

Treatment of ingrown nail using CO₂ laser – four-year own experience

Korekcja wrastającego paznokcia przy użyciu lasera CO₂ – czteroletnie doświadczenia własne

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Key words: ingrown toenails, CO₂ laser, matrixectomy, efficacy of therapy.

Słowa kluczowe: wrastające paznokcie, laser CO₂, matricektomia, skuteczność terapii.

Abstract

Introduction: Ingrown toenails are one of the most common nail disorders, with complex and multifactorial causes, for all age groups, mostly young adults. The essence of disease is congenital or acquired distortion of the proportions between the size of the nail bed and the nail folds. Laser treatment consists of the vaporisation of the matrix and bed, i.e. the reproductive sphere of the nail, using a CO₂ laser.

Aim of the research: Evaluation of the effectiveness of laser dissection using a CO₂ laser.

Material and methods: The methodology was divided into two stages. The first stage consisted of a retrospective analysis of the medical documentation of 165 patients who had undergone laser CO₂ dissection, during the period from February 2011 to May 2015 in the Laser CO₂ Surgery Room, according to the developed scheme. The second stage was follow-up control of patients participating in the study, a week and then a month after surgery. In addition, in May 2015 90 patients were audited in terms of effectiveness and satisfaction of the treatment and recurrence of symptoms. The remaining 70 patients answered these questions by telephone.

Results and conclusions: Laser dissection of the ingrown nail with matrixectomy is a very effective method, only in 4 (2%) patients was there a recurrence. Nearly 90% of patients expressed satisfaction with the outcome of the surgery. The cause of dissatisfaction was sometimes an anaesthetic appearance of the nail apparatus. Nearly 70% of patients were children and young adults aged up to 23 years. The most frequent cause of ingrown toenail was wearing inappropriate shoes and incorrect cutting of toenails.

Streszczenie

Wprowadzenie: Wrastające paznokcie palucha są jedną z najczęstszych chorób aparatu paznokciowego. Schorzenie to ma złożone oraz wieloczynnikowe podłoże i dotyczy wszystkich grup wiekowych, najczęściej młodych dorosłych. Istotą problemu jest wrodzone lub nabyte zaburzenie proporcji między wielkością łożyska i wałów paznokciowych. Zabieg laserowej korekcji wrastającego paznokcia polega na waporyzacji z wykorzystaniem lasera CO₂ macierzy i łożyska, czyli strefy rozrodczej paznokcia.

Cel pracy: Ocena skuteczności laserowej resekcji wrastającego paznokcia z wykorzystaniem lasera CO₂.

Materiał i metody: Badanie podzielono na dwa etapy. Pierwszy etap polegał na retrospektywnej analizie dokumentacji medycznej 165 pacjentów poddanych zabiegowi laserowej korekcji wrastającego paznokcia w gabinecie lasera CO₂ od lutego 2011 do maja 2015 roku wg opracowanego schematu. Drugi etap badań to tzw. *follow-up* – kontrola pacjentów uczestniczących w badaniu: tydzień i miesiąc po zabiegu. Ponadto w maju 2015 roku skontrolowano 90 pacjentów pod względem skuteczności zabiegu, nawrotu dolegliwości, stopnia zadowolenia, natomiast pozostałe 70 osób odpowiedziało na te pytania telefonicznie.

Wyniki i wnioski: Laserowa resekcja wrastającego paznokcia z matricektomią jest bardzo skuteczną metodą leczenia wrastającego paznokcia. W grupie badanej tylko u 4 pacjentów, tj. 2%, doszło do nawrotu. Większość pacjentów – prawie 90% – wyraża zadowolenie z efektu zabiegu. Powodem niezadowolenia bywa nieestetyczny wygląd aparatu paznokciowego. Prawie 70% pacjentów to dzieci i młodzi dorośli do 23. roku życia. Najczęstszą przyczyną wrastania paznokcia było noszenie nieodpowiedniego obuwia oraz nieprawidłowe skracanie płytek paznokci.

Introduction

Ingrown toenails are among the most frequent disorders of the nail apparatus. This disorder has a complex and multi-factor background, and concerns all age groups, most frequently young adults. The essence of the problem is congenital or acquired distortion of proportions between the size of the nail bed and the nail folds. The nail starts to grow in when its lateral edge is folded and presses the soft tissues of the nail bed, located underneath. At the first phase there occurs pain, which becomes increasingly intensive with the elapse of time. Subsequently there develops swelling and oedema, redness, and in consequence, the continuity of the skin may be interrupted. There occurs serous and purulent discharge, as well as an outgrowth of granulation tissue. Apart from pain, such a wound is often accompanied by infection, which considerably hinders the healing process [1–5].

In the case of advanced ingrown nails which are resistant to conservative treatment, an effective and technically simple therapeutic method is wedge resection of a part of the plate, followed by partial ablation of the matrix (the Queno method). Permanent reduction of the width of the plate is obtained only in this way [1].

The treatment of ingrown toenails consists of a change in the direction of growth of the plate, or permanent reduction of its width. Prior to the treatment, it is necessary to gain control over the inflammatory state and local infection. In very advanced inflammatory states, the administration of oral antibiotics is necessary (cefadroxil, clindamycin, or amoxicillin/clavulanic acid clindamycin). Less advanced changes may be treated conservatively [6–8].

The laser treatment of ingrown nail consists of the vaporisation of the matrix and bed, i.e. the reproductive sphere of the nail, using a CO₂ laser. The nail matrix is an epidermis which extends 3–6 mm under the proximal nail fold, and is responsible for growth and formation of the nail plate. The nail bed is located under the nail plate, between the lunula and the hyponychium. In addition, it is necessary to remove with CO₂ laser the inflammation-changed nail fold and, as a result, allow free growth of the nail plate [9–12].

The mechanisms responsible for the effects of laser radiation on living tissue depend on the parameters characterising the laser beam, i.e. strength, wavelength, duration of impulse or irradiation time, and cross-sectional area of the laser beam on the irradiated object, as well as the parameters characterising the tissue, such as absorption and dispersion coefficient – which is the radiation wavelength-dependent, medium density, and thermal conductivity coefficient. Laser light, while interacting with tissue, may be reflected, dispersed, conducted, or absorbed; from the therapeutic aspect, an important characteristic is absorption. In the skin, the absorbing particles are

called chromophores, which include: haemoglobin, melanin, water, and collagen [13–15].

The penetration of light into the skin depends on the combination of absorption and dispersion. An increase in the wavelength is accompanied by an increase in its penetration into the skin. A surgical CO₂ laser at a wavelength of 10,600 nm penetrates water only to a depth of approximately 20 µm, which provides it with an excellent cutting function.

The interaction of laser radiation and tissues may be divided into the following types: photo-thermal, photo-chemical, photo-ablative, and photo-destructive. The most important effect is a local increase of temperature, dependent on the duration of effect, and peak temperature obtained in the tissue. It is possible to obtain denaturation, coagulation, arrest of the escape of blood, cutting, ablation, and in extreme cases, tissue necrosis and carbonisation.

The cutting properties of the beam produced by CO₂ laser are the consequence of the rapid evaporation of water, which leads to the tearing of cells and the tissue composed of these cells. The thermal effects in the course of the process of water evaporation are simultaneously transferred to the adjacent tissues, and cause the cauterisation of small blood vessels, nerves, and lymphatic vessels. As a result of such a form of energy dissemination onto the adjacent tissues, blood vessels of diameter less than 0.5 mm are subject to coagulation during the cutting of tissue. Due to this process, excellent homeostasis is provided, enabling precise exposure of tissues within the surgical field, which is not blooded [13, 15–18].

Aim of the research

The objective of the study was an evaluation of the effectiveness of laser dissection of ingrown toenail using a CO₂ laser.

Material and methods

Retrospective analysis covered a group of 165 patients who had undergone laser surgical procedure for treatment of an ingrown nail laser treatment performed by the author of the presented study in the Laser CO₂ Surgery Room during the period February 2011 – May 2015.

The patients were qualified into the study according to the following criteria: patients diagnosed with ingrown nail L60.0 according to ICD-10; male and female patients; patients aged 11–76 years; patients with advanced inflammatory state, granulation, and considerable hypertrophy of the eponychium (Heifitz and Mogensen) or stage III and IV (Mozen).

Criteria for exclusion of patients from the study group: patients burdened with additional diseases (uncontrolled diabetes, obliterative atherosclerosis of the lower extremities); patients taking oral anticoagulants.

The methodology of the study was divided into two stages. The first stage consisted of a retrospective analysis of the medical records of patients who had undergone the laser treatment of ingrown toenail in the Laser CO₂ Surgery Room according to the developed scheme. The second stage of the study was the so-called follow-up, i.e. control of patients participating in the study – a week and a month after surgery. In addition, in May 2015 90 patients were audited in terms of effectiveness and satisfaction of the treatments and recurrence of symptoms. Another 70 patients answered these question by telephone.

Results

Characteristics of the study group

Using the criteria of inclusion and exclusion discussed above, the analyses covered 165 patients aged 11–75 years – 95 (58%) males and 70 (42%) females, with the diagnosis of ingrown nail – L60.0 according to the ICD-10, who had undergone laser resection and matrixectomy using CO₂ laser at the Laser CO₂ Surgery Room, performed by the author.

For the needs of appropriate illustration of the problem of age and aetiology of ingrown nail, the following age intervals of patients were adopted: children 11–17, young adults 18–23, adults 24–49, and mature adults 50–75.

Table 1 shows that children and young adults aged up to 23 years constituted nearly 70% of all patients. The disorder most rarely afflicted adult patients aged 24–49 years.

Table 2 presents the main causes of ingrown nail in the examined group of patients. Table 2 demonstrates that in the study group the most frequent cause of ingrown nail was wearing inappropriate shoes – 34% of patients, which together with inappropriate cutting of the plates constituted more than 50% of the causes of ingrown nail.

Table 3 presents the main complaints and problems reported by patients before the surgery. Table 3 demonstrates that each patient experienced pain while walking, in each patient there also occurred an inflammatory state of the nail fold, and all of them complained of the unaesthetic appearance of the nail apparatus. In nearly all patients (93%) the reported complaints limited activity.

In addition, a considerable number of patients – 121 (73%) – had been previously subjected to various cosmetic, podiatric, and surgical procedures, which proved to be ineffective. It should be mentioned that some of the patients had undergone multiple procedures, both conservative and surgical. Only 44 (27%) patients reported to the Laser CO₂ Surgery Room directly after the occurrence of symptoms of ingrown nail without previous procedures.

The vast majority of patients had been treated before with no satisfactory effect with other methods.

Table 1. Age interval of patients with ingrown nail

Age interval of patients	No. of patients	No. of patients (%)
Children (11–17)	49	30
Young adults (18–23)	63	38
Adults (24–49)	17	10
Mature adults (50–75)	36	22

Table 2. Aetiology of ingrown nail in the examined group of patients

Aetiology of ingrown	No. of patients	No. of patients (%)
Genetic predispositions	10	6
Mechanical damage	13	8
Wearing inappropriate shoes	56	34
Sweaty feet	12	7
Postural defects	8	5
Inappropriate cutting of plates	43	26
Hygienic neglect	17	10
Overweight	6	4

Table 3. Symptoms of ingrown nail in the examined group of patients

Symptoms of ingrown nail	No. of patients	No. of patients (%)
Pain while walking	165	100
Inflammatory state of the nail fold	165	100
Purulent discharge	124	75
Bleeding	76	46
Unaesthetic appearance of the nail apparatus	165	100
Unpleasant odour	104	63
Limitation of activity	153	93
Necessity for frequent change of dressings	127	77

Table 4 demonstrates that the patients from the study group – prior to the performance of laser ingrown nail surgery – had been most frequently subjected to the procedure of removal of the nail plate.

Most often the medical history of a patient with an ingrown nail was as follows:

– after the occurrence of the first symptoms of ingrown nail, for about a month the patient applied ‘home remedies’, such as soaking feet in a grey soap solution;

Table 4. Type of procedure to which the patients had been subjected prior to the laser treatment of ingrown nail

Type of procedure	No. of patients	No. of patients (%)
Tamponade	37	22
Protective caps	19	12
Ingrown toenails fixers	54	33
Cutting of the nail	68	41
Removal of the nail plate	89	54

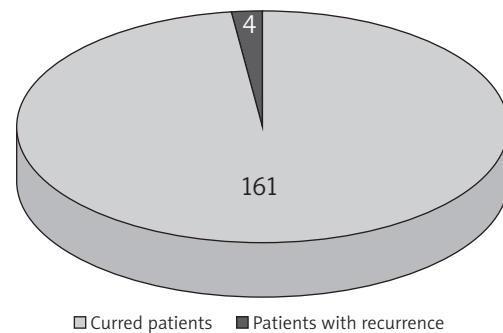
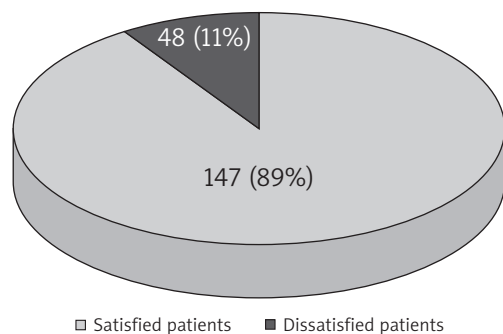
Table 5. Early and late complications after the procedure of laser resection and matrixectomy of ingrown nail in the study patients

Complications	No. of patients	No. of patients (%)
Early:		
Pain complaints requiring the taking of NSAIDs	43	26
Prolonged bleeding	23	14
Infection	0	0
Local necrosis	0	0
Late:		
Unaesthetic appearance of the nail apparatus	38	23
Thinning of nail plate	14	8
Scarring and pterygium of the nail fold	12	7

- subsequently, the patient visited a cosmetician, more rarely a podologist, where ingrown nail fixers were attached to the ingrowing nail plate;
- the patients then visited a family physician or dermatologist, who applied a tamponade or local antibiotic therapy;
- finally, the patient was referred to the surgeon who removed the nail plate.

It should be emphasised that the above-mentioned procedures occurred ineffective or only periodically effective in patients with advanced inflammatory state of the nail fold.

Table 5 shows that pain complaints requiring NSAIDs were the most frequent early complication after laser resection of an ingrown nail and matrixectomy, and concerned slightly more than 1/4 of patients. The patients reported that in later observation they were most disturbed by unaesthetic deformation of the nail apparatus; this problem concerned 23% of patients.

**Figure 1.** Effectiveness of the procedure of laser resection and matrixectomy of ingrown nail**Figure 2.** Patients' satisfaction with the outcome of the procedure of laser resection and matrixectomy of ingrown nail

'Follow up'

Figure 1 demonstrates that the procedures of laser resection and matrixectomy of ingrown nail are very effective. In the examined group, only in 4 (2%) patients there was a recurrence of ingrown nail. It should be emphasised that these were males aged 11–17 years, who did not comply with the recommendations after the surgery. One did not observe the appropriate foot hygiene, while the remaining three patients did not apply insoles correcting the inward rotation of the toenail.

Figure 2 shows that the vast majority of patients (almost 90%) expressed satisfaction with the outcome of the procedure. The remaining 18 patients were dissatisfied because of the unaesthetic appearance of the nail apparatus after the procedure of laser resection and matrixectomy of ingrown nail (Figures 3–5).

Discussion

Ingrown nail or onychocryptosis is a frequent disorder and most often concerns the toe. Many anatomical and behavioural factors contribute to the development of ingrown nail, such as repeated inappropriate cutting of the nail, accidental injury, genetic conditioning, excessive sweating, and poor foot hygiene. In the treatment, various procedures are ap-



Figure 3. Ingrown toenail in a 19-year-old male (Consultation Room Archive)

plied. Conservative treatment is justified in patients with a mild or moderate degree of ingrown nail, who do not experience considerable pain, erythema, or an intensified inflammatory state. When the problem is more intense or conservative therapy fails, surgical treatment is recommended. Surgical methods include a partial or total resection of the nail. However, a high percentage of recurrence is seen after the nail resection is observed; therefore, methods for permanent curing of ingrown nail are constantly sought. It seems that this difficult-to-treat disorder may be effectively cured by destroying the germinal matrix of the nail, i.e. the place that constitutes the germinative epithelium of the nail. This may be performed surgically, using phenol, trichloroacetic acid, or CO₂ laser [1–3].

The nail grows exclusively from the proliferation of the matrix, which is located underneath the nail bed – from outside visible as the nail lunula. If the germinal matrix is damaged, the nail plate will not regrow; hence, ablation of the germinal matrix or its resection is recommended in the treatment of ingrown nails [19].

According to the literature, ingrown nails are considerably more frequently observed in adolescents and young adults, with prevalence of the male gender. In the studies by Barreiros *et al.* 73% of patients were aged under 30 years [20]. In the group of patients in the presented study, nearly 70% were children and young adults aged up to 23 years, including 58% of males.

According to the relevant literature, the risk factors predisposing for the development of ingrowing nails include anatomical and behavioural mechanisms. Especially during the period of adolescence the feet sweat more often and the nail plate becomes softer, which predisposes for damage to the lateral nail fold



Figure 4. Nail of same patient directly after the surgery (Consulting Room Archive)



Figure 5. Nail of same patient 1 week after treatment (Consultation Room Archive)

and superinfection of the soft tissues. Another cause of ingrowing nails are bad habits in cutting nails - nail edges cut in a semi-circular or semi-elliptical shape. In the study by Barreiros *et al.*, 63% of patients inappropriately cut their nails, and 58% of them suffered from excessive sweating of the feet [1–3, 20]. In the presented study, the most frequent cause of ingrowing nail was wearing inappropriate shoes – 34% of patients, and inappropriate cutting of the nail plate – 26%.

Heifitz and Mogensen classified the intensity of ingrown nail into three stages:

- 1) mild – with domination of swelling, erythema, and pain with a pulsating sensation;
- 2) moderate – increased oedema, exudation, infection with serous or purulent discharge;
- 3) severe – chronic inflammation, granulation and considerable overgrowth of the eponychium [20].

In turn, Mozen classified onychocryptosis into four stages:

- stage I – associated with slight erythema, swelling, and pain;
- stage II – continuation of the first stage, with an intensification of erythema, swelling, and pain;

- stage III – the above-mentioned symptoms accompanied by serous or purulent discharge and hypertrophy of the skin with granulation of the inflamed tissue in the lateral fold, so-called ‘proud flesh’;
- stage IV - severe chronic deformation of the nail; hypertrophic tissue totally covers the medial and lateral part of the nail plate [14].

In the study group, all patients, i.e. 165, had severe ingrowing of the nail with chronic inflammation, granulation, and considerable hypertrophy of the eponychium (Heifitz and Mogensen) or stage III and IV (Mozen). Each patient experienced pain while walking, there occurred an inflammatory state of the nail fold, and all patients in the study group complained of the unaesthetic appearance of the nail apparatus. Almost all patients (93%) reported limited activity.

There are conservative and surgical methods of treatment. Surgical treatment should be offered in moderate and severe cases. There is no consensus on the best method for the surgical treatment of ingrown nails [20]. The ideal method of surgical treatment should have such characteristics as: use of local anaesthesia, technically easy to perform, quick healing with minimum post-operative morbidity, and a high indicator of success [21].

Initially, an ingrown nail should be treated as a response to the presence of a foreign body. In relevant literature, the methods of a partial resection of the nail plate are most frequently described, and chemical cauterisation of the edge of the matrix or its ablation with a CO₂ laser. The main aim is the destruction of the lateral edges of the matrix, which prevents the future ingrowing of the nail plate, a method first described in 1945 by Boll. The two most popular chemical agents applied in this procedure are phenol and trichloroacetic acid. Phenol was the first agent with success described in more than 95% of cases. Studies on animals showed that after penetration of the phenol into the circulatory system, there may occur many symptoms of acute intoxication; however, there is still no evidence for systemic complications in patients who had undergone matrixectomy with the use of phenol [14, 22–24].

There are also other possibilities, apart from exclusively surgical or chemical matrixectomy. A partial matrixectomy, using a carbon dioxide laser, electrocoagulation, and radio frequency, provides very good outcomes, although according to some researchers, especially Barreiros *et al.*, these are time consuming and costly techniques [20].

In the literature there is no unequivocal consensus concerning the selection of treatment for ingrowing nails. A partial or total removal of the nail is a frequently used conservative method of treatment; however, these procedures are characterised by a very high percentage of recurrences (42–83%) because the matrix – the germinal region of the nail – is not dam-

aged. Another popular method of surgical treatment is a wedge resection of the nail; however, according to Erdinc *et al.*, the recurrence of ingrowing nail regarding the wedge reaches as many as 33% of resections. In addition, it should be remembered that not only the recurrence of ingrowing nail decides about the therapeutic success, but also the ease of healing the wound after the surgery, and the frequency of occurrence of post-operative complications. Erdinc *et al.*, Barreiros *et al.*, Xiaogiang *et al.*, and others agree that the surgical methods of treatment of an ingrown nail, such as removal of the nail or wedge resection, are not only technically difficult, but are also associated with high recurrence, reaching 83% with the removal of the nail, and 33% with wedge resection. The surgical methods are also accompanied by a considerable risk of post-operative complications, including prolonged time of healing, considerable pain, and frequent infection. Therefore, the time of absenteeism from school or work is prolonged, and the aesthetic effect is not satisfactory for the patient [19–21].

Patients from the examined group – before the performance of laser surgery of ingrowing nail – had most often previously been subjected to the procedure of nail plate removal – 54%, and wedge resection of the nail – 41%.

The most important aim in the treatment of ingrown nail is the destruction of the nail matrix, i.e. the germinal layer, the so-called matrixectomy. There are two main methods of selective matrixectomy: chemical and mechanical [1].

Chemical matrixectomy is one of the very good methods which fulfils all criteria for a successful surgery and provides good outcomes. Chemical matrixectomy has been effectively applied since 1945, from the time of Boll. The aim of the treatment is chemical destruction of the lateral part of the germinal matrix of the nail in order to prevent its lateral growth and ingrowing into the soft tissues, to the lateral fold. During the selective matrixectomy it is very important to minimise damage to the surrounding healthy skin and soft tissues in order to shorten the time of healing and obtain a satisfactory cosmetic effect [4, 20, 25].

Most frequently, for chemical matrixectomy, phenol, sodium hydroxide, or trichloroacetic acid are used. These are substances that effectively denature proteins. Phenol leads to cauterisation producing thrombotic necrosis in the matrix and surrounding soft tissues. It possesses antibacterial properties and has a local anaesthetic effect, which is an additional advantage. Many researchers consider that matrixectomy using phenol is the method of choice in the treatment of ingrown nail, characterised by high effectiveness (91–100%), in annual observation. Nevertheless, this procedure is not without its disadvantages, which include: unpredictable damage to the tissues as a result of chemical burn, persistent infections, and

a prolonged time of healing [20, 21, 26]. Korkmaz *et al.*, also report abdominal pain, dizziness, haemoglobinuria, cyanosis, and sometimes in severe systemic responses, arrhythmia [4].

In recent years, it has been found that matrixectomy using sodium hydroxide is as effective as phenol, with a simultaneous shorter period of healing and lower risk of local or systemic toxicity. Sodium hydroxide causes less chemical burn, and healing is shorter. However, the long-lasting use of strong alkaline agents may cause excessive damage to the soft tissues and the lateral fold due to the advancing necrosis [4, 27].

Trichloroacetic acid (TCA) has recently been one of the agents most frequently applied in chemical obliteration. Trichloroacetic acid is a caustic chemical agent that causes thrombotic necrosis, similar to phenol; however, conversely to phenol, it does not lead to the systemic toxicity. In their last study, Kim *et al.* found that chemical matrixectomy using TCA was characterised by 95% effectiveness. In addition, they reported that undesirable effects, such as post-operative pain or infection of the wound, were slight [22].

Bostanci *et al.* observed that after matrixectomy with sodium hydroxide, the indicator of success was 95.1%, after matrixectomy with phenol – 95.8%, and after matrixectomy with TCA – 90%. In earlier studies these indicators were slightly lower, with a difference of 6–11% [25].

Surgical matrixectomy has a low frequency of recurrence, but technical difficulties, long time of healing of the post-operative wound, post-operative pain, and long-lasting limitation of activity limit the use of this technique. Therefore, some researchers report the benefits of using a CO₂ laser in the effective treatment of ingrown nail. The effectiveness of using a CO₂ laser is manifested primarily in the possibility to perform a selective matrixectomy, as well as undesirable effects, such as post-operative pain or post-operative infection. The CO₂ laser more selectively damages the matrix of the nail, compared to chemical matrixectomy, which is associated with considerably better final outcomes and low indicator of recurrences on the level of 2–6% [1, 21].

In the examined group, only in four out of 165 patients subjected to the procedure of matrixectomy using CO₂ laser, i.e. 2%, there occurred recurrence of ingrowing nail.

The researchers also emphasise that matrixectomy using a CO₂ laser, apart from satisfactory outcomes of treatment, also has disadvantages – it is a technically difficult technique and requires greater surgical skills. In addition, prolonged healing and aesthetic effects after surgery performed with CO₂ laser, do not always satisfy the patients [21].

In the study group, the majority of patients (almost 90%) expressed satisfaction with the outcome of

the surgery. The remainder, i.e. 18 patients, were dissatisfied because of the unaesthetic appearance of the nail apparatus after the procedure of matrixectomy and laser resection of ingrowing nail.

Pain complaints requiring the use of nonsteroidal anti-inflammatory drugs were the most frequent early complication after laser resection and matrixectomy of ingrown nail, and concerned just over a quarter of patients. In late observation, the patients were most disturbed by unaesthetic deformation of the nail apparatus – this problem concerned 3% of patients. None of the patients developed an infection.

Conclusions

Laser resection of ingrown nail with matrixectomy is a very effective method for the treatment of an ingrown nail. The cause of dissatisfaction of patients after surgical resection of the ingrown nail and matrixectomy is sometimes the unaesthetic appearance of the nail apparatus.

Conflict of interest

The authors declare no conflict of interest.

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