

Os Intermetatarsium Revisited: A Case Report of Rare Variant and Review of Literature

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ABSTRACT

Os intermetatarsium is the rarest accessory bone of the foot. It is usually found between 1st and the 2nd metatarsal bases arising typically from the base of the 2nd metatarsal. Only a few symptomatic cases have been reported in the literature, which were either unilateral or bilateral and radiographically they were of different shapes and sizes. We present a large, bilaterally symmetrical and unusual variant of os intermetatarsium. To our knowledge, such large, bilaterally symmetrical, fully formed os intermetatarsium, fusing to both metatarsals has not been described before. The case report also describes the surgical anatomy during the excision of os intermetatarsium and review of the literature to date.

Keywords: Os intermetatarsium, Accessory bone of the foot, Metatarsal bar, Deep peroneal nerve compression.

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INTRODUCTION

Gruber first described os intermetatarsium way back in 1877. Ever since, only a few cases of symptomatic os intermetatarsium have been reported. The incidence of os intermetatarsium quoted in the literature from cadaveric and radiological studies ranges from 0.2 to 12.5%. Coskun et al² identified 0.2% incidence in a radiographic study among 984 Turkish patients. Cilli found an incidence of 1.2% in 464 radiographs. Tsuruta et al⁴ studied the accessory bones of foot and ankle in 3460 radiographs of patients over a period of 7 years and observed that os Intermetatarsium is the rarest of the accessory bones of the foot and ankle with an incidence of 2.6%. Pfitzer⁵ documented a 12.5% incidence in his report of 520 cadaver dissections. Os intermetatarsium is usually bilateral and arises most commonly from the base of the 2nd metatarsal. It can be rudimentary or a

fully formed bone and can be of any shape or size.^{6,7} In our case, os intermetatarsium represents a large bony bridge between 1st and 2nd metatarsal.

CASE REPORT

A 14-year-old boy, who does karate at professional level, presented with a 4 months history of pain and prominence on the dorsum of the both feet. Pain aggravates during his karate training and especially when he sits on his heels. He was also complaining of intermittent pins and needles radiating to the 1st and 2nd toes.

On examination, he had normal gait, had prominence on the dorsum of both feet (Fig. 1). Both feet have normal medial arch and overall alignment of both lower limbs is normal. Palpating over the prominence caused mild discomfort and was bony hard in consistency. There were no neurovascular deficits, but Tinel's sign was positive on percussing over the base of the swelling. There was no hypermobility of the hallux. He had full range of movement in his ankle, subtalar, midfoot and forefoot. Knees, hips and spine were clinically normal. He had no generalized joint laxity.

Radiographs were obtained which demonstrated bony mass bridging between the first and second metatarsal (Fig. 2). With a differential diagnosis of osteochondroma a further CT scan was performed which clearly demonstrated the fused separate ossification center at the base of the second metatarsal and fully formed os intermetatarsium fused to the first metatarsal (Fig. 3).



Fig. 1: Prominence over the dorsum of both feet

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After consultation with the parents and with the patient, excision of os intermetatarsium of both feet was performed.

Surgical technique itself is an exercise in dissecting the neurovascular bundle and protecting them throughout the procedure (Figs 4 to 6).

Interoperatively, on both sides we noticed identical findings of inflammation and thickening of the deep peroneal nerve, just above the large os intermetatarsium. Os intermetatarsium itself was found arising from the base of the second metatarsal and extending distally to fuse with the shaft of the first metatarsal distally. This was excised and it measured $5 \times 1 \times 0.5$ cm on both sides (Fig. 6). At 3 months follow-up he was symptom-free and was allowed to go back to sports. At the final follow-up of 18 months he remained symptom-free and was back to his professional karate and plays all other sports without any problems. Radiographs at the final follow-up were normal with no further regrowth (Fig. 7).

DISCUSSION

Os intermetatarsium is a rare but well-documented accessory bone of the foot. It could be an incidental finding on routine radiographs or diagnosed when they become symptomatic. It can present as unilateral, bilateral, typically arising from the base of the 2nd or 1st metatarsals but can very rarely arise between 4th and 5th metatarsals.⁸ Various theories have been put forward. It



Fig. 2: Os intermetatarsium bridging 1st and 2nd metatarsal

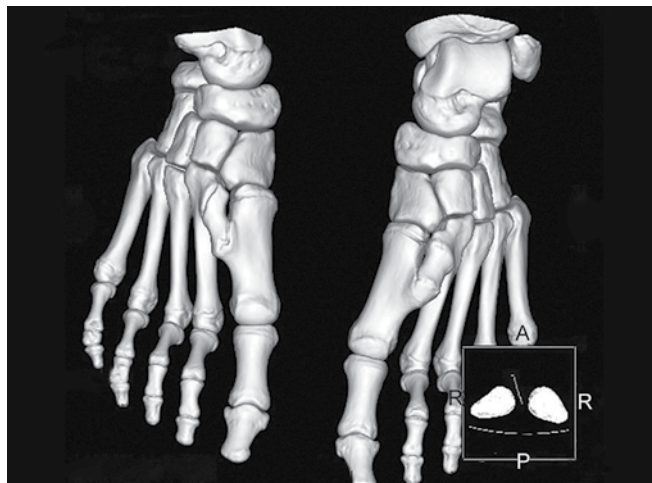


Fig. 3: Computed tomography reconstruction showing os intermetatarsium with ossification center at the base of the 2nd metatarsal



Fig. 4: Neurovascular bundle underneath the EHB

is commonly believed that it is a form of polydactylism.⁶ Henderson⁶ in his article proposed that this bony spur as the lost 1st plantar interosseous muscle and as a contributing factor for the development of the hallux valgus deformity in a case series of four patients. Friedl⁹ believed that it is a sesamoid bone of the first dorsal interosseous muscle from the calcification of the accessory tendon of the dorsal interosseous muscle. Our case demonstrates a complete bar extending from the base of the second metatarsal and fusing to the 1st metatarsal symmetrically in both feet suggestive of probable polydactylism or poly metatarsial etiology.

We did an extensive literature search and found that, from the time it was first described in 1877,¹ only 16 symptomatic cases of os intermetatarsium were reported. Reichmister¹⁰ presented three cases in a 19, 25 and 44 years old individuals who presented with dorsal foot pain. Knackfuss et al¹¹ reported a case of os intermetatarsium, compressing on the medial branch of the deep peroneal nerve in a 52-year-old female patient. Smith and Welch¹² reported a case of painful

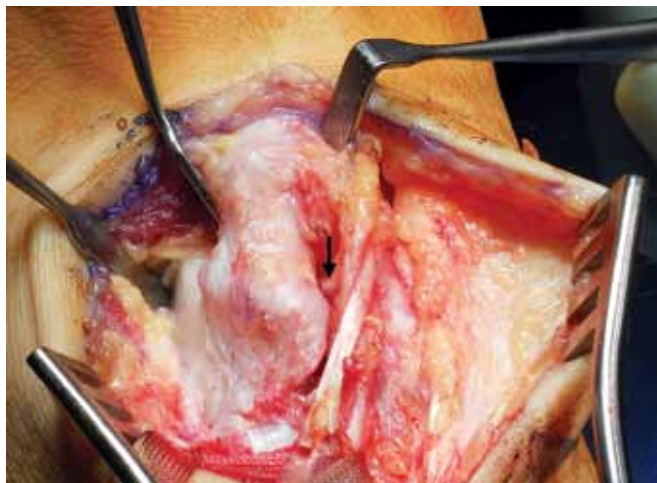


Fig. 5: Os intermetatarsium, between first and the second metatarsal. Arrow showing dorsalis pedis artery in close proximity to os intermetatarsium, coursing in between the base of 1st and 2nd metatarsal



Fig. 6: Excision of os intermetatarsium. Arrow showing dorsalis pedis artery



Fig. 7: Postoperative radiograph of both feet at final follow-up

os intermetatarsium without neurologic symptoms. It appears that symptomatic os intermetatarsium is usually presented during preadolescent or adolescent age groups and mainly symptomatic with sport

related activities. Nakasa et al¹³ from Japan described four cases in athletes. Ruffing et al¹⁴ from Germany described this entity in two athletes. Noguchi et al¹⁵ reported a painful os intermetatarsium in a soccer player. Waters¹⁶ in 1958 and Scarlet et al¹⁷ in 1978 reported a case of painful os intermetatarsium. In all these cases, symptoms were consistent with dorsal foot pain or compression neuropathy of the deep peroneal nerve. However, there is evidence-suggesting association between os intermetatarsium, metatarsus primus varus and hallux valgus.^{6,18} Henderson⁶ in his series of 4 patients described metatarsus primus varus and hallux valgus due to os intermetatarsium. Noguchi et al¹⁸ reported a case of bilateral hallux valgus associated with os intermetatarsium. Our patient was a 14-year-old karate player with deep peroneal nerve symptoms due to the stretch and compression of the nerve over the os intermetatarsium. In all these cases, symptoms improved after the excision of os intermetatarsium.

Compression of the nerve occurs typically between the os intermetatarsium and Extensor Hallucis Brevis (EHB). EHB forms the key anatomical landmark during the excision of os intermetatarsium. Deep peroneal nerve and dorsalis pedis artery lie just underneath EHB (Fig. 4) and can safely be protected by retracting EHB subperiosteally. One needs to be extremely careful in excising the proximal end of the os intermetatarsium, as the branch of the dorsalis pedis artery can be just coursing in close proximity between the base of 1st and 2nd metatarsal to form the deep plantar arch (Figs 5 and 6).

The deep peroneal nerve branches into medial and lateral branches just distal to the ankle mortise. Lateral branch provides motor innervation to extensor digitorum brevis (EDB) and EHB. Medial branch of the deep Peroneal nerve, courses over the talonavicular joint capsule and lies lateral to the first tarsometatarsal joint, then passes deep to the EHB tendon, where it is susceptible for compression between the EHB and os intermetatarsium. It further continues forward and bifurcates just before it terminates to give sensory innervation to the first web space.

CONCLUSION

Os intermetatarsium is a rear accessory bone of the foot. Young athletes presenting with dorsal foot pain and symptoms of deep peroneal nerve compression should raise the suspicion of this entity and should be a part of differential diagnosis of the dorsal foot pain. It is best investigated with radiographs and a CT scan. Magnetic resonance imaging scan may be needed rarely if not identified on a radiograph.¹⁹ Os intermetatarsium can be treated successfully by surgical excision.

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