Cuboid Syndrome

What is cuboid syndrome and its clinical presentation?

Cuboid syndrome is a debilitating foot condition caused by a disruption or subluxation of the cuboid bone due to a change in the structural integrity of the calcaneocuboid joint (Jennings and Davis, 2005). This syndrome is often associated with sinus tarsi, lateral foot, and mid foot pain. Given the lack of reliable tests, this syndrome can be challenging to identify. A physical therapist must link the subjective history, injury mechanism, physical exam, and their own clinical experience to establish a probable hypothesis. Therefore, recognizing the cluster of signs and symptoms becomes essential. Here is the most likely illness script.

- Plantar flexed, inversion injury mechanism
- Lateral ankle/foot pain and mid foot pain

- Signs of a flattened (over-pronated) foot
- Antalgic gait - most painful from pre-swing to the initial swing of the gait cycle (i.e., painful push-off)

- Cuboid bone is tender to palpation
- Pain provocation with mid foot mobility testing - particularly combined plantar flexion, inversion, and adduction motions. Restricted motion into cuboid-on-calcaneus dorsiflexion, abduction, and internal rotation.

- Pain with accessory motion and stress testing applied to the calcaneocuboid joint. Specifically, a loss of cuboid bone dorsal glide and pain provocation with a plantar glide. Pain provocation with stress testing of the short plantar ligament may be present.

- Weak and painful with isometric resistance testing for the peroneus longus/brevis and tibialis posterior.

- Pain with the single heel raise test and hop/jump testing
- There are no signs of fracture based on the Ottawa Ankle Rules or medical imaging.

Proposed Pathoanatomy

The injury mechanism linked to the cuboid syndrome is an inversion or twisting stress acting on the foot in the plantar flexed position - a typical injury pattern for lateral ankle sprains. This position places the joints of the rear foot and lateral foot in an open/loose-packed position. The peroneus longus muscle must forcefully contract to counter this sudden weight shift over the lateral forefoot (Figure 1). Combining these two factors may produce the positional fault of the cuboid in the direction of plantarflexion. Consequently, the cuboid cannot move into dorsiflexion (i.e., loss of dorsal glide) during the transition from initial contact to loading response of the gait cycle, altering the foot's normal transition from loading response into mid stance, and may account for the excessive foot flattening observed in cases of cuboid syndrome. The individual is likely to experience pain in the mid foot at the pre-swing and initial swing phases, which coincides with the calcaneocuboid joint's open/loose packing position. Ultimately, the sequela leads to abnormal contact forces between the first ray and the ground, along with changes in load distribution through the forefoot. Timely identification and treatment of cuboid syndrome may mitigate the development of other conditions, such as hallux valgus and metatarsalgia, to name a few.

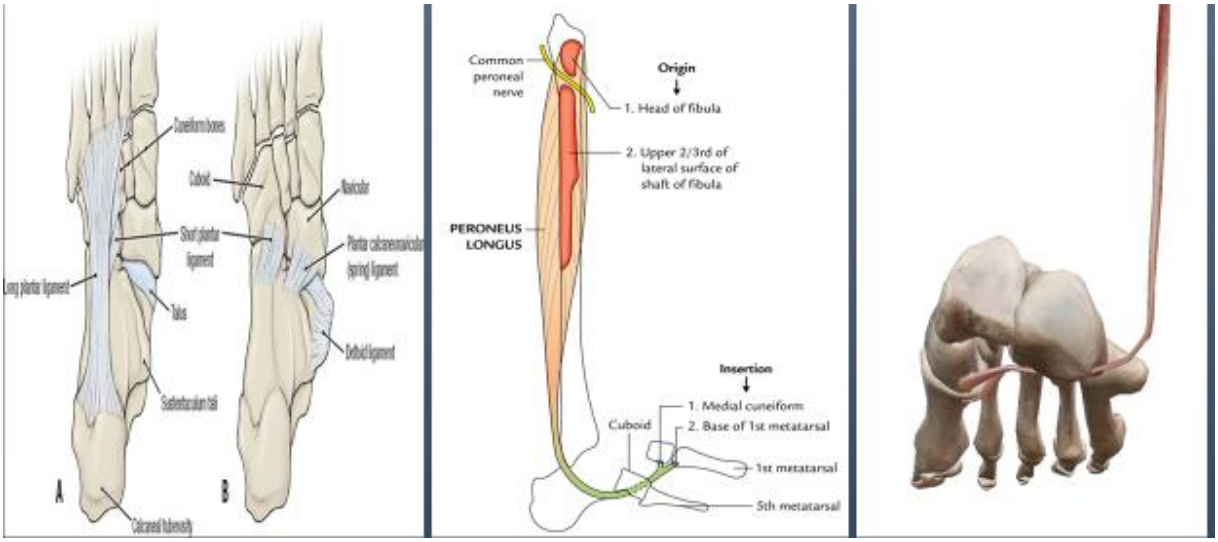

Figure 1. The peroneus longus muscle and relation to the cuboid bone and 1st ray.

How do we treat it?

The treatment recommendation is thrust joint manipulation of the cuboid bone to restore its dorsal glide relative to the calcaneus, along with the calcaneocuboid joint's ability to achieve a closed-packing position. Upon completing the appropriate "reset," the physical therapist must "reinforce" the cuboid's dorsal glide. Apply the cuboid sling technique immediately after the thrust joint manipulation, and then prescribe the appropriate neuromuscular re-education as part of the initial self-management program.

Cuboid-on-Calcaneus Dorsal Glide Thrust Joint Manipulation (Figure 2)

Purpose:

To restore dorsal glide mobility and functional closed-packing position of the lateral foot. A cuboid subluxation may occur in those experiencing a twisting injury with the foot in plantarflexion.

Procedure:

Clear patient for contra indications to thrust joint manipulation. Perform appropriate stress testing to rule out structural instability. Patient standing upright with full weight bearing through the unaffected leg. Hand on table/chair for support. Therapist applies thumb-over-thumb contact over the cuboid bone’s plantar surface – just distal to the center of the calcaneus. Perform a sustained dorsal glide of the cuboid and apply mini thrusts for 10-seconds. This serves as a pre-manipulative hold. Inquire about pain or other perceived symptoms, such as radiating pain or tingling sensation. If none, ask for the patient’s consent to proceed. Once granted by the patient, the therapist performs small excursions of the ankle/foot in an anterior and posterior direction. Upon taking up the motion up to, and into the restricted barrier, apply a quick impulse directed through the cuboid in a dorsal direction and at approximately a 60-degree angle. DO NOT whip the ankle into plantarflexion.

Figure 2: HVLAT manipulation applied to the cuboid in a dorsal direction (courtesy of Husson University School of Physical Therapy).

The following video links show the cuboid HVLAT. YouTube video

The video does not provide a comprehensive assessment and treatment for cuboid syndrome. Only a licensed physical therapist should perform an HVLAT technique upon receiving the appropriate education, training, and practice. Physical therapists should know the rules and regulations in their state practice acts concerning thrust joint manipulation.

Cuboid Sling Taping Technique (Figure 3A-B)

Figure 3 A: Cuboid sling taping

Figure 3B: Cuboid sling taping

In addition to the proposed manual interventions, the physical therapist should incorporate somatosensory training through short-toe exercises and associated progressions targeting the tibialis posterior and peroneus longus muscles. The adjunct of foot orthoses over the short term may also need consideration. Address proximal neuromuscular control deficits throughout the rehabilitation process.

Once the patient achieves restoration of cuboid mobility and pain-free gait, the physical therapist should incorporate proprioceptive training into the treatment program - especially in ankle/foot plantarflexion positions. For instance, have the patient maintain a heel raise position while applying an external perturbation, or maintaining their balance on a wobble board. Hopping and landing drills can be appropriate at this stage.

Additional Considerations

Physical therapists should perform a comprehensive exam of the foot's structural integrity – in particular, joints and ligaments of the rear foot and mid foot. Make sure to examine the integrity of the talocalcaneal ligaments, bifurcate ligament, and dorsal talonavicular ligament.

Disclaimer

Individuals experiencing foot pain should consult with a healthcare provider. Physical therapists can be instrumental in the patient care management of ankle/foot pain with mobility and strength deficits. Only a licensed physical therapist should perform an HVLAT technique upon receiving the appropriate education, training, and practice. Physical

therapists should know the rules and regulations in their state practice act concerning thrust joint manipulation.

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References

1. Jennings J, Davies GJ. Treatment of Cuboid Syndrome Secondary to Lateral Ankle Sprains: A Cases Series. JOSPT, 35(7); 2005.

2. Pettman E. Advanced Lower Quadrant Integration Course. Andrews University, Berrien Springs, MI. https://www.aspireomt.com/