Case Report

Alternative treatment for varus instability of the hallux interphalangeal joint: A case report

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ABSTRACT

Forefoot injuries are commonly caused by sport-related activities and are often around the metatarsophalangeal joints. The hallux interphalangeal (IP) joint is anatomically stable; therefore, injuries to this joint are considered to be rare compared with those to the metatarsophalangeal joint. Instability of the hallux IP joint has rarely been reported in barefoot contact sports, and its treatment has not been sufficiently explored. This study investigated chronic varus instability of the hallux IP joint. We performed a surgical reconstruction owing to conservative treatment failure. A good surgical outcome was achieved by reconstruction of the collateral ligament using the 4th extensor tendon—a promising alternative treatment option for this type of injury. This method indicated no morbidity outside the site of surgery and was more cost-effective than reconstruction using an allograft.

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Case Presentation

A 21-year-old male presented with chronic pain and instability of the hallux IP joint on his right foot. Specifically, he complained that his big toe was falling off when he walked barefoot, which we defined as instability. These symptoms worsened when he ran or walked rapidly.

The patient had previously engaged in taekwondo. Eight years prior, he experienced an open dislocation of the right great toe IP joint. He underwent wound repair and was given a plaster cast for a month. He reported little discomfort and no major barriers to movement in his daily life during this time. However, more recently, the patient began exercising and found that the pain and instability gradually increased such that it became impossible for him to run.

Upon physical examination, the hallux IP joint was found to be considerably unstable and easily displaced in a medial direction. There was tenderness on the lateral side of the joint. Radiographs indicated no structural abnormality; however, a review of the varus stress radiograph revealed remarkable widening of the joint space laterally compared with that of the contralateral foot (Figure 1). We diagnosed this condition as “chronic varus instability of the hallux IP joint.”

The patient experienced no improvement within two months of conservative treatment offered as a solution to this issue, including the use of buddy...
Taping. The hallux was fixed to the 2nd toe with taping. At this juncture, we had to consider the use of a surgical treatment to alleviate the problem.

The ligament was estimated to be irreparable or unreliable due to the chronic injury. Therefore, we decided to reconstruct the lateral collateral ligament. A palmaris longus tendon, the most common autogenic tendon, was used for reconstruction. In the current case, the patient terminated taekwondo training and was preparing to enter the college as a guitar player. Development of music instrument skills (playing the guitar) require constant hand practice. The patient refused to undergo any hand surgery and allogenic tendon grafting due to the high cost associated with the procedure. We reviewed all the possible options and decided to explore an alternative method.

The decision was made to use an autogenic 4th extensor digitorum tendon. A bilateral (medial and lateral) longitudinal incision over the hallux IP joint was made at the beginning of this procedure. The collateral ligament had been healed with scar tissue, but the quality of the tissue was not suitable for a direct repair. One half of the 4th extensor digitorum longus tendon was taken from the metatarsal bone level using two small incisions. Drill holes were made parallel to the joint at the normal insertion sites of the collateral ligament. The harvested tendon graft was passed through the holes from the lateral wound. Following this, the two graft ends were tied on the medial side of a separate wound after confirmation of the joint full range of motion (ROM) (Figure 2).

After four weeks of immobilization, the IP joint was mobilized for active ROM. Following this, three months after the operation, the patient was allowed to walk fast and/or run. He did not report any pain during fast movements. The hallux IP joint remained congruent (Figure 3). One year after the operation, the patient remained asymptomatic and the IP joint was stable and congruent without varus instability (Figure 4). The repaired joint exhibited full ROM (Figure 5). The patient could fully participate in all sports activities.

Discussion

The hallux IP joint is anatomically stable and does not get easily damaged. However, the damaged joint is difficult to treat and repair. In western countries, where shoes are commonly worn indoors, patients do not feel discomfort after conservative treatment. Alternatively, in oriental cultures, it is common to walk barefoot indoors and during outdoor sports activities. Instability of the hallux IP joint can result in discomfort when walking or running barefoot. Arthrodesis of the IP joint and ligament reconstruction are the suitable treatment options for instability of IP joints in case of conservative treatment failure. In particular, arthrodesis of the IP joint is the recommended treatment option...
that can provide definite stability during normal daily activities. Moreover, in our case, the patient was young and preferred to retain a mobile IP joint of the great toe.

We have been able to find only three recent reports on the reconstruction of the lateral collateral ligament of the IP joint. Cho J reported that a reconstruction of the lateral collateral ligament was
possible using the allograft (5). Gong et al. reported reconstruction of the lateral collateral ligament using the palmaris longus tendon (6). Finally, Cho et al. reported an augmentation procedure with suture tape after failed reconstruction (4).

The palmaris longus tendon is commonly used for ligament reconstruction; however, associated morbidity was observed at the donor site. This method has no associated major functional impairments; however, it cannot be selected for a patient who desires to develop sophisticated hand movements such as musical skills. Although the reconstruction method with allograft or suture tape was not marked by donor site morbidity, it was reasonably expensive. The patient was reluctant to consent for this method owing to high cost concerns. We had to design a new method that would allow minimization of both the morbidity of the donor site and the monetary cost of the procedure.

Therefore, in this case, we chose the 4th extensor digitorum tendon as the donor tendon. Considering that the 4th extensor digitorum tendon has been used for ankle lateral ligament reconstruction, it has been used as a donor site for various parts of the foot and ankle (9). The most important advantage of this surgery is that no morbidity was observed in other sites. Biomechanically, the extensor digitorum longus tendon has been shown to have a greater cross-sectional area and stiffness than the palmaris longus or plantaris tendon. Therefore, it could be well suited for joint-stabilizing procedures (10). We chose to remove this tendon because this procedure results in the least overall morbidity in the patient. This was especially relevant to the patient who frequently required the use of delicate hand motion for his university major.

**Conclusion**

Collateral ligament reconstruction using the 4th extensor digitorum tendon for chronic varus instability of the IP joint of the great toe is considered to be an alternative treatment option. This method is preferable to fusion because it can preserve the joint. Moreover, it offers less donor site morbidity and better cost effectiveness than reconstruction using palmaris longus and allograft.

**Informed Consent:** Written informed consent was obtained from the patient who participated in this study.

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**Conflict of Interest:** The authors have no conflicts of interest to declare.

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