Najib Ussef, MD
Orthopedic Surgery

OS TRIGONUM SYNDROME

Incidence:

- 10% unilateral and 2% bilateral in general population[1].
- Bilateral occurs in 50% of os trigonum population[4].

Mechanism of Injury:

- Os trigonum syndrome occurs due to repetitive, forceful plantarflexion (or pointing). This commonly affects dancers, especially those assuming the extreme plantarflexed position that pointe work requires.
- Athletes may also experience os trigonum syndrome due to pushoff maneuvers (i.e. kicking, downhill running, and jumping).

What is it:

- Os trigonum results from a secondary ossification center, thought to develop between 7-13 years old. Usually, the ossicle fuses to the talus, forming the posterolateral process of the talus or Steida's process. However, the os trigonum is present when nonunion occurs.
- When a dancer attempts to forefully pointe the foot beyond its range, the os trigonum is caught between the posterior lip of the tibia and the os calcis which may result in a fracture of the posterolateral process.
- There are 4 categories for the anatomical position of the posterolateral talus:
    I. Normal posterolateral talar process
    II. Elongated posterolateral talar process, or Steida's process
    III. Accessory bone or os trigonum
    IV. Os trigonum fused with posterolateral talus by cartilage or ligament (via synchondrosis or syndesmosis)

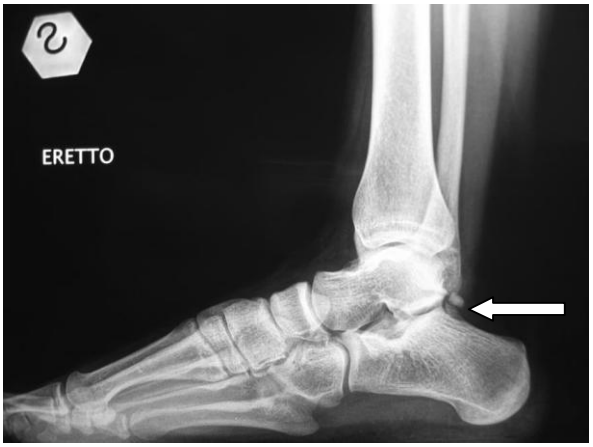

Figure 1: Note the presence of os trigonum.

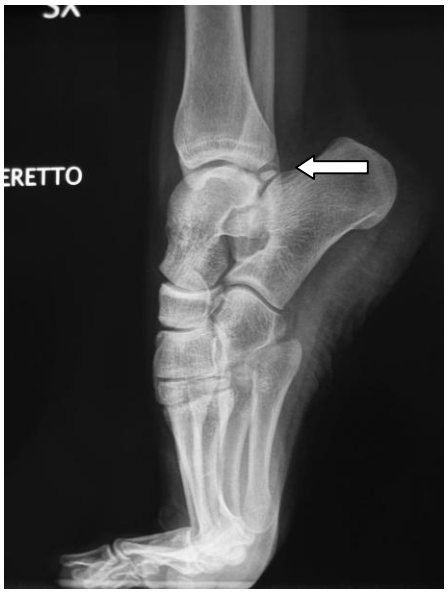

Figure 2: Note the posterior impingement of os trigonum during releve.

Symptoms:

- Pain on the outside of ankle, between Achilles and the lateral ankle bone (lateral malleolus of fibula)

- Pain with tendus, releves, and pointe work
- Swelling in ankle and/or foot
- Tenderness on outside of ankle
- Increased pain with forced pointing (plantarflexion) and wearing high heels
- May have concurrent symptoms of posterior ankle pain radiating into the medial arch due to flexor hallucis longus tenosynovitis *(see FHL tenosynovitis)*
- May be asymptomatic

Clinical Presentation:

- Pain with forced passive plantarflexion; pain with palpation in posterolateral ankle region, swelling in ankle and hindfoot, decreased ankle plantarflexion range of motion, presence of bony prominence in posterior ankle joint, decreased talo-crural joint motion, lateral position of os trigonum will force varus position that may cause lateral ankle sprains *(see lateral ankle sprains)*, and majority of plantarflexion occurs from midfoot region.

Risk factors/Sequelae:

- Structural/ anatomic:
  - Presence of os trigonum or large Steida's process
  - Previous ankle sprains decrease control and stability of ankle joint, such that the talus is not held in proper position.
- Dance choreography: repetitive pointing, releves, and pointe work
- Sport activity: repetitive kicking for soccer, pushoff for swimming, jumping, and running downhill.
- Decreased midfoot mobility, causing forced plantarflexion solely from talocrural joint

Treatment:

There are three main goals for treatment of os trigonum. 1) Reducing swelling, 2) strengthening foot and ankle musculature, and 3) mobilization of the ankle joint. Initially, conservative management aims at reducing swelling and decreasing pain. This involves applying ice to the ankle with compression 2-4 times per day, for 10-20 minutes each. NSAIDs are also helpful to reduce inflammation and provide pain relief. With os trigonum syndrome, modification of activites is the most important aspect of rehabilitation. Because repetitive plantarflexion exacerbates symptoms, healing cannot occur unless this motion is limited. Patients are instructed to modify their dance movements, working only in painfree ranges and eliminating releves and pointe work. Strengthening of the foot intrinsics and ankle stabilizers provides support for the ankle, allowing improved joint position and decreased stress on the joint. Mobilization is also important to restore proper joint mechanics, in order to improve plantarflexion mobility and avoid pinching of the posteriolateral process within the ankle joint.

Rehabilitation initially focuses on reducing swelling and decreasing pain through manual therapy and modalities. Edema mobilization, icing, ultrasound, and electrical stimulation control the inflammatory process and provide an optimal environment for healing to occur. Next, therapeutic exercises and neuromuscular reeducation focus on restoring plantarflexion range of motion, strengthening foot and ankle musculature, and improving motor control and proprioception. By inhibiting overuse of the calf muscles during pointe and using the ankle stabilizers instead, this will delay the impact of the os trigonum on the posterior tibia. Mobilization of both the midfoot and ankle joint is extremely important to increase available range of motion and prevent the dancer from aggressively forcing plantarflexion and exacerbating symptoms. Patients are encouraged to actively participate in their rehabilitation program, through regular icing to decrease swelling, modifying activities to allow healing to

occur, and compliance with their home exercise program.

Modalities	Manual Therapy	Therapeutic Exercise	Neuro Re-ed

• Phonophoresis
• Cryotherapy
• Electrical Stimulation
	• Edema mobilization
	• Joint mobilization (midfoot/ankle)
	• Soft tissue mobilization
	• Trigger point release
		• Intrinsic Strengthening:
		  ○ Doming
		  ○ Towel scrunches
		  ○ Marble pick-ups
		• Foam roller
		• Weight shift releves
		• Theraband releves
		• 2 to 1 eccentric releves
		• Theraband ankle exercises
		• Calf stretches
		• Plyometrics to return to dance
		  ○ 2 footed sautes, all planes
		  ○ 1 footed sautes and jetes, all planes
			• Skeletal Alignment Exercise
			• Gait Training
			• BAPS board
			• Pilates Reformer footwork
			• Pilates leg springs series (for proximal control)
			• Pilates jump board
			• Static balance activities:
			  ○ On compliant surfaces such as Dyna Disc, slant board, pillow, etc.
			  ○ Progression to single limb, with reaching, on releve, and other external perturbations