

## **Case report**

18 year Male Panel beater referred with a tibial shin syndrome with pain of 6 months. Pain over the anterolateral aspect of leg, bilateral and is precipitated walking 10 minutes.

**Your Diagnosis?**

## **Diagnosis: Chronic Exertional Compartment Syndrome**

### **Exercise induced leg pain**

- Chronic Exertion syndrome 40%
- Entrapment syndromes 5%
- Stress fractures 5%
- Medial tibial stress syndrome 40%
- Popliteal artery entrapment syndrome
- Excluded: Neurogenic or vascular claudications

### **1. Chronic Exertion syndrome**

- Mainly among the sports. Skaters and Runners.
- Incidence is 15% and 5% of recreational runners
- Often presents in bilateral form
- Site 80% Anterior/lateral or both
- 15% All compartment
- 5% Isolated deep posterior
- Age 16 (range, 14–18) years.
- Sex Equal incidence
- Duration Surgery 7 months [may be delayed by 4 years]
  
- Symptoms often overlap
- Diagnosis is difficult: It typically appears nonspecific in nature
- Clinical examination may be negative
- X rays usually normal
- Can be missed: radiographs, bone scans, MRI, Angiography, Pressure studies.
- 1/3rd may show evidence of muscle herniation

### **Tissue Pressure**

Sterling forces

- Hydrostatic pressure gradient [ 37 mm Hg at arterial end of capillaries 17 mm Hg at venous end of capillaries]
- Colloidal Osmotic pressure: 25 mm Hg
- Tissue pressure 0-10 mm Hg [1 mm Hg]

## Tissue pressure study

- Normal pressure < 0-8 mmHg
- Pre exercise >15 mm Hg
- Post exercise >30 mm Hg at 1 Min
- Post exercise > 20 mm at 5 minutes
- Always confirmed with the measurement of ICP using a Stryker Transducer

- **X rays** Normal
- **Bone scan:** rules out tibial shin and stress fracture
- Near infrared spectroscopy [NIRS]
- MRI

## Treatment

### Anterior compartment

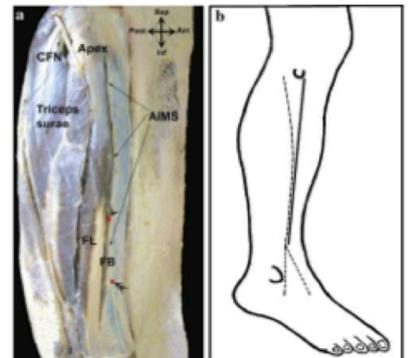
- Double, 4-cm incision between shin and fibula.
- The fascia over the anterior and lateral compartments identified
- This was split longitudinally over its entire length.
- Protect superficial peroneal nerves

### Posterior compartment

- A single, 10-cm long incision over the middle 1/3 behind the shin.
- The periosteum was stripped from the posteromedial aspect of the tibia
- Decompress both superficial and deep posterior compartment
- Protect saphenous vein and sural nerve

## Post operative

- Weight bearing ambulation 2 weeks



- Exercise on a bike: > 2 weeks postop
- Followed by isokinetic exercise 3 to 4 weeks
- At 6 weeks: running
- At 12 athletic return

### **Differential diagnosis**

- 1. Stress fracture
- 2. Medial tibial stress syndrome [periostitis along posteromedial tibia]
- 3. Peripheral nerve entrapment syndrome
- 4. Vascular claudication
- 5. Deep vein thrombosis
- 6. Stage I Tib Post DFS

### **Outcome**

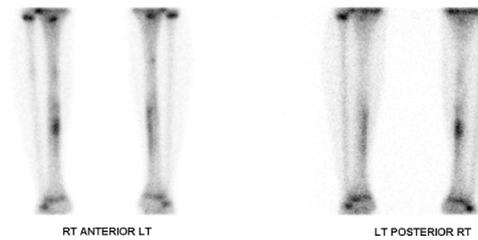
- Anterior (65%) and posterior (75%): Good-Excellent
- Outcome was more likely with the posterior compartment
- In anterior compartment outcome is better if the symptom duration had been less than 12 months.

## **II Medial Tibial Stress Syndrome [Shin splints]**

- The highest incidence of MTSS occurs in runners
- Usually occurs late in a sport season
- Some occur during pre-season training
- Pain, palpable tenderness, in rare cases swelling.
- Pain associated with MTSS frequently presents as a recurring dull ache over the distal one-third posteromedial cortex of the tibia.
- Pain at the beginning of a workout [relieved with continued activity]
- MTSS usually is alleviated with rest
- Typically does not occur at night.
- Tenderness along the posteromedial edge of the distal one third of the tibia
- Radiographs Negative

## BONE SCAN

A longitudinal uptake pattern along the distal one third of the tibia

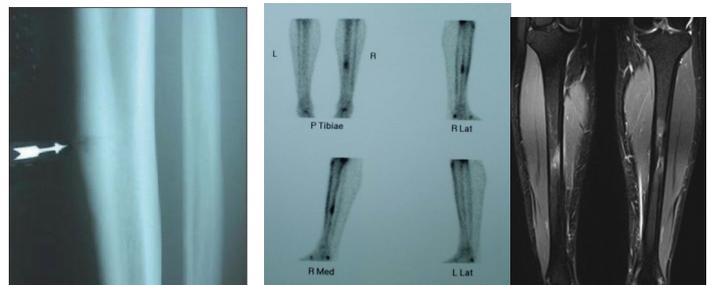


## Treatment

- Rest, Ice
- Nonsteroidal anti-inflammatory drugs (NSAIDS)
- Low-impact activities, including biking, swimming
- Gradual return to training
- Stretching during warm-up.
- Training may progress in increments of 10% to 25%
- Rare. A fasciotomy + Removal of a strip of periosteum

## III. Stress fracture

- Repetitive loading
- Tibial Stress fractures account for 50% of all stress fractures



- Most : Proximal metaphyseal [volleyball and basketball players]  
The midshaft or distal one third of the tibia [Runners]

- Training and activity should be evaluated to assess the risk of stress fracture.
- “Female athlete triad : Disordered eating, Amenorrhea, Osteoporosis.

## Clinical

- An insidious onset of pain
- Pain initially occurs as a mild ache after a specific amount of exercise and then subsides.
- As the condition progresses, pain may become severe and occur during earlier stages

of exercise, as well as after cessation of activity

- Pain is well localized to the fracture site
- Usually more proximal than that caused by MTSS.
- Joint ROM normal
- Radiography: may show stress reaction
- Initially normal [bone scan]

Bone scan: Stress fracture is a focal uptake in the area of fracture.

### **Treatment**

- Rest with weight bearing restriction
- Bracing or casting may be warranted for 3 to 12 weeks
- X 4 weeks. Mild analgesics or NSAIDS
- Ice
- Cross training.: cycling, swimming
- Factors contributing to stress fractures, including training errors, improper shoe wear, and muscle imbalance, identified in the history and physical examination, must be addressed to prevent fracture recurrence.

### **Anterior tibial stress fracture**

- A less common
- Particular attention : Mid anterior cortex because a small lucency, commonly referred to as the "dreaded black line,"
- More problematic
- Develop a characteristic V-shaped defect in the anterior cortex, with the open end of the "V" . Callus is absent
- Histopath: consistent with pseudarthrosis.
- Radionuclide imaging may demonstrate minimal activity, indicating nonunion of the stress fracture.
  
- Treatment
- Initial treatment: like other stress fracture.
- Surgical intervention becomes necessary.
- Intramedullary fixation has become the choice

••

### **MTSS VS Stress fracture**

	MTSS	Stress fracture
• Site	Lower 1/3rd	Upper third
• Pain	Disappears when rested	Pain that does not go away with rest.
• Night pain	Absent	May present
•		
• One-leg hop test	Can hop at least 10 times	Cannot hop

### **IV Nerve entrapment**

The common peroneal nerve repetitive exercises involving inversion and eversion, such as running and cycling.

The superficial peroneal nerve observed in dancers and athletes involved in body building, horse racing, running, soccer, and tennis

- SPN The lateral calf or dorsum of the foot
- SN Occurs just above the medial malleolus, with the possible presence of referred pain medial to the dorsum of the foot
- Tenderness at the site of nerve compression; • Paraesthesia
- The anaesthetic should be injected
- Nerve conduction tests
- Non-operative treatment, consisting of modification of the precipitating activity, biomechanical correction, physiotherapy, and/or soft tissue massage
- Fasciotomy alone is sufficient in most cases
- In cases of common peroneal nerve entrapment, resection of osteophytes, ganglion cysts, or other obstructions may be necessary before performing neurolysis.

### **V. Popliteal artery entrapment**

- An abnormal course of the popliteal artery in the popliteal fossa.
- Anomalous migration of the medial head of the gastro

- In males under the age of 30.
- After high-intensity exercise with excessive dorsiflexion and plantar flexion [football, basketball, soccer, and running athletes].
- Typically presents unilaterally
- Involves pain and claudication, which are related to the degree of entrapment of the popliteal artery. A deep ache or cramping involving the foot and leg
- Pain typically is posterior and occurs after strenuous or vigorous exercise.
  
- Physical examination results generally are normal
- Exercise-induced swelling +/-
- Provocation tests
- Pulses: Passive Dorsiflexion
- Active plantar flexion with the knee in extension
- MRI and MRA are recommended • decreased flow with provocation
- Arteriography is recommended to confirm
- Early operative treatment involves release of the popliteal artery and restoration of normal arterial flow.

## References

1. Am J Sports Med. 2005 Aug;33(8):1241-9.
2. J Am Acad Orthop Surg. 2003 Jul-Aug;11(4):268-76
3. Anatomy of SPN. Surg Radiol Anat (2008) 30:47–52
4. MRI in exertional compartment syndrome. Skeletal Radiol. 2012 Jul 13.
5. Popliteal entrapment syndrome. Eur J Vasc Endovasc Surg. 2012 Jan;43(1):81-7. Epub 2011 Nov 27.
- 6.