

## Case Report

# Hallux Varus

## An Underreported Presentation of Rheumatoid Arthritis

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**Abstract:** *The prevalence of hallux varus deformity in rheumatoid arthritis (RA) has been reported to be extremely rare. However, in South Asian Countries, where open-toed shoes are habitual footwear for the majority of people, we have found that hallux varus is a common deformity in patients with RA. This rate of occurrence is much more common than that in published hallux deformities in RA and reinforces the impact of footwear on the development of hallux deformities. In this report, we present 3 illustrative cases of hallux varus developed in patients with RA and review the etiology of hallux varus deformity.*

**Levels of Evidence:** *Therapeutic Level IV, Case Study*

**Keywords:** footwear; hallux varus; rheumatoid arthritis

### Introduction

Rheumatoid arthritis (RA) is a systemic autoimmune disease characterized by inflammation of synovial membranes within the joint. The inflamed synovium leads to a release of cytokines, resulting in an erosion of cartilage and bone, ligamentous laxity, and subsequent

deformity in the affected joints. The onset of RA in the foot and ankle region is reported to occur in approximately 20% of cases.<sup>1,2</sup> However, more than 90% of RA patients have foot and ankle symptoms during the course of their disease.<sup>1,3</sup> Among the regions of the foot and ankle, the forefoot is the most common site of involvement early in the course of RA, and its involvement increases with disease duration.<sup>1,4,5</sup> Hallux valgus is a common deformity of the forefoot,<sup>3</sup> and its prevalence in RA patients has been reported to be as high as 55% to 76%.<sup>3,4,6-8</sup> On the other hand, the prevalence of hallux varus deformity is reported to be extremely rare—as low as 0.2% to 0.5%.<sup>1,6</sup> In published studies of RA foot deformities, hallux varus is rarely cited, even in studies of more than 100 feet.<sup>3,4,7-11</sup> Despite the previously reported low prevalence of hallux varus in rheumatoid patients, we have noticed that hallux varus is not as uncommon as published and several orders of magnitude more frequent in the feet of RA patients in India. In the

South Asian Association for Regional Cooperation (SAARC) countries (Table 1), such as India and Pakistan, a large percentage of the population habitually wears open-toed shoes, where the great toe is “strapped.” In India, these sandals, called *kolhapuri chappals* (Figure 1), are traditional leather footwear.

In this report, we present 3 illustrative cases of surgically treated hallux varus in RA patients. These cases illustrate that hallux varus could be manifested as

“Among the regions of the foot and ankle, the forefoot is the most common site of involvement early in the course of RA, and its involvement increases with disease duration.”

a characteristic deformity of RA of the feet. In addition, we hypothesize that the disproportionate increase in hallux varus in these populations is associated with the use of footwear, such as the chappals, which tends to keep the great toe overly straight or even in slight varus.

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**Table 1.**

A List of Countries in the South Asian Association for Regional Cooperation (SAARC).

Afghanistan	Maldives
Bangladesh	Nepal
Bhutan	Pakistan
India	Sri Lanka

### Case 1

A 56-year-old woman presented to the foot and ankle clinic with complaints of right forefoot pain, the inability to walk, and callosities. She was not taking any rheumatological medications. She had unilateral hallux varus deformity and medial deviation of all lesser toes, with a history of progression over years. She had learned to accommodate with open-toed shoe wear; however, the pain had increased to a level where it was affecting her quality of life severely. She underwent a fusion of the first metatarsophalangeal (MTP) joint with resection of all metatarsal heads from the second to the fifth. She was placed in a short leg non-weight-bearing cast for 8 weeks and healed uneventfully.

### Case 2

A 61-year-old woman with RA presented to the foot and ankle clinic complaining of bilateral forefoot pain and deformity, with the left being worse than the right (Figures 2A, 2C, and 2D). Although she did not have pain associated with the hallux varus deformity, she had painful callosities under both plantar forefoot areas, with the left being more painful (Figure 2B). She had lived with the pain as best as possible but, finally, was unable to ambulate around the house without difficulty. She underwent a fusion of the first MTP joint with metatarsal head resection of all lesser toes. She was placed in a short leg non-weight-bearing cast. Four weeks after surgery, she had a

**Figure 1.**

Kolhapuri Chappal: Traditional Open-Toed Leather Footwear in India.



wound dehiscence of the dorsal incision at the fourth web space. This was successfully treated with local wound care. The rest of her recovery was uneventful, resulting in a well-aligned forefoot with little discomfort.

### Case 3

A 66-year-old woman with polyarticular RA presented complaining of bilateral hallux varus deformity, with the left being worse than the right (Figure 3). The left was more symptomatic, with the plantar callosities under the ball of the feet. She had used a nonsteroidal anti-inflammatory drug with minimal relief. She complained of walking difficulty in her day-to-day life. She underwent a fusion of the first MTP joint with metatarsal head resection of all lesser toes. She was placed in a short leg non-weight-bearing cast. Two weeks after surgery, she had a partial wound dehiscence of the dorsal incision at the great toe. Even with local wound care, the wound progressively expanded to

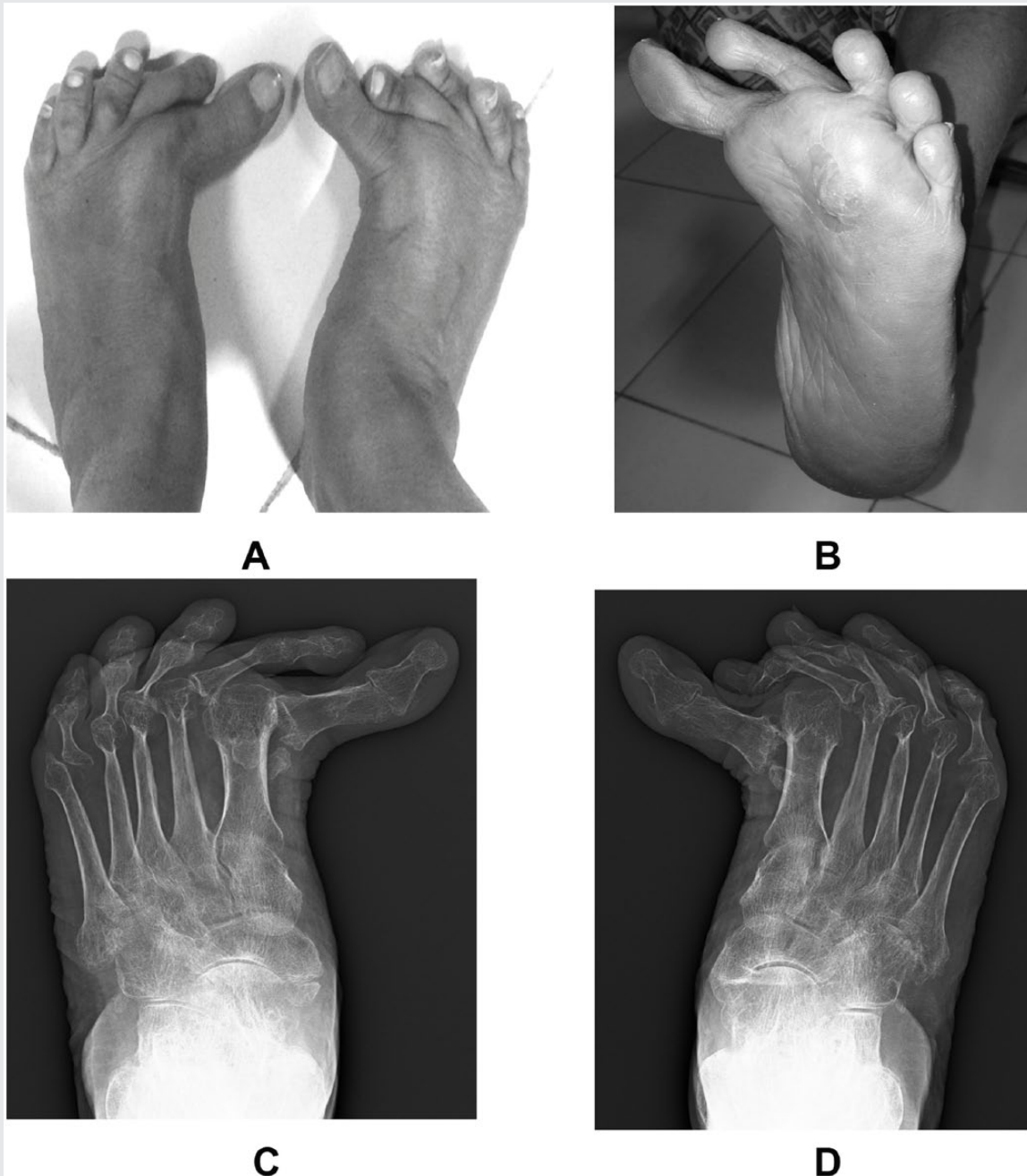
the point where the hardware was visible in the wound bed. She required a removal of hardware 6 weeks after the index procedure. The wound and the fusion site continued to heal uneventfully.

### Discussion

Hallux varus is a fairly rare entity, being defined as a deformity of the great toe that is characterized by adduction of the hallux and medial subluxation of the first MTP joint.<sup>12</sup> Hallux varus in the Western hemisphere is most commonly seen as an iatrogenic complication following bunion surgery.<sup>13-15</sup> Other causes include congenital abnormality,<sup>16</sup> idiopathic,<sup>17,18</sup> trauma to the lateral collateral ligament of the hallux,<sup>19,20</sup> inflammatory arthritis,<sup>1,6,21</sup> compartment syndrome,<sup>22</sup> congenital absence of the fibular sesamoid,<sup>23</sup> and neuromuscular disorders.<sup>23</sup> RA has been indicated as one of the causes of hallux varus. However, the prevalence of hallux varus in RA feet has been reported to be extremely rare.

**Figure 2.**

Case 2: A 61-Year-Old Woman. A. Preoperative Picture of Both Feet. B. Preoperative Picture of the Sole of the Left Foot Showing a Big Callosity Formation. C, D. Posteroanterior Preoperative Radiographs Showing Hallux Varus and Medial Deviation of the Lesser Toes of the Right Foot (C) and the Left Foot (D).



The most commonly described hallux deformity in RA feet is hallux valgus, which has been reported to be found in as high as 55% to 76% of RA

patients.<sup>3,4,6-8</sup> On the other hand, Vainio<sup>1</sup> reported in his study observing 1000 RA patients that he found only 2 patients (0.2%) with hallux varus. Kirkup et al<sup>6</sup>

reported the prevalence of hallux varus as 0.5% from his screening study of 200 consecutive patients admitted to hospital. However, our experience in India in the

**Figure 3.**

Case 3: A 66-Year-Old Woman. Preoperative Picture of Both Feet.



past 6 years has shown that 28 (39%) out of 72 patients with RA who were treated for hallux deformities had hallux varus, which is several orders of magnitude more than the corresponding numbers in Western countries.

In the normal foot, the first MTP joint is stabilized both by static and dynamic aspects. Disruption of the static stabilizers such as the capsule, collateral ligament, and sesamoid ligament could lead to hallux varus. Hallux varus after trauma to the lateral collateral ligament exemplifies this mechanism.<sup>19,20</sup> Dynamic imbalance between the abductor and adductor, or overresection of the first metatarsal head, could account for iatrogenic hallux varus following bunion surgeries.<sup>13-15</sup>

Factors associated with hallux valgus have been well researched because of the high prevalence among the general population in Western countries. A genetic influence for hallux valgus has been suggested.<sup>24,25</sup> There is also evidence of a racial/ethnic predilection, with reports that African Americans are twice as likely to have hallux valgus as Caucasians.<sup>26,27</sup> To the best of our

knowledge, there has been no study about the racial/ethnic difference in the prevalence of foot deformities between Indian and other ethnic groups. Also there is no evidence of the influence of genetic factors in the occurrence of idiopathic hallux varus.

Anatomical variations might also contribute to the prevalence of hallux varus.<sup>16</sup> In most cases, the abductor hallucis plays a role both as abductor and flexor because of its attachment structure with the medial sesamoid and the flexor brevis. A cadaveric study from Canada showed that in 5% of the specimens, the abductor hallucis inserted into the medial side of the base of the proximal phalanx as a true abductor.<sup>16</sup> Another cadaveric study, which dissected 25 feet of adults from south India, demonstrated that the insertion patterns of the abductor hallucis was almost the same as that described in the study from Canada.<sup>20</sup> In addition, a study comparing the foot pressures between Caucasians and Indians in the United Kingdom demonstrated no significant difference in pressure measurement at hallux.<sup>28</sup> We consider it unlikely that there would be

such a level of anatomical variations toward hallux varus in the SAARC patient population to account for the incomparable prevalence of hallux varus deformity in RA feet.

Footwear is considered to be a major contributing factor to hallux valgus deformity. It has been demonstrated that incorrectly fitting footwear is associated with foot pain and deformities.<sup>29,30</sup> Wearing high-heeled shoes is thought to be related to the development of hallux valgus by increasing the pressure under the metatarsal heads in the forefoot and pushing the hallux into a valgus position.<sup>30-34</sup> Additionally, the low prevalence of foot problems in unshod populations also indirectly supports the relationship between footwear and foot problems.<sup>35,36</sup> In India, most people habitually wear traditional flat sandals made of leather called *kolhapuri chappals*. These are characterized by an open-toed style with a T-strap extending from between the first web space to the dorsum of the foot and/or a supporting ring-like strap of the hallux (Figure 1). All our patients with hallux varus used Kolhapuri chappals as their regular footwear. In Japan, as well as in India, open-toed footwear such as clogs and sandals had been customary footwear until the mid-20th century. Kato and Watanabe<sup>37</sup> reported that changes in customs and styles after World War II, including the adoption of westernized footwear and the decline in use of traditional footwear, have led to the marked increase in the number of surgeries for hallux valgus. These authors did not mention the prevalence of hallux varus in their article. It is reported that the shod foot involved less force on the hallux, and the contact area and contact time with the hallux were smaller when compared with going barefoot<sup>38</sup>; these changes are correlated with the tightness of the toe box.<sup>39</sup> On the other hand, wearing thong style flip-flops has been reported to bring a gripping action of the hallux during walking to retain the thong. These reports indicate that footwear may interfere with normal great toe function variedly depending on its fashion. We speculate that open-toed footwear in

India, as well as in other SAARC countries, coupled with the ligament laxity of RA has led to the remarkably high prevalence of hallux varus in RA feet.

We have shown here that hallux varus is not necessarily a rare manifestation of RA hallux deformity and would like to propose that it should not be left out of classification of RA hallux deformities.

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## References

- Vainio K. The rheumatoid foot; a clinical study with pathological and roentgenological comments. *Ann Chir Gynaecol Fenn Suppl.* 1956;45:1-107.
- Fleming A, Crown JM, Corbett M. Early rheumatoid disease: I. onset. *Ann Rheum Dis.* 1976;35:357-360.
- Michelson J, Easley M, Wigley FM, Hellmann D. Foot and ankle problems in rheumatoid arthritis. *Foot Ankle Int.* 1994;15:608-613.
- Vidigal E, Jacoby RK, Dixon AS, Ratliff AH, Kirkup J. The foot in chronic rheumatoid arthritis. *Ann Rheum Dis.* 1975;34:292-297.
- Matsumoto T, Nakamura I, Miura A, Momoyama G, Ito K. Radiologic patterning of joint damage to the foot in rheumatoid arthritis. *Arthritis Care Res (Hoboken).* 2014;66:499-507.
- Kirkup JR, Vidigal E, Jacoby RK. The hallux and rheumatoid arthritis. *Acta Orthop Scand.* 1977;48:527-544.
- Spiegel TM, Spiegel JS. Rheumatoid arthritis in the foot and ankle: diagnosis, pathology, and treatment. The relationship between foot and ankle deformity and disease duration in 50 patients. *Foot Ankle.* 1982;2:318-324.
- Rojas-Villarraga A, Bayona J, Zuluaga N, et al. The impact of rheumatoid foot on disability in Colombian patients with rheumatoid arthritis. *BMC Musculoskelet Disord.* 2009;10:67.
- Shi K, Tomita T, Hayashida K, Owaki H, Ochi T. Foot deformities in rheumatoid arthritis and relevance of disease severity. *J Rheumatol.* 2000;27:84-89.
- Bouysset M, Tebib J, Noel E, et al. Rheumatoid flat foot and deformity of the first ray. *J Rheumatol.* 2002;29:903-905.
- Bal A, Aydog E, Aydog ST, Cakci A. Foot deformities in rheumatoid arthritis and relevance of foot function index. *Clin Rheumatol.* 2006;25:671-675.
- Vanore JV, Christensen JC, Kravitz SR, et al. Diagnosis and treatment of first metatarsophalangeal joint disorders. Section 3: hallux varus. *J Foot Ankle Surg.* 2003;42:137-142.
- Hawkins FB. Acquired hallux varus: cause, prevention and correction. *Clin Orthop Relat Res.* 1971;76:169-176.
- Miller JW. Acquired hallux varus: a preventable and correctable disorder. *J Bone Joint Surg Am.* 1975;57:183-188.
- Skalley TC, Myerson MS. The operative treatment of acquired hallux varus. *Clin Orthop Relat Res.* 1994;306:183-191.
- Thomson SA. Hallux varus and metatarsus varus: a five-year study (1954-1958). *Clin Orthop.* 1960;16:109-118.
- Granberry WM, Hickey CH. Idiopathic adult hallux varus. *Foot Ankle Int.* 1994;15:197-205.
- Davies MS, Parker BC. Idiopathic hallux varus. *Foot Ankle Int.* 1995;16:210-211.
- Hunter WN, Wasiak GA. Traumatic hallux varus correction via split extensor tenodesis. *J Foot Surg.* 1984;23:321-325.
- Joseph B, Chacko V, Abraham T, Jacob M. Pathomechanics of congenital and acquired hallux varus: a clinical and anatomical study. *Foot Ankle.* 1987;8:137-143.
- Sherman MS. Psoriatic arthritis; observations on the clinical, roentgenographic, and pathological changes. *J Bone Joint Surg Am.* 1952;34A:831-852.
- Dayton P, Haulard JP. Hallux varus as complication of foot compartment syndrome. *J Foot Ankle Surg.* 2011;50:504-506.
- Jahss MH. Spontaneous hallux varus: relation to poliomyelitis and congenital absence of the fibular sesamoid. *Foot Ankle.* 1983;3:224-226.
- Pique-Vidal C, Sole MT, Antich J. Hallux valgus inheritance: pedigree research in 350 patients with bunion deformity. *J Foot Ankle Surg.* 2007;46:149-154.
- Lee CH, Lee S, Kang H, et al. Genetic influences on hallux valgus in Koreans: the healthy twin study. *Twin Res Hum Genet.* 2014;17:121-126.
- Dunn JE, Link CL, Felson DT, et al. Prevalence of foot and ankle conditions in a multiethnic community sample of older adults. *Am J Epidemiol.* 2004;159:491-498.
- Golightly YM, Hannan MT, Dufour AB, Jordan JM. Racial differences in foot disorders and foot type. *Arthritis Care Res (Hoboken).* 2012;64:1756-1759.
- Putti AB, Arnold GP, Abboud RJ. Differences in foot pressures between Caucasians and Indians. *Foot Ankle Surg.* 2010;16:195-198.
- Frey C, Thompson F, Smith J, Sanders M, Horstman H. American Orthopaedic Foot and Ankle Society women's shoe survey. *Foot Ankle.* 1993;14:78-81.
- Menz HB, Morris ME. Footwear characteristics and foot problems in older people. *Gerontology.* 2005;51:346-351.
- Nguyen US, Hillstrom HJ, Li W, et al. Factors associated with hallux valgus in a population-based study of older women and men: the MOBILIZE Boston Study. *Osteoarthritis Cartilage.* 2010;18:41-46.
- Snow RE, Williams KR, Holmes GB Jr. The effects of wearing high heeled shoes on pedal pressure in women. *Foot Ankle.* 1992;13:85-92.
- Corrigan JP, Moore DP, Stephens MM. Effect of heel height on forefoot loading. *Foot Ankle.* 1993;14:148-152.
- Nyska M, McCabe C, Linge K, Klenerman L. Plantar foot pressures during treadmill walking with high-heel and low-heel shoes. *Foot Ankle Int.* 1996;17:662-666.
- James CS. Footprints and feet of natives of the Solomon Islands. *Lancet.* 1939;234:1390-1393.
- MacLennan R. Prevalence of hallux valgus in a neolithic New Guinea population. *Lancet.* 1966;1:1398-1400.
- Kato T, Watanabe S. The etiology of hallux valgus in Japan. *Clin Orthop Relat Res.* 1981;157:78-81.
- Nyska M, McCabe C, Linge K, Laing P, Klenerman L. Effect of the shoe on plantar foot pressures. *Acta Orthop Scand.* 1995;66:53-56.
- Branthwaite H, Chockalingam N, Greenhalgh A. The effect of shoe toe box shape and volume on forefoot interdigital and plantar pressures in healthy females. *J Foot Ankle Res.* 2013;6:28.