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A Soft Tissue Syndesmosis Procedure Salvaging a Failed Osteotomy Procedure for Hallux Valgus Deformity Correction: A Case Report

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Introduction

The hallux valgus (HV) is a common deformity of the foot. It can be corrected by soft tissue, osteotomy, or arthrodesis procedures. Soft tissue procedures have been considered less effective for their correction.[2] If a soft tissue procedure fails, osteotomy procedures are usually recommended for salvage. If an osteotomy procedure fails, a revision osteotomy or metatarsocuneiform fusion would be recommended.[4] However, to the author's knowledge, there has not been any report of a soft tissue procedure capable of salvaging a failed osteotomy procedure.

The soft tissue syndesmosis procedure is a non-osteotomy, non-arthrodesis technique. It applies 1-2 intermetatarsal cerclage sutures to realign the first metatarsal. Then, it induces a soft tissue syndesmosis-like connecting structure formation between the first and second metatarsals to prevent them from separating and, thus, metatarsus primus varus and HV deformities from recurring.[13,14]

Case Report

A 59-year-old woman had left foot chevron and Akin osteotomies 10 years earlier, and her postoperative recovery phase and pain were longer and more painful than she expected. Her preoperative symptoms of bunion pain, thick metatarsal callus, and metatarsalgia were unresolved. When her right foot HV condition worsened enough, she sought surgical treatment to resume her beloved hiking exercise. On examination, the first metatarsal of both feet were mobile, and the first metatarsophalangeal joints were flexible and painless. There were no signs of Morton neuroma. The soft tissue syndesmosis procedure was offered to salvage her left foot recurrence and to correct her right foot hallux valgus deformity at the same time.

The preoperative photos showed HV feet (Figure 1) and large calluses under the midmetatarsals of both her feet (Figure 2). The preoperative standing radiograph showed an intermetatarsal angle (IMA) and metatarsophalangeal angle (MPA) of 5.1 and 21.4 degrees, respectively, of her left foot and 16 and 27.4 degrees of her right foot by the proximal mid-articular surface to distal mid-articular surface technique (Figure 3). Her preoperative pedobarographic study by the F-Scan showed excessive concentration of abnormal forces and pressures (by color indicator: red > yellow > blue) under midmetatarsals corresponding to the large metatarsal callus formation of both feet (Figure 4).

Surgical technique

The same surgical technique was used for both feet, but additional surgery of metatarsal screw removal of her left foot was necessary. A straight 2-cm dorsal incision was made to expose the distal first intermetatarsal space. The contracted distal lateral soft tissues were released with an inverted "T" incision. The horizontal incision released the metatarsosesamoid ligament to facilitate fibula sesamoid realignment, and the vertical incision released the lateral collateral ligament of the metatarsophalangeal joint at its midsection to facilitate hallux realignment. Both were carried out with a pair of curved scissors. However, the adductor hallucis tendons were not released to prevent hallux varus complication. Four 2-mm drill holes were made in the

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Figure 1. This preoperative photo showed severe right hallux valgus deformity and cosmetically much improved left foot after an osteotomy procedure 10 years earlier.

Figure 2. Plantar photo showed large metatarsal calluses under midmetatarsal heads.

distal half of the first metatarsal. Two double-strand No. 1 absorbable PDS and two 2-O nonabsorbable Ethibond sutures were passed through drill holes and around the second metatarsal. They were then tied with moderate force after the opposing cortices of the distal half of the first and second metatarsals were scarified in a fish-scale fashion with an osteotome. No bunionectomy was carried out. Detailed surgical technique description has been previously published.[5,12,16]

The patient had minimal postoperative pain compared to her previous osteotomy procedure. Crutch-aided walking with as much weightbearing as tolerated was started on her first postoperative day. However, walking was limited to an average of 3000 steps daily for 3 months with forefoot

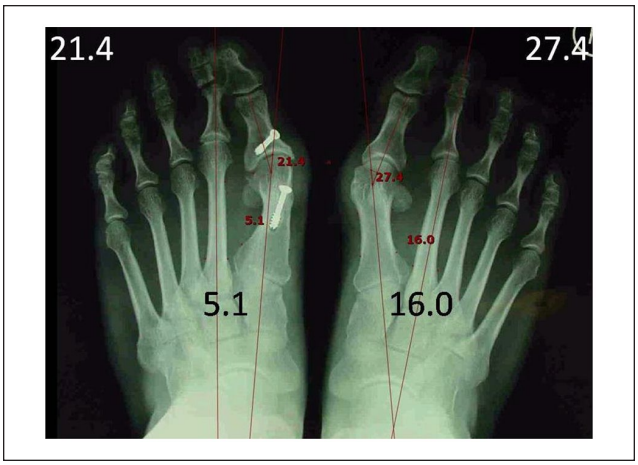

Figure 3. Standing full weightbearing radiograph showed left foot IMA of 5.1 and MPA of 21.4 degrees and right foot IMA of 16 degrees and MPA of 27.4 degrees. IMA, intermetatarsal angle; MPA, metatarsophalangeal angle.

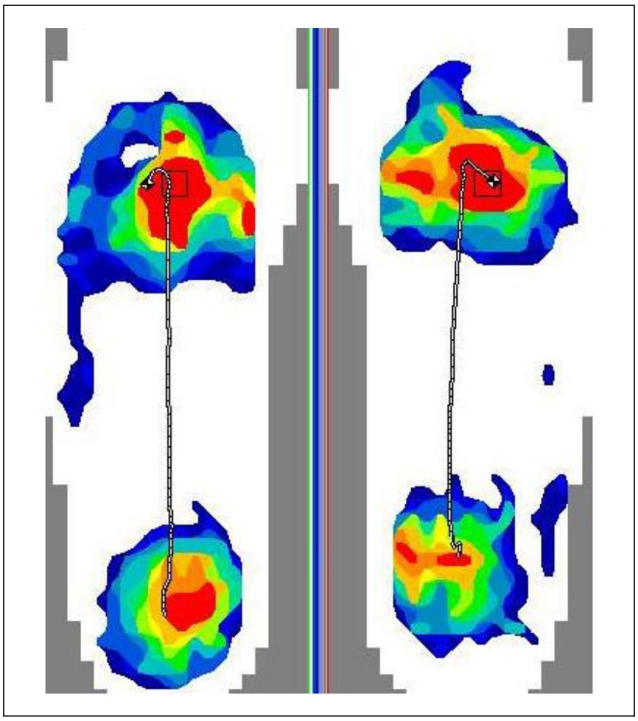

Figure 4. Pedobarographic scan revealed a concentration of pressures and forces under midmetatarsals in walking and nonfunctioning great toes. (Color guide: Red represents highest pressure, yellow less, and blue least).

casts. After that, she was allowed to return to normal walking gradually, but no running until after the first 6 postoperative months.

She returned to hiking 6 months postoperatively with no more bunion pain or metatarsalgia, and she also felt her feet

Figure 5. Postoperative follow-up photo showed satisfactory cosmetic result.

Figure 6. Follow-up photo showed much reduced midmetatarsal calluses.

stronger and more stable. Her 2-year postoperative photo showed her narrowed forefeet and straightened big toes (Figure 5). Despite her weekly hiking, her metatarsal calluses were still markedly reduced (Figure 6). Her metatarsalgia also disappeared. Her standing radiograph showed reduced left and right foot IMA from preoperative 5.1 and 16 degrees and MPA from 21.4 and 27.4 degrees to postoperative IMA of 2.1 and 8.3 degrees and MPA of 9.6 and 15.6 degrees, respectively (Figure 7). Her F-Scan also showed markedly improved force distribution under the first ray instead of the midmetatarsals (Figure 8).

The patient later moved out of the region but kept in touch. The last communication with her was in 2023, 17 years after her surgery; she still could enjoy her hiking freely from any problems in England.

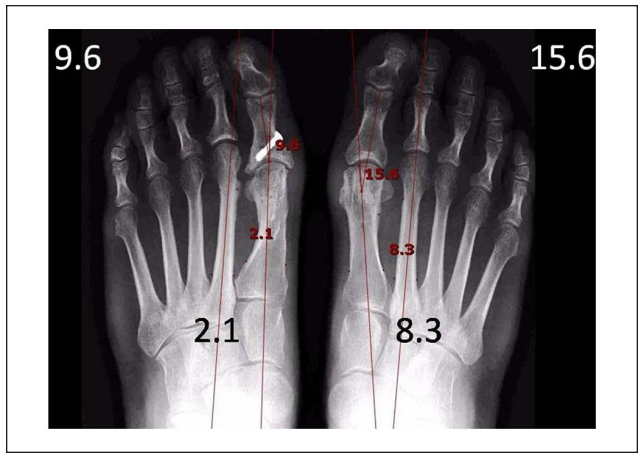

Figure 7. Follow-up radiograph revealed well-corrected and well-maintained IMA at 2.1 and 8.3 degrees, and MPA at 9.6 and 15.6 degrees of her left and right feet, respectively.

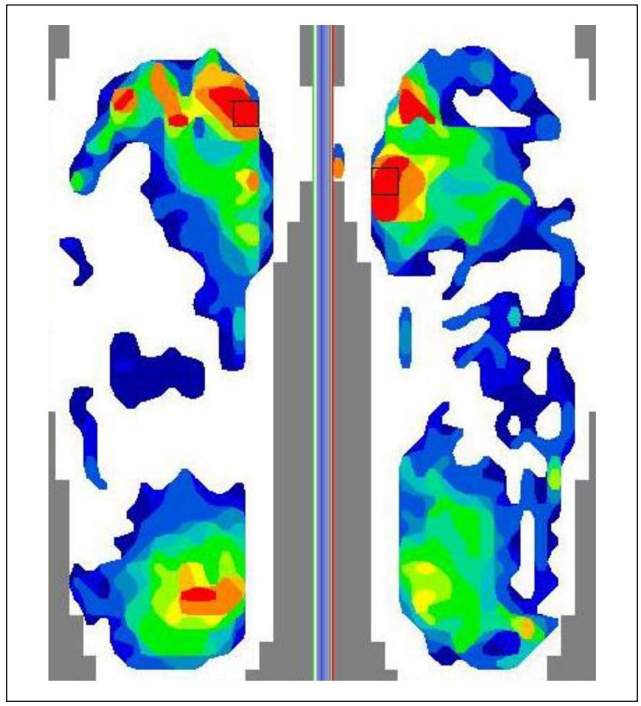

Figure 8. Pedobarographic scan revealed medialization of forefoot forces to the first ray of her feet in walking.

Discussion

Metatarsus primus varus (MPV) deformity has been recognized as the underlying cause of the HV deformity.[8,16] The cause of MPV deformity itself is deemed the failure of the first metatarsal stabilizing ligaments.[7,12,15] The weak stabilizing ligaments can be attributed to heredity, female estrogen, and degeneration. Many precipitating factors can cause

the ligaments to fail, such as shoes, long first metatarsal, increased DMAA angle, round metatarsal head, medially angled metatarsocuneiform joint, etc. The surgical principle of the syndesmosis procedure to realign the first metatarsal with 1-2 intermetatarsal cerclage sutures and to induce a 1-2 intermetatarsal syndesmosis-like bonding formation has been shown to be effective.[12,15,16] Although the soft tissue syndesmosis procedure has been found effective in realigning the first metatarsal and preventing MPV recurrence, its residual HV deformity above 15 degrees has been reported to be around 35%. This high HV deformity recurrence rate has been explained in past studies.[13,14] This case report demonstrated for the first time, to the author's knowledge, that a soft tissue procedure could correct a recurrent HV deformity after an osteotomy procedure.

The soft tissue syndesmosis procedure has been shown to restore the proper mechanical function of the first metatarsal consistently.[11] First metatarsal malunion and shortening after osteotomy procedures may compromise function restoration of the first ray.[1,3,6,9-11] Thus, the persistent metatarsal calluses and nonfunctioning of her left hallux and first ray after the osteotomy procedure were explained. However, after its soft tissue syndesmosis procedure, there was much reduced metatarsal calluses and medialization of plantar pressure to indicate that normal function of this patient's left foot could still be restored. This is probably related to restabilizing the first metatarsal to allow it to exert its propelling force again.

The main weakness of this report was that the patient could not return for a 17-year long-term examination. Its strength was the complete pre- and postoperative clinical, radiologic, photographic, and pedobarographic supportive documentation.

Conclusion

This case report demonstrated for the first time that the soft tissue syndesmosis procedure could be applied to salvage function failure and deformity recurrence after an osteotomy procedure. However, future studies with significant cohort sizes must demonstrate the same.

Ethical Approval

Ethical approval was not sought for the present study because it is a case report.

Declaration of Conflicting Interests

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