

Periostitis & Compartment Syndrome

Dr Manju Setia Khawal

RMT, BAMS

Learning Objectives

- Understand pathophysiology
- Recognize symptoms
- Perform assessment
- Apply treatment principles



Overview – Shin Pain Conditions

- Periostitis
- Compartment syndrome
- Tendinitis
- Stress fracture



Periostitis – Definition

What is the periosteum?

- A highly **vascular (rich blood supply)** and **nerve-sensitive** membrane
- Covers all bones (except joint surfaces)
- Functions:
 - Nourishes bone
 - Helps in repair and growth
 - Provides attachment for muscles and tendons
- **Periostitis** is the **inflammation of the periosteum**, which is the thin, fibrous connective tissue layer covering the outer surface of bones.



What happens in periostitis?

- Repetitive stress or traction (pulling) from muscles → irritates the periosteum
- Leads to:
 - Inflammation
 - Micro-tearing
 - Pain along the bone surface



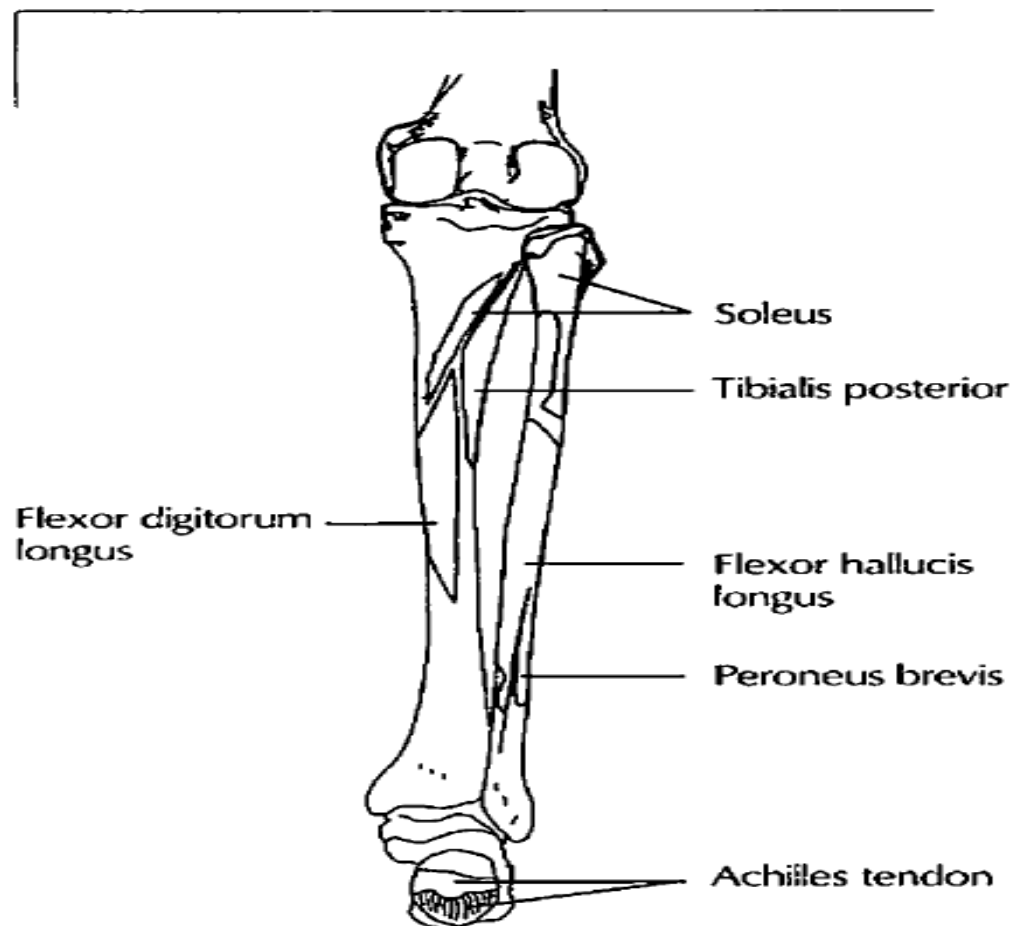


Figure 31.1
Muscle attachments on the right posterior leg. Soleus attachments are most commonly affected by periostitis.



Periostitis: Causes

- Overuse / repetitive activity
- Sudden increase in training
- Poor biomechanics (e.g., excessive pronation)
- Tight calf muscles (gastrocnemius, soleus)
- Hard running surfaces



Pathophysiology

- Repetitive traction
- Microtears
- Inflammation → fibrosis



Symptoms

- Dull aching pain along the bone (usually medial tibia)
- Pain:
 - Worse at start of activity
 - May improve with warm-up
 - Returns after exercise
- Tenderness on palpation
- Sometimes mild swelling



Assessment: Periostitis

- **Observations** include a postural assessment, noting any pronation and signs of swelling in the lower leg. Excessive external rotation of the hip joint (abducted gait) or knee varus may be present.
- **Palpation** along the medial border of the tibia reveals tenderness at the site of the inflammation. Taut bands may be present in the affected muscles. Bony irregularities may be present with chronic periostitis.
- **Testing** is the **active resisted test** of hopping on the affected leg to reproduce the pain.



Treatment: Acute Stage

- Client positioned prone with pillows under abdomen & ankles
- Cold hydrotherapy (ice pack) applied to affected leg
- Lymphatic drainage used to reduce inflammation:
- Starts with sacral pumping
- Treat distal leg first
- Stop before painful area
- Performed bilaterally if both legs affected
- Rhythmic techniques & Swedish massage (effleurage, petrissage) used on:
 - Low back
 - Gluteals
 - Proximal legs
 - Trigger points treated with:
 - Muscle stripping
 - Gentle ischemic compression
 - Gentle stroking & muscle squeezing used on leg & foot
- Client then turned supine for similar lymphatic drainage & Swedish techniques



Treatment: Chronic Stage

Positioning :Prone

- Deep moist heat applied before stretching gastrocnemius & soleus
- Swedish massage used on low back, gluteals & thighs
- Fascial techniques + passive stretching reduce muscle thickening & tension on periosteum

Techniques include:

- Skin rolling
- Fingertip spreading
- Myofascial release

Ischemic compression used on soleus & tibialis posterior

- Effleurage & petrissage for hypertonic muscles
- Trigger points treated with muscle stripping
- Passive stretching for gastrocnemius & soleus
- **Cross-fibre frictions** for adhesions followed by ice & stretching
- **Joint play** used for subtalar hypomobility



Compartment Syndrome – Definition

- There are four compartments surrounding the tibia and fibula, which are divided by dense, inelastic fascia (does NOT stretch much).
- The **4 Lower Leg compartments** are:
 - **Anterior compartment:** Tibialis anterior, Extensor hallucis longus and Extensor digitorum muscles as well as the **Anterior tibial artery, tibial vein and the deep peroneal nerve.**
 - **Lateral compartment:** peroneus longus and brevis muscles.
 - **Superficial posterior:** Gastrocnemius and Soleus muscles.
 - **Deep posterior:** Tibialis posterior, Flexor digitorum longus and Flexor hallucis longus muscles and the **Posterior tibial artery and veins, Tibial nerve and Peroneal artery and veins.**



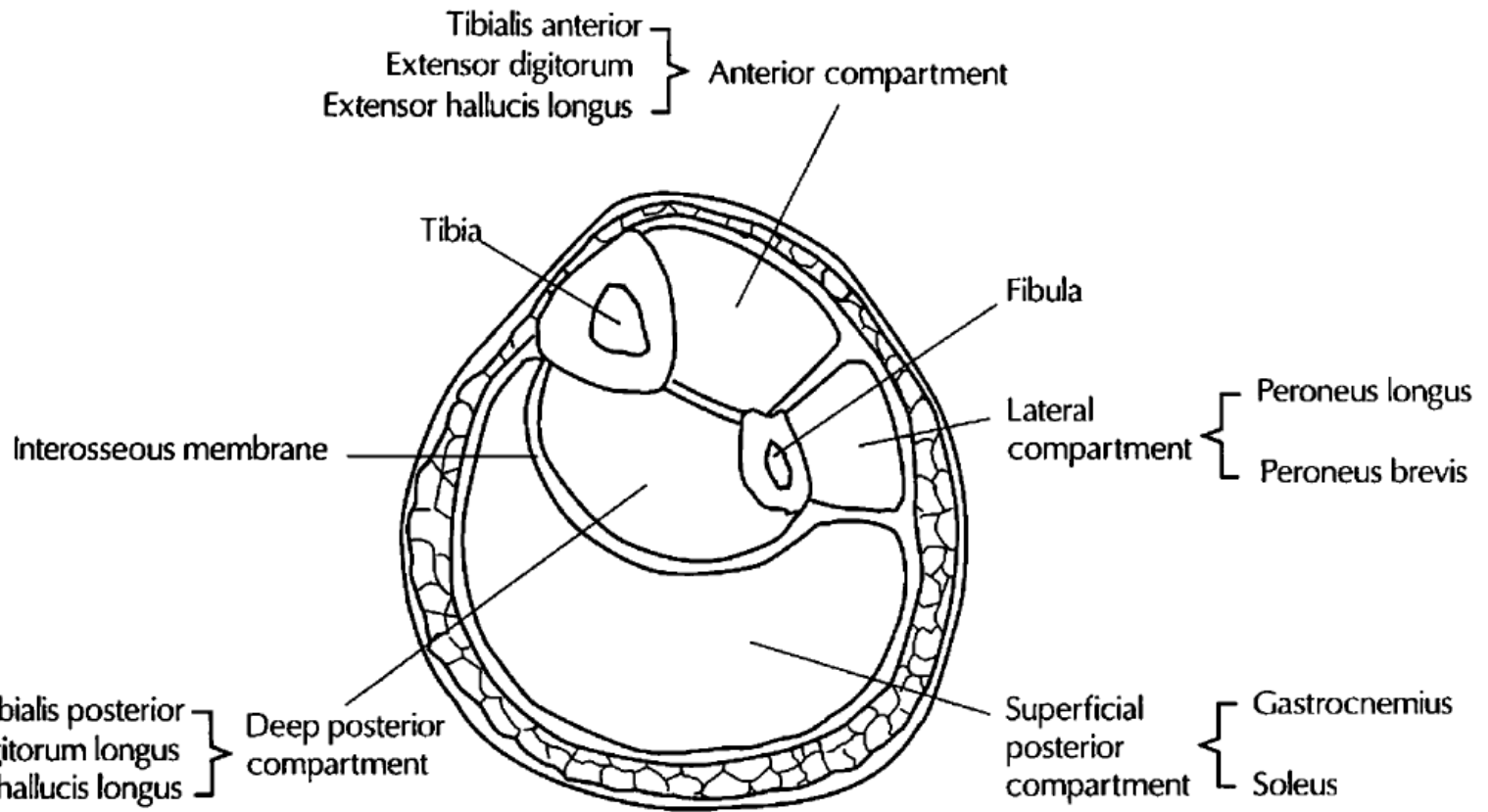


Figure 31.2
Compartments of the leg.



- A **compartment syndrome** is the result of an increase in pressure within the compartments of the lower leg
- Resulting in to Reduced blood flow

Types:

- Acute (emergency)
- Chronic (exercise induced)



Causes : Compartment Syndrome

Acute Compartment Syndrome (**Emergency**)

Main cause: Trauma

Examples:

- Direct blow to the leg
- Fracture
- Crush injury
- Internal bleeding within compartment

What happens:

- Bleeding + swelling inside a **closed fascial space**
- Rapid ↑ pressure
- Compresses blood vessels → **ischemia**

Important clinical point:

- Even though rare, **chronic compartment syndrome can become acute**
 - Due to **severe overuse**
 - This makes it dangerous if ignored



Causes

Chronic Compartment Syndrome (Exertional)

Main cause: Overuse

- Common in:
- Runners
- Athletes
- Military training

Contributing factors:

- Overtraining (too much, too fast)
- Poor technique
- Running on **hard surfaces**

Mechanism:

- Exercise → muscle swelling
- Fascia cannot expand → pressure builds
- Pain during activity, relieved by rest



Predisposing Factors

A. Anatomical Configuration

- Some people naturally have:
 - **Smaller compartments**
 - Tighter fascia

Result:

- Less space → pressure builds faster
- Higher risk of compartment syndrome



B. Muscle Imbalance & Tightness

Example: Anterior Compartment Syndrome

- Muscles involved:
 - Tibialis anterior (front)
- Antagonists:
 - Gastrocnemius & Soleus (back)
- If posterior muscles are tight:
- They limit ankle dorsiflexion
- Increase workload on anterior muscles
- → Overload + swelling → pressure ↑



C. Improper Footwear

- Footwear problems:
- Worn out shoes
- Too flexible → poor support
- Too stiff → poor shock absorption
- Lack of arch support

Leads to:

- Poor biomechanics
- Increased stress on compartments



- **D. Muscle Type Imbalance**
- **1. Tibialis Anterior = Phasic Muscle**
- Responds to stress by:
 - **Fatiguing**
- Becomes weak with overuse
- **2. Gastrocnemius & Soleus = Postural Muscles**
- Respond to stress by:
 - **Shortening / tightening**



Symptoms

Most Commonly Affected Area

- **Anterior Compartment of Leg**
- Pressure may compress:
- Anterior tibial artery
- Peroneal nerve

Without treatment:

- Permanent nerve damage
- Muscle necrosis may occur

Emergency Treatment

- **Fasciotomy**
- Surgical cutting of fascia
- Relieves pressure
- Restores blood flow

Delay may cause permanent damage



Symptoms

Anterior Compartment Syndrome:

Pain

- Severe
- Persistent
- Constant

Swelling

- Skin becomes:
 - Taut
 - Shiny

Temperature

- Affected area feels:
 - Harder
 - Hotter than opposite side



Sensory Symptoms:

Reduced sensation may occur

- Common area: **Between 1st and 2nd toes**
- **Other symptoms:**
- Tingling
- Numbness
- Paresthesia

Motor Symptoms:

- Difficulty performing:
- Dorsiflexion
- Toe extension
- Inversion

Due to severe pain and nerve compression



Pulse Finding

- **Dorsalis Pedis Pulse** :May be absent



- **What is Chronic Compartment Syndrome?**
- Exercise-related condition
- Pressure increases inside muscle compartment
- Common in:
 - Runners
 - Athletes
 - Military training



Pain Pattern

Main Feature:

- Pain begins at:
- Same time
OR
- Same distance during activity

Pain decreases with:

- Rest

What Happens During Exercise?

- During exercise:
- Blood flow to muscles increases
- Muscles become larger
- **Muscle size may increase:**
- → **About 20%**

This increases pressure inside the compartment



Normal vs Symptomatic Compartment

- **Normal Person**
- Enough space inside compartment
- Muscle returns to normal size within:
- **→ 5 minutes after exercise**

Symptomatic Person

- Compartment space is too small
- Pressure remains elevated



Why Pain Occurs?

- **Muscle swelling**



Pressure increases



Small capillaries compressed



Reduced blood supply (ischemia)



Pain develops



Progression of Symptoms

Early Stage

- Ache
- Tightness over compartment

Symptoms:

- Increase with exercise
- Decrease with rest

Advanced Symptoms:As condition worsens:

- Ischemia increases
- Pain limits activity

Other symptoms:

- Tingling
- Numbness
- Paresthesia in leg or foot



Bilateral Involvement:

Anterior Compartment Syndrome

- May affect both legs
- Usually worse on one side

Deep Posterior Compartment Syndrome

- Often bilateral

Pressure After Exercise

- Normally:
- Pressure decreases quickly after exercise
- In chronic compartment syndrome:
- Pressure may stay high

More than 20 minutes after exercise



Contraindications

- Frictions are contraindicated if acute inflammation is present or if the client is taking anti-inflammatory medication.



Treatment: Chronic Compartment

- **Aim** :Reduce anterior compartment tightness & pressure

Techniques

- Fascial release: skin rolling, fingertip spreading
- Myofascial release + passive movement
- Longitudinal work on gastrocnemius & soleus (with dorsiflexion)
- Cross-fibre frictions to tibialis anterior
- Connective tissue work along compartment borders
- Stretch: plantarflexion + calf stretching



