/Management Considerations:* Closed reduction and immobilization in a long arm cast with the elbow flexed to 90 degrees if neurovascular status permits; Post-reduction radiographs to confirm alignment; Regular monitoring for compartment syndrome.



Fracture Type(s) cont ...

Olecranon Fractures

- *Clinically Relevant Anatomy:* the olecranon is part of the proximal ulna, forming the bony prominence of the elbow. It serves as the insertion point for the triceps brachii tendon and articulates with the trochlea of the humerus.
- *Epidemiological/Etiology/Mechanism of Injury:* Olecranon fractures are more common in adults and account for approximately 10% of upper extremity fractures (Horneff & Kane, 2020).
- *Mechanism:* Direct trauma (e.g., a fall onto the elbow) or indirect trauma through triceps contraction during a fall.
- Clinical Characteristics/Presentation: Localized swelling and tenderness over the olecranon ; inability to actively extend the elbow due to triceps disruption; Pain exacerbated by elbow movement.
- *Fracture Diagnosis Process:* Imaging: AP and lateral elbow radiographs typically reveal the fracture and its displacement.
- *Clinical Tests:* Assessment of ulnar nerve function due to its proximity.
- *Differential Diagnosis/Associated Injuries:* Radial head fractures; Distal humerus fractures; Elbow dislocations.
- *Treatment/Management Considerations:* Nondisplaced fractures: Long arm cast with the elbow at 45-90 degrees of flexion to avoid triceps tension; Displaced fractures: Often require surgical fixation.

Fracture Type(s) cont ...

Radial Head Fractures

- *Clinically Relevant Anatomy:* The radial head articulates with the capitellum of the humerus and the radial notch of the ulna. This structure is integral to forearm pronation and supination.
- *Epidemiological/Etiology/Mechanism of Injury:* Radial head and neck fractures are the most common fractures of the elbow in adults, comprising about 20% of elbow fractures (Mason, 2021). Most result from a FOOSH injury with the forearm in pronation, transferring force to the radial head.
- *Clinical Characteristics/Presentation:* Lateral elbow pain and swelling; Pain aggravated by forearm pronation, supination, and elbow flexion; Mechanical block to motion may indicate a displaced fracture.
- *Fracture Diagnosis Process:* Imaging: AP and lateral elbow radiographs, possibly with oblique views. Computed tomography (CT) may aid in complex cases.
- *Clinical Tests:* Palpation of the lateral elbow for tenderness over the radial head.
- *Differential Diagnosis/Associated Injuries:* Olecranon fractures; Elbow dislocations; Coronoid process fractures.
- *Treatment/Management Considerations:* Nondisplaced or minimally displaced fractures: Long arm cast with the elbow at 90 degrees and the forearm in neutral rotation; Displaced or comminuted fractures: Surgical intervention may be required.

Fracture Type(s) cont ...

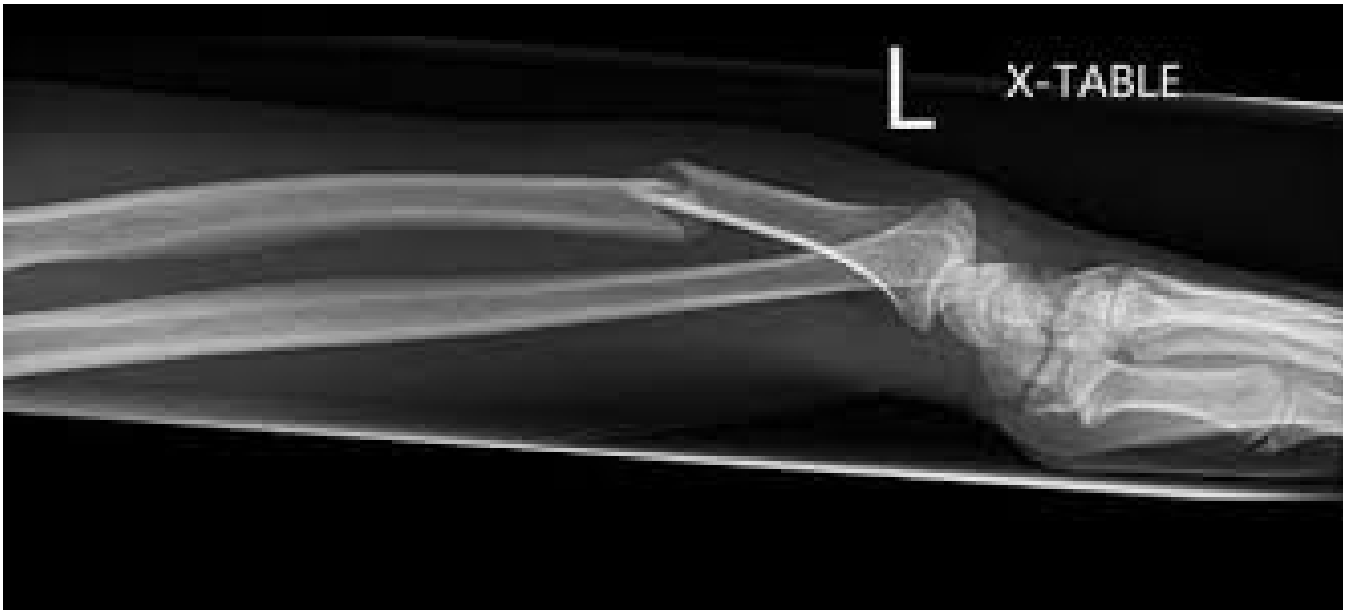
Midshaft Radius and Ulna Fractures

- *Clinically Relevant Anatomy:* The radius and ulna form the forearm's osseous framework and are connected by the interosseous membrane, which transfers force and maintains alignment.
- *Epidemiological/Etiology/Mechanism of Injury:* Most common in pediatric and adolescent populations but can occur in adults; High-energy trauma such as falls, direct blows, or sports-related injuries.
- *Clinical Characteristics/Presentation:* Forearm deformity, swelling, and ecchymosis; Pain and tenderness along the radius and ulna shafts; Reduced pronation and supination.
- *Fracture Diagnosis Process:* Imaging: AP and lateral forearm radiographs;
- *Clinical Tests:* Evaluation of neurovascular function due to proximity to the radial and ulnar nerves.
- *Differential Diagnosis/Associated Injuries:* Isolated radius or ulna fractures; Compartment syndrome; Associated elbow or wrist fractures.
- *Treatment/Management Considerations:* Nondisplaced fractures: Long arm cast with neutral forearm position; Displaced fractures: Surgical fixation is usually required.

Fracture Type(s) cont ...

Galeazzi Fractures

- *Clinically Relevant Anatomy:* the distal third of the radius and distal radioulnar joint (DRUJ) injury. The DRUJ stabilizes forearm rotation.
- *Epidemiological/Etiology/Mechanism of Injury:* Epidemiology: More common in adolescents and young adults.
- *Mechanism:* FOOSH injury with the forearm in pronation.
- *Clinical Characteristics/Presentation:* Swelling and deformity over the distal forearm; Tenderness at the wrist and limited forearm rotation; Instability or subluxation of the DRUJ.
- *Fracture Diagnosis Process:* Imaging: AP and lateral forearm radiographs with attention to the DRUJ alignment.
- *Clinical Tests:* Assessment of DRUJ stability under fluoroscopy if necessary.
- *Differential Diagnosis/Associated Injuries:* Isolated distal radius fractures; Distal ulna fractures; Ligamentous injuries of the wrist;
- *Treatment/Management Considerations:* Nondisplaced fractures: Long arm cast with forearm in supination; Displaced fractures or DRUJ instability: Surgical fixation required.



Fracture Type(s) cont ...

Monteggia Fractures

- *Clinically Relevant Anatomy:* a proximal ulna fracture with radial head dislocation. The interosseous membrane maintains the relationship between the radius and ulna.
- *Epidemiological/Etiology/Mechanism of Injury:* Epidemiology: Rare but often seen in pediatric populations.
- Mechanism: FOOSH injuries combined with pronation or hyperextension forces.
- *Clinical Characteristics/Presentation:* Forearm deformity with tenderness over the ulna; Limited forearm rotation and elbow extension; Radial head prominence may be palpable.
- *Fracture Diagnosis Process:* Imaging: AP and lateral radiographs of the forearm, elbow, and wrist. Look for radial head alignment with the capitellum.
- *Clinical Tests:* Evaluate radial nerve function.
- *Differential Diagnosis/Associated Injuries:* Isolated radial head dislocation; Galeazzi fractures (distal radial fracture with radioulnar joint disruption); Nerve injuries (posterior interosseous nerve).
- *Treatment/Management Considerations:* Closed reduction and immobilization in a long arm cast with the forearm in supination; Monitor for any displacement, which may require surgical intervention.

Long Arm Cast: Overview

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.

Long Arm Cast: Application

Stockinette Application

Applying a stockinette and padding correctly is crucial for patient comfort and protection. Here is a step-by-step guide on how to apply both the stockinette and padding:

- Prepare the materials: Gather the necessary materials, including a stockinette, scissors, and cast padding.
- Measure the stockinette: Measure the length of the patient's arm from the base of the hand to the axilla, and add a few extra inches to allow for folding at the top and bottom. Cut the stockinette to the appropriate length.
- Position the stockinette: Slide the stockinette over the patient's arm so that it covers the entire length of the limb. Make sure that the stockinette is not too loose or too tight.
- Fold the top of the stockinette: Fold the top of the stockinette down towards the patient's hand, leaving a few inches of excess material at the top. This will create a cuff that will protect the skin from the cast material.
- Fold the bottom of the stockinette: Fold the bottom of the stockinette up towards the patient's axilla, leaving a few inches of excess material at the bottom.
- Smooth the stockinette: Smooth out any wrinkles or folds in the stockinette to ensure a comfortable and snug fit.

Padding Application

- Apply the first layer: Start at the base of the hand and wrap the first layer of cast padding over the stockinette, making sure to cover the entire limb. The padding should overlap ½ with each turn to ensure a smooth and even surface.
- Apply the second layer: Once the first layer is in place, apply a second layer of cast padding in the same manner. The second layer should overlap the first layer by approximately half of its width.
- Continue adding layers: Depending on the severity of the injury and the physician's instructions, additional layers of cast padding may be needed. Apply each layer in the same manner as the first two, making sure to cover the entire limb.
- Smooth out any wrinkles: As you apply each layer of cast padding, make sure to smooth out any wrinkles or folds to ensure a comfortable fit. Wrinkles or folds can cause discomfort and may even lead to pressure sores.
- Check for proper fit: After applying the cast padding, check to ensure that it is not too tight or too loose. The padding should provide cushioning and protection for the limb, but should not constrict blood flow or cause discomfort.

Long Arm Cast cont ...

Fiberglass Cast Tape Application

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

- Prepare fiberglass tape: Put on gloves to protect your hands. The exact number of rolls will depend on the size of the patient's arm and the desired thickness of the cast.
- Dip fiberglass tape: Fully submerge a roll of fiberglass tape in lukewarm water for a few seconds to activate the resin. Squeeze the roll gently to remove excess water.
- Apply fiberglass tape: Start wrapping the fiberglass tape in the same manner as the short arm cast as well as applying fiberglass around the wrist - cut technique or fan fold" at the wrist
- Focus on positioning the elbow slightly above 90 degrees as the arm will migrate slightly to 90 degrees in final fiberglass application.
- Start with your next roll of fiberglass tape on the proximal end of your short arm cast and continue with figure 8 approached around the elbow. Cove the cast tape along the antecubital space - as demonstrated in the lesson video and continue to work your way towards the shoulder. Overlap each layer by 50% for uniform thickness. Make sure the tape lies smoothly without any wrinkles or air pockets.
- Mold the cast (per video): As you apply the fiberglass tape, use your hands to mold and shape the cast around the arm. Apply gentle pressure to ensure a snug fit without causing discomfort. Ensure the elbow is immobilized at an appropriate angle, usually around 90 degrees.
- Final molding: Once you have reached the desired thickness, smooth the outer surface of the cast using your hands or a gloved palm. This will help set the cast and make it more comfortable for the patient. Use the demonstrated molding technique from the instructional video for upper arm.
- Cast setting: Allow the fiberglass cast to harden, which usually takes around 10-15 minutes. The cast will feel warm as it hardens, which is normal.
- Inspect the cast: Once the cast is set, check for any sharp edges, pressure points, or skin irritation. Trim or smooth any rough edges as necessary. Ensure proper circulation by checking the patient's capillary refill time and ensuring they can move their fingers without difficulty.
- Provide aftercare instructions: Explain to the patient how to care for their cast, including keeping it dry, avoiding direct pressure on the cast, and reporting any signs of infection or discomfort.

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.

Long Arm Cast (SAC) - Removal

Long Arm Cast Removal

Follow these steps to remove a short arm cast using an orthopedic cast cutter:

- Explain the process: Inform the patient about the cast removal process, emphasizing that the cast saw will make noise and may feel warm but will not cut their skin.
- Position the patient: Have the patient sit or lie down in a comfortable position, ensuring their arm is well-supported throughout the process.
- Cast saw safety: Put on protective eyewear and ensure the cast saw is in good working condition before using it. Double-check that the blade is sharp and properly attached.
- Cutting the cast: Begin by cutting the cast longitudinally on each side, taking care to avoid direct contact with the patient's skin. Apply gentle pressure and use a steady, back-and-forth motion. Do not force the blade or attempt to cut through the padding in one pass. The cast saw is designed to cut through the rigid outer layer without cutting the padding underneath.
- Scissor insertion: Once the cast is cut on both sides, gently insert the blunt-nosed cast scissors or a spreader between the padding and the patient's skin, keeping the blade parallel to the skin. This will protect the patient's skin while you cut through the padding.
- Cut the padding: Carefully cut the padding along the same lines you cut the outer layer of the cast. Be cautious not to nick or cut the patient's skin.
- Cast spreading: Using a cast spreader, gently pry apart the two halves of the cast. If necessary, use additional cutting or spreading to ensure the cast can be removed without causing discomfort to the patient.
- Remove the cast: Carefully lift the two halves of the cast away from the patient's arm, taking care not to cause any sudden movements or excessive pressure on the healing fracture.
- Remove the padding and stockinet: Gently peel back the padding and stockinet, being cautious of any sensitive or tender areas on the patient's skin.
- Skin inspection: Examine the patient's skin for any signs of infection, pressure sores, or other issues that may require medical attention. Look for redness, swelling, discharge, or foul odor. Additionally, assess the patient's range of motion and strength in their arm and fingers.
- Clean the area: Gently cleanse the patient's skin with warm water and mild soap, and pat dry. Apply moisturizing lotion if the skin is dry or irritated.
- Follow-up care: Per MD instructions.