CONTINUING PROFESSIONAL UPDATE

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Driving excellence in foot health

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Continuing Professional Development (CPD) is an important part of professional duties to ensure up to date and safe practice. We would like to welcome you to a brand-new series of articles which will be published on a regular basis and distributed to readers of EveryStep. We will be publishing regular update articles on a range of topics which have been commissioned from some of the profession's most experienced authors and peer-reviewed by experienced clinicians and researchers to ensure they are relevant and current. We would like to thank Canonbury Products Limited for supporting this initiative without any conditions, allowing unrestricted editorial control of the series.

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From the editorial team, **Mike Potter, Ivan Bristow and Anthony Maher, collectively MI Podiatric CPU (Continuing Professional Update) Tools.**

An alternative approach to the treatment of ingrowing toenail – incisional nail surgery

Introduction

Onychocryptosis or ingrowing toenail (IGTN) is a common and painful pathological nail condition affecting a broad patient demographic. Estimates have suggested a prevalence of 2-5% of the population with suspected higher rates in those with diabetes compared with non-diabetic populations (1). IGTN may occur at any age and affect both genders. IGTN can result in a prolonged period of pain which is normally sufficient to interfere with work and social activities. A plethora of aetiological factors have been described including excess nail curvature, trauma, poor nail care, hypertrophic nail sulcus, subungual exostosis and even excessive foot pronation (2). Less commonly, IGTN may be associated with concurrent pathologies, such as benign and malignant tumours, which may disrupt local nail tissues, render diagnosis more difficult and mandate surgical treatment.

Whilst many medical afflictions are treated by specific clinical specialities, IGTN is treated by a broad range of medical and non-medical professional groups including orthopaedics, accident and emergency doctors, dermatologists, general practitioners (GPs), advanced nurse practitioners, podiatrists and foot health practitioners. It is therefore unsurprising that the management approach to this common and painful condition lacks standardisation. Non-clinical

influences on clinical decision-making profoundly affect medical decisions and this may partially account for the variability in approach within professional groups (3). In the context of IGTN a number of factors appear to influence clinician choice of treatment. Examples include:

Patient factors

- Age
- Presence / absence of infection
- Nail morphology
- Healing capacity

Clinician factors

- Access to care (e.g. access to paediatric facility, general anaesthesia)
- Clinician knowledge / training / licensure
- Inherent clinician bias

Other

- Legislative anomaly
- Organisational protocols

Whilst the humble IGTN may appear a low-level pathology unworthy of much clinical attention, sub-optimal treatment is associated with potentially serious clinical sequelae and costly litigation. Within podiatry in the United Kingdom, chemical ablation with phenol, under local anaesthetic, appears the near universal approach. This article aims to raise awareness of alternative techniques which may be more appropriate in some circumstances.

In preparing this article, the author reviewed cases in which litigation involving toenail surgery was represented in expert witness work in the last five years. Table 1 provides a summary of a single medical expert (the author) over a five-year period.

These represent only those cases where the author has provided expert evidence. It may therefore be reasonably assumed these do not reflect the total cases of litigation or serious sequelae relating to nail surgery.

Hertz provided the earliest classification of IGTN describing three stages (4):

Stage 1	Mild to severe pain with erythema, trace oedema,
Stage 2	Increased pain, discharge from the edge of the nail, and signs of bacterial paronychia
Stage 3	Hypertrophic granulation tissue forms

Whilst this classification may have some value, it fails to reflect the presence of important clinical features which have implications when deciding on choice of treatment. In the UK, most patients present directly to their GP practice where antibiotics are used as a primary treatment or as an adjunct to more definitive treatment. Reyzelman et al (2000) examined the role of antibiotics in the management of IGTN using a prospective study in which patients with infected IGTN were randomly assigned to one of three groups. They noted no clinical benefit from the provision of antibiotics as an adjunct to nail surgery (5). In the author's experience, antibiotics seldom if ever provide a cure for an established IGTN and removal of the offending spicule results in rapid resolution of the inflammatory process. A key message is that antibiotics are ineffective in the treatment of IGTN and typically only dampen down infection and inflammation whilst doing nothing to combat the underlying cause.

Table 1: Author's expert witness work relating to nail surgery

Cases (N)	Issue / Allegation	Comment
1	Phenol burns to adjacent toe	Claimant received 3cm phenol burn to 2nd toe
1	Use of phenol beyond expiry	Phenol used 1 week beyond marked expiry
1	Vandenbos procedure resulting in toe disfigurement	Claimant left with permanent toe disfigurement
4	Malignancy	Three cases of delayed diagnosis of malignant melanoma
5	Failure to progress active treatment	Cases where multiple courses of antibiotics were prescribed without improvement. Failure to implement definitive treatment resulted in complications including permanent nail dystrophy or osteomyelitis
2	Gangrene	Failure to remove tourniquet resulting in minor amputation
1	Patient paralysed	Poor healing post chemical ablation resulting in surgical site infection (SSI) and spinal abscess from haematogenous spread.

Key point: Antibiotics only reduce infection and inflammation so are ineffective in the treatment of IGTN.

Non-surgical approaches to IGTN

Alternative conservative techniques, such as nail bracing using looped wires glued to the nail plate, are favoured by some professional groups over more traditional invasive measures. In their retrospective study comparing Winograd matrixectomy with nail bracing, Guler et al (2015) (6) claim comparable outcomes. Liu & Hang (2018) make similar therapeutic claims in their retrospective study of twenty one patients (7). A small prospective study of fifty-three patients over six months demonstrated similar positive outcomes with recurrence in only 7.4% of cases (8). Robust clinical evidence is lacking with regard to treatment with nail braces, with only a handful of papers examining this technique. Given the non-invasive nature of this treatment and no requirement for anaesthetic, it is perhaps worthy of further research in the future.

Surgical Procedures

In terms of definitive treatment, chemical ablation, as described by Dagnall, remains the universal treatment of choice (9). Compared with phenolisation, surgical excision is reported as having greater complications and re-growth rates than chemical ablation which remains the gold standard (10-12). Phenol applied to the exposed nail matrix causes coagulation necrosis by precipitation of proteins (3). Despite its popularity, chemical ablation is not without complication or therapeutic limitation (4). Although there is strong evidence for chemical ablation in terms of clinical efficacy and cost effectiveness, it is incumbent on clinicians to be aware of alternative techniques and recognise the indications for alternative techniques over chemical ablation.

For the purposes of this article the term "surgical procedure" refers to those techniques which employ incisions through the periungual tissues. Whilst chemical ablation is broadly accepted as a "clean" procedure suitable for provision in an outpatient setting, surgical procedures are more commonly considered "sterile" mandating a theatre or minor operating type environment. Beyond the need for additional physical requirements to undertake surgical nail procedures, there are also implications in terms of staff training. Specialist training is required for both medical and allied health professionals (AHP) to achieve competency in these techniques.

As with many surgical procedures original descriptions give way to multiple modifications resulting in a plethora of purportedly different procedures. This article will look at the more common surgical nail procedures. In truth the shape of the incision is less important than understanding the goals of the procedure and most cases require adaptation on a case-by-case basis. In general terms, when choosing the most appropriate procedure, four questions need to be answered:

1. Would chemical ablation be a better alternative?
2. Does the nail plate need to be removed in part or in total?
3. Does the nail need to be prevented from regrowing, in part or in total?
4. Is there a need to remove additional soft tissue and/or bone?

If the literature confirms superior outcomes for phenolisation techniques over surgical excisional approaches, the question arises why there remains a need to consider procedures which are technically more complex, more costly and associated with marginally increased rates of regrowth. In the author's opinion there are four principal situations in which formal surgical excision should be considered in place of chemical ablation. These are:

1. Phenol toxicity
2. Poor healing capacity
3. Presence of associated lesion
4. Previous failed phenolisation technique

Phenol Toxicity

The International Agency for the Research on Cancer (IARC) has stated there is insufficient data (laboratory animals or humans) to assess whether or not phenol has the potential to cause cancer. The IARC has classified phenol as a Class III carcinogen (14). Chronic exposure to phenol, including phenol fumes, is associated with several negative health effects examples of which are given in tables 2 and 3 (14). Limited data indicate that exposure to phenol at concentrations that do not harm the mother are unlikely affect the health of the unborn child. However, it is not possible to assess the reproductive and developmental effects of phenol in humans. Historically phenol has been used in the treatment of a wide range of dermatological conditions (15, 16). The recognition of its high dermal toxicity has reduced its use in dermatological practice. Despite this recognition, deaths associated with application of phenol continue to

be reported in the literature.

Phenolic systemic toxicity manifests initially as CNS stimulation followed by CNS depression, coma, seizures, nausea, vomiting, diarrhoea, methemoglobinemia, haemolytic anaemia, diaphoresis, hypotension, arrhythmias, pulmonary oedema, acute kidney failure, tinnitus, and respiratory depression. (Department of Health and Human Services Agency for Toxic Substances and Disease Registry. Medical management guidelines for phenol [https://www.atsdr.cdc.gov/MHMI/mmg115.pdf]). Whilst there have, to the authors knowledge, been no cases of phenol toxicity associated with phenol used in nail surgery, the rare but serious complications cited in table 3 should at least raise awareness of the risks of toxicity with even relatively low concentrations particularly in both patients and operators.

Poor Healing Capacity

Phenol is a caustic and the most used chemical in the performance of nail ablation. Phenol denatures protein and causes non-selective tissue destruction in proportion to its concentration. Whilst it may appear the clinician is able to control exposure by modifying the following:

1. Concentration of phenol applied
2. Duration of application
3. Tissue contact

The finesse of this technique is limited with significantly more tissue exposure to phenol taking place than is required to destroy the nail bed. Liquid phenol typically contacts the entire nail sulcus after avulsion of the offending nail plate. Control of tissue destruction is limited compared with more precise cold steel techniques. The net result is a chemical burn which heals by secondary intention. A further consideration is that these procedures are performed in non-sterile environments, which in the UK is common. For a fit and healthy patient this simple and reliable approach has shown to be largely safe and effective. Discussion around paediatric regulations, elective surgery and anaesthetic selection are outside the remit of this paper other than to highlight the dangers of disparity in care standards in managing children that apply to different professional groups.

Table 2: Side effects of Phenol

Vapours	Headache Vertigo Wheezing Respiratory tract irritation Ocular exposure can cause irritation and corneal opacification.
Dermal Contact	Inflammation Burns Necrosis
Acute Ingestion / Injection / Absorption	Gastrointestinal tract irritation and pain Pale and sweaty skin Constricted or dilated pupils Cyanosis Cardiovascular failure Respiratory failure Death

Because chemical ablation is associated with an increased risk of infection compared with surgical procedures (22), for patients with impaired healing capacity or an increased risk of infection through immunosuppression, it is best to avoid the protracted healing by secondary intention from chemical ablation in favour or formal surgical excision. Surgical excision heals by primary intention, avoiding an open wound which is prone to surgical site infection.

Associated Nail Pathology

A significant limitation of chemical ablation is the inability to deal with co-existing pathology in contrast to the versatility of cold steel techniques. In the podiatric

Table 3: Phenol toxicity

Age	Treatment	Outcome
Infant	Application of Castellani's solution	Methemoglobinemia, drowsiness, and dyspnoea.(17, 18)
Newborn	2% phenol solution was applied to the umbilical stump	One developed circulatory collapse and died and the other developed severe methemoglobinemia. (19)
2yr old	Injection sclerotherapy 5 injections of 5% phenol in almond oil, total dose 10mls.	Infant experienced a sudden cardiac arrest and later anoxic encephalopathy, rhabdomyolysis leading to death.(21)
11yr old	Xeroderma pigmentosum chemical peeling with phenol	Severe cardiac arrhythmias.(20)
24yr old	A brush cleaned in Liquified Phenol B. P. (80% phenol) then washed under running water before being used to apply dermatological treatment to a man's body	Within minutes he was found to be unsteady on his feet before collapsing and developing seizures. He subsequently stopped breathing. Resuscitation and later cardiac massage were tried with no effect.(16)

setting the application of chemical ablation has almost become the single option for the treatment of IGTN. Explanation for this approach is further seen in the anaesthetic options offered for nail procedures despite the implication of legal short comings in the consent process, which demand patients are provided with an explanation of the range of treatment options.

Perhaps the most pressing concern is the failure to appreciate that a wide range of periungual lesions may be masquerading as simple nail pathology. Employing chemical ablation in these circumstances can deprive the patient of prompt diagnosis and histological confirmation. Table 4 highlights several conditions which may be confused with a simple IGTN and serves as a reminder that whilst rare, malignancy involving the nail apparatus should remain on the diagnostic radar.

Managing Subungual Exostosis

The precise cause of these lesions is unknown, but they have been cited as being linked to previous trauma, chronic irritation, longstanding infection and as part of multiple hereditary exostoses (33). In the author's experience patients frequently present without any obvious history, though care should be taken to examine for signs/symptoms of generalised osteochondral lesions (37, 38). Previously deemed a variant of an osteochondroma, which represent the most common of bone tumours, subungual exostoses are now considered to be a result of reactive metaplasia of cartilage, histologically distinct from osteochondroma.(39) From a clinical perspective differentiation makes little difference to management unless multiple lesions are apparent.

Where a subungual exostosis is suspected radiographic examination is necessary in order to:

1. Determine the extent and location of bone involvement thus aiding surgical planning
2. Determine the nature of bone involvement

In Figure 1 the exostosis involves the medial aspect of the terminal phalanx and has resulted in mild nail changes. Excision can be achieved via a modified hockey stick incision avoiding damage to the nail and nail matrix whilst providing sufficient exposure for the removal of the bony growth.

In these typical examples (Figure 2 overleaf) the exostosis may be removed using a distal incision through healthy tissue, typically a "J" or "Fishmouth" approach adjusted to the needs of the case. The goal is to remove the deforming bone growth and to preserve the nail

Table 4: Examples of tumours which may be associated with IGTN

Tumour Name	Comment
Acral lentiginous melanoma (ALM) (Subungual melanoma)	Acral lentiginous melanoma is a rare form of malignant melanoma characterised by its site of origin: palm, sole, or beneath the nail (subungual melanoma). It can arise de novo in, or it can develop within an existing melanocytic naevus (mole). (23-25)
Fibroma (Fibrokeratoma)	Typically slow growing pinkish brown lesions often with a keratotic surface. They are benign lesions which usually develop from beneath the proximal nail fold rather than the lateral nail.
Keloid	Keloid is a clinically intractable fibro-proliferative disease that spreads beyond the original scar or lesion. Lee (2013) describes a rare case of keloid formation that occurred on the great toe after a repeated paronychia secondary to an ingrown nail.(26)
Keratoacanthoma (Subungual keratoacanthoma SE)	A rare benign neoplasm which most commonly occurs in middle-aged Caucasians. It usually presents as a painful, rapidly growing lesion of the terminal phalanx (27, 28).
Koenen Tumours	Multiple periungual fibromas associated with tuberous sclerosis (29).
Lipoma	These are common tumours but rarely involve the nail folds. They are benign fatty tumours (30-32).
Osteochondroma	Osteochondromas represent the most common of all benign bone tumours and may be solitary or multiple. They are typically pedunculated outgrowths from the bone surface composed of cortical and medullary bone with hyaline cartilage cap (33).
Squamous cell carcinoma	Malignant tumours arising from keratinocytes in the nail matrix and nail bed (35) (36). They can be warty, ulcerative or keratinous in appearance.
Subungual exostosis (37-39)	A benign tumour of bone and cartilage arising on the dorsal surface of the distal phalanx typically on the hallux.

Figure 1: IGTN and Subungual Exostosis

Figure 2: Subungual Exostosis

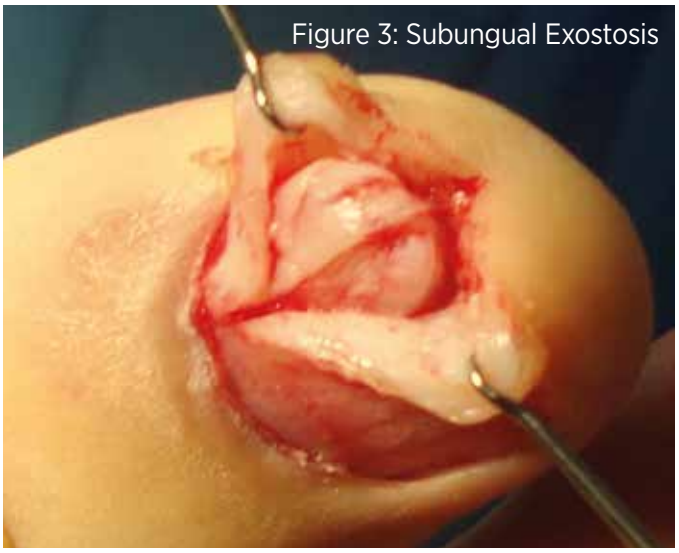

Figure 3: Subungual Exostosis

Figure 4: IGTN with hypergranulation tissue

plate if possible. Where the exostosis is more dorsally placed as in Figure 3 above, removal of the nail is necessary and excision of the bony mass is undertaken by exposure of the upper surface of the distal phalanx.

Key Point: No matter how skilled the clinician, visual assessment of a periungual mass cannot be confirmed without histological assessment. The standard of care is biopsy and histological assessment.

Figure 4 serves to highlight that the nail and nail fold are potential sites for life limiting lesions and, whilst it may be convenient to disregard diagnostic rarities, this is at the clinician's peril. The cherry red hypergranulation tissue associated with an IGTN in Figure 4 is a near diagnostic certainty but without histological confirmation from excision biopsy, there remains a risk of misdiagnosis and potential patient harm. Hypergranulation tissue is commonly associated with chronic IGTN and in this context probably represents a chronic healing response by the body to the presence of a foreign body, in this case, a nail spicule. In the acute phase it is identified as a red, friable, shiny tissue with a soft appearance above the level of the surrounding skin (Figure 4). Hypergranulation may occur in a range of wounds including burns, venous and pressure ulcers and is associated with delayed healing by preventing migration of epithelial cells across the surface of the wound (40). Although the cause of hypergranulation tissue is not well understood in other wounds, in terms of IGTN the most likely explanation is that the ongoing presence of nail spicule results in a prolonged stimulation of fibroplasia and angiogenesis. This assumption is largely based on the observation of rapid resolution after removal of the offending nail spicule. Whilst it may be tempting to treat with topical agents such as silver nitrate, caution is needed to avoid masking a potentially malignant lesion.

At first sight Figure 5 is consistent with a subungual exostosis with prominence of the toe dorsally at the end of the nail plate. Irritation of the skin and breakdown is not uncommon. In the absence of bone pathology on x-ray, a biopsy was undertaken confirming a high-grade Acral Lentiginous Melanoma. In this case the diagnosis was delayed due to protracted prior conservative management as an IGTN.

Figure 5: Acral Lentiginous Melanoma

TYPES OF SURGICAL PROCEDURE

Zadik's Type Matrixectomy

Originally described in 1950, this procedure remains widely used to this day (41). The procedure involves removal of the whole nail plate and surgical excision of the nail bed, and like all surgical procedures requires appropriate theatre protocol. It is typically, but not always, performed under digital tourniquet to improve intraoperative visualisation. The procedure is an alternative to chemical ablation where chemical ablation is contra-indicated or where adjunctive nail procedures are necessary e.g. excisional biopsy.

Once the nail plate has been removed, an incision is placed through the skin angled obliquely either side of the toe beginning approximately 0.5cm proximal to the eponychium extending to just beyond the lunula. Three skin flaps are created (one proximal and one each side of the toe). Careful dissection under the resulting skin flaps allows visualisation of the nail matrix which is then sharply dissected from the bone. Once excised and with careful checking for any fragments of nail bed which may require removal with a curette, primary closure with non-absorbable sutures, removal of tourniquet and heavy gauze dressings complete the procedure. Healing typically requires two weeks if full primary closure can be achieved. In the author's experience complete primary closure is often not achievable with small deficits which need to heal by secondary intention. In these circumstances complete healing may require three weeks. Published outcome data (Table 5 overleaf) appears varied particularly relating to recurrence or nail spicule formation. Meticulous surgical technique with care to avoid missing germinal nail matrix avoids these complications.

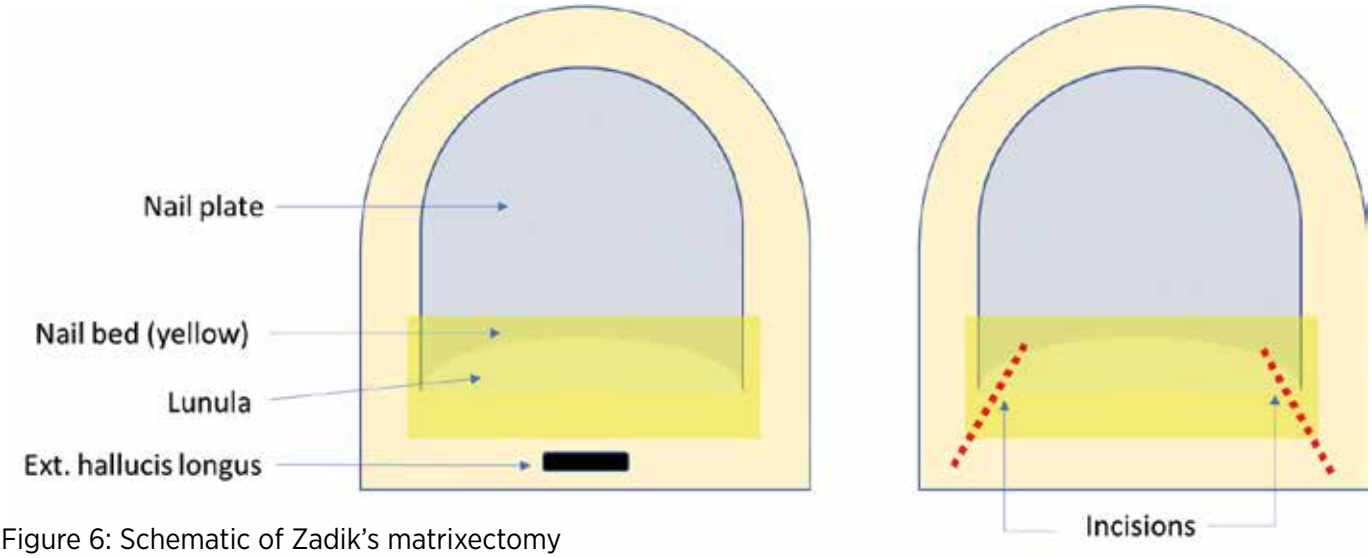

Figure 6: Schematic of Zadik's matrixectomy

Table 5: Reported outcome data Zadik's Procedure

Author	Study	Key outcomes
Shaath et al (2005)(42).	Prospective RCT 83 patients Compared Zadik's with chemical ablation	Return to normal shoes 2.13wk Zadik's, 3.73wk chemical ablation Return to normal activity 2.18wk Zadik's 3.89wk chemical ablation Number of post-op dressings required 3 for Zadik's group 8 chemical ablation Recurrence rates 60.5% Zadik's group 15.6% chemical ablation group
Sykes & Kerr (1988)(43).	Prospective study 140 patients (164 nails). Looked at avulsion of whole nail only	Recurrence 32% at 12 months Recurrence 42% at 36 months
Sykes & Kerr (1988)(43).	152 patients with IGTN randomly allocated to receive Zadik's or chemical ablation	No significant difference between the groups One surgeon had significantly poorer outcomes
Andrew & Wallace 1979(44).	107 patients semi- random allocation to Zadik's or chemical cauterisation	Onychogryphosis group Average healing time: 2wks Zadik's 2wks chemical ablation Recurrence of nail spike (6 months) 7/20 Zadik's 1/17 chemical ablation IGTN group Average healing time: 4wks Zadik's 3wks chemical ablation Recurrence of nail spike (6 months) 11/34 Zadik's 7/36 chemical ablation
Pettine et al (1988)(45).	Non-RCT design with only 9 cases relating to Zadik's	Regrowth seen in 33% (three of nine toes)


Figure 7: A failed Zadik procedure

The primary indications for Zadik-type matrixectomy are where chemical ablation is contra-indicated or where concurrent surgical procedures are required, typically bone excision or biopsy. The results in the literature suggest wide variation in regrowth rates which most likely suggest experience in the technique rather than inherent problems with the surgical procedure. Nail plate cannot regrow without nail matrix and thus failures as defined by regrowth reflect incomplete excision of the nail bed. This has however to be differentiated from the expected mild keratinous character typical of a healed Zadik-type procedure.

Wedge Excision (Winograd)

In 1929 Alvin Winograd described a surgical procedure for the treatment of IGTN (46). The original manuscript describes an incision line with the toenail extending back to the nail matrix. Scissors are then used to cut away the offending nail and the matrix is then curetted. Notably this original description did not involve excision of the nail fold (47). Following this description several

Table 6: Reported outcomes of wedge-type resections

Author	Study	Key outcomes
Kose et al (2012) (48)	Prospective study 116 patients all undergoing wedge resection.	Recurrence of IGTN 13% Average time to recurrence 6.7 months (range 2-12 months) 97% patients stated satisfaction with the procedure 91% rated cosmetic appearance as excellent 6% rated cosmetic appearance as acceptable 1% rated cosmetic appearance as poor
Pettine et al (1988) (45)	Non-RCT design with only 9 cases relating to wedge excision	Regrowth seen in 6% (six of ninety-five toes)
Gerritsma-Bleeker (2002) (49)	Single blind RCT 58 patients with 63 IGTN assigned to either chemical ablation or phenolisation	Recurrence of IGTN equal in both groups (seven cases in each group).
Van der Ham, Hackend & Yo (1990) (50)	Prospective RCT comparing chemical cautery with wedge excision in 249 patients	Less analgesic requirement following chemical cautery Recurrence 16% wedge excision, 9.6% chemical cautery

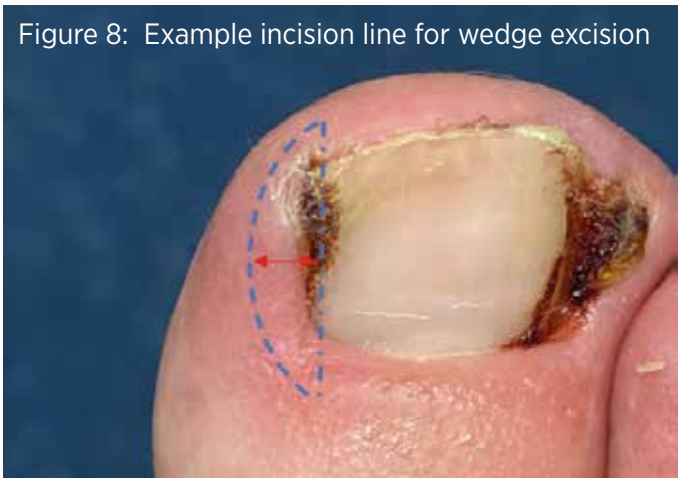
Figure 8: Example incision line for wedge excision

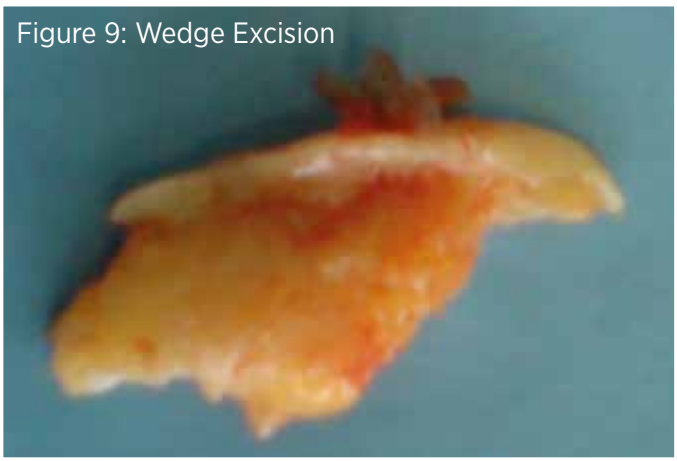
Figure 9: Wedge Excision

modifications have been described resulting in what most foot surgeons refer to incorrectly as the "Winograd wedge excision" (46).

Nowadays the wedge excision is widely performed with or without excision of the nail bed to manage IGTNs of varying severity. The ability of the wedge excision to remove nail fold tissue offers the surgeon great flexibility at the time of surgery to meet the needs of the patient. Widening the incision allows removal of precisely the correct amount of tissue from each sulcus. Placement of the linear incision is direct to bone where nail matrix is to be excised and allows precise amounts of nail section to be removed permanently, with no tearing of the residual nail plate sometimes seen with chemical ablation techniques. The curved incision initially passes through the skin before being deepened inwards to capture a wedge of tissue. Rapid healing is typical of these procedures with primary closure being possible in all cases. Healing by two weeks is typical which compares favourably with chemical ablative techniques.
This procedure is highly favoured by some surgeons as it provides exceptional versatility, rapid and predictable healing, and excellent cosmetic results compared with chemical ablation of the nail bed when care is taken to avoid excessive narrowing of the nail plate.(48)

Nail Fold Excision Without Nail Bed Excision

In 1959, Vandenbos & Bowers described a procedure which involved excision of the surrounding skinfold allowing the wound to heal by secondary intention (51). Despite the somewhat aggressive nature of the procedure, the authors cite remarkable results with this technique in their series of fifty five cases.

In 2008, Chapeskie published a paper extolling the virtues of this procedure citing complication rates with chemical ablation between 34% and 50% (52). Save for the reference cited by Chapeskie, literature has confirmed substantially higher success rates with alternative techniques to the Vandenbos procedure (2).

Whilst these published data are potentially encouraging the deliberate creation of such a large open wound,

Figure 10: Vandenbos Procedure

Figure 11: Cosmetic injury post Vandenbos-type surgery

available alternatives have led some surgeons to steer away from this procedure. In practice, a number of patients have been observed with unsightly disfigurement as a result of this technique.

Outcomes of wedge-type resections and Vandenbos procedures are shown in Tables 6 and 7.

Table 7: Results of Vandenbos procedure

Author	Study	Key outcomes
Livingston (2017) (53)	Prospective observational study 39 patients (59 toes) aged 4-20yrs	18% complication rate
Brenton (1980) (54)	Consecutive case series of forty-two children	88% cured within 5 weeks
Antrum (1984)(55)	Prospective case series (50 patients)	20% recurrence rate
Persichetti, Simone, Li Vecchi et al. (2004) (56)	Consecutive case series of 120 nails	5% recurrence rate
Haricharan, Masquijo, Bettolli (2013) (57)	Prospective two centre case series Fifty patients (67 procedures) Mean follow-up of 14 months (range 6-28)	0% recurrences Healing time 6-8weeks 9% post-op complication ▪ 1 nail dystrophy ▪ 2 patients excess granulation ▪ 3 patients excess bleeding.
Chapeskie & Kovac (2010) (58)	Retrospective review 124 cases median follow-up of 8yrs.	No recurrences reported 94% of patients reported highly satisfied Two patients reported loss of sensation
Vandenbos (1959) (51)	Case series (55)	Recovery time 7 days Return to shoes 23 days 18% post-op complications 0% recurrence 100% cases would recommend the procedure

Summary

Clinicians should keep in mind the absolute and relative contradictions for phenolisation techniques and give consideration to incisional techniques. Though more technically challenging, these impose a lesser burden in terms of wound healing, avoid phenol exposure and permit adjunctive procedures, such as biopsy, soft tissue excision and exostectomy. ■

Case Study

Figure 12: Pre-op image

Figure 13: Intraoperative image

Figure 14: Excision nail and tissue

Case Study 1.

Ms MS presented to her GP with a painful left hallux. The toe was dressed by the practice nurse. She attended twelve further appointments between presentation in March and November the same year before seeing the orthopaedic team. At this appointment an immediate referral for biopsy was made which confirmed acral lentiginous melanoma (ALM). Despite undergoing amputation of the hallux within two weeks of the biopsy, the claimant developed metastases.

Key Point: The perceived rarity of malignancies masquerading as benign IGTN can be a barrier to inclusion on the differential diagnostic list. Clinicians are encouraged to maintain a high index of suspicion and consider early referral for biopsy. Nothing is lost in the event of a negative biopsy but much can be gained by early identification of malignant lesions.

Case Study 2.

Ms AJ presents with a recurrent IGTN for which she has previously received conservative care using skilful nail trimming but with resultant ongoing pain and discomfort. Her GP had prescribed two previous courses of antibiotics but unfortunately the nail problem has not resolved. Due to COVID-19 restrictions her ability to see her GP face-to-face has been restricted.

She presented to the author's clinic with an apparent IGTN of the right hallux, fibular sulcus. Medical history was unremarkable save for the patient being in the first trimester. The toe presents with friable tissue consistent with hypergranulation tissue.

A decision to undertake an excisional procedure was made based on three key reasons. Firstly, whilst the tissue appears to be granulation tissue, it is impossible to know for certain the cellular characteristics without confirmatory histology. Secondly it is, in the opinion of the author, prudent to avoid exposure to phenol in pregnancy due to the small but potential risk of toxicity. The third reason is that excisional matrixectomy will permit closure by primary intention providing an excellent cosmetic result with rapid healing.

Healing was complete at two weeks with sutures removed and the patient able to return to normal activities. ■

Note: The College of Podiatry has produced nail surgery guidelines which can be accessed here: https://membersarea.cop.org.uk/api/documentlibrary/download?documentId=21

Figure 15: Wound at closure

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