

INTRODUCTION

Heterotopic ossification (HO) is a known and documented sequela of osteotomy and bony injury. Previous literature has focused primarily on HO following hip and knee arthroplasty and high energy trauma. There is a scarcity of podiatric literature describing HO in the foot, most pertinently following partial amputation. Ergo, there is a paucity of literature stating the incidence of HO or discussing risk factors associated with its development in the foot following partial amputation. We present a case series of said surgical sequelae.

LITERATURE REVIEW

The most widely used classification system for HO outside the foot and ankle is that developed by Brooker et al who described a four-stage classification regarding HO about the hip joint⁸. Boffelli et al¹² developed a classification scheme for the radiographic staging criteria to quantify the severity of HO in the foot.

Prophylactic management includes treatments aimed at; disrupting the inductive signaling pathway, altering the osteoprogenitor cells in the target tissue and/or modifying the environment which is conducive to osteogenesis. Two modalities for HO occurrence or recurrence are oral nonsteroidal anti-inflammatory drug (NSAID) therapy and low-dose radiation therapy¹⁷.

Bedi et al¹⁹ found in their study of 616 patients that the incidence of HO after hip arthroscopy is comparable with that after open surgical dislocation of the hip. Boffelli et al²⁰ retrospectively analyzed 72 patients who underwent partial metatarsal resection and radiographically diagnosed incidence of HO in 75%. The initial onset of heterotopic ossification was not appreciated until greater than ten weeks postoperatively.

Prior history of HO is thought to be the most significant risk factor. Furthermore, the severity of the HO appears to be a risk factor for developing clinically significant HO. Armstrong et al²³ in their study of ninety-two diabetic adults who had an isolated partial amputation of a ray of the foot found the formation of HO, as defined by more than three millimeters of regrowth on repeat radiographs, in forty-one (45%). They concluded that intraoperative reasoning for forming HO in the foot, included osteotomy at the metaphyseal region and use of hand rather than power instrumentation.

CASE #1

A 68 year old male with a PMH of DM Type 2, HTN, CAD, Hypothyroidism presented with gangrene of the Left foot and underwent staged incision and drainage with drainage transmetatarsal amputation with subsequent primary closure.

Follow up was uneventfully pursued until the appearance of heterotopic bone was identified during postoperative outpatient follow up appointment.

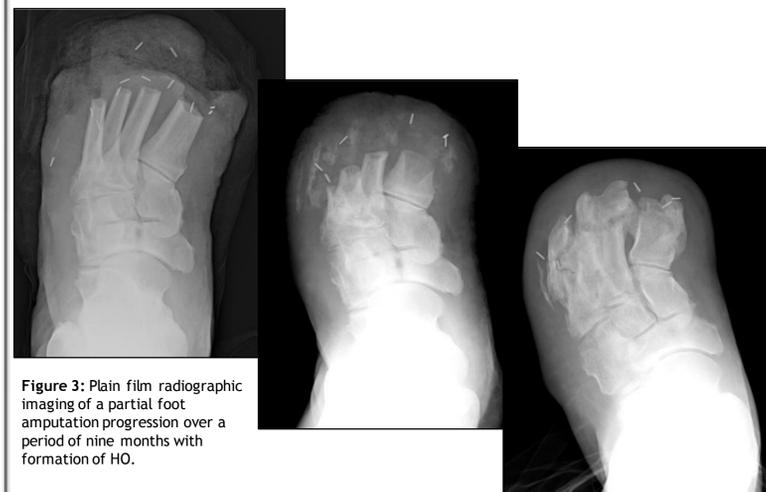


Figure 3: Plain film radiographic imaging of a partial foot amputation progression over a period of nine months with formation of HO.

This patient underwent several surgical interventions to resect heterotopic bone formation that caused aberrant plantar pressure and subsequent pressure ulceration. Three stages of HO are recognized and identified as early, intermediate, and mature



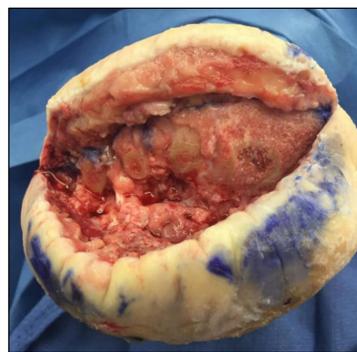
CASE #2



This 40 year old male with PMH of DM Type 2, HTN, and previous digital amputation originally presented with plantar 1st MPJ infection and confirmed osteomyelitis. After undergoing staged debridement with eventual transmetatarsal amputation in the face of clean operative post-debridement cultures this patient was discharged and follow up commenced.

Follow up revealed aggressive heterotopic ossific bone formation and bone bridging to adjacent metatarsals in an accelerated timeline.

This patient underwent subsequent resection of heterotopic bone formation and revisional TMA with additional single-dose radiation therapy, in the hopes that it would prophylax against further abnormal bone formation.



CASE #3

This 76 year old female with PMH of DM Type 2, HTN, ESRD and COPD originally presented with lateral 5th metatarsal exposed bone and confirmed osteomyelitis. After undergoing staged debridement with eventual partial 5th ray amputation and closure in the face of clean operative post-debridement cultures.

Follow up revealed progressive heterotopic ossific bone formation and bone bridging to the adjacent 4th metatarsal.

Fortunately for this patient, no aberrant plantar pressures or otherwise were observed and no additional surgical interventions were required following primary closure of this amputation.



Figure 6: Plain film Radiographic imaging of partial fifth ray amputation progression over a period of seven months with formation of heterotopic ossification. This patient was managed conservatively with relief padding and custom orthoses.

CONCLUSION

Incorporating the published evidence reveals a knowledge gap regarding heterotopic ossification in the foot following partial amputation. However, through a combined effort, the establishment of incidence, risk stratification, early detection, and development of systemic and local prophylaxis and treatment may soon be attainable. For the time being, continued advancement of useful screening tools and predisposing factors will aid in further understanding of this anecdotally prevalent pathology as well as to help further the treatment and prophylaxis of these patients and prevent the complication of heterotopic ossification in the foot following partial amputation. Future research should place emphasis on the establishment of incidence of HO in the foot following partial amputation, elucidate predisposing risk factors in its formation, as well as the further development of safe treatment and/or prophylaxis practices.

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