Delving into the depth: On the historical aspect of ingrown toenails from the ancient period till the 19th century

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…the evolution of bipedal locomotion seems to have preceded other uniquely human attributes. It appears quite probable that our ancestors walked first, and subsequently became large-brained, tool-using humans.

Mednick LW (1955).1

Introduction
The erect posture and subsequent bipedal locomotion are considered the first and singular most important factor in the hominid evolution. With bipedalism, humans gained a distinct advantage over most other animals. To avail this evolutionary benefit the feet became flat and the great toes were predominantly modified.2,3 The immense role of the great toe in erect posture and bipedal walking has puzzled and attracted attention of the scholars working on the kinetics and kinematics of bipedal walking. The hallucal distal phalanx of humans is both laterally angled in the transverse plane and medially torqued along the long axis of the bone and helps in bipedal propulsion. The centre of gravity passes through the ball of the great toe and in the final stage of forward propulsion while walking, the body weight is transferred to the ball of the foot with peak pressure under the medial metatarsal and ultimately ending with toe-off pressure.4-5 But as every good thing comes with a price, so also do the advantages of big toes. Various diseases of the big toes, namely ingrown toenails, corns, and callosities have rendered trouble and posed profound challenges to mankind. Consequently, men tried to find the reason and remedy since the early days which was evident in the medical texts since ancient times. As footwear has been held as one of the common contributory factors, the description of ingrown toenails is more prevalent in the medical literature of foot-wear using civilisations. Controversies surrounded this entity including its cause and treatment since the ancient period. These debates settled with the description of Durlacher.6

Etymology
Since the early days, ingrown toenails have been described under the different names of paronychia, onychia, whitlow, etc. With time, it had been variously termed as ingrowing or ingrown toenails, infleshed toenails, embedded toenails, onychocryptosis, onyxis, ongle incarné, unguis incarnatus, etc. Greeks called it pterúgion (Πτερύγιον) and in Latin it was reduvia or excrecentia unguis fungosa.7 It has been argued that when the nail is primarily at fault, the condition should be termed as an ingrown or ingrowing toenail, whereas with problems in the lateral nail folds, it is onychocryptosis.8 Different types of this ailment have been described.9

On the disease and its aetiology: from the pages of history
In the history of medicine, Egyptian papyri are considered the oldest written records discovered to date. The Hearst papyrus of the first half of the second millennium BCE contained discussions on the ailments of fingers and toes in plate numbers XI to XIII. The subjects on pages XII (lines 6, 7, 11, 13, and, 15) and XIII (lines 3 and 6) specifically discussed the diseases of fingers and toes. Out of these prescriptions, plate number XII, line 11, and plate number XIII, line 7 mentioned an open sore around the toenail and swelling of the toes, respectively. Whether it included ingrown toenails was difficult to ascertain.10,11 The Ebers

How to cite this article: Mukhopadhyay AK. Delving into the depth: On the historical aspect of ingrown toenails from the ancient period till the 19th century. Indian J Dermatol Venereol Leprol. doi: 10.25259/IJDVL_1034_2023

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Received: September, 2023 Accepted: November, 2023 EPub Ahead of Print: March, 2024 Published: ***

DOI: 10.25259/IJDVL_1034_2023 PMID: ***
papyrus (c. 1550 BCE) also discussed nail diseases but did not mention ingrown toenails.12

In the ancient Ayurvedic literature of India, a description suggestive of this disease (Chippam) and its medical and surgical management have been mentioned. It was also designated as Upanakha and Kshataroga and placed under a group of smaller diseases (Kshudraroga).13,14 Sushruta Samhita (c. 6th century BCE) remarks that the deranged humour of vayu and pitta vitiating the flesh of the fingernails gives rise to a disease that is characterised by pain, burning, and suppuration.15 A similar condition (charmanakhashotha) arising between the nail and the flesh that may be suggestive of this ailment can be found in Charak Samhita of the first-millennium BCE.16,17 Madhavanidana (c. 7th century CE), a book of diagnostics, mentioned this sickness like its predecessors.18

Votive offerings of ingrown toenails were presented in ancient Italy during the 4th to 1st century BCE.19,20 Celsus (c. 25 BCE–c. 50 CE) in his De Medicina described a disease around the nails that contained some condition (caruncle) like ingrowing toenails though he described it under the heading: Of the ulcers in the fingers. Celsus mentioned that the Greeks called it pterygion.21 Oribasius (320–400 CE), a Greek medical writer and personal physician of the Roman emperor Julian, wrote about it.22 Paulus Aegineta (c. 625–c. 690) also described the condition of fungous flesh covering part of the nail as pterygium caused by whitlow or some identical condition. Ingrown toenail has been described by eminent authorities of the Islamic world like Rhazes (c. 864/865–c. 925/935), Haly Abbas (930–994), Albucasis (936–1013), Avicenna (980–1037) and others.23,24 The ancient foot–binding practice originated in 10th century China and was a painful exercise that sometimes led to onychocryptosis.25

The eminent British physician Daniel Turner (1667–1741) in his De morbis cutaneis (1723), the first book of skin diseases in the English vernacular, described the condition and held the ill-fitting shoes responsibly - [Figures 1a, and 1b].7 Rousselot, a French surgeon, wrote about this ailment in Toilette des pieds (1769) – a treatise considered to be the first book on chiropody [Figures 2a, and 2b].26

Figure 1a: The title page of Daniel Turner’s De morbis cutaneis (1723). (Credit: De morbis cutaneis. A treatise of diseases incident to the skin, with an appendix concerning the efficacy of local remedies by Daniel Turner. Wellcome Collection. Public Domain Mark 1.0).

Figure 1b: On the management of ingrown toenails in Turner’s De morbis cutaneis (1723). (Credit: De morbis cutaneis. A treatise of diseases incident to the skin with an appendix concerning the efficacy of local remedies by Daniel Turner. Wellcome Collection. Public Domain Mark 1.0).
After the death of Rousselot, these notes were relocated to Nicholas Laurent La Forest, a practicing Chirurgien-pédicure, to Louis XVI. He began the scientific writing on chiropody in his *L’art de Soigner Les Pieds* (1781) and explained the cause of onychocryptosis. Plenck (1735–1807) in *Doctrina de morbis cutaneis* (1783) mentioned it as *pterygium unguis* in the chapter of *Morbi unguium*. At the beginning of the nineteenth century, the chiropodist Heymann Lion portrayed a detailed account in his *Spinae pedum* (1802). He blamed faulty paring of nails with rounding of the corners. Wardrop (1814) also provided a comprehensive explanation of the subject in his surgical discourse. Durlacher in later years acknowledged Wardrop’s view. Rayer, a distinguished dermatologist of the early nineteenth century, maintained that the affliction was caused by mechanical irritation secondary to accidental trauma, the defective configuration of the nail, irregular growth or great convexity of the nail, and pressure of the tight shoes. The eminent dermatologists of the nineteenth century like Erasmus Wilson, Tilbury Fox, Duhring, and others also held similar views. From the ancient days of medical history till the nineteenth century, several works provided exhaustive descriptions of the cause and clinical picture of this condition but in 1845 Durlacher was probably the pioneer in mentioning and emphasising the inappropriate cutting of the nail as the reason behind this ailment. He gave a clear and complete picture of the condition describing it as the ‘nail growing into the flesh’ in his treatise *A treatise on corns, bunions, the diseases of nails and the general management of the feet* (1845) [Figures 3a and 3b]. Notably, this book also contained the first illustration of an ingrown toenail [Figure 4].

**Nail into the flesh or flesh onto the nail**

Several arguments have been put forward and a lot of causative factors have been enumerated regarding the aetiopathogenesis of ingrowing toenails. Heifetz argued...
that ingrown toenail is a misnomer and wrote: *It is generally conceded that the underlying pathology is not the growth of the nail into the flesh, but rather the growth of the flesh upon the edge of the nail.*

Historically, the earliest explanation was proposed in the ancient Indian texts of Ayurveda as the vitiation of the humours *vata* (air) and *pittam* (bile) as the reason for ingrown toenails. Paulus Aegineta commented that it was commonly caused by accident. Turner opined that any trauma from splinters, pins, or needles was the reason and blamed shoes that might compress the nail leading to the malady. Plenck maintained that prolongation and increase of the epidermis at the root of the nail was the cause. Though Durlacher is credited with his argument of ‘nail growing into the flesh’, Wardrop in an article commented about the ‘growth of the nail into the flesh’ in 1814.

**Treatment: A Look Back**

Since the early days of human history, various remedies have been tried to mitigate the misery of painful ingrown toenails. The several avenues available today to manage it are the outcomes of the endeavour of innumerable known and unknown medical persons.

The ancient Egyptian papyri like the Hearst papyrus mentioned many finger and toe conditions that might have included this ailment too, albeit not very clearly. There are about 36 remedies and one of them is to ‘remove the swelling of the toe’. The ancient Indian Ayurvedic text *Sushruta Samhita* (c. 6th century BC) said that the affected part should first be washed with hot water, drained with a knife, and subsequently anointed with medicated oil. Resin powder should be sprinkled over it and bandaged. If this failed, thermocautery used to be done. Similar therapies echoed...
History of ingrown toenail

in other Ayurvedic texts like Astanga Hridayam (6th century CE), Sharangadhara Samhita (12th century CE), Bhavaprakasha (16th century CE), etc. Chakradatta, an 11th-century treatise, has advised fomentation instead of washing with hot water which is in contrast with Sushruta’s advice.  

As footwear is an important factor, the quest for remedies for ingrowing toenails is more ubiquitous in the medical literature of shoe-wearing civilizations. Celsus suggested a mixture made of alum and honey to be rubbed on the lesion for extirpation. If it does not work, it should be fomented and a medicine composed of calcite, pomegranate bark, copper scales, honey, etc., should be applied and wrapped with moistened linen. In case it failed, surgery using a knife was the final way to alleviate the ailment. Orbisius prescribed various mixtures composed of crushed incense, iron, realgar, etc. Another combination he prescribed was a compound containing honey, gallnuts, sour pomegranate peel, red copper, and burnt dried fig compounded to form a liniment and applied under a bandage twice daily. Paulus Aegineta advised a formula of arsenic and manna covered with a plug or roll of lint containing wine and sponge. Along with this, he also suggested the administration of medicines and methods as previously described by Celsus and Orbisius. Paulus also suggested raising and cutting the corners of the nails with a scalpel. Various famous authorities like Rhazes, Haly Abbas, Albucasis, and Avicenna of the Islamic medical world also described in detail the management of medicines as well as surgery using lancets and cautery. Ambrose Parè (1510–1590) treated this condition by pushing a straight-edged bistoury through the base of the soft parts covering the nail and removing these with subsequent cauterisation with the red-hot iron. Fabrizius ab Aquapendente (1537–1619) advised excision and avulsion of the ingrowing nail margin. Turner suggested the introduction of the point of the scissors underneath the area of the nail and clip it at the earliest, but if the excrescence was very painful then cathertick powder or escherotick or crude vitriol and lunar caustic is used to expedite the sloughing of the growth and then the affected nail is removed. La Forest echoed the views of Turner. Plenck in his Doctrica de morbis cutaneis remarked that the epidermis be separated from the nail with a knife as treatment. Lion opposed the then-prevalent practice of scraping the nail. He described the operation for the ingrowing toenail exhaustively in his treatise. Wardrop discussed the management with lunar caustic and suggested the old but prevalent method of cutting a V-shaped notch in the upper surface of the nail. Michaelis (1830) described various treatment procedures. Gosselin described the removal of an elliptical wedge-shaped piece of nail matrix and skin including the whole nail groove along the edge. Durlacher, the most prominent chiropodist of his time in England, reviewed the ancient and prevalent methods of management of the condition and advocated his way of treatment of dividing the affected nail longitudinally to relieve the sulcus pressure. Hildebrandt (1884), Quenu (1887), Anger (1899), and others added further to the subject. Quenu’s radical nail bed and matrix ablation method was popularised in the 20th century as Zadik’s procedure. Foote in 1899 compared different methods of operation for ingrowing nails and for the first time described selective matrix horn resection. Most of the time the treatment was more painful and even fatal than the disease itself, so much so that at times it had to witness a tragic end. This can be visualised from the description of Dupuytren in article VIII entitled D’ongle rentré dans les chairs (Of the nail tucked into the flesh) of his book Lecons orales de clinique chirurgicale where he wrote:...

…the moment of the operation being judged suitable, I engage the tip of a branch of straight, solid well-sharpened scissors under the middle of the nail. I drag them by a rapid movement to the root and divide the nail by one cut into two roughly equal halves; then seize...
Considering the prevailing situation of agonising management of the condition, one of the most important developments is the use of anaesthesia which ended the anguish of patients and helped surgeons to perform their job better to yield a more fruitful outcome. It was probably in 1853, Robert Liston (1794–1847) the British surgeon famous for his skill and swiftness in surgery during the pre-anaesthetic era first used anaesthesia for the operation of an ingrown toenail ‘removed, by revulsion (avulsion), both sides of the great toenail’.

Many dermatologists, surgeons, and chiropodists worked and detailed the management of the ingrowing toenails during and after Durlacher, but they followed the existing ones without much new contribution during the 19th century. Many newer methods were developed thereafter, but there is no unanimous way to relieve the agony of the sufferers yet and debate is continuing about the best way to treat this condition.

The history of ingrowing toenails is fascinating. Since the early days of medical history, this painful condition has been mentioned. Men tried to find out its reason and remedy and all possible avenues were ventured – from poultice of bread to paring of nails, from lateral matricectomy to most advanced laser surgery but it had remained a tough problem to treat. About 170 years back, Gosselin enumerated about 75 types of local management.

The history of the ingrown toenail witnessed various landmark events and the seeds of major developments germinated during the 19th century. A summary of these significant events is given in Table 1. We have traversed a long way since the ancient period to reach the modern scientific remedy for this ailment and various strategies have developed. Table 2 summarises these different treatment options and the landmark progress with the period of these procedures is presented in Table 3. The advent of anaesthesia has led to the tragic picture of agonising pain inflicted by the pointed blade of sharp scissors, a common scenario in the operating room, to the pages of the book of the history of medicine. With the rapid advancement in medical science and technology, days are not far away when there will

### Table 1: Landmarks in the history of ingrown toenails (from the ancient period till the 19th century)

<table>
<thead>
<tr>
<th>Authorities</th>
<th>Period</th>
<th>Important events</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hearst papyrus11</td>
<td>First half of the second millennium BCE</td>
<td>Mentions open sore around the toenail and swelling of the toes (probable ingrown toenail).</td>
</tr>
<tr>
<td>Charak Samhita18</td>
<td>First-millennium BCE</td>
<td>Described charmanakhashotha – an entity suggestive of ingrown toenails.</td>
</tr>
<tr>
<td>Celsus21</td>
<td>c. 25 BCE–c. 50 CE</td>
<td>Suggested a mixture of alum and honey for extirpation and surgery, if needed.</td>
</tr>
<tr>
<td>Ambrose Paré51</td>
<td>1510–1590</td>
<td>Used bistoury and red hot iron.</td>
</tr>
<tr>
<td>Fabricius ab Aquapendente9</td>
<td>1537–1619</td>
<td>Advised excision and avulsion of the ingrowing nail margin</td>
</tr>
<tr>
<td>Daniel Turner7</td>
<td>1667–1741</td>
<td>Held ill-fitting shoes as the responsible factor. Suggested use of scissors and escharotics.</td>
</tr>
<tr>
<td>Nicholas Laurent La Forest37</td>
<td>1781</td>
<td>Tried to explain the cause of onychocryptosis scientifically.</td>
</tr>
<tr>
<td>Heymann Lion29</td>
<td>1802</td>
<td>Blamed faulty paring of nails and ill-fitting shoes.</td>
</tr>
<tr>
<td>Wardrop38</td>
<td>1804</td>
<td>Use of lunar caustics and supported the cutting of a V-shaped notch.</td>
</tr>
<tr>
<td>Lewis Durlacher6</td>
<td>1845</td>
<td>Gave a clear and complete picture of the condition describing it as the ‘nail growing into the flesh’ in his treatise.</td>
</tr>
<tr>
<td>Robert Liston46</td>
<td>1853</td>
<td>First anaesthesia for ingrown toenail operation.</td>
</tr>
<tr>
<td>Emmert17</td>
<td>1869</td>
<td>Proposed three stages of ingrowing toenails.</td>
</tr>
<tr>
<td>Quenu9</td>
<td>1887</td>
<td>Advocated radical nail bed and matrix ablation.</td>
</tr>
<tr>
<td>Foote45</td>
<td>1899</td>
<td>First described selective matrix horn resection.</td>
</tr>
</tbody>
</table>

### Table 2: Common methods and various techniques for the management of ingrown toenails

<table>
<thead>
<tr>
<th>Method</th>
<th>Techniques</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Conservative treatment</strong></td>
<td>Compression and massage, Taping, Packing, False nail, Use of dental floss, Gutter treatment, Unbending of nails using braces, Nail tube splinting (sleeve technique), Use of superelastic wire, Nail ironing</td>
</tr>
<tr>
<td>Narrowing the nail plate permanently</td>
<td>Narrowing the nail plate permanently, Chemical cauterisation (phenol, sodium hydroxide, trichloroacetic acid), Wedge excision (Winograd’s, Zadik’s, or Emmert’s procedures, etc.), Laser therapy (e.g., CO2 laser), Electrocautery, Radiosurgery</td>
</tr>
<tr>
<td>Reduction of the periungual soft tissue</td>
<td>Howard–Dubois procedure, Vandenbos’ procedure, Super U procedure, Noël’s procedure, Tweedie and Ranger’s transposition flap, Terminal Syme operation, Avulsion, Deroofing</td>
</tr>
</tbody>
</table>
be no more long-lasting morbidity and permanently distorted toes and nails and the tale of the painful ingrown toenail will become a story of the past.

Acknowledgement
The author would like to express his gratitude to Prof. Vincent J. Hetherington, DPM, MS, Emeritus Professor, College of Podiatric Medicine, Kent University, Ohio, USA for the critical review and suggestions during the preparation of this article and for providing various instrumental literature on the subject.

Declaration of patient consent
Patient’s consent is not required as there are no patients in this study.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

Use of artificial intelligence (AI)-assisted technology for manuscript preparation
The authors confirm that there was no use of artificial intelligence (AI)-assisted technology for assisting in the writing or editing of the manuscript and no images were manipulated using AI.

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