

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

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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.

Abstract

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.

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 ($\geq 90\%$). 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

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Figure 1: View from the back of the patient to visualise his foot deformity



Figure 2: Preoperative view with distinct deficit of dorsal extension at the left foot



Figure 3: Intraoperative picture showing the tibialis anterior tendon

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 than in other types of coalitions [14]. The



Figure 4: Radiograph of the left foot showing a cuboid-navicular coalition.



Figure 5: Postoperative X-ray showing anchor for the tibialis anterior tendon in os naviculare



Figure 6: Picture 3 months postoperative showing complete restored range of motion

Table 1: Detailed review of the literature with 34 published CNC cases

Autor	Number of cases	Location, Age, Sex	Foot Abnormalities
Chu JS, Underriner T, Yegorov A. A rare case of cubonavicular coalition. Radiol Case Rep 12:133-135, 2017.	1	Right, 34, female	Posttraumatic pilon fracture: arthritis symptoms
Awan O, Graham JA. The rare cuboid-navicular coalition presenting as chronic foot pain. Case Rep Radiol 2015:625285, 2015.	1	right, 17, male	swelling along the medial aspect of his foot, tender over the tarsonavicular
Kamiya T, Watanabe K, Teramoto A, Yamashita T. Cuboid-Navicular Tarsal Coalition in an Adolescent Female Athlete: A Case Report. JBJS Case Connect 5:e93, 2015.	1	right, 14, female	none
De Keyzer B, Øvreide P, Crevits I. Cubonavicular coalition. JBR-BTR 96:400, 2013.	unclear	unclear	unclear
Sarage, AL, Gambardella GV, Fullem B, Saxena A, Caminear DS. Cuboid-navicular tarsal coalition: report of a small case series with description of a surgical approach for resection. J Foot Ankle Surg 51: 783-786, 2012.	4	1. left, 15, female	1. subtalar joint 10° decreased in range of motion
		2. bilateral, 16, male	2. none
		3. unclear, 35, male	3. Arthritic changes in the tarsometatarsal joints, osteopenia
		4. right, 18 female	4. none
García-Mata S, Hidalgo-Ovejero A. Cuboid-navicular tarsal coalition in an athlete. An Sist Sanit Navar 34:289-292, 2011.	1	right, 45, male	none
Hounshell CR. Regenerative tissue matrix as an interpositional spacer following excision of a cuboid-navicular tarsal coalition: a case study. J Foot Ankle Surg 50:241-244, 2011.	1	left, 37, female	decreased subtalar motion
Johnson TR, Mizel MS, Temple T. Cuboid-navicular tarsal coalition - presentation and treatment: a case report and review of the literature. Foot Ankle Int 26:264-266, 2005.	1	left, 15, male	decreased subtalar motion and transverse tarsal joint motion, fixed pes planus deformity
Piqueres, X, de Zabala S, Torrens C, Marin M. Cubonavicular coalition: a case report and literature review. Clin. Orthop. Relat. Res., 396:112-114, 2002.	1	left, 14, male	flat foot, valgus rear foot, restriction of plantar flexion and eversion
Talkhani, IS, Laing P. Cuboid-navicular coalition in an adult: a case report. Foot and Ankle Surgery 5:151-154, 1999.	1	left, 42, male	morning stiffness, movement of midtarsal joint movements diminished by 50% to right side
Williamson DM, Torode IP. Cubonavicular coalition: an unusual cause of peroneal spastic flat foot. Aust N Z J Surg 62: 506-507, 1992.	1	bilateral, 14, male	bilateral valgus hind-feet with gross restriction of subtalar moment, marked peroneal spasm on inversion
Palladino SJ, Schiller L, Johnson JD. Cubonavicular coalition. J Am Podiatr Med Assoc 81:262-266, 1991.	1	bilateral, 13, male	rigid foot position, pes planovalgus, propulsive gait, peroneal spasm
Castellet FE. Cubonavicular synostosis: a case report. Acta orthopaedica belgica A., 57(3):305-308, 1991.	1	left, 24, male	none
E. C. Feliu. Cubonavicular synostosis. A case report. Acta Orthopaedica Belgica, vol. 57, no. 3, pp. 306-308, 1991.	1	Unclear	unclear
O'Neill, DB, Micheli LJ. Tarsal coalition. A followup of adolescent athletes. Am J Sports Med 17:544-549, 1989.	1	right, 15, female	Inversion and eversion of rearfoot restricted
Stormont, DM, Peterson HA. The relative incidence of tarsal coalition. Clin Orthop Relat Res 181:28-36, 1983.	1	left, 26, male	unclear
Kolikian AS, Sarrafian SK. Sarrafian's anatomy of the foot and ankle: descriptive, topographical, functional. Third Edition. Philadelphia: Wolters Kluwer Health/Lippincott Williams & Wilkins, 111-112, 2011.	8	x,x,x	text just mentions 8 cases (Cruveilhier 1x, Gruber 4x, Pfltzner 3x)
Prado MP, Mendes AAM, Olivari R, Amodio DT. CUBOID-NAVICULAR TARSAAL COALITION. Rev Bras Ortop 45:497-499, 2010.	1	right, 9, female	diminished active varization of the hindfoot, limitation on mobility of the midtarsal joint
Cowell HR. Tarsal coalition--review and update. Instr Course Lect 31:264-271, 1982.	1	unilateral,x, male	limited subtalar motion
Cavallaro, DC, Hadden HR. An unusual case of tarsal coalition: a cuboid navicular synostosis. J Am Podiatry Assoc 68:71-75, 1978.	1	bilateral, 12, female	hindfoot motion restricted, peroneal spasm
Rankin EA, Baker GI. Rigid flatfoot in the young adult. Clin Orthop Relat Res 104:244-248, 1974.	1	unilateral, x, x	unclear, just mentioned one case in a table
Harris, RI. Retrospect--peroneal spastic flat foot (rigid valgus foot). J Bone Joint Surg Am 47:1657-1667, 1965.	1	x,x,x	unclear, just mentioned one case in the text
Del Sel, JM, Grand NE. Cubo-navicular synostosis; a rare tarsal anomaly. J Bone Joint Surg Br 41-B:149, 1959.	1	bilateral, 43, m	moderate cavus deformity, slight limitation of inversion and eversion
Waugh W. Partial cubo-navicular coalition as a cause of peroneal spastic flat foot. J Bone Joint Surg Br 39-B:520-523, 1957.	1	left, 15, m	both feet valgus, considerable peroneal spasm with prevented supination
Dwight T. A clinical atlas. Variation of the bones of the Hands and Feet. Philadelphia & London. J.B. Lippincott Company Plate XXX, 1907.	1	unilateral, x, x	Unclear
	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].

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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.

Conflict of Interest: Nil

Source of Support: Nil

Consent: The authors confirm that Informed consent of the patient is taken for publication of this case report

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