

# **CUBOID SYNDROME**

## **Background**

1. Definition: Lateral midfoot pain associated with subluxation or dislocation of cuboid bone
  - Usually in medial-plantar direction
  - May also be dorsal
2. General Information:
  - Lateral midfoot pain with pushing, running or jumping
  - Can be acute, subacute or chronic
  - When acute, can be associated with inversion-plantar flexion ankle injury
  - Radiation of pain:
    - Plantar aspect of medial foot
    - Anterior ankle
    - 4<sup>th</sup> or 5<sup>th</sup> metatarsals
  - Pain worse with higher impact activities

## **Pathophysiology**

1. Pathology of Disease:
  - Cuboid bone is keystone of lateral arch
  - Articulates with:
    - 4<sup>th</sup> and 5<sup>th</sup> metatarsals distally
    - Navicular and cuneiform medially
    - Calcaneus proximally
  - Several mechanisms of injury proposed for plantar subluxations
    - Most common theory:
      - During inversion injury, peroneus longus reflexively contracts causing a plantar medial force on the cuboid with resulting subluxation<sup>1</sup>
2. Incidence, Prevalence:
  - Rare
    - Reported to be 4% of all foot injuries<sup>2</sup>
    - Most common in ballet dancers
      - Reported as high as 17% of all foot and ankle injuries when looking at a single ballet theater company<sup>3</sup>
    - Cuboid syndrome specialists have diagnosed it in 6.7% of patients with inversion-plantar flexion ankle injuries<sup>4</sup>
3. Risk Factors:
  - Ballet dancing
  - Acute lateral ankle sprains
  - Peroneal tendon pathology
  - Foot instability
  - Interosseous ligament hypermobility
  - Uneven running terrain
  - Pes planus
  - Prior heel spur surgery<sup>5</sup>

## **Diagnostics**

1. History:
  - Acute onset can be with or without inversion/plantar flexion ankle injury
  - Can also present with chronic lateral foot pain
  - Pain can radiate to:
    - Anterior ankle
    - Fourth and fifth metatarsals
    - Medial plantar arch
  - Weakness in pushing off or jumping
  - Pain may be with sport specific activity, walking or rest
2. Physical Examination:
  - In plantar subluxations there may be a tender palpable fullness on plantar surface and/or a visible depression on dorsal foot
  - Swelling may be present in acute, subacute and chronic injuries
  - Decreased active and passive range of motion
  - Plantar subluxations
    - Decreased dorsal glide of cuboid bone
  - Dorsal subluxations
    - Less common
    - Notable for decreased plantar glide
3. Diagnostic Testing
  - Diagnostic imaging: X-rays, CTs, and MRIs typically not helpful for confirmation
    - Usually minimal displacement
    - Variances of normal anatomy are significant
  - Imaging studies are most helpful to eliminate other diagnoses
  - Ultrasound can be helpful in evaluating the joint both pre and post reduction, especially when compared to the normal side
    - A qualitative process<sup>6</sup>

## **Differential Diagnosis**

1. Key Differential Diagnoses
  - Cuboid Fractures (Acute and stress)
  - Gout
  - Arthritis (Inflammatory and non-inflammatory)
  - Sinus Tarsi Syndrome
  - Peroneus Longus Tendonopathy
  - Proximal Fifth Metatarsal Fractures
2. Extensive Differential Diagnoses
  - Tarsal coalitions (Adolescents)
  - Malalignment
  - Lateral process fracture of the talus
  - 4<sup>th</sup> Metatarsal subluxation
  - Lisfranc injuries
  - Os peroneus
  - Radiculopathy (S1)
  - Calcaneus Fracture

## Therapeutics

1. Acute Treatment: If no contraindications, reduction manipulation should be attempted
  - Contraindications:
    - Acute fracture
    - Gout
    - Arthritis
    - Significant soft tissue swelling or ecchymosis
    - Neoplastic bone disease
    - Neural or vascular abnormalities
  - Cuboid Squeeze (Plantar Subluxations)
    - Have patient lie prone and flex knee
    - Cup dorsal foot with fingers and overlap thumbs on medial/plantar cuboid bone
    - Gradually stretch the foot/ankle into maximal plantarflexion
    - When soft tissues relax-apply lateral dorsal force via squeezing thumbs
    - An audible pop may be heard
  - Cuboid Whip (Plantar Subluxations)
    - Have patient lie prone and flex knee
    - Cup dorsal foot with the fingers and overlap thumbs on medial/plantar cuboid bone
    - With ankle in neutral position, swing foot in an arc
    - When guarding is minimal, and peroneals are relaxed, a high-velocity, low-amplitude force is applied dorsally and laterally to cuboid bone when foot enters the plantar flexion portion of swing
    - An audible pop may be heard
  - Gravity 4<sup>th</sup> Metatarsal Distraction (Dorsal Subluxation)
    - Have patient lay supine with knee straight and fully relaxed leg
    - Grasp 4<sup>th</sup> metatarsal and lift foot off the table allowing gravity to exert a distracting force on the joint
    - 4<sup>th</sup> metatarsal is pulled longitudinally, placing foot in mild plantar flexion
  - Seated Distraction (Dorsal Subluxation)
    - Have patient seated on floor or exam table
    - Patient should stabilize their distal tibia/fibula with foot flat on floor
    - Apply distracting longitudinal traction to 4<sup>th</sup> and 5<sup>th</sup> metatarsals with one hand
    - Apply a plantar force with other hand
    - An audible pop may be heard
  - Rest – Immobilization
    - Based on level of pain and significance of injury
    - Acute injuries without soft tissue swelling
      - Relative rest 1-2 weeks
    - Acute injuries with significant swelling or chronic injuries
      - Cast or boot
      - Non-weight bearing for 3 weeks
    - Until asymptomatic

- Ice
  - To help reduce swelling with acute injury and after manipulation
- Arch support
- Taping
- Cuboid pad placement—dorsal aspect of cuboid bone
- 2. Further Management (24 hrs)
  - Re-evaluation of lateral foot mobility to assess for re-subluxation if initial reduction was successful
  - Repeat manipulation may be necessary, especially if injury is chronic
- 3. Long-Term Care
  - Return to play varies:
    - Severity of injury
    - Duration of symptoms
    - Should be individualized based primarily on pain relief
  - If injury is acute and mild, and manipulation relieves pain, return to play can be immediate

### Follow-Up

1. Return to Office
  - As needed for persistent pain or recurrence
2. Refer to Specialist
  - Referral to Podiatry for continued pain and/or repeated subluxations
  - Surgery to address abnormal cuboid articulations may be needed
    - Typically used as a last resort

### Prognosis

1. Excellent recovery in most cases with one or two manipulations

### References

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- <sup>1</sup> Mooney M, Maffey-Ward L. Cuboid plantar and dorsal subluxations: Assessment and treatment. *J. Orthop. Sports Phys Ther.* 1994; 20: 220-6.
  - <sup>2</sup> Newell SG, Wodde A. Cuboid syndrome. *Phys. Sports Med.* 1981; 9:71-6.
  - <sup>3</sup> Marshall P, Hamilton WG. Cuboid subluxation in ballet dancers. *Am. J. Sports Med.* 1992; 20:169-75
  - <sup>4</sup> Jennings J, Davies GJ. Treatment of cuboid syndrome secondary to lateral ankle sprains: a case series. *J. Orthop. Sports Phys Ther.* 2005; 35:409-15
  - <sup>5</sup> Adams E, Madden C. Cuboid subluxation: A case study and review of the literature. *Current Sports Medicine Reports.* 2009; 8:300-7
  - <sup>6</sup> Adams E, Madden C. Cuboid subluxation: A case study and review of the literature. *Current Sports Medicine Reports.* 2009; 8:300-7

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