

# CME

Follow the link from the online version of this article to obtain certified continuing medical education credits

# The management of ingrowing toenails

Derek H Park, Dishan Singh

Foot and Ankle Unit, Royal National Orthopaedic Hospital, Stanmore HA7 4LP, UK

Correspondence to: D H Park  
derekpark@doctors.net.uk

Cite this as: *BMJ* 2012;344:e2089  
doi: 10.1136/bmj.e2089

## bmj.com

Previous articles in this series

- ▶ Diagnosis and management of primary hyperparathyroidism (*BMJ* 2012;344:e1013)
- ▶ Female genital mutilation: the role of health professionals in prevention, assessment, and management (*BMJ* 2012;344:e1361)
- ▶ Childhood cough (*BMJ* 2012;344:e1177)
- ▶ Ductal carcinoma in situ of the breast (*BMJ* 2012;344:e797)

Ingrowing toenails are a common condition that causes pain and disability in the foot. The condition occurs when the nail plate traumatises the nail fold, giving rise to pain, inflammation, or infection (or a combination thereof). It commonly occurs in the great toe but can also affect the lesser toes. Patients with ingrowing toenails are usually male, between the ages of 15 and 40 years; they are often encountered in general practice, with an estimated 10 000 new cases presenting in the United Kingdom each year.<sup>1</sup> The condition is managed by a wide variety of healthcare professionals including general practitioners, podiatrists, dermatologists, general surgeons, and orthopaedic surgeons. The surgical treatments for ingrowing toenails include procedures on the nail plate, the nail bed (germinal matrix), and the surrounding soft tissues. Historically, a recurrence rate of 13-50% has been reported after surgical treatment,<sup>2</sup> although more recent papers have reported recurrence rates of less than 5%, particularly with the use of wedge resection of the nail and phenol ablation of the nail matrix.<sup>3-4</sup> A Cochrane review of nine randomised clinical trials of surgical treatments concluded that simple nail avulsion combined with phenol ablation was most effective in reducing symptomatic recurrence.<sup>5</sup> It is important to recognise, however, that the presentation and disease process of ingrowing toenails covers a wide spectrum, and that management options will depend on the stage at which a patient presents. We review the management of ingrowing toenails, focusing on the effectiveness of the procedures most commonly used.

## Anatomy of the nail and surrounding area

Figure 1 depicts the anatomy of the nail and the surrounding area.

## How does an ingrowing toenail occur?

The term ingrowing toenail is used to describe a sharp spike of nail growing into an overlapping nail fold. This condition is caused by a combination of extrinsic and intrinsic factors, such as poorly fitting shoes, improperly trimmed nails, tight socks, excessive sweating, soft tissue abnormalities of the toe, and inherent nail deformity.<sup>9</sup> Normal nails vary greatly in shape, and the nail walls are adaptable to marked curvature of the nails. Ingrow-

## SOURCES AND SELECTION CRITERIA

We searched Medline (PubMed), the *Cochrane Database of Systematic Reviews*, Cochrane central register of controlled trials, and CINAHL using the search terms “ingrowing toenails”, “ingrown toenails”, and “onychocryptosis”. We identified additional literature from the references of identified papers. In addition, we consulted standard orthopaedic textbooks on the subject and reviewed the main references quoted.

ing toenails can occur in the context of normal nail shape or abnormal nail shape. In normal nails the nail plate is slightly convex from side to side; in people with normal nails, improper nail trimming can lead to a nail spike that traumatises soft tissue. This provides a port of entry for bacterial and fungal skin flora, resulting in tenderness, inflammation, and infection. Poorly fitting shoes can exacerbate the situation. Ingrowing toenails can also occur in people with abnormal nail shapes, such as incurvated nails or a wide nail plate. In this situation, the condition can occur congenitally or in adults, where increased pressure on the nail leads to increased transverse curvature that causes the edge of the nail to dig into the toe.<sup>6-9-11</sup>

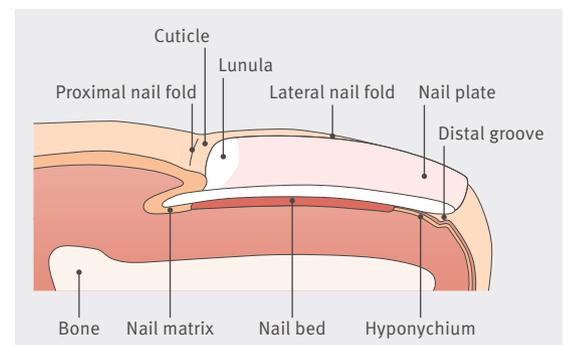
## What are the clinical features of an ingrowing toenail?

The clinical presentation of an ingrowing toenail has traditionally been divided into three stages (fig 2; box):

Stage I: Pain, swelling, and erythema

Stage II: Signs of inflammation together with active or acute infection

Stage III: Chronic infection leading to formation of hypergranulation tissue at the nail folds.<sup>7-12-13</sup>



**Fig 1 | Anatomy of the nail and surrounding area.** The nail plate inserts proximally into the proximal nail fold and consists of modified skin epithelium composed mainly of keratin. The cuticle is a thin membranous extension of the proximal nail fold. The nail bed matrix lies beneath the nail plate and is conventionally divided into the germinal matrix proximally and the sterile matrix distally; the germinal matrix is the regenerative part of the nail, whereas the sterile matrix adds thickness to the nail as the nail grows longitudinally along the nail bed. The hyponychium is the area under the free edge of the nail plate.<sup>6-8</sup> The lunula is a white crescent shaped area seen in the posterior fifth of the nail plate, distal to the cuticle: it marks the distal part of the less vascular germinal centre

## SUMMARY POINTS

Ingrowing toenails are common, cause serious disability, and affect mainly young men

There is a spectrum to the clinical presentation with pain progressing to infection, hypergranulation, and finally chronic infection

Ingrowing toenails can occur in normal or abnormally shaped nails

Cases in abnormally shaped nails are more difficult to manage conservatively and usually require surgery

Symptoms are less likely to recur after partial nail avulsion and segmental phenol ablation than after simple nail avulsion or wedge excisions alone



Fig 2 | An ingrowing toenail at different stages of presentation. (A) Stage I with pain, swelling, and erythema; (B) stage II with signs of inflammation together with active or acute infection; (C) stage III with chronic infection leading to granulation tissue formation at the nail folds

It can be difficult to determine the clinical stage, however, and it is simpler to consider the presentation as being on a spectrum of the disease process. The initial clinical presentation is of pain, swelling, erythema, and hyperhidrosis in the affected toe. After the initial inflammation and infection, a draining abscess causes further erythema, oedema, hyperhidrosis, and tenderness. Attempts at healing lead to the formation of hypertrophic granulation tissue, which is slowly covered by epithelium; this inhibits drainage and promotes oedema, leading to chronic infection and hypertrophy of the nail wall.

**What are the treatment options for ingrowing toenails?**

Traditionally, management has been dictated by the clinical stage of presentation.<sup>7 12-14</sup> With the recent evaluation of treatment methods such as partial nail avulsion and segmental phenol ablation, however, the management of this condition has changed, and it is simpler to classify ingrowing toenails into those that occur in normal nails and those occurring in abnormally wide or incurvated edge toenails (fig 3).

**Normal nails**

Ingrowing toenails in normal nails tend to present in younger people and are usually a result of improper nail trimming of the lateral edge, which leaves a sharp nail spike that traumatises the nail fold. Evidence from obser-

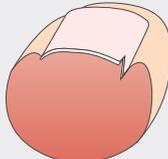
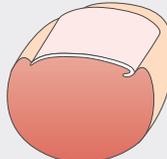
	Improperly cut normal nail	Abnormal nail
		
<b>Features</b>	Normal nail plate; slightly convex from side to side	Abnormally wide nail or incurvated edge nail
<b>Treatment</b>	Advice on toenail trimming  Chiroprapist may remove offending nail spike  Partial nail avulsion is rarely needed	Advice on toenail trimming  Partial nail avulsion with segmental phenol ablation

Fig 3 | Management options for normal and abnormal toenails

**Clinical features**

- Pain, swelling, erythema, and hyperhidrosis of the affected toe
- ↓
- Inflammation and infection lead to a draining abscess with discharge
- ↓
- Development of hypertrophic granulation tissue, epithelial lining inhibits drainage, chronic infection results

vational studies indicates that the initial treatment should be conservative, with the patient given general instructions in foot care and footwear.<sup>9 12</sup> The nail should be trimmed at right angles to the long axis of the toe and patients are able to carry this out at home. A chiroprapist can gently retract the nail fold and trim the offending nail spike.

**Abnormal nails**

Ingrowing toenails most commonly develop in adults with abnormally wide toenails or those with an incurvated edge. Incurvated (or involuted) toenails can be caused by a bony malformation of the dorsum of the distal phalanx,<sup>15</sup> or by secondary changes in the toenail as a result of irritation and pressure.<sup>16</sup> There is no consensus on standard non-operative treatment of ingrowing toenails in abnormally shaped nails, but failure of conservative management should lead to consideration of surgical options. These patients are best offered partial nail avulsion with segmental phenol ablation. Phenol has potent antiseptic properties, so the procedure can be carried out even in the presence of infection without risk of wound infection. Patients with severe involuted nails on both the tibial and fibular sides (pincer nails) would be left with a too thin nail after wedge excision and may be better treated with a total nail avulsion.<sup>14</sup>

**What are the different types of surgical treatments?**

The surgical options consist of procedures that are temporary or permanent.

**Temporary procedures**

A Cochrane review has shown that recurrence of symptoms is high after temporary measures, such as simple (or partial) nail avulsion without chemical or surgical ablation, and this may lead to low patient satisfaction.<sup>2</sup> Therefore, we prefer to perform the procedure in selected patients only. However, removal of the nail spike is curative if followed by appropriate aftercare, as detailed above.

**Permanent procedures**

Historically, ablation of the germinal matrix centre (Zadik's procedure) or reductive procedures to the lateral nail fold (Winograd's procedure) were popular.<sup>17 18</sup> In Zadik's (sometimes mistakenly called Zadek's) procedure, the nail forming part of the nail bed is removed and adequate skin cover is provided without shortening the distal phalanx.<sup>17</sup> Winograd's technique of wedge excision involves partial removal of the nail plate and matrix,<sup>18</sup> as well as removal of a wedge of the lateral nail fold. In essence, these procedures attempt to prevent nail recurrence by destroying the germinal matrix by surgical ablation, but are less commonly performed than procedures that combine partial nail avulsion with ablation of the nail matrix

Fig 4 | (A) An ingrowing toenail causing chronic infection; (B) a cut is made in the isolated nail segment to allow partial nail avulsion; (C) partial nail avulsion with removal of a nail segment that extends under the eponychium; (D) application of phenol; (E) postoperative dressing



#### ADDITIONAL EDUCATIONAL RESOURCES FOR PATIENTS

Patient.co.uk ([www.patient.co.uk/health/Ingrowing-Toenails-\(Ingrown-Toenails\).htm](http://www.patient.co.uk/health/Ingrowing-Toenails-(Ingrown-Toenails).htm))—Patient website that provides health information to patients

British Orthopaedic Foot and Ankle Society ([www.bofas.org.uk/PatientAdvice/Ingrowingtoenail.aspx](http://www.bofas.org.uk/PatientAdvice/Ingrowingtoenail.aspx))—Information for patients on how to detect, prevent, and care for ingrowing toenails, in addition to when to seek professional advice

American Academy of Orthopaedic Surgeons (<http://orthoinfo.aaos.org/topic.cfm?topic=a00154>)—Information on surgical treatments for ingrowing toenails

using electrocauterisation, laser surgery, or agents such as phenol or sodium hydroxide.

A Cochrane review of surgical treatments suggests that simple nail avulsion combined with phenol ablation should be the treatment of choice.<sup>5</sup> A recent randomised clinical trial also showed lower rates of recurrence with partial nail avulsion and phenol ablation compared with partial avulsion with nail matricectomy.<sup>19</sup> The success of phenol matricectomy depends on the use of good quality phenol and satisfactory haemostasis. Individually packed and sealed sterile containers of 90% liquid phenol with appropriately sized cotton tips are now available, and these are safer to use than phenol in brown bottles, which usually come from pharmaceutical suppliers. These individually packed containers also reduce the risk of spillage.

#### Partial nail avulsion with segmental phenol ablation

We use the following technique when performing this procedure (fig 4). The toe is cleaned with an appropriate skin preparation, such as povidone-iodine or chlorhexidine. A ring block with 1% plain lidocaine is injected at the base of the toe and a coloured ring tourniquet with a tag is applied—flesh coloured glove tourniquets are no longer used because of the risk of failing to remove them at the end of the procedure. Blunt dissection is carried out to separate the edge of the appropriate nail plate from the soft tissues. A cut is made with a straight Beaver mini-blade to isolate an appropriate (usually 3–5 mm) section of the affected nail segment extending under the proximal nail fold, which is lifted off by grasping with an artery clip and using a central to lateral twisting motion to avulse the germinal centre. Good haemostasis should be achieved before application of phenol because the presence of blood prevents a proper matricectomy. Denatured matrix looks white as opposed to the black colour of denatured blood. The surrounding skin is protected by application of paraffin jelly. A one minute application of phenol is usually performed twice, followed by a washout with normal saline. A washout with alcohol is commonly performed but is unnecessary. The chemical action of phenol is self limiting as a result of the process of cellular destruction, not the change in solvents after the application of alcohol.<sup>20</sup> A postoperative dressing is applied (fig 4E) and the patient is asked to remove the dressing in 48 hours and soak the foot in tepid salt baths daily. This is done to prevent debris from accumulating in the nail folds because this can lead to infection. Patients usually experience very little postoperative pain and can return to work the next day. Warn the patient that a serous discharge often occurs but usually

settles within two weeks, although it can sometimes persist for several weeks.

The rate of recurrence after phenol ablation is low and is usually treated by repeat application of phenol.<sup>3 4 19 21-24</sup> An added advantage of this procedure is that it can be carried out even in the presence of acute infection. We advise against making an incision in the skin to remove the nail segment in the presence of acute infection.

**Conclusion**

The treatment of ingrowing toenails has traditionally been blighted by high recurrence rates and poor patient satisfaction,<sup>2</sup> but with the increasing use of chemical ablation of the nail matrix in combination with partial nail avulsion reported recurrence rates have decreased. On the basis of the Cochrane review and our review of the current literature, fig 3 sets out a simple approach to the management of this common but poorly treated condition.

**Contributors:** Both authors helped in the conception of the manuscript, the analysis of the relevant literature, the drafting and revision of the manuscript, and the final approval of the version to be published. DS is guarantor.

**Funding:** None received.

**Competing interests:** None declared.

**Provenance and peer review:** Not commissioned; externally peer reviewed.

**Patient consent not required (patient anonymised, dead, or hypothetical).**

- 1 Sykes PA. Ingrowing toenails: time for critical appraisal? *J R Coll Surg Edinb* 1986;31:300-4.
- 2 Laxton C. Clinical audit of forefoot surgery performed by registered medical practitioners and podiatrists. *J Public Health Med* 1995;17:311-7.
- 3 Herold N, Houshian S, Riegels-Nielsen P. A prospective comparison of wedge matrix resection with nail matrix phenolization for the treatment of ingrown toenail. *J Foot Ankle Surg* 2001;40:390-5.

- 4 Shaikh FM, Jafri M, Giri SK, Keane R. Efficacy of wedge resection with phenolization in the treatment of ingrowing toenails. *J Am Podiatr Med Assoc* 2008;98:118-22.
- 5 Rounding C, Bloomfield S. Surgical treatments for ingrowing toenails. *Cochrane Database Syst Rev* 2005;2:CD001541.
- 6 Pardo Castello V, Pardo Sanson OA. Diseases of the nails. 3rd ed. Thomas, 1960.
- 7 Zaias N. The nail in health and disease. MTP, 1980.
- 8 Zook EG, Van Beek AL, Russell RC, Beatty ME. Anatomy and physiology of the perionychium: A review of the literature and anatomic study. *J Hand Surg Am* 1980;5:528-36.
- 9 Lloyd-Davies RW, Brill GC. The aetiology and out-patient management of ingrowing toe-nails. *Br J Surg* 1963;50:592-7.
- 10 Fowler AW. Excision of the germinal matrix: a unified treatment for embedded toe-nail and onychogryphosis. *Br J Surg* 1958;45:382-7.
- 11 Brearley R. Treatment of ingrowing toenail. *Lancet* 1958;2:122-5.
- 12 Dixon GL Jr. Treatment of ingrown toenail. *Foot Ankle* 1983;3:254-60.
- 13 Heifetz CJ. Ingrown toenail. *Am J Surg* 1937;38:298-315.
- 14 DeLauro TM. Onychocryptosis. *Clin Podiatr Med Surg* 1995;12:201-13.
- 15 Lerner LH. Incurvated nail margin with associated osseous pathology. *Curr Podiatr* 1962;11:26-8.
- 16 Parrinello JF, Japour CJ, Dykji D. Incurvated nail: does the phalanx determine nail plate shape? *J Am Podiatr Med Assoc* 1995;85:696-8.
- 17 Zadik FR. Obliteration of the nail bed of the great toe without shortening the terminal phalanx. *J Bone Joint Surg* 1950;32-B:66-7.
- 18 Winograd AM. A modification in the technique of operation for ingrown toenail. *JAMA* 1929;92:229-30.
- 19 Bos AM, van Tilburg MW, van Sorge AA, Klinkenbijl JH. Randomized clinical trial of surgical technique and local antibiotics for ingrowing toenail. *Br J Surg* 2007;94:292-6.
- 20 Espensen EH, Nixon BP, Armstrong DG. Chemical matrixectomy for ingrown toenails: is there an evidence basis to guide therapy? *J Am Podiatr Med Assoc* 2002;92:287-95.
- 21 Greig JD, Anderson JH, Ireland AJ, Anderson JR. The surgical treatment of ingrowing toenails. *J Bone Joint Surg* 1991;73-B:131-3.
- 22 Issa MM, Tanner WA. Approach to ingrowing toenails: the wedge resection/segmental phenolization combination treatment. *Br J Surg* 1988;75:181-3.
- 23 Ross WR. Treatment of the ingrown toenail and a new anesthetic method. *Surg Clin North Am* 1969;49:1499-504.
- 24 Van der Ham AC, Hackeng CA, Yo TI. The treatment of ingrowing toenails. A randomised comparison of wedge excision and phenol cauterisation. *J Bone Joint Surg Br* 1990;72-B:507-9.

Accepted: 14 February 2012

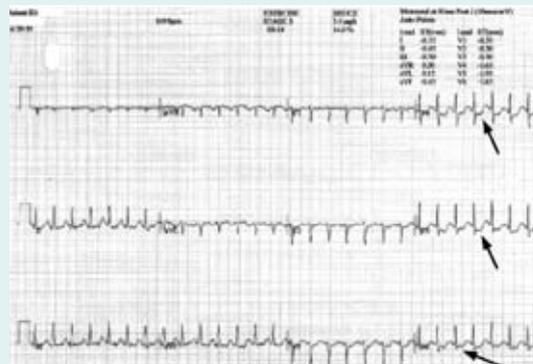
**ANSWERS TO ENDGAMES, p 46**

For long answers go to the Education channel on [bmj.com](http://bmj.com)

**PICTURE QUIZ**

**A 43 year old woman with a 40 year history of exertional chest pain**

- 1 Down-sloping ST segment depression in the lateral leads (V4-V6), which is suggestive of myocardial ischaemia (fig 2).
- 2 Underlying causes include atherosclerosis, coronary spasm, coronary microvasculature dysfunction, and external compression of a coronary artery. Younger women have a higher false positive rate with this test and so the results should be interpreted with caution.
- 3 When a coronary artery emerges from the wrong side of the aorta it often has to course between the aorta and pulmonary artery to reach its normal territory. The artery is then susceptible to compression by the great vessels, especially during hyperdynamic states such as physical exertion.
- 4 Functional cardiac imaging, such as stress echocardiography, radioisotope perfusion scanning, or stress magnetic resonance imaging, will determine the presence (or absence) and location of ischaemia, which is vital in determining appropriate management.



Exercise tolerance electrocardiogram showing ST segment depression in leads V4, V5, and V6 (arrows)

- 5 If functional imaging shows reversible ischaemia in the territory of the right coronary artery, the case should be discussed with a cardiac surgeon for consideration of right coronary artery reimplantation, bypass grafting, ostioplasty, or percutaneous coronary intervention with stenting.

**STATISTICAL QUESTION**

**One way analysis of variance**

Statement b is true, whereas a and c are false.

**ANATOMY QUIZ**

**Anatomy of the female pelvis**

- A: Bladder
- B: Endometrium
- C: Myometrium
- D: Cervix
- E: Vagina