## CHRONIC EXERTIONAL COMPARTMENT SYNDROME
### SUMMARY OF RECOMMENDATIONS

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### Risk Factors
- Age of 25 to 28 years
- Male gender
- Aberrant running biomechanics including over-striding, over-pronation, and rearfoot strike pattern at initial contact
- Participation in sport with running
- Significant increase in weight-bearing activities and training volume
- Use of anabolic steroids and creatine supplementation
- Active military duty

### Differential Diagnosis
- Medial tibial stress syndrome
- Stress fracture
- Popliteal artery entrapment
- Tibial nerve entrapment

### Examination
- Outcome Measures: UWRI (University of Wisconsin Running Injury and Recovery Index), SANE (Single Assessment Numerical Evaluation); LEFS (Lower Extremity Functional Scale); pain free running distance
- Body structure and function impairments
- Running gait biomechanical deficits

### Phases
- Symptom Relief
- Running Gait Re-training

### Interventions
- Risk Factor Modification
- Activity Modification
- Running Gait Retraining
- Functional Manual Therapy
- Patient Education

### Criteria For Discharge
- Symptom relief during and after exertion
- Return to running without pain
- Home exercise plan to maintain physical and functional improvements

### Alternate Treatment Options
- Botulinum toxin A injection
  - May provide symptom relief within 5 months after singular injection
- Ultrasound fascial fenestration
  - Health care provider first administers local anesthesia, then surgically creates opening in the fascia to relieve pressure
  - May provide symptom relief lasting up to 18 months
- Surgical Release of Involved compartments – refer to post-operative guideline for more information
### A. Symptom Management

#### Patient Presentation  
*Moderate level evidence*

1. Patient experiences pain at anterolateral leg or deep in the calf with specific amount and intensity of exertion and pain ceases with rest  
   Neurological symptoms may or may not be present including numbness, tingling or foot drop in some cases  
2. Inability to perform activity due to pain onset  
3. Palpable leg compartment tenderness and tightness during and after exertion

#### Activity Modification  
*Moderate level evidence*

1. Reduce load and volume of inciting activity, ranging from significant volume reduction to complete cessation  
2. Oral non-steroidal anti-inflammatory drugs, stretching, ultrasound, orthotics, and electrical stimulation are not effective unless paired with activity restriction  
3. Patient Education: cessation of aggravating activity indefinitely is one of the only successful non-operative treatment strategies supported by the literature for symptom management

#### Conservative Interventions  
*Expert opinion*

**Manual Therapy**
- Decreased flexibility, joint mobility or soft tissue adhesions may be contributing to increased round reaction forces or poor shock attenuation.  
- Incorporating a combination of soft tissue techniques and joint mobilizations may help to reduce symptoms.

**Fasciotomy  
*Strong evidence***

- Surgical decompression where the fascia is opened to reduce constriction on the muscles  
- Success rate is compartment dependent  
  - 81 to 100% with anterior, best outcomes with surgical release  
  - Poor prognosis with deep posterior involvement  
  - 66% cumulative success rate  
- 3 to 17% overall complication rate  
  - Negative outcomes include infection, ankle pain, recurrence, sensory changes  
- 0 to 44% recurrence rate
# B. Running Gait Retraining

## Patient Presentation

**Expert opinion**
- Rear foot running pattern at initial contact
- Running cadence less than 180 steps/min
- Symptoms exacerbated by running and cease with stopping activity

## Running Modifications

**Expert opinion**
- Encourage midfoot or forefoot strike during running
- Train runner to achieve cadence of 180 steps/minute or higher using digital metronome, increasing at gradual rate between 5 to 10% at a time
- Include running drills to improve body weight perception, motor control, and running mechanics (see appendix)
- Train hamstring activation over gastrocnemius/soleus complex use for swing phase initiation to reduce intracompartmental pressure (see appendix)
- Alter proximal mechanics including increasing hip flexion while running to reduce impact loading
- Performing running drills or some running in barefoot has been suggested to help with proprioception during training
- Running modification is expected to take about 6 weeks to implement

## Cueing

- “Take shorter faster steps”
- “Increase step rate”
- “Run quietly”
- “Land with foot closer to underneath the body”
- Use visual feedback, with two-dimensional video tape of running to assist with patient education
References
Appendix

Foot tapping
- **Purpose:** Hamstring engagement over gastrocnemius/soleus use for initiation of swing phase in attempt to reduce ICP; pull the foot versus push off
- **Cues:** Use hamstrings to lift leg, let gravity assist lowering of leg to ground

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High hopping
- **Purpose:** To facilitate improved hip flexor and quadriceps flexibility and improve hamstring activation
- **Cues:** Touch buttocks with heels, keep quadriceps relaxed
Falling Forward
- **Purpose**: To promote forward lean while in running position
- **Cues**: A controlled fall towards the wall; progress in distance away from wall to make it harder

Weight Shifting
- **Purpose**: To improve body awareness of center of mass alterations, shifting weight from heel to balls of foot
- **Cues**: Hinge at the ankles, not the trunk; chest leads
**Forward lean drill**

- **How:** Stand upright with feet flat on the ground, lean forward until you are about to lose your balance, then jog forward maintaining your forward position of your trunk.
- Make sure the lean is a true lean of the entire body, and not just hinging forward at the hips.
- Practice 3-5 times to get a feel for what running feels like with a forward trunk lean and your feet under your body.