© Pediatr Med Rodz 2023, 19 (1), p. 21–27
DOI: 10.15557/PiMR.2023.0003

Received: 22.01.2023
Accepted: 14.03.2023
Published: 30.06.2023

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Ingrown toenail – an update of knowledge and a proposal of a novel treatment approach

Zespół paznokcia wrastającego – aktualizacja stanu wiedzy i propozycja nowej metody leczniczej

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Abstract

Ingrown toenail is one of the most common foot health problems, which is the reason for frequent paediatric, surgical, family medicine and podology appointments. The problem most often affects schoolchildren and young adults, with incorrect hygiene habits and improper care typically considered its causes. The disorder is usually managed in a surgical clinic, with a wedge-shaped undercutting of the nail plate or, in advanced cases, total nail avulsion, being the most common treatment approaches. However, these techniques are characterised by poor efficacy and high recurrence rates, and often lead to further complications, as well as permanent deformations of the nail plate. Therefore, we propose an alternative approach to the problem of ingrown toenails and present a causative surgical method. This technique consists in soft tissue plasty to reduce the prominence of nail folds followed by adaptation of healthy tissues with the use of skin sutures to the shape and dimensions of the nail plate. Since the procedure is performed under local anaesthesia, the treatment can be performed in an outpatient setting. Nail fold plasty allows for effective and permanent resolution of ingrown toenail symptoms, however, it requires strict compliance with postoperative recommendations, which mainly focus on proper care. The lack of interference in the structure of the nail matrix and plate minimises the risk of complications, permanent deformations of the nail apparatus and allows for maintaining the full width of the nail plate.

Keywords: ingrown toenails, onychocryptosis, nail fold plasty

Streszczenie

Paznokieć wrastający to jedna z powszechniej występujących dolegliwości stopy, będąca przyczyną częstego zgłaszania się pacjentów do poradni pediatrycznych, chirurgicznych, lekarzy medycyny rodzinnej i gabinetów podologicznych. Problem dotyczy najczęściej młodzieży szkolnej oraz młodych dorosłych, a za jego przyczynę uważa się najczęściej błędy pielęgnacyjne i nieprawidłowe nawyki higieniczne. Powszechnie leczenie tego schorzenia prowadzone jest w ramach poradni chirurgicznej, a najczęściej stosowaną metodę stanowi klinowe podcięcie płytki paznokciowej lub jej całkowita awulsja w zaawansowanych postaciach wrastania. Techniki te cechują się jednak niską skutecznością oraz wysoką częstością nawrotów dolegliwości, a ich zastosowanie niejednokrotnie skutkuje rozwojem dalszych powikłań, jak również trwałych deformacji płytki paznokciowej. Niniejsza praca przedstawia alternatywne podejście do problemu wrastania paznokcia i prezentuje technikę leczenia chirurgicznego uwzględniającego jego przyczynę. Technika ta polega na plastyce tkanek miękkich redukującej uwydatnienie wałów paznokciowych oraz adaptacji zdrowych tkanek za pomocą szwów skórnych do kształtu i wymiarów płytki paznokciowej. Metoda wymaga znieczulenia miejscowego, dzięki czemu leczenie można przeprowadzić w warunkach ambulatoryjnych. Technika plastyki wałów paznokciowych pozwala uzyskać skuteczne i trwałe ustąpienie dolegliwości o typie wrastania paznokcia, wymaga jednak ścisłej realizacji zaleceń pozabiegowych przez pacjenta w warunkach domowych, przy czym zalecenia te skupiają się głównie na odpowiedniej pielęgnacji. Dzięki brakowi ingerencji w strukturę macierzy i płytki paznokciowej metoda minimalizuje ryzyko wystąpienia powikłań, trwałych deformacji aparatu paznokciowego i pozwala na zachowanie pełnej szerokości płytki paznokciowej.

Słowa kluczowe: paznokieć wrastający, onychokryptoza, plastyka wałów paznokciowych

INTRODUCTION

Ingrown toenail (onychocryptosis) is a common health problem affecting the big toe, which significantly impairs the quality of life, generates local, irritating and recurring pain, and causes frequent inflammation as a result of local infection. The problem mainly affects patients in the second and third decades of life, with male predominance. The aetiological factors of the disease primarily include genetic predispositions in the form of prominent, "meaty" nail folds, as well as an abnormal axis of the big toe[1]. Other causes include incorrect hygiene and care habits, overweight, increased feet sweating, incorrectly selected or too tight footwear, sports shoes in particular[2]. The disorder most commonly affects the lateral nail fold, which is caused by its traumatisation and friction between the lateral edge of the nail plate and the second toe, especially when wearing covered footwear. Bilateral nail folds are the second most common location of onychocryptosis, while the medial nail fold is the least likely to be affected. The ingrowth of nails results from the persistent pressure of the edge of the nail plate on the soft tissues of the nail folds[3]. As a consequence, a wound is formed in the fold, which is prone to infection. The subsequent proliferation of inflammatory granulation tissue initiates repair processes, such as scarring and epithelialisation, which further consolidates the pathological hypertrophy of the soft tissues of the nail fold[4] and intensifies onychocryptosis in the "vicious circle" mechanism. Typically, three grades of ingrown nails are distinguished. This classification was proposed by Heifetz in 1937, and later detailed and updated by Mozena in 2002[5,6]. Based on these classifications, algorithms containing both conservative and more invasive solutions have also been proposed[7]. The aim of the paper is to present an alternative cause-oriented approach to the problem of ingrown nails.

METHODS

Commonly used therapies based on conservative approaches are implemented in podology offices. At this point, it should be noted that the profession of a podologist is still not subject to legal regulations and is currently classified as a cosmetological rather medical profession in Poland. This means that a podologist can only provide treatment that does not cross the epidermal barrier. Despite these limitations, podologists have a relatively wide range of conservative options to effectively manage an ingrown toenail. The available methods include cotton wisps[8], taping of the nail folds away from the nail plate[9] or nail correction with an orthonyxie (with the use of special nail braces) (Fig. 1)[10]. However, the efficacy of conservative therapies depends on the baseline stage of the problem. The highest efficacy is observed for interventions taking place at the first signs of ingrowing nails; however, they are associated with high recurrence rates, reaching up to 50%[11].

In the practice of a family medicine doctor, the management of an ingrown nail is limited to care recommendations, often involving the use of grey soap or compresses with ethacridine lactate solution. Broad-spectrum topical antibiotic therapy in the form of ointments or creams is also common. However, such management is not in line with the assumptions of the National Program for the

Fig. 1. Conservative podological approaches: cotton wisps, abduction taping, orthonyx braces

DOI: 10.15557/PiMR.2023.0003

Fig. 2. Examples of scarring of the nail matrix and permanent deformation of the nail plate following wedge resection of the nail

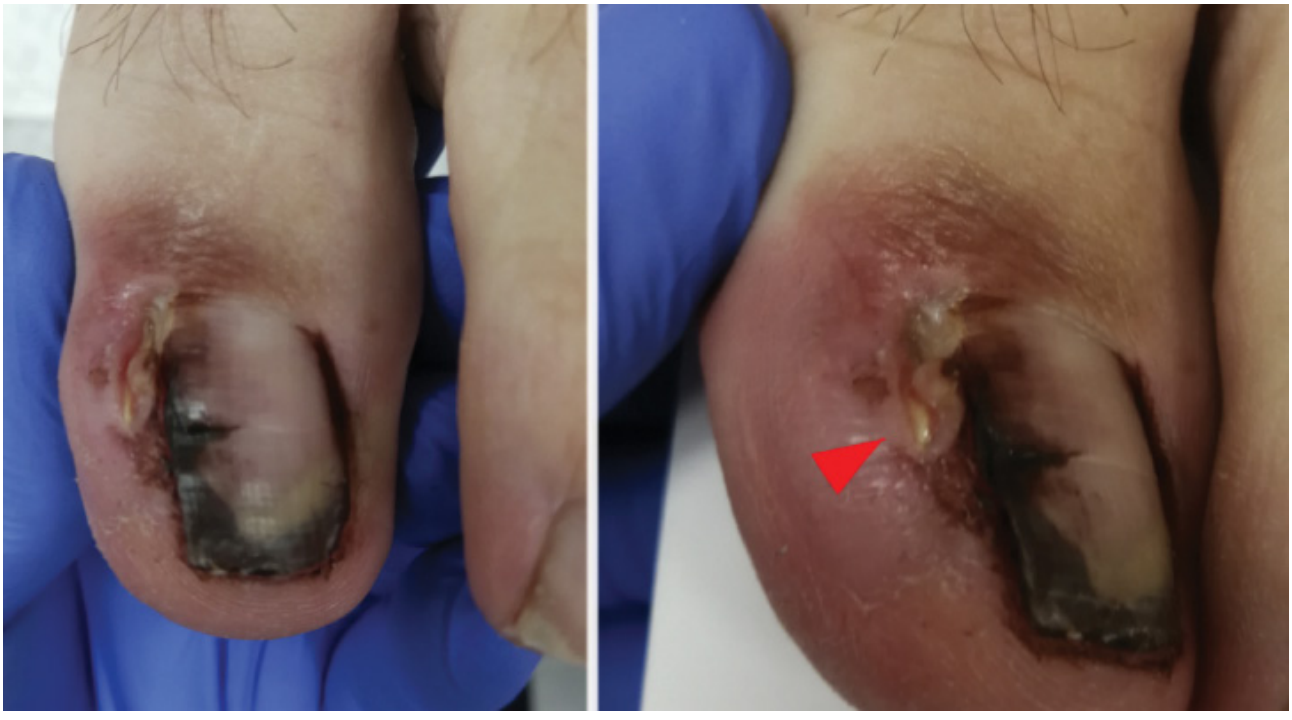

Fig. 3. Regrowth of a residual nail fragment (red arrow) as a result of incomplete removal of a fragment of the nail plate matrix

Protection of Antibiotics, as it is characterised by low efficacy and potential contribution to antibiotic resistance. Contemporary standards of treatment of infected wounds, such as in the case of an ingrown nail, rely on appropriately selected antiseptics (PHMB, hypochlorites, povidone iodine). The use of conservative solutions is not justified in higher grades of ingrown nails, with signs of local bacterial infection of the nail fold and the presence of serous or purulent exudates, as well as in the case of proliferation of inflammatory granulation tissue. All podological interventions in a high-grade ingrown nail generate significant pain, and therefore require local anaesthesia. This type of treatment can only be carried out in an outpatient surgical clinic.

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Fig. 4. Regrowing keratin deposits of the nail plate (red arrows) embedded in the fold as a result of suturing the fold onto the site after wedge resection of a nail fragment

Several dozen methods of surgical correction of ingrown toenails along with their numerous modifications have been described so far. Wedge resection (Winograd procedure) of the nail plate, i.e. removal of the 2–4 mm lateral and/or medial margin of the nail, is most commonly used. Irreversible damage to the nail matrix, resulting in permanently reduced width of the nail plate, which, in addition to a relatively poor aesthetic effect, often leads to its further deformation and disruption of the nail growth path as a result of scarring, is a disadvantage of this solution (Fig. 2). The regrowth of the residual free nail plate fragment in the form of persistent nail spicule in the fold, which is a consequence of incomplete removal of the nail matrix, is another common complication (Fig. 3). If the surgeon fails to remove the nail matrix and suture the site after the removed fragment of the nail, the complication may take the most serious form, i.e. an impacted nail. In such case, the sutured fragment of the nail matrix produces keratin deposits that accumulate in the soft tissues of the sutured nail fold (Fig. 4), resulting in local inflammation with tenderness, redness, and even formation of a fistula and local ulceration. In addition to surgical resection of a fragment of the nail matrix, the literature describes methods of chemical matrix ablation with the use of phenol, 5–10% sodium hydroxide solution, trichloroacetic acid, nitrous oxide or silver nitrate[12], as well as physical methods based on electrocoagulation[13] or laser therapy[14]. However, these techniques may lead to permanent destruction of the nail matrix and a cosmetic defect of the remaining nail plate. Advantages, on the other hand, include a relatively short duration of therapy and quick resumption of physical activity[15].

In advanced forms of an ingrown toenail, when the proliferation of inflammatory granulation tissue within nail folds causes their overgrowth and overlapping with the nail plate, provoking separation of the nail from the bed (onycholysis), complete avulsion of the nail plate is a common surgical option. This method is also burdened with high rates of recurrence, bringing only temporary improvement of the local condition and the patient's quality of life. Recurrence usually occurs after a few weeks and is a consequence of the regrowth of the full-width nail plate. Radical matricectomy after nail resection (Zadik's procedure) makes it possible to eliminate recurrent inflammation within the nail folds, but it causes mutilation and permanently excludes the chance of regaining the nail, which is often associated with poor satisfaction with treatment outcomes.

Nail fold plasty is a surgical alternative for an ingrown nail. This method involves the resection of pathologically changed, scarred, often infected and defective soft tissues of the nail fold. It makes it possible to effectively avoid interference with the matrix structure, its traumatisation and consequences in the form of a deformed nail plate. During the procedure, infection foci located in the folds, proliferation of pathological inflammatory granulation tissue and scarring within the folds are removed. After effective disinfection of the surgical site with the use of an antiseptic, the soft tissues of the folds are adjusted using skin sutures in such a way as to ensure complete exposure of the nail plate (Fig. 5). After healing, the released nail plate no longer

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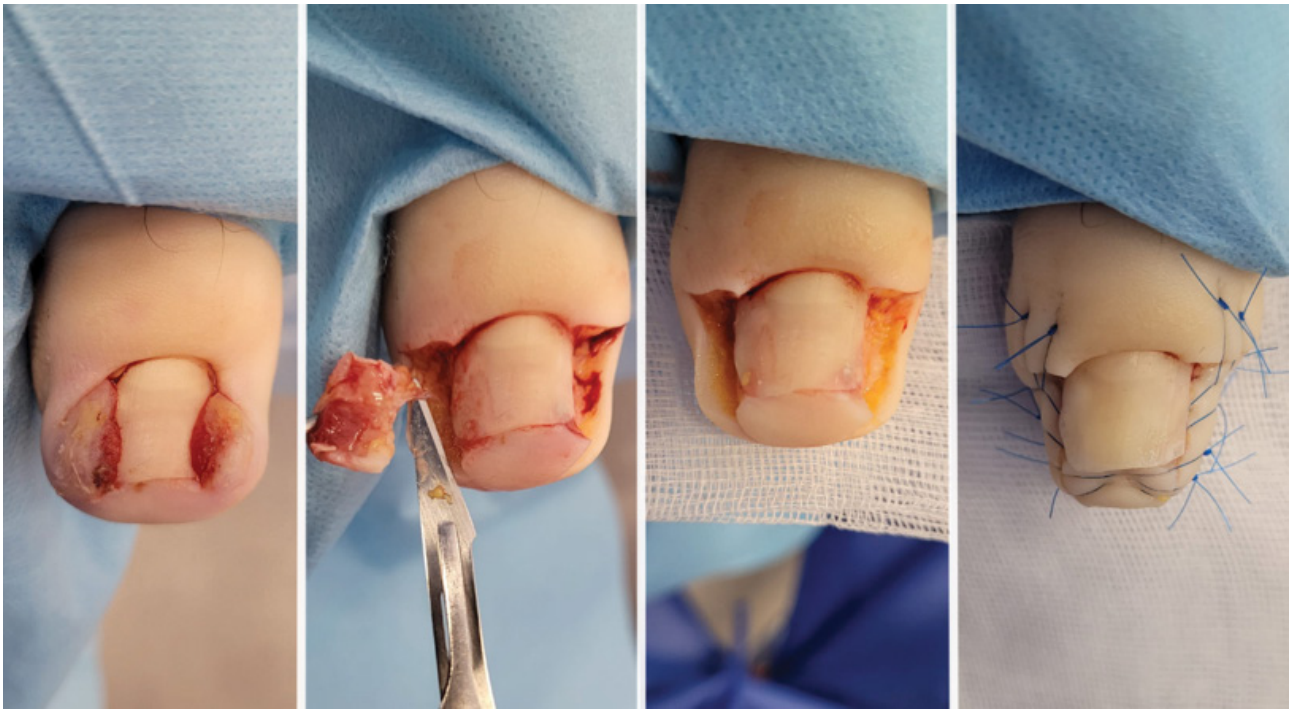

Fig. 5. Nail fold plasty – individual stages of the procedure, complete exposure of the nail plate and reduction of nail fold soft tissues

Fig. 6. Treatment outcomes for an ingrown nail plate using the method of nail fold plasty. Visible overgrowth of the folds and attempts at conservative treatment with cotton wisps. Outcomes at 5 weeks after the procedure

compresses the surrounding soft tissues, as its edges are outside the nail folds. The treatment can be performed in an outpatient setting, under local anaesthesia, but it requires close cooperation between the patient and the surgeon and the podiatrist, as well as compliance with postoperative recommendations at home. It should be remembered that the procedure is most often performed in an initially infected environment, which increases the risk of healing disorders, mainly in the form of recurrence of local infection[16]. In order to reduce the risk of these complications occurring immediately after the procedure, a minimum 2-week recovery period with limited activity and regularly changed

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Fig. 7. Treatment outcomes in an advanced form of an ingrown nail using the method of nail fold plasty. An attempt at conservative treatment with an orthonyx brace. Outcomes at 7 weeks after the procedure

Fig. 8. Treatment outcomes in an advanced form of an ingrown nail using the method of nail fold plasty at 9 weeks after the procedure. Despite the massive proliferation of inflammatory granulation tissue, full healing was achieved

dressings with the use of an appropriate, individually selected antiseptic are needed. This method allows for permanent regression of subsequent recurrences of inflammation of the nail folds. The lack of interference with the structure of the nail matrix and the plate itself allows for maintaining the full width of the nail, ensuring an optimal aesthetic effect and, importantly, it does not generate further complications. Furthermore, nail fold plasty is widely used for every grade of ingrown nails. It is effective and useful both in patients with hypertrophied nail folds, who struggle with

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troublesome subungual corns, as well as in advanced forms of ingrown nails with the presence of purulent exudates and proliferation of inflammatory granulation tissue (Figs. 6–8). The duration of convalescence is 4–6 weeks in such cases. The concept of periungual soft tissue resection was initiated by Vandenbos and Bowers in 1959, who proposed healing by granulation, which took up to 6 months[17].

CONCLUSIONS

Many surgical approaches to onychocryptosis have been presented in the specialist literature so far[18–20]. The ideal procedure is expected to offer low recurrence rates, a quick resumption of physical activity, as well as a high degree of patient satisfaction with functional and aesthetic treatment outcomes. Nail fold plasty is a surgical treatment method for ingrown nails characterised by high efficacy and predictability, low recurrence rates and good aesthetic effect. We believe that the solutions used so far, which mainly focus on intervention in the nail plate or matrix, such as wedge resection or nail avulsion, should be considered historical as they do not eliminate the root cause of the problem, but yield unsatisfactory outcomes and generate multiple complications. The 4–6-week recovery period with significant reduction of daily activity for a minimum of 2 weeks may be considered the only disadvantage of this technique.

Conflict of interest

The authors do not declare any financial or personal links to other persons or organisations that could adversely affect the content of this publication or claim rights thereto.

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