Lateral Column Compression Syndrome

Cuboid Syndrome

• Cuboid syndrome is defined as a minor disruption or subluxation of the structural congruity of the calcaneocuboid joint.

• It is a poorly understood condition in both the athletic and non-athletic population and therefore, is often misdiagnosed and mistreated.

Etiology

Extrinsic trauma:

• Isolated fractures are rare

• The mechanism of injury is usually plantarflexion of the hindfoot and midfoot against a fixed forefoot.

• The term “nutcracker fracture” describes compression of the cuboid between the calcaneus and the 4th and 5th MT.

• Plantar flexion/inversion sprains account for the majority of the cases reported.


Etiology

Intrinsic trauma:

- Repeated microtrauma injuries are rarely described in the literature, merely mentioned.
- A retrospective study by Yu et al. found the incidence of cuboid stress fractures in the 4% range over a 19 year period.
- Reported hypotheses on the causes of cuboid stress fractures:
  - Repeated pull of the peroneal tendons
  - Malalignment with altered biomechanics
  - Insufficiency fractures resulting from a loss of bone density
  - Overpronation of the foot
  - Calf muscle inflexibility

Prevalence

- Reported incidence of cuboid fractures:
  - 4% of all foot problems in athletes
  - 17% of foot or ankle injuries in ballet dancers
  - 7% in patients following inversion ankle sprains

Predisposing Factors

- Reported predisposing factors include:
  - Mid-tarsal hypermobility
  - Changes in exercise intensity, frequency and duration
  - Training on uneven surfaces
  - Overpronation of the foot, which can cause the peroneus longus to exert its pull on an unlocked mid-foot during push off
**Differential Diagnosis**

- Tarsal coalition
- Stress fracture 5th metatarsal
- Peroneal tendon subluxation
- Peroneal tendinopathy
- Anterior calcaneal process fracture

**Imaging**

MRI and technetium bonescan are considered the gold standard imaging tools to identify fractures and bone stress injuries. Though imaging has little value in the diagnosis of “cuboid syndrome” since bony anomalies are common in the midfoot and joint dysfunctions are, as a rule, undetectable on imaging.

**Treatment**

Reported treatments include:
- Joint manipulation
- Low grade mobilizations
- Taping
- Orthotics, including a cuboid pad
- Graded load bearing activities
A two patient case study by Matthews and Clause (2014) identified bone pathology in conjunction with cuboid dysfunction. The insidious onset of the bone pathology was inferred to as a systemic problem, which may have contributed to the chemical stimulus for nociception and a cascade of sensitization of the nervous system.

Conclusion: They were not able to provide a direct link with the cuboid dysfunction and the bone pathology.


At this point in time, treatment approaches focus on fixing the symptoms, not the underlying movement impairment.

• Our understanding of the underlying pathophysiology and arthrokinematics has been insufficient to explain the occurrence of cuboid dysfunctions and stress fractures.

• This is a similar situation as to how we used to treat SIJ dysfunctions up until 20 years ago.
  • As in the SIJ, many theories and assessment schemes/treatments were proposed, but most of them would only fix the acute symptom (the joint dysfunction) and not the underlying movement impairment that would cause the dysfunction of the joint in the first place.

• In order to fix the cause of the cause of cuboid dysfunctions, a different frame of reference is needed.

We propose that the bone pathology and cuboid dysfunction are not separate entities, but are in fact closely related.

• The causal factor of both the bone stress injury and the joint dysfunction can be explained by a movement impairment syndrome we have labeled “lateral column compression syndrome.”
Lateral Column Compression

A collection of signs and symptoms that occurs when the patient is not able to sufficiently stabilize the foot in standing.

For a variety of reasons the foot is not able to absorb normal loading during weightbearing.

The midfoot overpronates, and the forefoot ends up in a valgus position.

This causes the medial column of the foot to elongate and the lateral column to compress.

The cuboid then gets caught between the hammer (calcaneus) and anvil (MT4-5) during normal weight bearing.

Subsequently it drops down in dysfunction (“dropped cuboid”) or in extreme cases it will sustain a stress fracture.

Contributing Factors

- There are a multitude of factors that contribute to the development of lateral column compression. Each factor needs to be evaluated in order to determine the cause of the syndrome.

- Often times it is not just one contributing factor, but a variety of factors that contribute to the complaints, including:
  - Anterior glide/medial rotation of the femur
  - Genu valgus – increased Q angle
  - Loss of talocrural extension
  - Soft tissue restrictions in the distal calf muscle
  - Poor mid and hindfoot strength
  - Poor calf strength
  - Poor structural stability of the foot
The lateral column compression syndrome appears to be the underlying movement impairment syndrome that drives many seemingly unrelated foot and ankle overuse injuries.

In essence, when this movement impairment occurs, you just wait to see where the weakest link in that particular patient's body is, and that is where the breakdown will occur.

The following injuries can be tied to the lateral column compression syndrome:
- Joint dysfunction medial cuneiform/MT 1
- Lateral impingement of the calcaneus
- Achilles tendinopathy
- Plantar fasciopathy
- Medial tibial stress syndrome
- Tarsal tunnel syndrome

Lateral Column Compression

Hindfoot/midfoot Neutral
Patient’s Preferred Posture

Hindfoot/midfoot Neutral

Patient’s Preferred Posture
The hindfoot plays a crucial role in lateral column compression syndrome.

The required amount of ankle extension for running and walking is 15-20 degrees but when talocrural extension is limited, the body will have to find a different way to bring the body weight forward during the gait cycle.

Most frequently, this compensation is achieved by tibial internal rotation, calcaneal eversion and midfoot pronation which in turn, leads to lateral column compression.
Hindfoot Mechanics

- During the gait cycle, the foot needs to be able to transition from a torque converter during stance phase to a rigid lever during toe off.
- This locking and unlocking mechanism of the midfoot, is driven by the subtalar joint.
- During heelstrike the calcaneus everts, which unlocks the midtarsal joints, allowing the foot to become a torque converter.
- During toe off, the calcaneus inverts, which locks the midtarsal joints, allowing the foot to become a solid lever necessary for efficient toe off.
- If the subtalar joint is in dysfunction and not able to convert from eversion to inversion, the midtarsal joints will stay unlocked and will in essence drive the midfoot into overpronation/forefoot abduction during toe off.

Assessment

Things to consider during assessment:
- Posture
- Single leg stance
- Single leg stance ¼ squat
- Tarsal mobility testing: TC joint, subtalar joint, midtarsal joints
- Strength testing: gastrocnemius, soleus, FDL, FDB, lumbricals/interossei

Treatment

Joint Manipulation

Restore proper joint function in affected joints, which allows for restoration of normal hind/midfoot mechanics.
Exercises

• The essence of the exercise portion of the treatment is that the patient needs to be taught to find subtalar/midfoot neutral and then superimpose LE/trunk activities.

• This is much like rehab principles we use in low back pain patients, where we teach them to find lumbar spine neutral and then superimpose UE/LE activities to increase the degree of difficulty.

• Towel crunches
• Stretching
• Heel raises
• Single-leg presses/curls kickback

Golfer’s Squat

Standing TKE
Stagger stance

References