International Journal of Surgery Case Reports 89 (2021) 106593

Contents lists available at ScienceDirect

International Journal of Surgery Case Reports

journal homepage: www.elsevier.com/locate/ijscr

Case report

Lateral subtalar dislocation associated with a lateral malleolus and a nutcracker cuboid fracture: Case report of a rare pattern of lesion

André Pinto Moura [a,*], Sofia Caldeira-Dantas [a], Gonçalo Vaz Pinto [a], Sofia Madeira [b], João Protásio [c], Maria José Seno [a]

[a] Orthopaedics Department, Hospital do Litoral Alentejano, Monte do Gilbardinho, 7540-230 Santiago do Cacém, Portugal
[b] Orthopaedics Department, Hospital Garcia de Orta, Avenida Torrado da Silva, 2805-267 Almada, Portugal
[c] Orthopaedics Department, Hospital Beatriz Ângelo, Avenida Carlos Teixeira 3, 2674-514 Loures, Portugal

ARTICLE INFO

Keywords:
Lateral subtalar joint dislocation
Lateral malleolus fracture
Nutcracker cuboid fracture
Surgical traumatology
Case report

ABSTRACT

Introduction and importance: Combined fracture of the lateral malleolus and cuboid due to a lateral subtalar dislocation is an uncommon injury. Literature is scarce on this trauma association. To the best of our knowledge, this represents a new lesion pattern. Hereby we describe its mechanism, management and outcomes.
Case presentation: We report a case of a 58-year-old woman, who fell from the stairs and presented with pain and an acute deformity of the left foot and ankle. Plain radiographs and CT scan revealed a lateral subtalar dislocation with a lateral malleolus and cuboid fractures. After a failed closed reduction, the patient underwent an open reduction and fixation of the talonavicular joint. An external fixator was applied to address the cuboid fracture. The lateral malleolus was treated conservatively with 5.5 weeks of immobilization. At 38 months of follow-up, the patient scored 87% on the AOFAS ankle-hindfoot scale and returned to normal daily activity. Radiographs demonstrate signs of posttraumatic arthritis at the subtalar and talonavicular joints.
Clinical discussion: After reduction of the lateral subtalar dislocation, addressing the nutcracker cuboid fracture was essential, since it can contribute to a flatfoot deformity. Although the patient progressed to posttraumatic arthritis, the sequelae are usually well tolerated and a good outcome was achieved.
Conclusion: The rarity of this pattern of lesion is related to the necessary multidirectional forces. Correct management of the associated fractures is essential.
Our study demonstrates a new lesion pattern of lateral subtalar dislocations, its mechanism, management and outcomes.

1. Introduction

Combined dislocation of both the subtalar and talonavicular joints, constitute a rare lesion pattern known as subtalar dislocation [1]. Subtalar dislocations represent about 1% of all dislocations [2]. The majority occur in males, from highenergy trauma. Although, hindfoot sprains or sports have been reported [3,4].

Between 20% and 25% of all subtalar dislocations are open injuries, more frequently with the lateral type [2].

The classification is dictated by the direction of the dislocated foot, relatively to the talus. The most common type is the medial dislocation which represents about 79.5% of all subtalar dislocations, while lateral dislocations occur in 17%. Posterior (2.5%) and anterior (1%) subtalar dislocations are even rarer [1].

We analyzed the literature, from the 21st century, in search of similar patterns of injury. Hereby, to the best of our knowledge, we report an undescribed pattern of associated injuries of a lateral subtalar dislocation, its mechanism of lesion, management and outcomes.

This paper has been reported in line with the SCARE 2020 criteria [5].

2. Case presentation

A 58-year-old, otherwise healthy woman, was brought by ambulance to the Emergency Department of a central hospital, after falling down the stairs and sustaining an eversion injury of the left foot. The patient referred severe pain and noted a foot deformity. She had no previous surgeries or allergies and denied psychosocial, drug or relevant familiar

* Corresponding author.
E-mail address: andre.moura@ulsla.min-saude.pt (A. Pinto Moura).

https://doi.org/10.1016/j.ijscr.2021.106593
Received 5 October 2021; Received in revised form 7 November 2021; Accepted 9 November 2021
Available online 12 November 2021

histories.

Primary evaluation revealed a deformed left foot and ankle with tenting on the medial aspect of the plantar arch and with functional impairment. The pedal pulses and sensation on the foot were undisturbed, without any evidence of compartment syndrome. Several diagnoses were considered: calcaneal fracture, talar fracture, ankle fracture-dislocation and subtalar dislocation. Radiographs were obtained and revealed a lateral subtalar dislocation with fracture of the lateral malleolus (Fig. 1).

Under conscious sedation, an attempt on closed reduction was performed, without success. It was decided to proceed with an open reduction. A CT scan was done, allowing the identification of a nutcracker cuboid fracture (Fig. 2).

The patient was then taken to the operating room and general anesthesia was performed. Antibiotic prophylaxis with intravenous cefazolin was administered. With the patient in supine position, a left lower limb pneumatic tourniquet was inflated and the patient was submitted to an open reduction by an anteromedial approach. It was observed an interposition of capsule and ligaments in the talonavicular joint, holding the hindfoot irreducible. After clearing soft tissues, it was possible to reduce the talonavicular and subtalar joints. Due to subtle instability, the talonavicular joint was fixed with a Kirschner wire of 2.5 mm. The shortening of the lateral column was addressed with a distraction external fixator (Mini External Fixator, DePuy Synthes®) with a pin in the calcaneus and two wires on the fourth and fifth metatarsal bases (Fig. 3). The lateral malleolus achieved proper alignment after reduction of the subtalar dislocation and was treated in a non-weight-bearing short-leg splint. The surgical procedure was performed by an orthopaedic foot and ankle surgeon (JP).

There were no complications to register. Venous thromboprophylaxis with low-molecular-weight heparin was undertaken in the post-operative period, until splint removal. The patient was discharged on the 2nd postoperative day to outpatient follow-up, with weekly evaluations. The splint, Kirschner wire and external fixator were removed at the 5.5 weeks appointment, and progressive passive and active range of motion exercises of the foot and ankle were allowed. At 7 weeks the patient started on partial weight-bearing with crutches and progression to full weight-bearing was allowed after 9 weeks. The patient was compliant with the recommendations provided for the post-operative period. Serial radiographs confirmed congruence of the subtalar, talonavicular and calcaneocuboid joints.

The patient was followed-up for 38 months. At the last follow-up, the tibiotalar active range of motion was 20° of dorsiflexion and 46° of plantarflexion. The subtalar range-of-motion was 18° of inversion and 14° of eversion. The subtalar movements, although restricted, were painless. No instability at the ankle, subtalar or talonavicular joints on stress tests was noted. The AOFAS ankle-hindfoot score was 87%. Radiographs demonstrated signs of posttraumatic arthritis at the subtalar and talonavicular joints (Fig. 4). However, the patient is ambulatory without support, having only mild and occasional pain on uneven ground. The patient is satisfied with the outcomes and was able to resume daily and recreational activities (hiking).

3. Discussion

Our case report did not fit the typical demographics or mechanism, since it describes a female in her 6th decade, who suffered a low-energy trauma.

We believe that a sequential mechanism was the culprit for this presentation. The multidirectional forces necessary to produce this pattern are:

1- Eversion, which forced the lateral part of the calcaneus on the lateral malleolus, determining its fracture and the lateral subtalar dislocation (Fig. 1);
2- Bodyweight transmission through the anterior foot, fixed in plantar flexion, originated the nutcracker fracture of the cuboid, between the bases of the 4th and 5th metatarsals and the anterior process of the calcaneus (Fig. 2).

Fractures of the malleoli, talus, metatarsals, calcaneus and cuneiform have been described, although we have not found in our literature review, the association of a lateral malleolus and cuboid fractures in a lateral subtalar dislocation (Fig. 5 and Table 1). In total, 23 articles comprised this review [6–28].

In our case, the CT scan allowed identification and proper surgical planning for the cuboid fracture. CT scan is essential since some of the associated fractures of subtalar dislocations cannot be diagnosed by plain radiographs, but their presence alters the treatment strategy, rehabilitation and prognosis [6,29].

Surgical treatment is needed in 2–38% of cases and is reserved for open injuries or failure of closed reduction [11,30]. For the last, the use of brute force and multiple attempts are strongly discouraged and an open reduction, as soon as possible, should follow [3,13], being our rationale, avoiding several attempts on a closed reduction.

The cuboid fracture originated a lateral foot column shortening, which if left unaddressed, would result in several long-term sequelae, with forefoot abduction and lateral subluxation of the lesser metatarsals,

Fig. 1. Clinical and radiographic presentation of a left lateral subtalar dislocation with a lateral malleolus fracture. Swelling may develop rapidly and mask bony deformity.

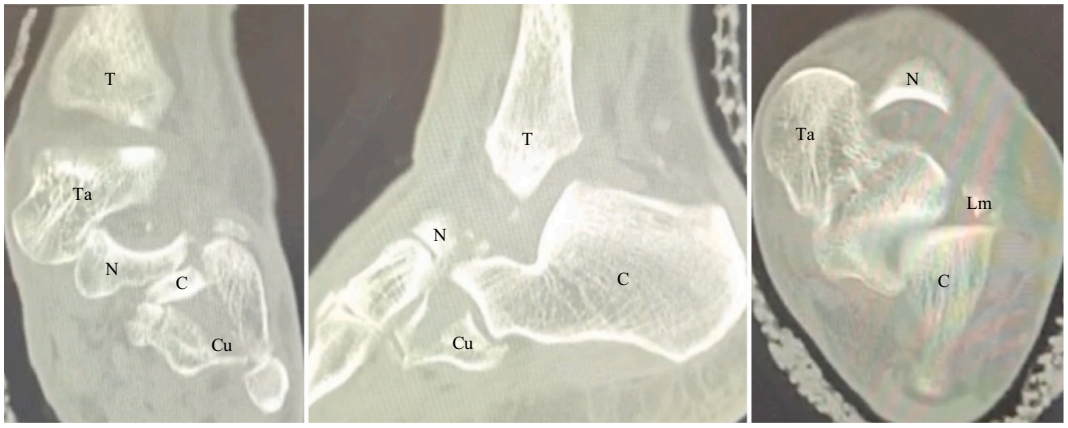

Fig. 2. CT scan of the ankle and the foot confirmed the diagnosis but revealed a nutcracker cuboid fracture.
T tibia, *Ta* Talus, *N* Navicular, *C* Calcaneus, *Cu* Cuboid, *Lm* Lateral malleolus.

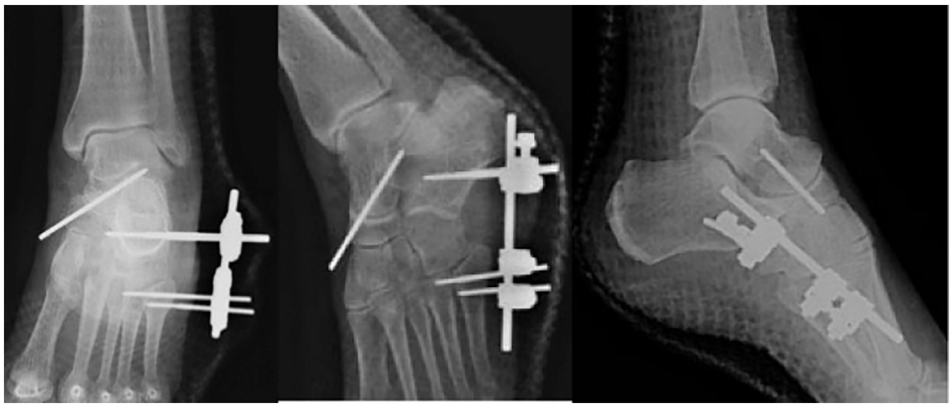

Fig. 3. Immediate postoperative radiographic control.

Fig. 4. Last follow-up radiographic control, showing subtalar and talonavicular arthritis.

resulting in a planovalgus deformity and mechanical foot dysfunction [31]. Disruption of the peroneal groove, on the plantar surface of the cuboid, may also result in peroneus longus tendinopathy and further pain and disability [31].

An external fixator is recommended in most cases of lateral column shortening, which aids in the reduction and may provide distraction to reduce abduction-compression forces on the lateral column [31].

The clinical presentation of a lateral subtalar dislocation is already an acute and severe flatfoot, abducted and everted [16]. Although, edema may develop rapidly and mask bony deformity (Fig. 1). To achieve a good result, it is critical to manage the lateral subtalar dislocation, but also the cuboid fracture, since both may be associated with a flatfoot deformity.

The optimal duration of immobilization is an equilibrium between short-term immobilization, with the associated risk of subtalar instability and not respecting the lateral malleolus healing time and

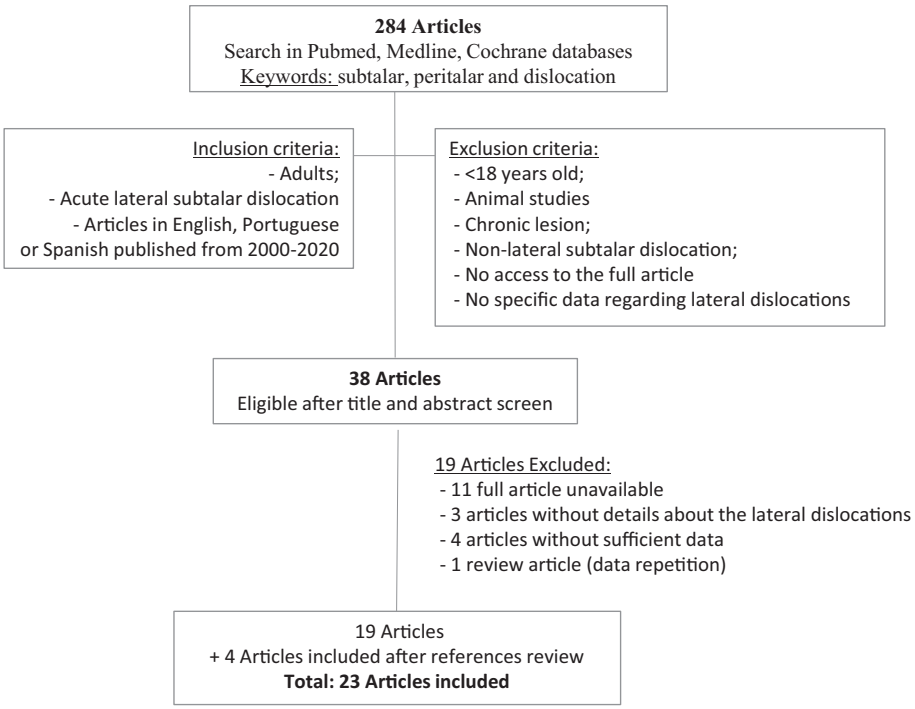

Fig. 5. Literature search and article selection algorithm.

prolonged immobilization which often leads to loss of function [2,32,33]. Due to the association of lateral malleolus fracture, we opted for 5.5 weeks of immobilization. Progressive weight-bearing and rehabilitation, as soon as possible, may also provide the best functional outcomes [33].

Osteoarthritis is one of the most common complications reported in subtalar dislocations, ranging in the literature from 30% to 89% of the patients [9,34]. Although most of these degenerative changes are asymptomatic or well-tolerated, further surgical procedures are necessary in some cases. A prolonged follow-up is advisable.

We have presented the mechanism, management and outcomes of a lateral subtalar dislocation, associated with a lateral malleolus and a nutcracker cuboid fracture, which is, based on our literature review, the only reported case of such kind.

Nevertheless, our study has limitations. The AOFAS ankle-hindfoot scale is the most used classification, although it is not a validated outcome score. Since we reported a single patient, higher-quality evidence studies are desirable to answer which are the best option treatments, rehabilitation protocols, with validated outcome scales and determinants of prognosis.

4. Conclusion

The rarity of this pattern of lesion is related to the necessary multidirectional forces.

Correct surgical management of the lateral foot column shortening is essential to achieve a good result. Furthermore, it is mandatory to respect the lateral malleolus healing time, but also to avoid a prolonged immobilization.

Adjusted and timely rehabilitation contributes to the best results.

Our study demonstrates a new lesion pattern, its mechanism, management and outcomes. In the absence of high-quality studies, case reports can provide new clinical presentations and treatment approaches.

Sources of funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Ethical approval

This study is exempt from ethical approval in our institution.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Research registration

Not applicable.

Guarantors

André Pinto Moura, MD.
Sofia Caldeira-Dantas, MD-PhD.

Provenance and peer review

Not commissioned, externally peer-reviewed.

CRediT authorship contribution statement

André Pinto Moura: conceptualization, writing, original draft.
Sofia Caldeira-Dantas: conceptualization, investigation.
Gonçalo Vaz Pinto: investigation.
Sofia Madeira: data collection.
João Protásio: writing, review & editing.
Maria José Seno: supervision, head of orthopaedic service.

Table 1
Studies with data from lateral subtalar dislocations in the 21st century.

	References	Study design	Associated injuries (% of the lateral dislocations)
1	Bibbo et al. (2001) [6]	Retrospective Case serie	1 (50%): Lateral and medial malleolar fractures + fracture medial talar process; 1 (50%): Lateral malleolar fracture + avulsion of sustentaculum tali + fracture posterior talar process + incarceration of FHL tendon
2	Jenkinson et al. (2001) [7]	Case report	–
3	Perugia et al. (2002) [8]	Retrospective Case serie	–
4	Bibbo et al. (2003) [9]	Retrospective Case serie	–
5	Rivera et al. (2003) [10]	Retrospective Case serie	Lateral malleolus and posterior malleolus fractures
6	Garofalo et al. (2004) [11]	Retrospective Case serie	3 (60%): Talus fracture; 1 (20%): 4th and 5th metatarsal fracture; 1 (20%): Posterior tibial artery and saphenous vein lesion
7	Randall et al. (2004) [12]	Case report	Fibula + talus + calcaneus fracture
8	Wagner et al. (2004) [13]	Retrospective Case serie	–
9	Specchiulli et al. (2007) [14]	Retrospective Case serie	3 (100%) had associated fractures 1 (33.3%) also presented a ruptured posterior tibial artery and saphenous vein
10	de Palma et al. (2008) [15]	Retrospective case serie	–
11	Harris et al. (2008) [16]	Case report	Fracture of the lateral process of the talus and shear anterior fracture of the talus
12	Jungbluth et al. (2010) [17]	Retrospective Case serie	–
13	Conesa et al. (2011) [18]	Case report	Fracture of the lateral and medial malleolus
14	Jayaprakash et al. (2011) [19]	Case report	–
15	Ghani et al. (2014) [20]	Case report	Rupture of deltoid ligament + anterior subluxation of the tibialis posterior tendon + laceration of the posterior tibial artery and vein + Rupture of the FDL tendon
16	Camarda et al. (2015) [21]	Retrospective case serie	1 (33.3%): Posteromedial fracture of the talus; 1 (33.3%): 5th metatarsal fracture
17	Karslıoglu et al. (2015) [22]	Case report	–
18	Tanwar et al. (2016) [23]	Case report	Flexor hallucis longus tendon incarceration with a checkrein deformity of the toe
19	Harris et al. (2016) [24]	Case report	–
20	Ruhlmann et al. (2016) [25]	Retrospective Case serie	–
21	Veltman et al. (2016) [26]	Case report	–
22	Banerjee et al. (2017) [27]	Case report	Dorsal dislocation of the 4th and 5th tarsometatarsal joints + fracture of the lateral cuneiform
23	Zaraa et al. (2017) [28]	Case report	Sustentaculum tali

FHL Flexor hallucis longus; *FDL* Flexor digitorum longus.

Declaration of competing interest

There is no conflict of interest.

References

[1] A. Prada-Cañizares, I. Auñón-Martín, J. Vilá y Rico, J. Pretell-Mazzini, Subtalar dislocation: management and prognosis for an uncommon orthopaedic condition, International Orthopaedics. 40 (2016) 999–1007, https://doi.org/10.1007/s00264-015-2910-8.

[2] T.J. Zimmer, K.A. Johnson, Subtalar dislocations, Clin. Orthop. Relat. Res. (1989) 190–194. http://www.ncbi.nlm.nih.gov/pubmed/2910600.

[3] F. Hoexum, M.J. Heetveld, Subtalar dislocation: two cases requiring surgery and a literature review of the last 25 years, archives of orthopaedic and trauma, Surgery 134 (2014) 1237–1249, https://doi.org/10.1007/s00402-014-2040-6.

[4] S. Grantham, Medial subtalar dislocation: five cases with a common etiology, J. Trauma 4 (1964) 845–849. http://www.ncbi.nlm.nih.gov/pubmed/14225332.

[5] R.A. Agha, T. Franchi, C. Sohrabi, G. Mathew, for the SCARE Group, The SCARE 2020 guideline: updating consensus Surgical CAse REport (SCARE) guidelines, International Journal of Surgery 84 (2020) 226–230, https://doi.org/10.1016/j.ijsu.2020.10.034.

[6] C. Bibbo, S.S. Lin, N. Abidi, W. Berberian, M. Grossman, G. Gebauer, F.F. Behrens, Missed and Associated Injuries after Subtalar Dislocation: The Role of CT, Foot & Ankle, International. 22 (2001) 324–328, https://doi.org/10.1177/107110070102200409.

[7] M.D. Jenkinson, S.J. Scott, B.H. Pennie, Subtalar dislocation in a case of Ehlers-Danlos syndrome, Foot Ankle Surg. 7 (2001) 51–52, https://doi.org/10.1046/j.1460-9584.2001.00240.x.

[8] D. Perugia, A. Basile, C. Massoni, S. Gumina, F. Rossi, A. Ferretti, Conservative treatment of subtalar dislocations, Int. Orthop. 26 (2002) 56–60, https://doi.org/10.1007/s002640100296.

[9] C. Bibbo, R.B. Anderson, W.H. Davis, Injury characteristics and the clinical outcome of subtalar dislocations: a clinical and radiographic analysis of 25 cases, Foot AnkleInternational. 24 (2003) 158–163, https://doi.org/10.1177/107110070302400210.

[10] F. Rivera, C. Bertone, E. Crainz, P. Maniscalco, M. Filisio, Peritalar dislocation: three case reports and literature review, J. Orthop. Traumatol. 4 (2003) 39–44, https://doi.org/10.1007/s101950300007.

[11] R. Garofalo, B. Moretti, V. Ortolano, P. Cariola, G. Solarino, M. Wettstein, E. Mouhsine, Peritalar dislocations: a retrospective study of 18 cases, The Journal of Foot and Ankle Surgery. 43 (2004) 166–172, https://doi.org/10.1053/j.jfas.2004.03.008.

[12] D.B. Randall, A.J. Ferretti, Lateral subtalar joint dislocation, J. Am. Podiatr. Med. Assoc. 94 (2004) 65–69, https://doi.org/10.7547/87507315-94-1-65.

[13] R. Wagner, T.R. Blattert, A. Weckbach, Talar dislocations, Injury 35 (2004) 36–45, https://doi.org/10.1016/j.injury.2004.07.010.

[14] F. Specchiulli, R. Gabrieli, V. di Carlo, B. Maiorana, Peritalar dislocations, Foot 17 (2007) 10–14, https://doi.org/10.1016/j.foot.2006.07.006.

[15] L. de Palma, A. Santucci, M. Marinelli, E. Borgogno, A. Catalani, Clinical outcome of closed isolated subtalar dislocations, Archives of Orthopaedic and Trauma Surgery 128 (2008) 593–598, https://doi.org/10.1007/s00402-007-0459-8.

[16] J. Harris, L. Huffman, M. Suk, Lateral peritalar dislocation: a case report, The Journal of Foot and Ankle Surgery. 47 (2008) 56–59, https://doi.org/10.1053/j.jfas.2007.08.012.

[17] P. Jungbluth, M. Wild, M. Hakimi, S. Gehrmann, M. Djurisic, J. Windolf, G. Muhr, T. Kälicke, Isolated subtalar dislocation, The Journal of Bone and Joint Surgery-American Volume 92 (2010) 890–894, https://doi.org/10.2106/JBJS.I.00490.

[18] X. Conesa, V. Barro, D. Barastegui, L. Batalla, J. Tomás, V. Molero, Lateral subtalar dislocation associated with bimalleolar fracture: case report and literature review, J Foot Ankle Surg 50 (2011) 612–615, https://doi.org/10.1053/j.jfas.2011.04.034.

[19] M.R. Jayaprakash, V. Kulumbi, A. Sampagar, C. Umarani, Lateral subtalar dislocation of the foot: a case report, J. Foot Ankle Surg. (2011), https://doi.org/10.3827/faoj.2011.0411.0001.

[20] Y. Ghani, K. Marenah, P. Kumar, Isolated proximal rupture of flexor digitorum longus tendon in a traumatic open subtalar dislocation, Ann R Coll Surg Engl. 96 (2014) e10–e12, https://doi.org/10.1308/003588414X13946184902802.

[21] L. Camarda, A. Abruzzese, A. la Gattuta, R. Lentini, M. D'Arienzo, Results of closed subtalar dislocations, Musculoskelet. Surg. 100 (2016) 63–69, https://doi.org/10.1007/s12306-015-0380-1.

[22] B. Karslıoglu, Y.E. Eyi, There is something wrong but where? Dislocation or fracture? Turkish Journal of Emergency Medicine. 15 (2015) 111–112, https://doi.org/10.1016/j.tjem.2015.11.002.

[23] Y.S. Tanwar, S. Singh, R.K. Arya, N. Aujla, A. Mathur, Y. Kharbanda, A closed lateral subtalar dislocation with checkrein deformity of great toe due to entrapment of flexor hallucis longus, Foot & Ankle Specialist. 9 (2016) 461–464, https://doi.org/10.1177/1938640016630060.

[24] A.P. Harris, J.M. Ramirez, J. Johnson, G.R. Waryasz, Lateral subtalar fracture-dislocation with maintenance of the talonavicular joint: case study, diagnosis and management, Am. J. Emerg. Med. 34 (2055) (2016) e3–2055.e5, https://doi.org/10.1016/j.ajem.2016.03.006.

[25] F. Ruhlmann, C. Poujardieu, J. Vernois, L.-E. Gayet, Isolated acute traumatic subtalar dislocations: review of 13 cases at a mean follow-up of 6 years and literature review, The Journal of Foot and Ankle Surgery 56 (2017) 201–207, https://doi.org/10.1053/j.jfas.2016.01.044.

[26] E.S. Veltman, E.J. Steller, P. Wittich, J. Keizer, Lateral subtalar dislocation: case report and review of the literature, World J. Orthop. 7 (2016) 623, https://doi.org/10.5312/wjo.v7.i9.623.

[27] S. Banerjee, M.M. Abousayed, D.J. Vanderbrook, K. Bagchi, Lateral subtalar dislocation with tarsometatarsal dislocation: a case report of a rare injury, Case Reports in Orthopedics. 2017 (2017) 1–6, https://doi.org/10.1155/2017/8090721.

[28] M. Zaraa, I. Jerbi, S. Mahjoub, H. Sehli, M. Mbarek, Irreducible subtalar dislocation caused by Sustentaculum tali incarceration, Journal of Orthopaedic Case Reports. 7 (2017) 58–60, https://doi.org/10.13107/jocr.2250-0685.688.
[29] D.R. Bohay, A. Manoli, Occult fractures following subtalar joint injuries, Foot & Ankle International. 17 (1996) 164–169, https://doi.org/10.1177/107110079601700309.
[30] J.C. DeLee, R. Curtis, Subtalar dislocation of the foot, J. Bone Joint Surg. Am. 64 (1982) 433–437. http://www.ncbi.nlm.nih.gov/pubmed/7061560.
[31] J. Borrelli, S. De, M. VanPelt, Fracture of the Cuboid, J. Am. Acad. Orthop. Surg. 20 (2012) 472–477, https://doi.org/10.5435/JAAOS-20-07-472.
[32] P. Merianos, K. Papagiannakos, A. Hatzis, E. Tsafantakis, Peritalar dislocation: a follow-up report of 21 cases, Injury 19 (1988) 439–442, https://doi.org/10.1016/0020-1383(88)90143-X.
[33] N.G. Lasanianos, D.N. Lyras, G. Mouzopoulos, N. Tsutseos, C. Garnavos, Early mobilization after uncomplicated medial subtalar dislocation provides successful functional results, J. Orthop. Traumatol. 12 (2011) 37–43, https://doi.org/10.1007/s10195-011-0126-2.
[34] R.B. Heppenstall, H. Farahvar, R. Balderston, P. Lotke, Evaluation and management of subtalar dislocations 20 (1980) 494–497, https://doi.org/10.1097/00005373-198006000-00011.