

Unit 8B: Posterior Rigid Splint

A posterior rigid splint is a **non-circumferential immobilization** device used primarily in acute settings for **temporary stabilization** of lower extremity injuries. Common indications include:

- **Acute fractures of the tibia, fibula, or ankle** before definitive casting
- **Severe ankle sprains** with extensive soft tissue damage
- **Achilles tendon ruptures** requiring immobilization in plantarflexion
- **Postoperative immobilization** for foot and ankle surgery
- **Management of severe lower leg contusions** with swelling risk



Anatomical & Injury Considerations

Clinically Relevant Anatomy:

The posterior rigid splint primarily **stabilizes the lower leg**, ankle, and foot, providing **support while allowing room for swelling**. The device immobilizes the affected limb along the posterior aspect, from just below the knee to the metatarsal heads, leaving the **anterior leg and dorsum of the foot exposed**. Key anatomical structures involved include the **gastrocnemius-soleus complex**, Achilles tendon, tibia, fibula, and associated neurovascular structures such as the **posterior tibial artery and tibial nerve** (Moore et al., 2020).

Epidemiology / Etiology / Mechanism of Injury

- **Tibia and fibula fractures:** High-energy trauma such as motor vehicle accidents, sports injuries, or falls from height can lead to acute fractures that require splinting before definitive treatment.
- **Severe ankle sprains:** Ligamentous injuries involving high-grade sprains (ATFL, CFL, deltoid ligament tears) often benefit from temporary immobilization to reduce swelling and pain.
- **Achilles tendon ruptures:** Sudden eccentric loading of the Achilles tendon, common in middle-aged recreational athletes, can result in a rupture requiring immediate plantarflexion positioning for healing (Bucholz et al., 2021).

Clinical Characteristics

Clinical Characteristics / Presentation

- ✓ Pain and swelling localized to the injured region
- ✓ Deformity (if displaced fractures are present)
- ✓ Inability to bear weight in lower leg fractures or Achilles tendon ruptures
- ✓ Instability in ligamentous injuries
- ✓ Neurovascular assessment is crucial to rule out compartment syndrome

Fracture Diagnosis Process

1. Physical Examination

- Assess for deformity, swelling, and bruising
- Palpate for bony tenderness and soft tissue injury
- Check distal neurovascular function (capillary refill, pulses, and sensation)

2. Imaging Studies

- X-ray (AP, lateral, oblique views of the lower leg, ankle, or foot)
- Ultrasound for Achilles tendon rupture
- MRI if ligamentous or soft tissue injuries are suspected

Differential Diagnosis / Associated Injuries

- Compartment syndrome (can develop after tibial fractures)
- Tendon injuries (Achilles rupture vs. severe strain)
- Lisfranc injuries (midfoot instability)
- Severe ankle sprains with syndesmotic involvement

Treatment / Management Considerations

- Temporary immobilization with a posterior rigid splint for acute fractures or severe soft tissue injuries before definitive treatment.
- Achilles tendon rupture → Immobilization in 20-30 degrees of plantarflexion before orthopedic referral.
- Severe ankle sprains → Splinting with non-weight-bearing status for 1-2 weeks, followed by progressive rehabilitation.
- Postoperative immobilization → Used to protect surgical repairs while allowing swelling to subside.

Conclusion

The posterior rigid splint serves as an essential temporary immobilization tool for managing acute lower extremity injuries. Unlike circumferential casts, it allows for swelling accommodation while providing adequate stability. Early application, proper positioning, and careful monitoring are essential to prevent complications, including compartment syndrome and neurovascular compromise. Once swelling subsides, patients are transitioned to definitive treatment, which may include casting, functional bracing, or surgical intervention, depending on the severity of the injury. Proper patient education on weight-bearing restrictions and follow-up care ensures optimal outcomes and minimizes long-term complications.

Posterior Rigid Splint: Application

Patient Preparation

Preparing a patient's skin prior to the application of an orthopedic splinting 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 splint for the lower extremity helps to ensure patient comfort, proper fitting, and effective healing while reducing the risk of complications during the treatment and recovery process.**
- **Evaluate the affected limb for deformity, swelling, and neurovascular status (capillary refill, pulse, sensation, and movement).**
- **Per MD/DO, confirm the need for a posterior rigid splint based on the injury type (e.g., fractures, sprains, soft tissue injuries).**
- **Explain the Procedure: Inform the patient about the procedure, expected duration, and potential discomfort.**
- **Position the limb: Properly position the patient's limb in the desired position for splinting - place the patient in a seated or supine position for comfort and stability.**
- **Inspect and Prepare the Skin: Check for open wounds, abrasions, or lacerations; dress any wounds with sterile gauze if necessary; Ensure the skin is clean and dry before applying the splint; Avoid applying splints directly over areas of swelling or pressure points to prevent skin breakdown.**

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

Posterior Rigid Splint cont ...

Stockinette Application

A stockinette provides a protective barrier between the skin and padding materials, preventing irritation.

- Choose a stockinette width appropriate for the limb (typically 2–4 inches for extremity splints). Measure the stockinette:
- Measure the length required for the stockinette - Cut the stockinette approximately 2–3 inches longer than the anticipated splint length to allow for secure tucking.
- Apply the stockinette: Slide the stockinette over the patient's foot/ankle and up their lower leg, ensuring it covers the entire area where the splint will be applied. Smooth out any wrinkles or folds.

Padding Application

Padding protects the skin and provides cushioning to prevent pressure sores.

- Use soft, orthopedic padding (cotton or synthetic) for comfort and shock absorption.
- Apply the Padding: (1) Start at the foot/toes and wrap circumferentially in an overlapping pattern (50% overlap) to ensure full coverage to the desired proximal end; (2) Extend the padding 2–3 inches beyond the expected splint length; (3) Ensure additional padding over bony prominences (e.g., ulnar styloid, olecranon) to prevent pressure sores.
- Secure the Padding: (1) Smooth out wrinkles to prevent pressure points; (2) Ensure a snug, but not overly tight, application to allow for mild swelling.

Posterior Rigid Splint cont ...

Fiberglass Cast Tape Application

- **Preparation:** • Pre-fabricated splinting material; Elastic bandage (Ace wrap or cohesive bandage); Scissors; Bucket with cool water (if fiberglass splint requires activation); Protective gloves; Trauma shears (if trimming is needed)
- **Check Patient Position:** Have the patient lie supine with the lower leg elevated and supported; Maintain the ankle at a neutral position (90° dorsiflexion), unless contraindicated due to swelling or pain.
- **Prepare the Splinting Material: Fiberglass:** Activate by dipping in cool water for 2–5 seconds, then gently squeeze out excess water; Cut the splint long enough to extend from just below the knee to the metatarsal heads (leaving the toes exposed).
- **Apply the Splint:** Position the splint posteriorly along the lower leg, from just below the knee to the foot; Ensure good contact with the limb while maintaining neutral ankle positioning; Avoid excessive compression to prevent pressure sores.
- **Secure the Splint with an Elastic Bandage:** Begin wrapping the Ace wrap distal to proximal (from foot to calf); Apply firm but not constrictive pressure to secure the splint; Check for puckering or tight spots and adjust as needed.
- **Key Considerations & Tips**
 - ✓ Use adequate padding to avoid skin injury.
 - ✓ Ensure the ankle is in neutral position unless contraindicated.
 - ✓ Do not wrap too tightly—allow room for swelling.
 - ✓ Avoid excessive water activation for fiberglass to prevent heat burns.
 - ✓ Always perform a final neurovascular check before discharging the patient.

Remember to monitor the patient's condition and coordinate the necessary referral / follow up as needed to ensure proper healing and prevent complications.

Posterior Rigid Splint Removal

The removal of a pre-fabricated splint must be done carefully to prevent patient discomfort, soft tissue injury, or damage to healing structures. Below is a step-by-step guide to safely removing the splint.

- **Explain the process:** Inform the patient about the splint removal process.
- **Position the patient:** Have the patient sit or lie down in a comfortable position, ensuring their leg is well-supported throughout the process.
- **Gather Supplies:** Trauma shears or bandage scissors; Splint spreader (optional, if applicable); Gloves; Towel or drape (to contain debris).
- **Assess the Limb Before Removal:** Check the patient's pain level before starting; Assess for any signs of skin irritation, pressure sores, or swelling; Confirm that removal is appropriate (as per physician's orders or follow-up instructions).
- **Cut the Elastic Bandage:** Start at the proximal (upper) end of the splint and carefully cut down toward the foot using trauma shears; Avoid cutting too close to the skin—keep shears parallel to the limb to prevent accidental injury; If the bandage is tight, gently pull it away from the skin while cutting.
- **Remove the Padding & Stockinette:** Once the elastic bandage is removed, unroll the padding (Webril) carefully; Cut and remove the stockinette in a similar fashion; If padding adheres to the skin due to sweating or swelling, moisten with warm water for easier removal.
- **Remove the Splint Material:** If the splint is still adhering to the skin, slide a gloved hand underneath and gently lift it away.

Posterior Rigid Splint - Post-Removal Care

- **Inspect the Skin:** Check for redness, pressure sores, blisters, or abrasions; Assess for swelling or signs of circulatory compromise; Assess Neurovascular Status; Check capillary refill, sensation, pulses, and movement to ensure proper circulation.
- **Clean the Skin:** If needed, clean the skin with mild soap and warm water to remove any debris; Apply moisturizer if the skin is dry or irritated.
- **Next Steps (based on physician orders):**
 - (1) If the splint was for temporary immobilization, provide further instructions on casting, bracing, or additional care;
 - (2) If the splint is being replaced or adjusted, ensure the new splint or cast is applied promptly to maintain immobilization;
 - (3) Educate the patient on any post-removal symptoms to monitor (e.g., pain, swelling, or weakness).
- **Key Considerations & Tips**
 - ✓ Use blunt-tip trauma shears to avoid injury while cutting the bandage and stockinette.
 - ✓ If the splint is tight, remove it gradually and allow for periodic patient feedback.
 - ✓ Always check circulation and sensation before & after removal.
 - ✓ If the patient experiences increased pain or discomfort, stop and reassess before proceeding.

Conclusion

The application and removal of pre-fabricated lower leg splints are essential skills in orthopedic and emergency care, ensuring proper immobilization while minimizing complications. Mastering this technique requires attention to proper positioning, padding, and secure application to provide stability and comfort for the patient. Equally important is the safe and systematic removal of the splint, prioritizing patient safety, skin integrity, and neurovascular assessment. By following these step-by-step procedures, healthcare professionals can ensure effective injury management, reduce the risk of complications, and optimize patient outcomes. Consistent practice and adherence to best practices will help students gain confidence in applying and removing lower leg splints in clinical settings.