Relationship Between Hallux Valgus Interphalangeal Deformity and the Recurrence of Ingrown Toenail in Children

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Background: An abnormal hallux interphalangeal angle may be an important risk factor for the recurrence of ingrown toenails.

Methods: Sixty pediatric patients who underwent surgery for an ingrown toenail were evaluated retrospectively in terms of recurrence. The patients were divided into two groups. Group 1 included 30 patients (22 boys and eight girls) with hallux valgus interphalangeal deformity. Group 2 included 30 patients (20 boys and ten girls) without toe deformity.

Results: The mean ± SD patient age was 12.8 ± 1.42 years and 12.5 ± 1.45 years in groups 1 and 2, respectively. There was no significant difference between the patient and control groups in terms of age and sex ($P > .05$). The mean ± SD follow-up time was 30.2 ± 13.46 months in group 1 and 31.3 ± 12.86 months in group 2 ($P = .286$). We observed recurrence in six patients (20%) in group 1 and in two patients (6.7%) in group 2.

Conclusions: The recurrence of an ingrown toenail may be associated with an increased hallux interphalangeal angle in pediatric patients. Factors related to the hallux interphalangeal angle abnormality, which increases the risk of ingrown toenails, also increase the recurrence rate in these patients. Therefore, it is surmised that hallux valgus interphalangeal deformity should be evaluated before surgery, and patients and their families should be informed about the increased risk of recurrence. (J Am Podiatr Med Assoc 114(2), 2024; doi:10.7547/21-217)

Ingrown toenails are a common problem for people of all ages.[1,2] The prevalence in the general population has been reported to be 2.5% to 5%.[3] However, ingrown toenails are most common in people aged 11 to 30 years.[3] Pain and discomfort while walking and during other daily activities are common. Although many conservative, as well as surgical, treatments have been used, the recurrence rate is still reported to be high.[1,2,4-8] Many risk factors have been identified as being associated with ingrown toenails. Tight-fitting shoes, trauma, abnormal nail shape, and incorrect trimming of toenails have been listed as extrinsic risk factors.[2,9] In addition, congenital and hereditary risk factors have been associated with ingrown toenails.[9]

Although many studies have been conducted on the treatment methods of this problem, there are fewer studies and data on its etiology and relationship with recurrence. Darwish et al[5] reported that an ingrown toenail can be caused by the internal pressure of the distal phalanx on the lateral edge of the nail. It has also been reported that an increased hallux interphalangeal angle may be an important risk factor for ingrown toenails.[3,5,9] It is also possible that an abnormal hallux interphalangeal angle may be an important risk factor for the recurrence of ingrown toenails.

In the present study, we aimed to observe the relationship between the recurrence of ingrown toenails and hallux valgus interphalangeal deformity in pediatric patients with hallux valgus interphalangeal deformity versus those who had no deformity. The secondary aim was to emphasize the need to inform patients and their families that relapses may be more common in adolescents with hallux valgus interphalangeal deformity.

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Materials and Methods

Sixty pediatric patients who had undergone surgery for an ingrown toenail between January 1, 2010, and January 1, 2017, were evaluated in terms of recurrence and sorted into two groups. The study was performed in line with the principles of the Declaration of Helsinki.

The great toe was unilaterally affected for all of the patients; it was the first presentation, and the lateral edge of the toe was affected. Group 1 included 30 patients (22 boys and eight girls) with hallux valgus interphalangeal deformity. Group 2 included 30 patients (20 boys and ten girls) without toe deformity. The mean ± SD patient age was 12.8 ± 1.42 years and 12.5 ± 1.45 years for groups 1 and 2, respectively. There was no significant difference between the patient and control groups in terms of age and sex ($P > .05$).

The patients, who were aged 10 to 16 years, underwent the same surgical technique, had only the lateral edge of the toe affected, and displayed only hallux valgus interphalangeal deformity. The control group consisted of children having no deformity who were operated on and whose hallux interphalangeal angle was 10° or less. Patients who had previously undergone surgery due to an ingrown toenail, those who experienced trauma, and patients with any other foot or toe deformity and neurologic disorders were excluded from the study.

A stress (standing) radiographic view was performed as part of the treatment protocol in patients with an ingrown toenail. The interphalangeal angle of the great toe was measured on the radiograph, and no other variables were measured. The interphalangeal angle was formed by the intersection of two lines, one line along the long axis of the proximal phalanx and the other line along the long axis of the distal phalanx.[5] Any value more than 10° was considered abnormal (Fig. 1).[5,10]

Wedge excision with diathermy ablation was applied to all of the patients as a surgical technique. This technique was advocated as the primary treatment for ingrown toenails in children.[2] All of the patients used a prophylactic antibiotic after surgery.

All of the postoperative cases were followed up clinically in the outpatient clinic on days 3 and 7 for pain, infection, healing, and dressing. Soaking was allowed after 1 week. The patients started normal ambulation on day 7, and return to their normal activities in 3 weeks was possible. Healing was inspected for the complete reepithelialization of the nail bed and regression of edema. The patients were checked for spike formation, nail edge dystrophies, recurrence, and postoperative patient satisfaction with the new general shape of their healed nails. We defined the presence of symptomatic ingrown toenails after surgical treatment as a local recurrence. The mean ± SD follow-up time was 30.2 ± 13.46 months in group 1 and 31.3 ± 12.86 months in group 2 ($P = .286$).

A software program (IBM SPSS Statistics for Windows, Version 20.0; IBM Corp, Armonk, New York) was used for statistical analysis. Descriptive statistics of the data were used to describe the study population. Independent-samples t test and χ^2 test were used to compare qualitative variables. A $P \leq .05$ was considered statistically significant.

Results

Patient demographic and follow-up data are summarized in Table 1. The postoperative infection rate was 13.3% ($n = 4$) in group 1 and 10% ($n = 3$) in group 2. All of the patients improved with antibiotic use and dressing.

Recurrence was observed in six patients (20%) in group 1 and in two patients (6.7%) in group 2. The recurrence rate in group 1 was significantly higher than that in group 2 ($P = .003$). The mean ± SD hallux interphalangeal angle was 12.8° ± 1.61° and 8.13° ± 1.07° in patients in groups 1 and 2, respectively ($P < .001$).

The recurrence rate was significantly higher in patients with a hallux interphalangeal angle of 14° or greater (high grade) compared with the other group ($P < .001$). In addition, the recurrence rate was significantly higher in children who were older than 14 years with hallux valgus interphalangeal deformity ($P = .005$) (Table 2). A second operation was performed on patients who had a recurrence. There was no second recurrence in these patients during follow-up.

Discussion

Ingrown toenails are among the most commonly encountered conditions in orthopedics that result in pain and disability.[3,11] In particular, they are a significant problem in pediatric and especially adolescent patients.[1] It was reported that most patients treated with surgery were in the 11- to 13-year-old age range.[1]

Although many surgical and conservative methods have been reported, the recurrence rate is still very high. Recurrence rates between 4% and 59% have been reported in different studies depending



Figure 1. Measurement method for the hallux valgus interphalangeal angle (the interphalangeal angle was formed as the intersection of the lines drawn along the long axes of the distal and proximal phalanges).

Table 1. Patient Demographic and Follow-up Data

Characteristic	With Hallux Valgus Interphalangeal Deformity (n = 30)	Without Toe Deformity (n = 30)	*P* Value
Age (mean ± SD [years])	12.8 ± 1.42	12.5 ± 1.45	.495
Sex (No. [%])			
Male	22 (73.3)	20 (66.7)	.554
Female	8 (26.7)	10 (33.3)	
Follow-up (mean ± SD [mo])	30.2 ± 13.46	31.3 ± 12.86	.286
Hallux interphalangeal angle (mean ± SD [°])	12.8 ± 1.61	8.13 ± 1.07	<.001[a]
Postoperative infection rate (%)	13.3	10.0	.138

Note: Descriptive statistics were used for analysis.
[a]Statistically significant ($P < .05$).

on the surgical technique.[1,12,13] Haricharan et al[4] reported no recurrence in a study that used nail fold excision as a surgical technique. Farrelly et al[14] reported a 10% recurrence rate in 302 patients treated with wedge nail excision and diathermy ablation. No recurrence was reported in seven patients treated with this method by Kaleel et al.[2] In the present study, we preferred wedge excision

Table 2. Comparisons of the 60 Study Patients According to Puberty Stage and Hallux Interphalangeal Angle

Characteristic	Reccurence (No.)		*P* Value
	Absent	Present	
Hallux interphalangeal angle			
Normal (7°–10°)	28	2	<.001[a]
Low grade (11°–13°)	21	1	
High grade (≥14°)	3	5	
Puberty stage			
≤14 years old	41	2	.005[a]
>14 years old	11	6	

Note: The χ^2 test was used for statistical analysis.
[a]Statistically significant ($P < .05$).

with diathermy ablation as a surgical technique. This technique was advocated as the primary treatment for ingrown toenails in children.[2]

It has been reported that an incomplete understanding of the etiologic factors associated with the development of ingrown toenails is the underlying cause of inadequate success in treatment despite various available surgical and conservative techniques.[5] Because of the biomechanical imbalance between the first and second toes, external pressure from shoes may contribute to the development of an ingrown toenail mainly on the lateral edge.[5,11] It has been reported that abnormalities in the interphalangeal and hallux valgus angles can also cause this condition.[5] Darwish et al[5] reported that the incidence of an abnormal hallux interphalangeal angle was higher in patients with an ingrown toenail. Higher hallux interphalangeal angles were also reported in patients with ingrown toenails in a study by Cordoba-Fernandez et al.[9] Kuru and Olçar[3] reported that ingrown toenails were associated with an increased first interphalangeal angle. Kose et al,[11] however, reported no correlation between the ingrown toenail and increased hallux interphalangeal angle. In the present study, we found a significant difference in recurrence rates between the two groups: 20% in patients with hallux valgus interphalangeal deformity and 6% in patients without deformity.

The literature supports the relationship between the increased hallux interphalangeal angle and ingrown toenail etiology[3,5,9]; however, to our knowledge, there is no study that represents a possible correlation between an increased hallux interphalangeal angle and an increased rate of recurrence of ingrown toenails. Therefore, the goal of the present study was to determine whether an increased hallux interphalangeal angle was associated with the recurrence of ingrown toenails in children. Ingrown toenails are most common in people aged 11 to 30 years.[3] In this study, we observed that the rate of recurrence was higher in patients with hallux valgus interphalangeal deformity than in patients in the control group. We also observed a significantly increased recurrence rate in patients who had a hallux valgus interphalangeal deformity angle of 14˚ or higher. A significantly higher recurrence rate was also found in patients who were older than 14 years.

The present study has some limitations. First, it was retrospective in design, and second, the number of patients was relatively low. Third, surgical interventions were not performed by a single team.

Conclusions

The recurrence of ingrown toenails may be associated with an increased hallux interphalangeal angle in pediatric patients. Factors related to hallux interphalangeal angle abnormality, which increases the risk of ingrown toenails, also increase the recurrence rate in these patients. Therefore, hallux valgus interphalangeal deformity should be evaluated before surgery, and patients and their families should be informed about the increased risk of recurrence. A prospective study with more patients and the values obtained as a result of follow-up may be more valuable.

Financial Disclosure: None reported.
Conflict of Interest: None reported.

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