Knee Surg Sports Traumatol Arthrosc
(2004) 12 : 250–253

ANKLE

DOI 10.1007/s00167-003-0465-5

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Post-traumatic overload or acute syndrome of the os trigonum: a possible cause of posterior ankle impingement

Received: 25 May 2003
Accepted: 4 October 2003
Published online: 28 January 2004

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Abstract The purpose of this paper is to discuss the post-traumatic overload syndrome of the os trigonum as a possible cause of posterior ankle impingement and hindfoot pain. We have reviewed 19 athletes who were referred to our foot unit between 1995 and 2001 because of posterior ankle pain, and in whom a post-traumatic overload syndrome of os trigonum was diagnosed. All these patients were followed up over a period of 2 years. In 11 cases a chronic repetitive movements in forced plantar flexion was found. In the other eight cases the pain appeared to persist after a standard treatment of an ankle sprain in inversion plantar flexion. The diagnosis was based on clinical history, physical examination and X-rays that revealed a non-fused os trigonum. The confirmation of diagnosis was carried-out injecting local anaesthetic under fluoroscopic control. In all cases a corticosteroid injection as first line treatment was performed. In 6 cases a second injection was necessary to alleviate pain because incomplete recovery with the first injection. Three cases (16%) were recalcitrant to this treatment and in these three cases a surgical excision of the os trigonum was carried out. Our conclusion is that after some chronic athletic activity or an acute ankle sprain the os trigonum, if present, may undergo mechanical overload, remain undisrupted and become painful. Treatment by corticosteroid injection often resolves the problem.

Keywords Posterior ankle impingement · Os trigonum · Overload trauma

Introduction

Os trigonum syndrome is often ignored in findings that can result in hind-foot pain. It results from numerous disorders and may in fact be associated with an os trigonum or posterior trigonal process.

The differential diagnosis of this condition includes flexor hallucis longus tenosynovitis, peroneal tenosynovitis and tendinitis, intraarticular loose bodies and ankle synovitis [2, 7, 8, 10, 11, 12, 14, 15, 18].

This pathology is frequently encountered in athletes such as ballet dancers, soccer players, javelin throwers and runners, who must perform repetitive movements of the foot in the extreme range of plantar flexion or dorsiflexion [1, 2, 11, 16, 20].

The purpose of this paper is to present the "post-traumatic overload syndrome of os trigonum", to point to the differential diagnosis with other pathologies which are included in the ambit of "os trigonum syndrome".

Anatomy, pathomechanics and clinical aspects

The os trigonum in order of frequency is the second sesamoid after the sesamoid bones of the first metatarsal [20]. Its incidence is between 3% and 13% in the population [15, 17] and is twice as common unilaterally as bilaterally [8].

Between 8 and 10 years of age in females and between 11 and 13 years in males, separate centres of ossification appear at the level of the medial and lateral tubercles of the talus [20]. They usually fuse with the body of the talus within 1 year, forming the so-called trigonal or Stieda's process, and in some cases it may persist through life as a separate ossicle [22].

Grogan [9] noted that the os trigonum development is analogous to a secondary ossification centre because it is formed within a cartilaginous extension from the posterior portion of talus. The posterior part of the talus consists of two processes, lateral and posterior.

Dorsiflexion may increase the tension on the posterior talofibular ligament, which can result in avulsion of the ossicle or lateral tubercle [7]. Otherwise, during the plantar flexion, the posterior aspect of the talus strikes the posterior margin of the tibia. If the foot is forced into extreme plantar flexion, the posterior structures of the talus are pinched between the calcaneus and the posterior rim of the tibial plafond.

This mechanism, similar to "nut in a nutcracker" [11], results in an impingement of the posterior capsuloligamentous and osseous structures.

The "os trigonum syndrome" may be caused by an acute trauma. The chronic impingement of the posterior process of the talus against the tibia caused by chronic microtrauma can lead to an inflammatory process of the os trigonum. It can also result in degenerative changes in the posterior capsule of the ankle joint, adjacent ligaments, tendon and chondrosynovial surface [21].

Sometimes an acute trauma in plantar flexion may result in contusion, compression, or fracture of the os trigonum, the trigonal process, or the posterior process of the talus.

These injuries may cause an overload post-traumatic syndrome of the os trigonum. In this condition, the os trigonum becomes painful, but appears undisrupted on the lateral X-rays.

Clinically, the patient complains of pain during push-off while running. The pain is often absent during walking on level ground, but appears on uneven terrain.

Usually pain is complained of posterolaterally at the ankle joint, but may sometimes be located in the posteromedial region [2, 11].

Physical examination can reveal the presence of moderate swelling on only the medial or on both sides of the Achilles tendon, with tenderness on palpation.

An important clinical finding is tenderness on either side of the subtalar joint, whilst walking pain is referred to as unilateral, medial or lateral.

A forced passive plantar flexion of ankle and foot will reproduce the symptoms.

After clinical examination, a routine lateral radiograph of the ankle should reveal an os trigonum. In our experience, the test leading to the definitive diagnosis of post-traumatic overload or acute os trigonum syndrome is an injection of local anaesthetic under fluoroscopic control which, if positive, will bring immediate relief of the symptoms in rest and under stress.

We must think about this pathology when the mechanism of accident is clearly identified and after non recovery after adequate treatment of ankle sprain.

Material and methods

In the period between 1995 and 2001, thirty-five athletes with posterior ankle impingement were referred to our foot unit.

A "post-traumatic overload or acute syndrome of os trigonum" was diagnosed in 19 patients. One of the 19 patients had a bilateral os trigonum lesion. There were 6 women and 13 men. The mean age of the patients was 26 years (range 19–32 years).The 16 other patients had other pathology.

Eleven of the 19 patients (two ballet dancers, three soccer players, three runners, one hurdler and two pole-vaulters) had been suffering from chronic pain in the posterolateral region of the foot for an average of 5 months (range 4–7 months). They didn't speak of a preceding acute trauma of their foot or ankle. Their sports activities, particularly if associated with significant repetitive plantar flexion, were reported as aggravating factors of the symptomatology.

The other eight cases (three soccer players, three basketball players and two handball player) were referred to our centre for persistent posterolateral ankle pain after a benign ankle sprain in inversion supination, which was treated symptomatically and with physiotherapy for a mean period of 5 weeks (range 4–6 weeks) without success.

After a physical examination which established a possible diagnosis of "os trigonum syndrome", we performed an X-ray study of the ankle. The lateral film showed the presence of an undisrupted os trigonum. The definitive diagnosis was achieved injecting 2 cc of Depomedrole/lidocaine 40 mg/ml; 1% into the area of os trigonum under fluoroscopic control.

Three cases showed no improvement after the two infiltrations, and an open surgical excision of the os trigonum was carried out.

The surgery was performed through a medial retromalleolar approach, which allows an excellent exposure and reduces the risk of damaging the flexor hallucis longus tendon or the neurovascular bundle.

Results

In all cases the initial treatment consisted of a local corticosteroid injection. In ten cases one infiltration was sufficient to resolve the pain. In six cases, two infiltrations with an interval of 15 days were necessary to complete pain alleviation. All these 16 patients were allowed to return gradually to sport activities.

Physical activities for our three operated patients were initiated after a mean period of 13 weeks (range 10–14 weeks) and the average time required for return to full sport activity/full recovery in these patients was 8 months (range 7–9 months).

The athletes were reviewed 2 years after the treatment and were questioned about complaints, level of satisfaction and sports activities.

A clinical examination to evaluate motion of the ankle was performed by one single author. The presence of pain

at extreme degree of passive plantar flexion was evaluated.

At the last follow-up, no patient complained of hindfoot pain and all confirmed the same level of sports or work activities as before injury. No patient had undergone further treatment. Complications such as infection, lipodystrophy or flexor hallucis longus tendon rupture were not found in any patient treated with corticosteroid injection. No infection occurred in the patients who had been operated on. The active and passive range of motion of the ankle joint showed no significant differences between the treated and contralateral ankle, and no patient complained of pain at the extreme forced plantar flexion.

Discussion

Based on our findings, an os trigonum syndrome could be suspected in non-athletic patients or in recreational or professional athletes who suffer from posterior ankle pain, particularly if they complain of ankle-sprain symptoms that do not resolve after 4 to 5 weeks of conservative treatment.

The literature reports various causes of post-traumatic posterior ankle impingement syndrome. They include: enlarged posterior talar process, prominent process of calcaneus [12], avulsion fracture by traction applied to the posterior tibiotalar ligament [5], loose bodies [6], thickened posterior capsule, surrounding inflammatory soft tissues and calcified debris [10], as well as degenerative changes in the chondrosynovial surfaces [21].

With this paper, we wish to describe the "overload post-traumatic os trigonum syndrome" as a possible cause of hindfoot pain and/or posterior ankle impingement by repetitive or acute extreme plantar flexion of the foot with presence of os trigonum.

In this situation, after a traumatic chronic or acute ankle injury the os trigonum may remain undisrupted, but become painful and responsible for functional disability. In all our cases an os trigonum was found, and after accurate diagnosis it was considered as the only factor responsible for pain.

Some authors have recently noted with MRI [3] that after a trauma of the ankle joint the os trigonum may show a bony bruise and be symptomatic.

In the past a conservative treatment with a short leg cast for 4 to 6 weeks was recommended [23]. In our opinion this is a not suitable treatment for athletes, because in our series 84% of the patients responded to treatment with a corticosteroid injection immediately. This treatment is not recommended by some authors [10, 19].

In our series, the outcome was good in the operated patients. The only problem related to this procedure is the necessity to wait a long period of time before returning to sports activities. In our cases, as in other reported cases [9] full resumption occurred after a mean period of 8 months. This period is longer than when a series of arthroscopic excisions [23] was performed.

We concluded that the pathology of post-traumatic overload of os trigonum must be well distinguished from other possible causes of posterior ankle impingement syndromes or hind-foot pain.

The diagnosis is based on clinical history, physical examination, X-rays which will show the presence of an os trigonum and finally on a local anaesthetic injection test.

Some authors [4, 7, 13] have proposed bone scintigraphy, CT-scan or MRI to diagnose an os trigonum syndrome. We concluded that these imaging studies as well as MRI must be performed in cases of diagnostic doubt. The first-line treatment can be corticosteroid injection, which appears to be a safe and valid option allowing a fast return to sports activities. In recalcitrant cases an open or arthroscopic excision of the os trigonum may be performed. Larger series and longer follow-up are necessary to determine the risk of secondary osteoarthritis of the subtalar joint following excision of the os trigonum. In fact, this ossicle represents a small part of the roof of the posterior aspect of the subtalar joint, and its excision could decrease the contact area between the os calcis and talus producing an increased unit-pressure loading.

Conclusion

For recreational or professional athletes suffering from posterior ankle pain, after repetitive or acute extreme plantar flexion of the foot, or after non-recovery from ankle sprain in spite of adequate treatment, we must think about an os trigonum syndrome, assess its existence with a lateral ankle X-ray and confirm and treat it with anaesthetic-steroid injection.

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