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Minimal Implant Fixation in Correction Deformity of Hallux Valgus and Hammer Toe with Lapidus Procedure and Distal Chevron Technique – A Case Report

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ABSTRACT

Introduction: Hallux valgus is a complex positional deformity that leads to altered joint mechanics,dysfunction, and progressive pain often at the medial eminence of the first metatarsophalangeal (MTP) joint. Hammertoe is described as partial or complete dislocations of the proximal interphalangeal joints. This disease is usually asymptomatic, however, in somecases, it can cause pain and may cause discomfort when wearing footwear. Surgical treatment is routinely recommended for the severe hallux vagus and hammer toe deformity that is refractory to conservative care. In this case, clinical and minimally invasive surgery for reconstruction of deformity correction of the hallux vagus and hammer toe are described. ***Case illustration:*** We reported a 54-year-old female presented with a 4-year history of worsening pain and deformity to the left great toe which was initially aggravated by wearing tight shoes while the patient was working. She also complained of pain in the second toe of the left foot since 3 years ago, the pain felt worse when doing activities using footwear. The patient said that initially the left big toe was bent outwards so the second toe also became bent. Clinically she has hallux vagus and mallet toe. On a plain radiograph, her deformity was classified as severe with a Hallux Vagus Angle (HVA) of 46 degrees, and an intermetatarsal angle (IMA) of 25 degrees. She was offered surgical correction by Lapidus procedure and Chevron Procedure, the alignment was maintained with klep and screw. Postsurgical correction shows improvement and on the fifth week, the patient was allowed to full weight bearing with no immediate complication. ***Conclusion:*** Hallux Valgus is a common foot deformity but complex. It is not a single deformity but rather a rangeof deformities and in some cases, it can cause pain and discomfort suggesting that several factors may be responsible. More than one hundred techniques have been introduced for the correction of Hallux valgus but there is no established ideal operation. This is due to the fact that etiology and pathogenesis are not yet known certainty. This surgical procedure that was chosen in this case shows good results. Therefore, further research is needed to explore the possibility of determining factors that are common to each foot and then hopefully lead an optimal treatment protocols for Hallux valgus in the future.

Keywords: Hallux valgus; lapidus procedure; chevron osteotomy; hammer toe

INTRODUCTION

Hallux valgus also called bunion is a complicated positional deformity that causes changed joint mechanics, dysfunction, and increasing discomfort, most commonly at the first metatarsophalangeal (MTP) joints medial eminence [1]. Hallux valgus is described as a lateral deviation of the great toe at the metatarsophalangeal joint. The etiology of hallux valgus remains unclear, many factors have been identified that cause hallux valgus such as genetics, tight footwear, hyperlaxity, pes planus, and a tight Achilles tendon [2]. Patients with hallux valgus can develop secondary hammertoe deformities of the lesser toes.

Hammer toe is a chronic progressive deformity with flexion noted to the proximal interphalangeal joint. It results from an imbalance between the weak intrinsic muscles and the stronger extrinsic muscles surrounding the metatarsophalangeal joints. For severe hallux valgus and hammer toe abnormalities that have not responded to conservative treatment, surgery is frequently recommended. Operative management can be more extensive since both the primary hallux valgus and the secondary deformity have to be corrected simultaneously [3].

Although there are many complications associated with hallux valgus surgery including recurrence, infection, and hallux varus that affect patients undergoing primary correction of Hallux Valgus. Recurrence of Hallux Valgus is one of the most common adverse events that make it challenging for surgeons [4]. More than 100 various techniques for treating hallux valgus have been recorded; the procedure chosen depends on the severity and location of the deformity, as well as the surgeon's preference. Minimally invasive (MIS) surgery and rotational deformity correction methods such as the Lapidus and Chevron procedures are becoming increasingly popular. As a surgeon, you should investigate current therapeutic approaches for recurrent Hallux Valgus and their outcomes[5]. The primary goal of this casereport is to go over hallux valgus and hammer toe treatment using Lapidus arthrodesis and distal chevron osteotomy.

CASE PRESENTATION

A 54-year-old woman came to The Orthopaedic Polyclinic at Surya Husadha Hospital Denpasar with a four-year history of worsening pain and malformation of the left big toe which was initially aggravatedby wearing tight shoes while the patient was working. The pain she described was primarily medial eminence pain of the left great toe and admitted that she was unable to wear shoes anymore, she could only wear sandals. Initially, the patient wore tight shoes frequently, which caused a painful lump to form over time, which grew larger and caused the thumb to bend outwards. The aggravating elementis that the discomfort is worse when she is active and lighter when she is resting, and the footwear is removed. The patient additionally reported pain in the second toe of her left foot since three years ago, with the pain being worse when doing activities/walking and better when resting.

The patient stated that the left big toe was originally bent outwards, causing the second toe to bend as well and that it grew more crooked and uncomfortable with time. The patient had a history of hypertension and high cholesterol. The patient's daughter was likewise reported to have slight bunion issues.

There were no further complaints discovered. She was diagnosed with symptomatic Severe Hallux valgus ofthe left great toe with Hallux Vagus Angle (HVA) 46 degrees, intermetatarsal angle (IMA) 25 degrees, and Hammer toe on the left foot digitti II and was examined using clinical examination (Figure 1) and plain radiography (Figure 2). She was offered surgical repair via the Lapidus procedures with clamp wire and screw fixation to keep the alignment (Figure 3) and Distal Chevron Technique with wire fixation (Figure 4). She also provided surgical correction arthrodesis MP joint on the left second toe (Figure 5). Clinical examination (Figure 6) and post-operative plain radiograph (Figure 7). Every week, the patient was seen in the Orthopaedic Polyclinic at Surya Husadha Hospital Denpasar. The patient complained of pain in the surgical wound during the first week after surgery, although it was properly maintained.

The patient is also taught not to bear weight (Figure 8). The surgical wound had been mended by the second week after surgery, and the stitches had been removed (Figure 9). The wire was removed from the patient in the fourth week. The patient's wound had closed by the fifth week, and he was able to bear full weight. The deformity has been corrected with an IMA value of 6 degrees and an HVA of 10 degrees (Figure 10).

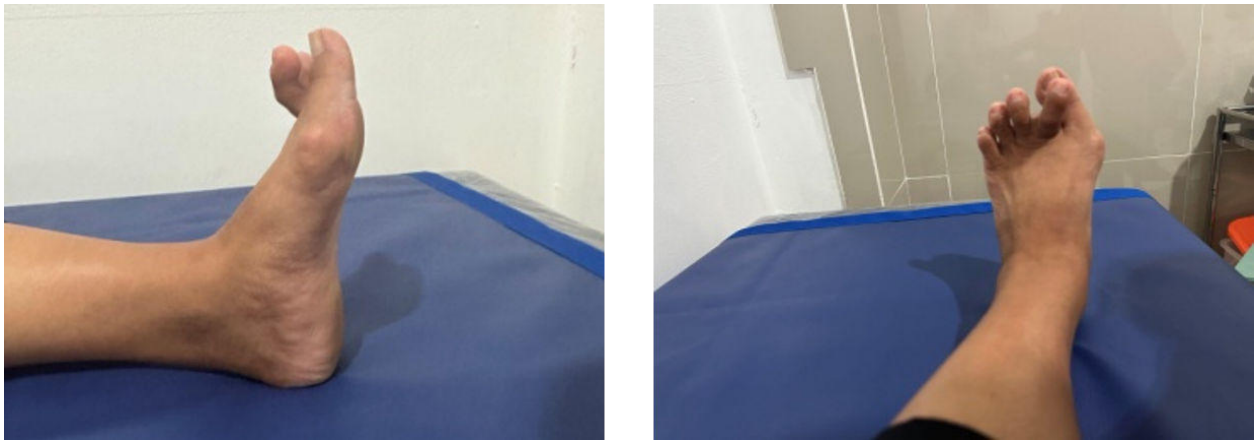

FIGURE 1: Clinical Examination Picture of the Patient.

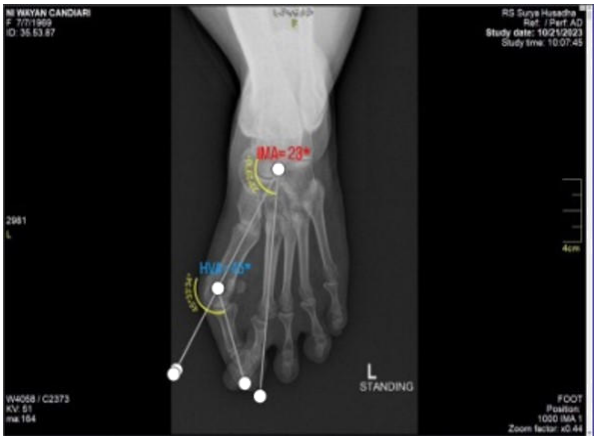

FIGURE 2: Patient's Left Foot X-Ray in Anteroposterior Standing View with an IMA Value of 23 Degrees and an HVA Value of 45 Degrees.

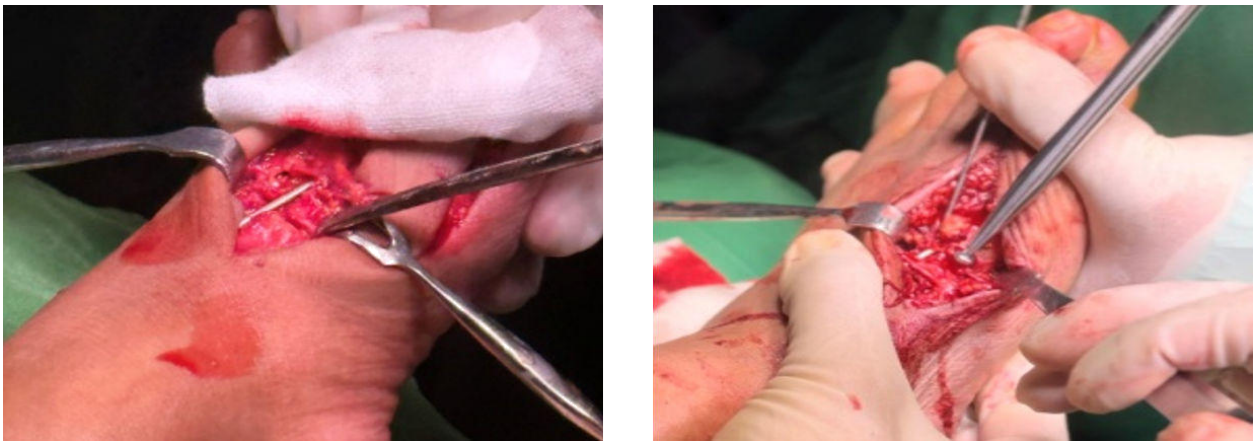

FIGURE 3: Intraoperative Lapidus Procedure Picture on the Left Foot with Clamp Wire and Screw Fixation.

FIGURE 4: Intraoperative Distal Chevron Technique Picture on the Left Foot with Wire Fixation.

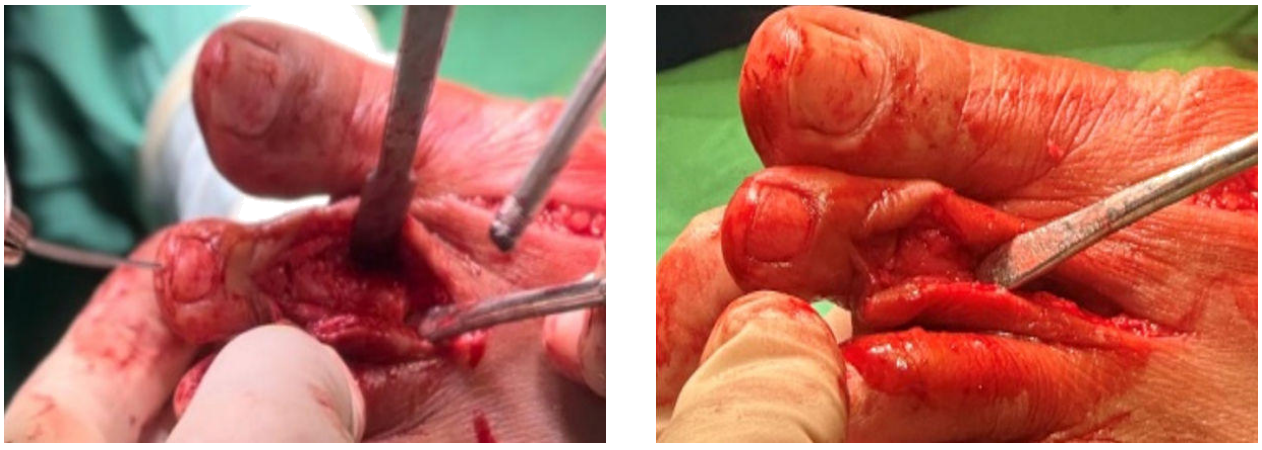

FIGURE 5: Intraoperative Surgical Correction Arthrodesis MP joint The picture on the Left Foot with Wire Fixation.

FIGURE 6: Clinical Examination Postoperative picture on Left Foot.

FIGURE 7: Postoperative X-Ray Anteroposterior/Lateral View Picture on Left Foot.

FIGURE 8,9: Followed Up One Week and the Second Week After Surgery
(The Second Week After Surgery, The Surgical Wound has Improved and The Stitches have been Removed).

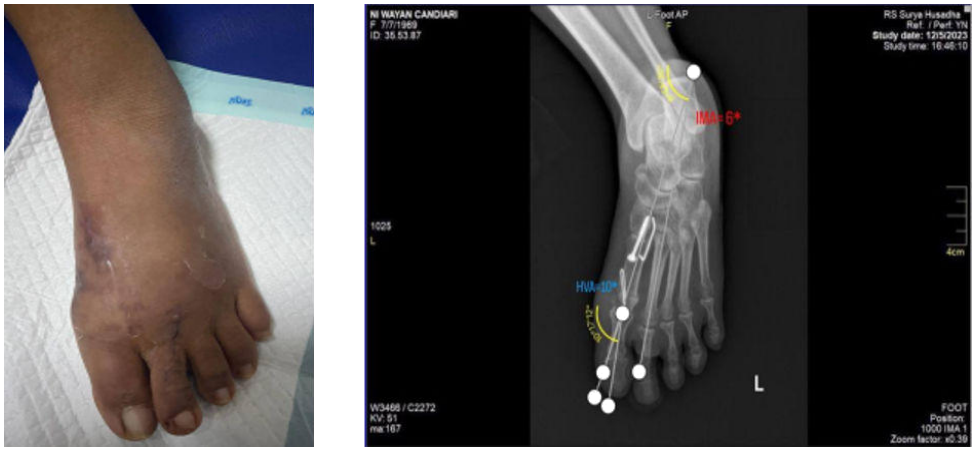

FIGURE 10: In The Fourth Week, The Patient underwent Wire Removal. In the Fifth week, The Patient's Wound had Closed and The Patient was Allowed to Full Weight Bearing. Deformity has been Corrected with an IMA Value of 6 Degrees and an HVA of 10 Degrees.

DISCUSSION

Hallux Valgus is a foot deformity caused by a metatarsal bone protrusion that is characterized by a bonefracture due to excessive pressure, aberrant rotation, and lateral deviation of the great toe [6]. Accordingto Kavlak (2015), the prevalence of Bunion patients in general adulthood is between 21 and 61% of the population [7]. Bunions can be caused by a variety of factors, including genetic factors (70% of patients have family members whose descendants have similar complaints) and are more common in women, long-term wearing of the wrong or too extreme shoes (shoes with tight sizes), or other causessuch as degenerative arthritis, according to Gomez 2019 [8]. This is also consistent with the findings of Nix S et al 2010, who discovered a prevalence of 23% in people aged 18-65 years and 35.7% in the elderly [9]. They also showed a consistently larger prevalence among females (30%) than males (13%). According to scientists, HV prevalence is higher in females and increases with age. This is also consistent with research conducted by Gould N et al in 1980, which discovered a 2:1 to 4:1 ratioof girls vs boys [10]. It is in accordance with medical complaints and epidemiology toward a 54-year-old woman with a 4-year history of growing discomfort and deformity to the left big toe at Surya Husadha Hospital's Orthopedic Polyclinic.

According to M U Christmas 2020, shoes have been a significant aspect of apparel since the dawn of civilization, principally for the sake of foot protection [11]. According to Coughlin MJ et al. 1995, footwear in the Western population has changed over time from soft restriction-free shoes to more rigid high-fashion footwear [12]. They also saw an increase in foot abnormalities as the footwear changed over time. Furthermore, because a man's shoe fits the outer portions of the foot and does not compress or constrict the foot, guys have a significantly lower prevalence. The authors believed that restricting shoe usage was to blame for foot abnormalities in the Western population throughout time. This is also consistent with one of the risk variables identified in patients, who frequently wear shoes in small sizes and occasionally wear high heels.

Intrinsic etiology, such as genetic susceptibility, has been implicated in the etiology of bunion deformity of the great toe, according to M U Christmas 2020 [11].

Pique-Vidal et al constructed three-generation pedigree charts from 350 hallux valgus patients and discovered that approximately 90% ofpeople with hallux valgus reported a positive family history, indicating that the condition is compatible with autosomal dominant inheritance with partial penetrance [13]. Coughlin et al. discovered that 86 (83%) of 103 patients with hallux valgus had a positive family history of hallux valgus abnormalities [14]. This is also consistent with this case, as the patient stated that her daughter had identical concerns, albeit to a lesser extent.

There are two treatment options for hallux valgus: conservative treatment and surgical surgery. According to Domiziano T et al., conservative therapy can only treat symptoms because no non-surgical treatment methods can permanently rectify hallux valgus deformity and it is impossible to reverse the deformity's irreversible cartilage, bone, and soft tissue adaption [2]. To treat acute, episodic inflammatory processes, nonsteroidal anti-inflammatory medications, and physical therapy can be used. Injections of corticosteroids can also help with acute inflammatory disorders in the first metatarsophalangeal joint[15,16]. There is no evidence to recommend long-term physical therapy for hallux valgus. This is also consistent with this case, in which conservative therapy was not used and surgery was performed instead.

The primary indication for surgery is discomfort that is not relieved by conservative therapy approaches. The pain is usually felt above the bunion region or under the second MTP joint (Mehak and Rajesh Kakwani 2021). According to Ray et al's 2019 study, surgical intervention should be reserved for those who have failed nonoperative treatment due to chronic difficulties with wear or pain. This is also consistent with the findings of Wulkar and Mittag's 2012 study, which stated that if there are concurrent complaints of smaller toe abnormalities, surgery is indicated [17]. The authors also said that the surgical approach was chosen based on the degree of the deformity as indicated by the AP X-Ray Hallux Valgus Angle (HVA) and First-second Intermetatarsal Angle (IMA) (Table 1, Figure 11).This accordance with this case, the indication surgery in this case is severe hallux valgus with chronic pain that does not improve with conservative therapy.

FIGURE 11: Weight Bearing Foot Anteroposterior Radiograph Demonstrating HVA/IM A/DM AA. Adapted from Robinson and Limbers (2005) [18].

TABLE 1: Measured angles and their corresponding level of deformity. Adapted from Robinson and Limbers.

Severity of Deformity	Hallux Valgus Angle (HVA)	Intermetatarsal Angle (IMA)
Norm al Mild	Less than 15°	Less than 9°
Moderate	Up to 19° 20e41°	Up to 13° 14e20°
Severe	More than 40°	More than 20°

According to Shi et al in 2020, a proximal osteotomy can be useful in lowering deformity in patients with severe abnormalities [19]. This is further backed by a study published in 2019 by Braito et al, who found that these severe abnormalities can be corrected by double osteotomy, which has the potential for additional rectification [20]. The authors also said that a Lapidus operation can be employed in situations of severe hallux valgus deformity, particularly those coupled with arthritis or initial TMTJ instability. This is also corroborated by research conducted by Macmahoon et al 2016. According to their study, 81% of the patients were satisfied with their return to activities, and 80% were able to engage in their former sports. In addition to this surgery, Distal Chevron Osteotomies are the most commonly performed operative treatments in hallux valgus cases [21]. According to Chang 2001 research, distal metatarsal osteotomy using the Chevron technique and its modification, the most often performed, has been indicated in patients with mild or moderate deformity with IMA up to 15 degrees [22]. This is also consistent with research by C Nery et al 2013 and HJ Trnka 1997, which stated that distal chevron osteotomies are indicated in mild to moderate hallux valgus deformities, and the benefits of this procedure include inherent stability to dorsiflexion and minimal metatarsal shortening [15,16]. The distal chevron osteotomy has yielded favorable results in the literature. This is also true in this case, as the patient underwent two procedures, the Lapidus operation and the Distal Chevron Osteotomies. In the Lapidus Procedure and Distal Chevron using screw and wire fixation only, but the deformity of the patient has been corrected with an IMA value of 6 degrees and an HVA of 10 degrees, and the patient's outcome is also statistically significant.

CONCLUSION

Hallux valgus is a common foot deformity but complex. It is not a single deformity, but rather a range of deformities accompanied by deformities and symptoms in lesser toes, suggesting that several factors may be responsible. More than one hundred techniques have been introduced for the correction of Hallux valgus suggesting there is no established ideal operation. This is due to the fact that its etiology and pathogenesis are not yet known with certainty. Many authors say poor footwear is a risk factor, but not everyone who wears shoes with high heels and tight develop hallux valgus. Therefore, further research is needed to explore the possibility of determining the intrinsic and extrinsic factors that are common to each foot. this will then hopefully lead to an optimal treatment protocol for Hallux valgus in the future.

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