Rare Combination of a Cuboid-navicular Tarsal Coalition with a Closed Tibialis Anterior Tendon Rupture: A Case Report and Review of the Literature

Josephine Berger-Groch¹, Johannes M Rueger¹, Alexander S Spiro²

Learning Point of the Article:
TAT rupture and CNC findings are rare diseases. In case of TAT X-ray of the foot to exclude tarsal coalition is recommended. Then TAT ruptures treatment is paramount. If this problem is solved and the patient is still in pain, a further treatment of the coalition can be discussed.

Introduction: Tibialis anterior tendon (TAT) rupture and cuboid-navicular coalition (CNC) are rare, to the best of our knowledge, only 238 cases of TAT rupture and 34 cases of CNC are described in the past century.

Case Report: A 47-year-old man came with a sudden onset of foot pain including drop foot to our department. We diagnosed a TAT rupture, which was fixed through suture. The pathologist testified degenerative changes in the tendon. In addition, a CNC was diagnosed. No extra treatment was necessary for the CNC. At the 6-year follow-up examination, the patient had no pain and went back to normal day activities (AOFAS 95/100 points).

Conclusion: We presume that, in our case, the long-term stress at the TAT through the foot deformity, caused by the CNC, may have supported the tendon rupture. CNC normally is symptom free. Therapy of a painful CNC should start with a conservative therapy. When this fails, an operation can be considered.

Keywords: Bunnell, Calcaneonavicular coalition, Foot deformity, Foot drop, Peroneal spasm, Talocalcaneal coalition.

Abstract
Case Report
Introduction
The tibialis anterior tendon (TAT) rupture was first described by Brüning, in 1905 [1]. Tibialis anterior (TA) tendon rupture is a relatively rare injury that has been documented primarily in case reports and small case series [2]. About 80% of the TAT ruptures are spontaneous and 20% are traumatic [3]. The closed TAT rupture mostly occurs in male patients between 60 and 70 years. The main cause is degeneration of the tendon through repeating microtrauma at the retinaculum inferior, steroids, inflammatory arthritis, goat, diabetes, infection, ischemia, or hyperparathyroidism [4]. A tarsal coalition is a connection between tarsal bones. The incidence is ~1% and the appearance of a bilateral coalition is believed to be 50% or more [5]. The most commonly seen coalitions in the foot are talocalcaneal and calcaneonavicular (≥90%). The cuboid-navicular coalition (CNC) is the least reported one. Besides the congenital coalition, an acquired coalition is discussed (trauma, infection, arthritis, and tumor), but this is much more uncommon [6]. The abnormal articulation between the bones can lead to deformation of the foot with degeneration, stiffness, and pain. Asymptomatic coalitions in the adult can become symptomatic after a trauma [7]. Microfractures and bone remodeling of the coalitions have been identified to be one cause of pain activator [8].

Case Report
A 47-year-old male athletic patient was transferred from his local orthopedic surgeon to our department. After a firm
footstep, he has heard a snap sound and afterward was unable to lift up his left foot while playing tennis. The patient has no medical history and no regular medication. At admission, the patient reported an unclear constant pain at the medial side of the left ankle for 6 weeks. On clinical examination, a swollen left ankle with pain at the dorsodistal lower leg was recognized. The skin was intact; there were no numbness and a normal perfusion. Dorsiflexion of the left ankle was reduced to 2/5 grade of muscle strength. The patient had a pes valgus and a slight pes abductus. While checking out the radiographs of both feet, we recognized a CNC on the left side and the frequently seen coalition between calcaneus and navicular bone on the right side. The MRI scan showed a complete TAT rupture on the left side. 5 days after the trauma, the patient underwent surgical treatment with refixation of the TAT at os naviculare through a suture anchor and a side-to-side suture of the tendon according to Bunnell. Postoperatively, the patient received a lower leg cast for 6 weeks. Afterward, slow muscle training was performed. The pathologist testified degenerative changes in the tendon. At the 6-year follow-up examination, the patient had no pain and returned to a normal grade of activity (AOFAS 95/100 points) (Fig. 1-6).

Discussion

The dorsiflexion of the foot is based on the power of the M tibialis anterior by 80% [9]. The most common area of TAT rupture is close to the retinaculum inferior. A reason could be the blood supply of the tendon. In the middle part of the anterior tendon, half exist an avascular zone 5–16 mm above the tendon insertion [10]. For active patients, a surgical treatment is recommended in case of a TAT rupture. Otherwise, persistent pain and pes planus are possible long-term problems [11]. Just bedridden patients, low demand patients, or patients with contraindications for an operation should be treated with a cast for 6 weeks [2]. However, the biggest comparing therapy-study about TAT ruptures was not able to find a difference between operative and conservative treatment [4]. The kind of operation depends on the location of the tendon rupture. A distal rupture can be fixed with a screw, while proximal lesions can be reconstructed with a direct tendon suture (Bunnell/Kessler). Different surgical procedures were used to treat delayed diagnosed ruptures: Z-plasty, different tendon transfers, and graftings. The different authors report good results. No technique can be favored as all published data are case presentations.

A detailed review of the literature showed only 34 published CNC cases (Table 1). The diagnosis of coalition is usually made by plain radiographs. The 45° medial oblique view is the best view to show a CNC [5]. Looking at the literature, 1/3 of patients coming with a painful coalition have a foot abnormality. Most frequently valgus deformity reduced mobility in the subtalar joint and peroneal spasm is found [12]. Waugh described a case with a peroneal spasm in a boy with a CNC and recommended to look carefully for coalitions in patients of a spastic flat foot [13]. Because the CNC preserves the Chopart and Lisfranc joint, chronic pain symptoms are much more uncommon then in other types of coalitions [14].

![Figure 1: View from the back of the patient to visualise his foot deformity](image1)

![Figure 2: Preoperative view with distinct deficit of dorsal extension at the left foot](image2)

![Figure 3: Intraoperative picture showing the tibialis anterior tendon](image3)

![Figure 4: Radiograph of the left foot showing a cuboid-navicular coalition.](image4)

![Figure 5: Postoperative X-ray showing anchor for the tibialis anterior tendon in os naviculare](image5)

![Figure 6: Picture 3 month postoperative showing complete restored range of motion](image6)
### Table 1: Detailed review of the literature with 34 published CNC cases

| Case Description                                                                 | Country | Region | Location | Age | Sex | Foot Abnormalities                                                                 |
|----------------------------------------------------------------------------------|---------|--------|----------|-----|-----|----------------------------------------------------------------------------------|
| Posttraumatic planar fracture: arthritis symptoms                                 |         |        | Right    | 34  | Female |                                                                                  |
| Working along the medial aspect of his foot, tender over the peroneal tuber      |         |        | Right    | 17  | Male      |                                                                                  |
| Cuboid-navicular tarsal coalition in an athlete: Am Soc Sports Jour 24:288-292, 2011 |         |        | Right    | 43  | Male      |                                                                                  |
| Decreased subtalar motion and transverse tarsal joint motion, fixed pes planus deformity |         |        | Left     | 15  | Male      |                                                                                  |
| Decreased subtalar motion and motion of subtalar joint movements decreased by 50% to right side |         |        | Left     | 50  | Female    |                                                                                  |
| Bilateral navicular hind foot with gross restriction of subtalar motion, marked peroneal spasm on inversion |         |        | Left     | 42  | Male      |                                                                                  |
| Right foot, planus, foot, restriction of planus flexion and evasion               |         |        | Left     | 14  | Male      |                                                                                  |
| Bilateral hind foot, movement of midtarsal joint movements restricted              |         |        | Left     | 46  | Male      |                                                                                  |
| Inversion and eversion of rearfoot restricted                                     |         |        | Right    | 15  | Female    |                                                                                  |
| Axial deviation of hindfoot, limitation on mobility of the midtarsal joint         |         |        | Left     | 27  | Female    |                                                                                  |
| Bilateral hind foot, movement of midtarsal joint movements decreased by 50% to right side |         |        | Left     | 30  | Female    |                                                                                  |
| Right foot position, pes planovalgus, oponalisis gait, peroneal spasm             |         |        | Left     | 42  | Male      |                                                                                  |
| Diminished active variation of the hindfoot, limitation on mobility of the midtarsal joint |         |        | Right    | 9   | Female    |                                                                                  |
|United subtalar motion                                                            |         |        | Left     | 15  | Male      |                                                                                  |
| Hindfoot motion restricted, peroneal spasm                                       |         |        | Left     | 12  | Male      |                                                                                  |
| Unilateral, e, x, x                                                               |         |        | Left     | 17  | Male      |                                                                                  |
| Cuboid-navicular tarsal coalition: a case report                                 |         |        | Left     | 15  | Male      |                                                                                  |
| Bilateral navicular hind foot with gross restriction of subtalar motion, marked peroneal spasm on inversion |         |        | Left     | 30  | Female    |                                                                                  |
| Axial deviation of hindfoot, limitation on mobility of the midtarsal joint         |         |        | Left     | 27  | Female    |                                                                                  |
| Unilateral, e, x, x                                                               |         |        | Left     | 42  | Male      |                                                                                  |
| Unilateral, e, x, x                                                               |         |        | Left     | 17  | Male      |                                                                                  |
| Unilateral, e, x, x                                                               |         |        | Left     | 30  | Female    |                                                                                  |
| Unilateral, e, x, x                                                               |         |        | Left     | 17  | Male      |                                                                                  |
| Unilateral, e, x, x                                                               |         |        | Left     | 30  | Female    |                                                                                  |

**N = 34**
treatment of a symptomatic CNC should start with a conservative therapy including rest, anti-inflammatory medication, and orthotic device. If no pain relief is noticed, surgery can be considered as follows:

- Simple resection of the bar
- Resection of the coalition and interposition of adipose graft or other types of interpositional spacer
- Triple arthrodesis [15].

**Conclusion**

We presume that, in our case, the long-term stress at the TAT through the foot deformity, caused by the CNC, may have supported the tendon rupture. CNCs normally are symptom free. Therapy of a painful CNC should start with a conservative therapy. When this fails, an operation can be considered.

**Clinical Message**

In conclusion, TAT rupture and CNC findings are rare diseases. A patient with both should be treated first for the TAT rupture. If this problem is solved and the patient is still in pain, a further treatment of the coalition can be discussed.