

# Determination of Types of Foot in the Indian Population and Its Association with Ingrowing Toenail

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## ABSTRACT

**Aim:** Ingrown toenail (onychocryptosis) is a common condition affecting great toenail. Several risk factors including foot shape, particularly, Egyptian foot, has been implicated in the pathogenesis. The purpose of this study is to determine the types of foot in normal Indian population and its relationship with incidence of ingrowing toenail.

**Materials and methods:** A total of 197 healthy adults were included in the study and their foot type was determined by direct observation and classified into one of the three foot types. Consecutive 25 patients (25 feet) undergoing treatment for ingrowing toenails were selected. Each foot was classified into one of the three foot types and analyzed.

**Observations:** Out of 197 adults, 77 had Egyptian foot, 47 had square foot, and 73 had Greek foot. In the male population, Greek foot (44.0%) was most prevalent and this was statistically significant ( $p = 0.023$ ). In female subjects, Egyptian foot was the most common and seen in 44.3% ( $p = 0.1763$ ). In ingrowing toenail group, out of 25 adults 11 had Egyptian foot, 7 had square foot, and 7 had Greek foot.

**Conclusion:** In the Indian population, the most common foot type is Egyptian foot (39.08%), followed by Greek foot (37.05%) and square foot (23.85%). Though ingrowing toenail is thought to be the more common in Egyptian foot, it is not proved to be a risk factor in this study.

**Keywords:** Egyptian, Foot shape, Greek, Ingrown toenail.

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## INTRODUCTION

Ingrown toenail (onychocryptosis) is a painful condition of the foot causing inflammation and subsequent acute paronychia. Several risk factors have been associated with its pathogenesis, including anatomic abnormalities and

biomechanical imbalance between the hallux and the second toe, improper nail trimming, tight-fitting shoes, bad foot hygiene, and trauma.<sup>1</sup> In addition, foot shape, especially the Egyptian foot, is commonly thought to be a factor predisposing to ingrown toenail.<sup>2</sup> The purpose of this study is to determine the types of foot in Indian population and its relationship with ingrowing toenail in the Indian circumstances.

## MATERIALS AND METHODS

This study was conducted in the Department of Surgery in a tertiary referral center in central India over a period of 1 year. In this study, we determined the incidence of type of foot in Indian population and the relationship of type of foot with ingrowing toenail.

Totally, 197 healthy adults of both sexes and from varying social and cultural backgrounds, representing the general population, were included in the study. The subjects were numbered and age, gender were noted. Subjects with congenital anomalies of foot, history of trauma, and previous surgery were excluded. Persons were asked to stand and keep both feet together in relaxed position. Photographs were taken and the type of foot was determined by direct observation. Each foot was classified into one of the three types. Egyptian foot (first toe is longer than the second toe) (Fig. 1), Polynesian or square foot (first and second toes are of same length) (Fig. 2), and Greek foot (first toe is shorter than the second toe) (Fig. 3). Consecutive 25 patients (25 feet) undergoing



Fig. 1: Photograph showing Egyptian foot

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Fig. 2: Photograph showing square foot



Fig. 3: Photograph showing Greek foot

Table 1: Distribution of type of foot in normal population

	Egyptian	Square	Greek	Total
Male	38 (34.9%)	23 (21.1%)	48 (44.0%)	109
Female	39 (44.3%)	24 (27.3%)	25 (28.4%)	88
Total	77	47	73	197
p-value	p = 0.1763,	p = 0.3122,	p = 0.023,	
	95% CI	95% CI	95% CI	
	(0.36–1.25)	(0.35–1.45)	(1.05–3.79)	

CI: Confidence interval

treatment for ingrowing toenails were selected. Each foot was classified into one of the three types and analyzed.

## RESULTS

In a total of 197 adults, 109 were male and 88 were females. Out of 109 males, 38 had Egyptian foot, 23 had square foot, and 48 had Greek foot. Out of 88 females, 39 had Egyptian foot, 24 had square foot, and 25 had Greek foot. In a total of 197 adults, 77 had Egyptian foot, 47 had square foot, and 73 had Greek foot (Table 1). In male population, Greek foot (44.0%) was most prevalent ( $p = 0.023$ ). In female subjects, Egyptian foot was most common and seen in 44.3% ( $p = 0.1763$ ). In ingrowing toenail group, out of 25 patients, 16 were males and 9 were females. Out of 16 males, 7 had Egyptian foot, 5 had Greek foot, and 4 had square foot. Out of 9 females, 4 had Egyptian foot, 3 had square foot, and 2 had Greek foot. Out of 25 adults, 11 had Egyptian foot, 7 had square foot, and 7 had Greek foot (Table 2). Though ingrowing toenail was more common in Egyptian foot, it was not significant statistically.

## DISCUSSION

PubMed was searched using key words “type of foot, onychocryptosis and Indian population.” There is paucity of literature showing relationship between type of foot and onychocryptosis. There is no study showing direct correlation of type of foot with onychocryptosis from

Table 2: Distribution of type of foot in ingrowing toenail group

	Egyptian	Square	Greek
Male	7 (18.4%)	4 (17.4%)	5 (10.4%)
Female	4 (10.3%)	3 (12.5%)	2 (8.0%)
Total	11 (14.3%)	7 (14.9%)	7 (9.6%)

India. Majority of Indian articles are about management of onychocryptosis, and there are few reports about biomechanical and morphological study of foot correlating with onychocryptosis.<sup>3,4</sup>

Ingrowing toenail (onychocryptosis) is a common foot problem and its etiology is not well understood. Various anatomical abnormalities like medial rotation of the toenail, fold hypertrophy, and upturned abnormality of the distal phalanx have been implicated as potential risk factors for ingrowing toenail and other extrinsic factors like improper nail trimming, tight-fitting shoes, bad foot hygiene, and trauma act only as triggers.<sup>3,5-8</sup> On the contrary, many investigators failed to demonstrate any abnormality in forefoot alignment in patients with symptomatic ingrowing toenails, and suggested that treatment should not be based on the correction of the anatomy if no abnormality exists.<sup>1,9</sup>

Manna et al<sup>10</sup> compared foot dimension of adult males and females and evaluated the foot hazards due to ill-fitted footwear. They observed that ill-fitted footwear leads to biomechanical imbalance and gives rise to blisters, corn, ankle injury, and chronic pain. But, they have not demonstrated the effect of foot volume and ill-fitted footwear to have any predisposition for ingrowing toenail.

Other investigators showed a relation between certain foot type and ingrown toenail.<sup>2,11,12</sup> Viladot<sup>11</sup> reported that Egyptian foot is a risk factor for ingrown toenail. However, Ogawa and Hyakusoku<sup>2</sup> and Günal et al<sup>12</sup> showed that the incidence of ingrown toenail is higher in Greek and square foot. They speculated that counterpressure of the

second toe on the lateral nail fold is greater in these foot types. In this study, 25 consecutive patients with ingrowing toenail were identified. There was no significant association found with Egyptian foot and ingrowing toenail. Due to these discrepancies in the literature, it is hard to conclude that a certain foot type is a predisposing factor for ingrown toenail.

Prevalence of different foot types based on forefoot shape was also determined in the present study. A total of 197 adults' commonest foot type was Egyptian foot (39.08%), followed by Greek foot (37.05%), and least common variety was square foot (23.85%). A study by Ganapathy et al<sup>4</sup> showed that the most common type of foot shape found was Egyptian type (53.6%) followed by Greek foot (46%) and the least common type found was square foot (0.4%), which is similar to our study.

## CONCLUSION

In Indian population, overall prevalence of Egyptian foot is higher; nevertheless, in the male population, Greek foot is most common, while in female patients, Egyptian foot is more common. Common belief is that Egyptian foot is a risk factor for development of ingrowing toenail, but this study does not support this perception and type of foot is not proved to be a risk factor in this study.

## REFERENCES

1. Kose O, Celiktas M, Kisin B, Ozyurek S, Yigit S. Is there a relationship between forefoot alignment and ingrown toenail? A case-control study. *Foot Ankle Spec* 2011 Feb;4(1):14-17.
2. Ogawa R, Hyakusoku H. Does Egyptian foot present an increased risk of ingrown toenail? *Plast Reconstr Surg* 2006 May;117(6):2111-2112.
3. Venkatachalam S. Ingrowing great toenail following metatarsophalangeal joint fusion for hallux valgus: a case report and proposed mechanism of aetiology. *J Foot Ankle Surg* 2001 Jun;7(2):113-115.
4. Ganapathy A, Sadeesh T, Rao S. Morphometric analysis of foot in young adult individuals. *World J Pharm Pharma Sci* 2015 Jul;4(8):980-993.
5. Langford DT, Burke C, Robertson K. Risk factors in onychocryptosis. *Br J Surg* 1989 Jan;76(1):45-48.
6. Li J, Chen J, Hong G, Chen Z, Weng Y, Wang F. Clinical study of treatment for recalcitrant ingrown toenail by partial distal phalanx removal. *J Plast Reconstr Aesthet Surg* 2009 Oct;62(10):1327-1330.
7. Parrinello JF, Japour CJ, Dykyj D. Incurvated nail: does the phalanx determine nail plate shape? *J Am Podiatr Med Assoc* 1995 Nov;85(11):696-698.
8. Darwish FM, Haddad W, Ammari F, Aoudat Z. Association of abnormal footangles and onychocryptosis. *Foot (Edinb)* 2008 Dec;18(4):198-201.
9. Pearson HJ, Bury RN, Wapples J, Watkin DF. Ingrowing toenails: is there a nail abnormality? A prospective study. *J Bone Joint Surg Br* 1987 Nov;69(5):840-842.
10. Manna I, Pradhan D, Ghosh S, Kar SK, Dhara P. A comparative study of foot dimension between adult male and female and evaluation of foot hazards due to using of footwear. *J Physiol Anthropol Appl Human Sci* 2001 Jul;20(4):241-246.
11. Viladot A. Metatarsalgia due to biomechanical alterations of the forefoot. *Orthop Clin North Am* 1973 Jan;4(1):165-178.
12. Günel I, Koşay C, Veziroğlu A, Balkan Y, İlhan F. Relationship between onychocryptosis and foot type and treatment with toe spacer: a preliminary investigation. *J Am Podiatr Med Assoc* 2003 Jan-Feb;93(1):33-36.