



## An Unusual Stress Fracture of the Proximal Phalanx of the Second Toe in a Common Peroneal Nerve Palsy Patient Associated With Hallux Valgus

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Stress fractures of the foot are common, but rare in the toes. Most reported stress fractures of the toes are in the great toes and have been associated with hallux valgus deformity. Stress fracture of the proximal phalanx of the second toe has been reported in only one case and it was a sport-related injury. Hallux valgus and abnormal gait related stress fracture of the proximal phalanx of the second toe has not been reported. We present a 41-year-old male, who had neurogenic equinus and hallux valgus of right foot suffering from stress fracture of the proximal phalanx of the second toe. Eventually, he received the operation for correcting the hallux valgus and equinus contracture, and conservative treatment with casting for the stress fracture. Good union of the fracture was achieved following our intervention.

Key words: second toe; phalanx; stress fracture; common peroneal nerve injury; hallux valgus

### INTRODUCTION

Stress fractures of the foot are common, usually in the metatarsals<sup>1,2</sup>, but rare in the toes. Yokoe and Mannoji in 1986 reported a case series of a sprinter, a Kendo player, and a rugby player with this injury in the great toe.<sup>3</sup> Then Shiraishi and colleagues in 1993 reported three cases of this injury in a long distance runner, a volleyball player, and a soccer player.<sup>4</sup> Matsusue and colleagues in 1992 reported this injury in a shot putter.<sup>5</sup> Pitsis in 2004 reported two cases of this injury in a triathlete and a gymnast.<sup>6</sup> Pitsis and colleagues in 2003 reported this injury of the proximal phalanx of the second toe in a basketball player.<sup>7</sup> We can find most of the patients were young athletes reporting stress fractures of the great toe with associated hallux valgus deformity. Hallux valgus and abnormal gait related stress fracture of the proximal phalanx of the second toe had not been reported. We present a case and illustrate particular features and the treatment of this rare injury.

### CASE REPORT

A 41-year-old male, businessman had experienced fracture of right tibial plateau complicated by common peroneal nerve injury about 4 years ago. Impaired dorsiflexion of the right ankle with stand-on-toe position and high-stepping with “foot slapping” gait were noted. In addition, pain and valgus deformity in the right great toe (Fig.1 left) were noted since two years ago and pain in the second toe especially the push off phase of walking was noted without significant trauma since one year ago. He has no other notable personal or family history. Physical examination at our orthopaedic out-patient department showed right foot drop, equinus deformity, Achilles tendon contracture with walk-on-toe gait, hallux valgus with overriding right great toe on the second toe and painful plantar callus development on the second toe. There was mild swelling and pain localized to the right second metatarsophalangeal joint. Plain radiography revealed hallux valgus with medial exostosis of the first metatarsal head and a minimal displaced fracture of the proximal phalanx of the right second toe.(Fig.2 left) Eventually, he received the McBride procedure operation, bunionectomy and lengthening of extensor hallucis longus tendon for correcting the hallux valgus (Fig.1 right & 2 middle), lengthening of the Achilles tendon for correcting the equinus contracture and conservative treatment with casting of the stress fracture. Excellent clinical and radiological union of the stress fracture was achieved within 10 weeks of splint fixation and non-weight-bearing rest using crutches (Fig.2 right). No recurrent walk-

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Fig. 1 The gross appearance of hallux valgus. Left: Preoperative picture. Right: Postoperative picture.

ing pain of the right foot was found from phone-inquiry about two years later.

## DISCUSSION

### Pathophysiology

The walk-on-toe gait resulted from common peroneal nerve injury complicated by equinus contracture. In addition, hallux valgus developed after the accident three years later. Because of the equinus contracture of the foot and the overriding big toe on the second toe (Fig.1 left), the second toe touched the floor first when stepping. Therefore, the second toe bears the biggest transient force from either the axial compressive forces on the toes or the windlass action of the plantar aponeurosis and muscle. There may have been offloading of the stress from the shaft to the adjacent proximal aspect of the phalanx, possibly related to the adjacent hypermobile first ray and hyperpronation of the foot during walking.<sup>7</sup> Besides, the shear force generated by repeatedly striking the ground was also the possible cause. Theoretically, equinus contracture and hallux valgus are both the postulated biomechanical predisposing factors to this stress fracture.

### Treatment

This kind of stress fracture was expected to heal with conservative treatment of four to six weeks of non-weight-bearing rest. The predisposing factors need to be solved appropriately. Therefore, we performed corrective surgeries of the hallux valgus and Achilles tendon contracture several months later followed by conservative treatment of the stress fracture with casting. Besides, we had informed the patient that tendon transfer is considered necessary for his neurogenic equinus. However,



Fig. 2 Left: Valgus deformity of right big toe with medial exostosis of first metatarsal head and a minimal displaced fracture of the proximal phalanx of the second toe.(arrow: fracture site) Middle: radiograph after corrective surgery of hallux valgus. (arrow: fracture site) Right: Radiological union of the stress fracture at 10 weeks after diagnosis.

he still wanted to try the physical therapy and orthosis-wearing at that time.

There have been eleven reported cases of sports related stress fracture of the first proximal phalanx in the previous literatures. It is thought to be associated with repeated forced dorsiflexion of the first metatarsophalangeal joint in sports. Eight of the eleven cases were adolescent athletes. This group seems to have a tendency for this kind of stress fracture. Besides, many cases had an associated hallux valgus as a biomechanical predisposing factor. There was only one stress fracture of the proximal phalanx of the second toe, which was reported in a volley ball player. So far, there is no research on the hallux valgus related stress fracture of the second toe. In our case, a middle-aged male with the sequela of common peroneal nerve injury, equinus contracture and hallux valgus were both determined to be biomechanical predisposing factors resulting in the structure-related stress fracture. We thought these factors may expose the patient to higher levels of stress on the second toe in the weight-bearing activities. This reminds us to be alert to this injury in patients with abnormal gaits or deformed feet presenting with pain in the feet.

Also, there was no discussion of the relationship between equinus contracture and hallux valgus deformity in the previous literatures according to our search. Perhaps someone will offer his viewpoint after further studies.

## CONCLUSIONS

An unusual stress fracture of the proximal phalanx of the second toe is presented. Conservative treatment with non-weight-bearing rest resulted in clinical and radiological improvement. In conclusion, this diagnosis should be added to the list of differential diagnoses if the patients present with feet pain, particularly in patients with abnormal gaits or deformed feet.

## REFERENCES

1. Brudvig TJ, Gudger TD, Obermeyer L. Stress fracture in 295 trainees: a one year study of incidence as related to age, sex and race. *Milit Med* 1983;148:666-667.
2. McBryde AM. Stress fractures in runners. *Clin Sports Med* 1985;4:737-752.
3. Yokoe K, Mannoji T. Stress fracture of the proximal phalanx of the great toe: a report of three cases. *Am J Sports Med* 1986;14:240-242.
4. Shiraishi M, Mizuta H, Kubota K, Sakuma K, Takagi K. Stress fracture of the proximal phalanx of the great toe. *Foot Ankle* 1993;14:28-34.
5. Matsusue Y, Yamamuro T, Nakagawa Y, Hama H. Stress fracture of the proximal phalanx of the great toe: the case report of a shot-putter. *Clin J Sport Med* 1992;2:279-282.
6. G C Pitsis, J P Best, M R Sullivan. Unusual stress fractures of the proximal phalanx of the great toe: a report of two cases. *Br J Sports Med* 2004;38:e31.
7. Pitsis G, Perry P, Van der Wall H. Stress fracture of the proximal phalanx of the second toe. *Clin J Sports Med* 2003;13:118-119.