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Traumatic boutonniere deformity of the second toe caused by sumo wrestling: A case report

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ABSTRACT

INTRODUCTION: Traumatic boutonniere deformities of the fingers are well documented unlike those of the lesser toes. With few existing reports on boutonniere deformities of the lesser toes, the related pathology and treatment guidelines remain unclear.

PRESENTATION OF CASE: We present a case of traumatic boutonniere deformity of the second toe caused by sumo wrestling in a 23-year-old man. A flexion deformity of the proximal interphalangeal joint and hyperextension of the distal interphalangeal joint of the right second toe were observed, including a torn central slip and plantarly displaced lateral bands during surgery. Surgical repair of the extensor mechanism and temporary pinning led to good clinical results.

DISCUSSION: Acute traumatic boutonniere deformity of the interphalangeal joint of the lesser toe is very rare. The mechanism of boutonniere deformity in this case is thought to be due to forced passive flexion exerted on an actively extended PIP joint, which is similar to that seen in fingers.

CONCLUSION: We describe the pathophysiology of a case of boutonniere deformity of the lesser toe and suggest the effectiveness of surgical treatment.

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1. Introduction

The boutonniere deformity involves the rupture of the central slip of the extensor tendon, which results in a flexion deformity of the proximal interphalangeal (PIP) joint. Furthermore, the lateral bands slip to the volar side, which causes hyperextension of the distal interphalangeal (DIP) joint [1,2]. Boutonniere deformity is more commonly known as a finger deformity among orthopedic surgeons. However, only three reports regarding boutonniere deformity of the lesser toe, also known as “acute Hammer toe,” have been previously presented [3–5]. Here, we report a rare case of boutonniere deformity of the second toe. This work has been reported in line with the SCARE criteria [6].

2. Presentation of case

A 23-year-old man was sumo wrestling (Japanese national sport) on a sandy beach when he felt some discomfort in his right forefoot and noticed a deformity in his right second toe on account of which he presented to the hospital on the same day. No manual reduction for dislocation was performed before the visit. Examination

of his right second toe revealed minimal swelling and flexion deformity at the PIP joint with associated hyperextension of the DIP joint (Fig. 1). The patient could flex the PIP joint but was unable to actively extend it. Manual correction of the deformity was simple, but the deformity easily recurred. The digit appeared normal under neurovascular examination and no fractures or dislocations were observed with plain radiography and computed tomography (Fig. 2). He had no history of trauma, forefoot bone or joint disorders, or inflammatory disease and had not taken any recent steroid injections. Moreover, he had no significant medical history, no family history including any genetic information, and no psychosocial history. All blood laboratory parameters were within the normal limits. The findings and management plan were discussed with the patient. Informed consent was obtained, and the patient prepared and was moved to the theatre surgery.

The right second toe was repaired surgically by an experienced orthopedic surgeon. The dorsal aspect of the second toe was approached using an arcuate dorsal incision in supine position under spinal anesthesia using air tourniquet. Surgical exploration confirmed that the central slip was torn over the PIP joint, and the lateral bands were displaced plantarly. A small stump remained at the insertion of the slip into the middle phalanx. There was no bony or articular damage (Fig. 3). The PIP joint was transfixed in the neutral position using a surgical wire. The central slip was repaired with a simple single-knot, and the lateral bands were recentral-

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Fig. 1. Preoperative photograph. Right second toe with a flexion deformity of the proximal interphalangeal joint and hyperextension of the distal interphalangeal joint (boutonniere deformity).

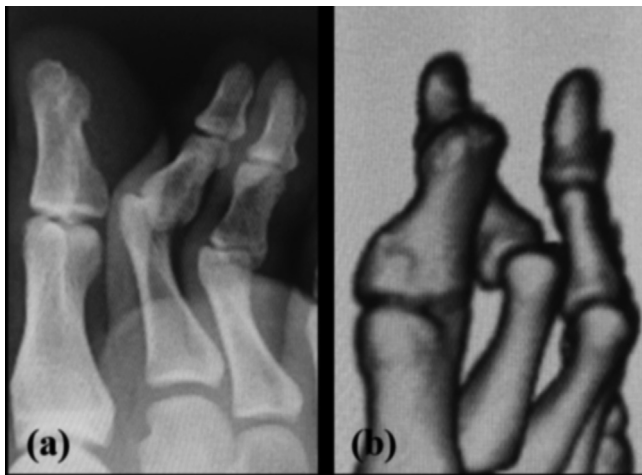


Fig. 2. Radiographic examination. (a) Plain radiography and (b) computed tomography revealed no fracture or dislocation.

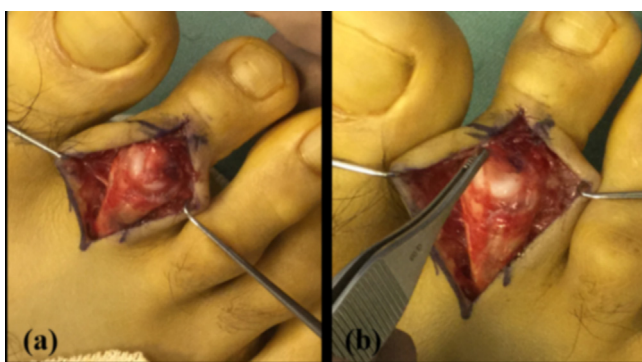


Fig. 3. Surgical findings. (a) The central slip is torn, and the lateral bands are displaced plantarly. (b) Forceps pinching the margin of the central band.

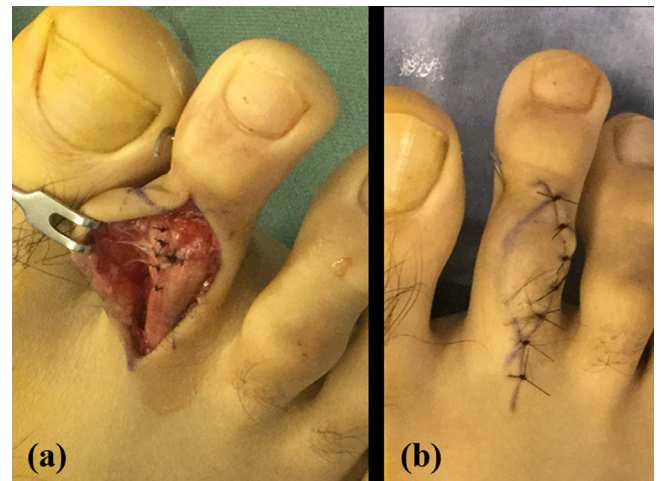


Fig. 4. Surgical repair of the extensor mechanism and temporary pinning. (a) Before skin closure. (b) After skin closure.

ized (Fig. 4). Postoperatively, he was not allowed heavy lifting for 4 weeks. The surgical wire was removed 4 weeks post operation, and the patient resumed his normal activities. The toe had the same range of motion as that on the contralateral side, and there was no recurrence of deformity. The patient did well and was satisfied with the outcome.

3. Discussion

Acute traumatic boutonniere deformity of the interphalangeal joint of the lesser toe is a very rare type of forefoot injury [3–5]. Judo, kickboxing, and traffic accidents have been previously reported to cause a boutonniere deformity of the lesser toe [3–5]. Acute traumatic boutonniere deformity of the lesser toe is thought to be due to moderate energy trauma. In the current case, the deformity was caused by sumo wrestling. The mechanism of boutonniere deformity of the lesser toe and of the fingers is the same, both being observed following closed injuries. It is thought to occur due to forced passive flexion exerted on an actively extended PIP joint [4,5]. Similar to previous reports [4,5], the current case demonstrated a ruptured central slip of the extensor tendon with the margin of the ruptured central slip remaining in the middle phalanx. The lateral bands were displaced plantarly and acted on the PIP and DIP joints in a similar manner to that seen in the more common finger deformities, with the bands causing flexion of the PIP joint and hyperextension of the DIP joint.

Dislocation of the big or lesser toe is relatively rare, and has mostly been described in case reports as no epidemiological studies have been performed on this topic [7–9]. A previous study reported a PIP joint dislocation that was accompanied by a boutonniere deformity of the lesser toe [5], while another report did not specify dislocation [4]. In the current case, the boutonniere deformity was not accompanied by dislocation. Further case reports need to be accumulated regarding the relationship between the boutonniere deformity and dislocation of the PIP joint.

Both conservative treatment by various types of splints [10] and surgical treatments have been developed for boutonniere deformities of the finger [11,12]. The treatment for a boutonniere deformity of the lesser toe has not been established because of the small number of cases. There are no reports of conservative treatment using splints for boutonniere deformities of the lesser toe. Realistically, we believe that splint treatment is difficult due to the morphology of the toes. Furthermore, surgical treatment has previously been recommended for treating boutonniere deformity of the lesser toes [4,5]. Similar to that in previous reports, surgical treatment was

utilized in the current case, and the clinical result was found to be satisfactory.

4. Conclusion

We report a case of boutonniere deformity of the lesser toe. The mechanism of boutonniere deformity of the toe is the same as in the fingers. However, unlike that of the fingers, conservative treatment may be difficult in boutonniere deformity of the toe. Surgical repair of the extensor mechanism and temporary pinning were effective as in the present case.

In conclusion, this report describes findings regarding the pathophysiology of boutonniere deformity of the lesser toe and suggests the effectiveness of surgical treatment for this condition. Additional case reports of other successful treatments are needed to help reach a consensus for the optimal treatment of such patients.

Declaration of Competing Interest

The authors declare that there is no conflict of interest regarding the publication of this article.

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Ethical approval

The study protocol adhered to the ethical guidelines of the 1975 Declaration of Helsinki, and the study was approved by the institutional review board of our institute.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Author contribution

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Akira Hashimoto: Writing - Original draft preparation.
Sakumo Kii: Writing - Reviewing and Editing.
Shuichi Eto: Writing - Reviewing and Editing.
Tatsuya Sakai: Writing - Reviewing and Editing.
Masaaki Mawatari: Supervision.

Registration of research studies

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