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Case Report Open Access

Fatigue Fracture of the Calcaneus: A Case Report

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Abstract

We describe the clinical presentation of a 47-year old woman, presenting with heel pain and swelling around the calcaneus. No trauma had occurred, but radiographic evaluation showed a calcaneal fracture. The conservative treatment resulted in a malunion in varus which lead to multiple ankle sprains necessitating surgical correction. A spontaneous calcaneus fracture is a rare diagnosis, can be easily misdiagnosed and may result in malunion. Different risk factors exist for the predisposition of spontaneous calcaneus fracture and should be investigated.

Keywords: Calcaneus fracture; Spontaneous; Stress fracture; Heel pain

Introduction

The differential diagnosis of traumatic and non-traumatic heel pain is extensive. The occurrence of a calcaneal fracture without trauma is uncommon, but has been described in military recruits undergoing rigorous training programs [1-3].

Different factors can influence the bone quality and therefore result in a patient being more prone to a stress fracture of the calcaneus. This includes osteoporosis, benign or malign neoplasms, systemic diseases, transient osteoporosis (TO) and the presence of a tarsal coalition [4].

We report a case of a patient with a non-traumatic fracture of the calcaneus. We describe the differential diagnosis of heel pain and risk factors for calcaneus fatigue fractures.

Case

A 47-year-old woman presented to the orthopaedic outpatient service with spontaneous pain and swelling in the left heel region, without previous trauma.

The pain started three weeks previous to this visit; the patient had started walking on crutches due to the pain in her left foot and ankle. Her main complaint was, she couldn't put weight on her left heel.

During physical examination swelling of the ankle and heel was seen, with pressure pain predominantly in the heel region. Furthermore range of motion of the subtalar joint was painful and limited. The Achilles tendon appeared sensitive but intact. Her general practitioner had already performed an ultrasound of the left heel, which showed no abnormalities in the Achilles tendon.

Although no trauma had occurred an additional X-ray of the ankle was made, which showed a calcaneus fracture with some shortening. A supplementary CT-scan was performed to judge the extensiveness of the fracture and deformation. The CT-scan showed an extra articular fracture in the dorsal part of the calcaneus, running from cranial to caudal. Some displacement was seen of the dorsal part in cranial direction. The fracture was clearly of older date, due to increased density of the fracture lines while no union was reached at that time. There was no involvement of the subtalar joint (Figures 1 and 2).

Figure1: CT-scan of the foot with calcaneal fracture - Sagittal view.

Figure 2: CT-scan of the foot with calcaneal fracture - Transverse view.

The patient was given a lower leg cast for 6 weeks, after which the pain subsided and patient was advised to increase her activity level again. Due to increasing pain and swelling after removal of the cast,

patient returned to our outpatient service. Extensive swelling was seen over the complete foot and ankle. Infection parameters were not elevated. The MRI showed an incomplete union, there was no sign of osteomyelitis. The delayed union was treated with partial weight bearing in a lower leg cast for another 6 weeks. In the following period the patient twisted her left ankle frequently. A new X-ray showed malunion of the calcaneus in varus. The malunion resulted in tilting of the ankle. Due to the frequent sprains of the ankle and subsequent pain, a lateral sliding calcaneal osteotomy was performed (Figures 3 and 4).

Figure 3: Post-operative X-ray of the calcaneal osteotomy, fixation with two cancellous screws - Transverse view.

Figure 4: Post-operative X-ray of the calcaneal osteotomy, fixation with two cancellous screws - Sagittal view.

In screening our case DEXA scanning revealed osteopenia (femoral neck value T – 1,3 and Z – 1,6) and a vitamin D deficiency was revealed by chemical blood analysis. Patient was started on Vitamin D supplements to treat the vitamin D deficiency. Another risk factor found was the fact that patient was pre-menopausal and has used Depo-Provera (Pfizer, 235 East 42nd Street NY, NY 10017 USA) for more than 20 years. Depo-Provera has been shown to reduce bone mineral density in pre-menopausal women [5].

Discussion

There is an extensive differential diagnosis for traumatic and non-traumatic heel pain. One of those is a fracture of the calcaneus. Calcaneal fractures typically occur after falls from height. Spontaneous calcaneus fatigue fractures are uncommon. Calcaneal fatigue fractures are the result from multiple compressive loads in weight-bearing activities. They are most often seen in military recruits [1-3]. Furthermore Leabhart et al. [2] described that more calcaneal stress fractures occured in marine recruits who performed minimal to no physical activity before training started, compared to recruits who were physically active before training started. The patient described in our case suffered from a severe depression and performed no exercise in daily life, which put her at a greater risk of developing a stress fracture. An extra risk factor for a calcaneal stress fracture is the existence of a calcaneonavicular coalition, which is one of the tarsal coalitions, from which 48.1% is talocalcaneal and 43.6% is calcaneonavicular [4,6]. A tarsal coalition can be comprised of bone (osseous coalition), cartilage (synchondrosis) or fibrous tissue (syndesmosis) and may be partial or complete. The calcaneonavicular coalitions are mostly osseous. Classically these patients present with a rigid flat foot with abduction of the forefoot and heel valgus [6,7]. Due to the calcaneonavicular coalition the potential motion center between the calcaneus and the navicular bone is stiff and more pressure is distributed on the surrounding joints and bones, which more easily can result in a stress fracture. This fracture will mostly occur in the anterior process of the calcaneus [4]. Our patient did not show any form of a tarsal coalition and furthermore she did not show a calcaneal fracture in the anterior process but in the posterior process.

Symptoms of the calcaneus fatigue fracture include swelling on both sides of the heel and pain on palpation on medial and lateral aspects of the calcaneus.

Just as in the metatarsal stress fracture, in the first couple of weeks the X-rays may not become positive. A bone scan or MRI scan may be useful with negative radiographs.

The common treatment of a calcaneal (stress) fracture without displacement consists of reduction of activity in a cast or through brace immobilization for 6-8 weeks or until bone-healing is evident on radiographs and clinical symptoms have resolved.

If displacement exists or malunion occurs an operation to align and fixate the fracture parts is necessary.

Another differential diagnosis is that the patient could suffer of transient osteoporosis (TO) also known as bone marrow oedema syndrome (BMOS). The disorder was first described in 1959 by Curtiss and Kincaid [8]. Transient osteoporosis is a rare disorder without any clear pathogenesis, in which there is localized pain over the affected bone [9-11]. A plain radiograph can show signs of osteopenia or osteoporosis of the affected bone, which mostly is only seen after 4-10 weeks on primary complaints and a technetium diphosphonate bone imaging scan can show an increased uptake in affected bones. However the main finding is bone marrow edema in the affected extremities shown on MRI scanning [10,11]. It is most common in middle aged men and in woman in the third trimester of pregnancy of directly post-partum [11,12]. The hip, knee and ankle are mostly affected [9]. TO is a benign and self-limiting disorder, [9,11] although

Hofmann [13] describes it as the initial phase of avascular necrosis which is mostly self-limiting, but with the potential to progress in to avascular necrosis. It usually only affects one bone, but has been described as migratory in which more bones can be affected [14]. The foot is rarely involved an might be overlooked therefore. So far no clear pathogenesis has been shown, although many theories have been formed [10,15]. It is important to distinguish transient osteoporosis from other conditions such as, benign and malign neoplasms, infections, stress fractures, avascular osteonecrosis, degenerative osteoarthritis, plantar fasciitis, osteochondral lesions, and reflex symptomatic dystrophy.

Treatment regimens differ from NSAID's or analgesics [16] and bisphosphonate treatment [15,17], to bone marrow decompression [13,16,18] in combination with rest or immobilization. In most cases the bone marrow edema, osteoporosis and pain disappear in 3-10 months [9,19-25].

Conclusion

Heel pain can be caused by a fatigue fracture of the calcaneus [25-28].

The primary treatment is conservative in means of unloading the affected foot [29-34]. Due to displacement and subsequent malunion in varus resulting in instability our patient had to undergo a calcaneus osteotomy for realignment [35-38]. Further treatment consists of finding risk factors leading to fatigue fractures such as a tarsal coalition, infection, neoplasm, BMOS, osteopenia and overuse of the foot.

References

1. Kono T, Kanematsu T, Kitajima M (2009) Exodus of Kampo, traditional Japanese medicine, from the complementary and alternative medicines: is it time yet? Surgery 146: 837-840.
2. Motoo Y, Seki T, Tsutani K (2011) Traditional Japanese medicine, Kampo: its history and current status. Chin J Integr Med 17: 85-87.
3. Terasawa K (2004) Evidence-based Reconstruction of Kampo Medicine: Part-III-How Should Kampo be Evaluated? Evid Based Complement Alternat Med 1: 219-222.
4. Terasawa K (2004) Evidence-based Reconstruction of Kampo Medicine: Part I-Is Kampo CAM? Evid Based Complement Alternat Med 1: 11-16.
5. Denlinger CS, Engstrom PF (2011) Colorectal cancer survivorship: movement matters. Cancer Prev Res (Phila) 4: 502-511.
6. Hung A, Mullins CD (2013) Relative effectiveness and safety of chemotherapy in elderly and nonelderly patients with stage III colon cancer: a systematic review. Oncologist 18: 54-63.
7. Jin XL, Shibata C, Naito H, Ueno T, Funayama Y, et al. (2001) Intraduodenal and intrajejunal administration of the herbal medicine, dai-kenchu-tou, stimulates small intestinal motility via cholinergic receptors in conscious dogs. Dig Dis Sci 46: 1171-1176.
8. Nagano T, Itoh H, Takeyama M (1999) Effect of Dai-kenchu-to on levels of 3 brain-gut peptides (motilin, gastrin and somatostatin) in human plasma. Biol Pharm Bull 22: 1131-1133.
9. Shibata C, Sasaki I, Naito H, Ueno T, Matsuno S (1999) The herbal medicine Dai-Kenchu-Tou stimulates upper gut motility through cholinergic and 5-hydroxytryptamine 3 receptors in conscious dogs. Surgery 126: 918-924.
10. Kaneko A, Kono T, Miura N, Tsuchiya N, Yamamoto M (2013) Preventive Effect of TU-100 on a Type-2 Model of Colitis in Mice: Possible Involvement of Enhancing Adrenomedullin in Intestinal Epithelial Cells. Gastroenterol Res Pract 2013: 384057.
11. Kono T, Kaneko A, Omiya Y, Ohbuchi K, Ohno N, et al. (2013) Epithelial transient receptor potential ankyrin 1 (TRPA1)-dependent adrenomedullin upregulates blood flow in rat small intestine. Am J Physiol Gastrointest Liver Physiol 304: G428-436.
12. Kono T, Koseki T, Chiba S, Ebisawa Y, Chisato N, et al. (2008) Colonic vascular conductance increased by Daikenchuto via calcitonin gene-related peptide and receptor-activity modifying protein 1. J Surg Res 150: 78-84.
13. Kono T, Omiya Y, Hira Y, Kaneko A, Chiba S, et al. (2011) Daikenchuto (TU-100) ameliorates colon microvascular dysfunction via endogenous adrenomedullin in Crohn's disease rat model. J Gastroenterol 46: 1187-1196.
14. Munekage M, Ichikawa K, Kitagawa H, Ishihara K, Uehara H, et al. (2013) Population pharmacokinetic analysis of daikenchuto, a traditional Japanese medicine (Kampo) in Japanese and US health volunteers. Drug Metab Dispos 41: 1256-1263.
15. Munekage M, Kitagawa H, Ichikawa K, Watanabe J, Aoki K, et al. (2011) Pharmacokinetics of daikenchuto, a traditional Japanese medicine (kampo) after single oral administration to healthy Japanese volunteers. Drug Metab Dispos 39: 1784-1788.
16. Manabe N, Camilleri M, Rao A, Wong BS, Burton D, et al. (2010) Effect of daikenchuto (TU-100) on gastrointestinal and colonic transit in humans. Am J Physiol Gastrointest Liver Physiol 298: G970-975.
17. Quinn B (2013) Efficacy of a supersaturated calcium phosphate oral rinse for the prevention and treatment of oral mucositis in patients receiving high-dose cancer therapy: a review of current data. Eur J Cancer Care (Engl) 22: 564-579.
18. Stindt D, Brown MJ (2013) Chemotherapy-Induced mucositis. Adv NPs PAs 4: 27-28.
19. Kase Y, Hayakawa T, Aburada M, Komatsu Y, Kamataki T (1997) Preventive effects of Hange-shashin-to on irinotecan hydrochloride-caused diarrhea and its relevance to the colonic prostaglandin E2 and water absorption in the rat. Jpn J Pharmacol 75: 407-413.
20. Kono T, Kaneko A, Matsumoto C, Miyagi C, Ohbuchi K, et al. (2014) Multitargeted Effects of Hangeshashinto for Treatment of Chemotherapy-Induced Oral Mucositis on Inducible Prostaglandin E2 Production in Human Oral Keratinocytes. Integr Cancer Ther.
21. Kono T, Satomi M, Chisato N, Ebisawa Y, Suno M, et al. (2010) Topical Application of Hangeshashinto (TJ-14) in the Treatment of Chemotherapy-Induced Oral Mucositis. World J Oncol 1: 232-235.
22. Andre T, Boni C, Mounedji-Boudiaf L, Navarro M, Tabernero J, et al. (2004) Oxaliplatin, fluorouracil, and leucovorin as adjuvant treatment for colon cancer. N Engl J Med 350: 2343-2351.
23. Hidaka T, Shima T, Nagira K, Ieki M, Nakamura T, et al. (2009) Herbal medicine Shakuyaku-kanzo-to reduces paclitaxel-induced painful peripheral neuropathy in mice. Eur J Pain 13: 22-27.
24. Kono T, Mamiya N, Chisato N, Ebisawa Y, Yamazaki H, et al. (2011) Efficacy of goshajinkigan for peripheral neurotoxicity of oxaliplatin in patients with advanced or recurrent colorectal cancer. Evid Based Complement Alternat Med 2011: 418481.
25. Yoshida T, Sawa T, Ishiguro T, Horiba A, Minatoguchi S, et al. (2009) The efficacy of prophylactic Shakuyaku-Kanzo-to for myalgia and arthralgia following carboplatin and paclitaxel combination chemotherapy for non-small cell lung cancer. Support Care Cancer 17: 315-320.
26. Nishioka M, Shimada M, Kurita N, Iwata T, Morimoto S, et al. (2011) The Kampo medicine, Goshajinkigan, prevents neuropathy in patients treated by FOLFOX regimen. Int J Clin Oncol 16: 322-327.
27. Kono T, Hata T, Morita S, Munemoto Y, Matsui T, et al. (2013) Goshajinkigan oxaliplatin neurotoxicity evaluation (GONE): a phase 2, multicenter, randomized, double-blind, placebo-controlled trial of goshajinkigan to prevent oxaliplatin-induced neuropathy. Cancer Chemother Pharmacol.
28. Kawakami Z, Kanno H, Ueki T, Terawaki K, Tabuchi M, et al. (2009) Neuroprotective effects of yokukansan, a traditional Japanese medicine,

on glutamate-mediated excitotoxicity in cultured cells. Neuroscience 159: 1397-1407.

29. Kawakami Z, Ikarashi Y, Kase Y (2010) Glycyrrhizin and its metabolite 18 beta-glycyrrhetinic acid in glycyrrhiza, a constituent herb of yokukansan, ameliorate thiamine deficiency-induced dysfunction of glutamate transport in cultured rat cortical astrocytes. Eur J Pharmacol 626: 154-158.
30. Mizoguchi K, Shoji H, Tanaka Y, Tabira T (2011) Ameliorative effect of traditional Japanese medicine yokukansan on age-related impairments of working memory and reversal learning in rats. Neuroscience 177: 127-137.
31. Mizoguchi K, Tanaka Y, Tabira T (2010) Anxiolytic effect of a herbal medicine, yokukansan, in aged rats: involvement of serotonergic and dopaminergic transmissions in the prefrontal cortex. J Ethnopharmacol 127: 70-76.
32. Nishi A, Yamaguchi T, Sekiguchi K, Imamura S, Tabuchi M, et al. (2012) Geissoschizine methyl ether, an alkaloid in Uncaria hook, is a potent serotonin â‚A receptor agonist and candidate for amelioration of aggressiveness and sociality by yokukansan. Neuroscience 207: 124-136.
33. Matsuda Y, Kishi T, Shibayama H, Iwata N (2013) Yokukansan in the treatment of behavioral and psychological symptoms of dementia: a systematic review and meta-analysis of randomized controlled trials. Hum Psychopharmacol 28: 80-86.
34. Ohno T, Yanai M, Ando H, Toyomasu Y, Ogawa A, et al. (2011) Rikkunshito, a traditional Japanese medicine, suppresses cisplatin-induced anorexia in humans. Clin Exp Gastroenterol 4: 291-296.
35. Yakabi K, Sadakane C, Noguchi M, Ohno S, Ro S, et al. (2010) Reduced ghrelin secretion in the hypothalamus of rats due to cisplatin-induced anorexia. Endocrinology 151: 3773-3782.
36. Takeda H, Sadakane C, Hattori T, Katsurada T, Ohkawara T, et al. (2008) Rikkunshito, an herbal medicine, suppresses cisplatin-induced anorexia in rats via 5-HT2 receptor antagonism. Gastroenterology 134: 2004-2013.
37. Fujitsuka N, Asakawa A, Uezono Y, Minami K, Yamaguchi T, et al. (2011) Potentiation of ghrelin signaling attenuates cancer anorexia-cachexia and prolongs survival. Transl Psychiatry 1: e23.
38. Seike J, Sawada T, Kawakita N, Yamamoto Y, Yuasa Y, et al. (2011) A New Candidate Supporting Drug, Rikkunshito, for the QOL in Advanced Esophageal Cancer Patients with Chemotherapy Using Docetaxel/5-FU/CDDP. Int J Surg Oncol 2011: 715623.