

Медичні науки

УДК 616.577-002.36

Vergun Andrij

PhD, surgeon, associate professor of family medicine
Danylo Galitski Lviv National Medical University

Chulovskyj Yaroslav

Head doctor
Communal 4 City Clinical Hospital (Lviv, Ukraine)

Shalko Iryna

PhD, surgeon, associate professor
Danylo Galitski Lviv National Medical University

Kit Zoriana

PhD, acting assistant professor of department of family medicine
Danylo Galitski Lviv National Medical University

Moshchynska Oksana

Chief of the Department of Palliative Care
Communal 4 City Clinical Hospital (Lviv, Ukraine)

Lytvynchuk Mykhailo

Ordinator of the Department of Palliative Care
Communal 4 City Clinical Hospital (Lviv, Ukraine)

Marko Oksana

Ordinator of the Department of Palliative Care,
Communal 4 City Clinical Hospital (Lviv, Ukraine)

Kultchuckyj Vasyl

Ordinator of the Department of Palliative Care
Communal 4 City Clinical Hospital (Lviv, Ukraine)

Tsybukhovska Vira

Chief of the Department of endocrinology
Communal 4 City Clinical Hospital (Lviv, Ukraine)

Krasnyj Mykhailo

PhD, assistant of department of endocrinology
Danylo Galitski Lviv National Medical University

Abashyna Nataliia

PhD, surgeon, associate professor
Danylo Galitski Lviv National Medical University

Vergun Oksana

PhD, associate professor, Department
of Therapy №1 and Medical Diagnostics FpgE
Danylo Galitski Lviv National Medical University

ONYCHOMYCOSIS WITH NAIL INCARNATION: COMPLEX SURGICAL TREATMENT (CLINICAL ANALYSIS)

Summary. Clinical parallels of in-patient and out-patient surgical treatment for nail ingrowth (complicated and combined mycotic-associated processes and relapses) were clarified; morphologic changes were studied; causes of unsatisfactory outcomes of chronic pathology complex treatment were analyzed for prospective approaches to preventing relapses. Over a five-year period 436 unguis incarnates diagnosis (325 cases of incarnated mycotical-associated nail pathology) were performed. If the infection is limited to less than one-half of the eponychium, a single incision placed to drain the paronychium and to elevate the eponychial fold for excision of the proximal one-third of the nail is satisfactory. Extension to the opposite side of the fingernail, which is uncommon, is called a run-around abscess. In these cases, the paronychia is compressed along the nail edge, trapping the abscess. All procedures that successfully treat paronychia separate it from the hard nail. Analysis of subonychial scraping allowed stating the prevalence of red trichophytia, where in 74% cases it was associated with mold, in 26% cases it was associated with yeast fungi; and in 31% cases – with the bacterial flora; applied 4-5 five-day system "pulses" of 400 mg/day itraconazole therapy. In patients embedded and applied the low-impact methods of excision of the nail and partial marginal

matricectomy mechanical carving and coagulation with the further dermatophytoms scraping off by the Folkman's spoon. Sanation of other nails for prevention of mycotic reinfection was carried out by ciclopirox & amorolfine nail lacquer. Frequent variants of nail lesions are onychocryptosis (incarnation of the nail) and destructive onychomycosis, which account for more than half of all calls for medical care for onychial pathology. With onychocryptosis clinically and morphologically manifesting there are changes in the eponychium.

Key words: Destructive onychomycosis, nail incarnation, recurrent ingrown nail, antimycotic therapy, surgical removal.

The need for complex research on surgical nail pathology is primarily determined by a large number of clinical observations of uncomplicated and complicated cases, especially relapses. In the domestic and foreign literature there is a significant number of works devoted to pathology of the nail plate, however, the surgical aspects of the onychology are assigned a minimal, secondary role. We have not found complex studies on the principles of evidence-based medicine aimed at studying surgical treatment of ingrown nails (taking into account nosological forms, clinical and morphological options, applied complex treatment methods). To find ways to prevent relapses, optimal methods of surgical correction in the structure of complex treatment of chronic mono-disorders, complicated, combined and combined (mycotic-associated) primary processes and relapses have been approved.

Dermatophytes, infecting a nail matrix, determined of the dystrophic changes of nail and a subnail hyperkeratinization and dermatophytoms (onychomatricoma) [1, 2, 4], surgical nail pathology, that compress a nail that is the driving nosotropic member of the secondary ingrowing and has an influence on curative tactics [2, 3], in particular on the necessity of the surgical moving away [6]. The article clarifies the clinical features and ways to optimize the treatment of patients with onychomycosis and destructive secondary ingrown nails. The results of complex treatment of the patients on nail trichophytosis,

associated with ingrown toenail; submitted of depending on a nail plate and eponychial changes are presented in the publication. The aim of research is optimal sequence of holiatry, clinical and biochemical parallels of complex treatment after moving away of the staggered nails at destructive polyonychomycosis, complicated by the secondary ingrown nail for some patients with the complicated mycotic defeat of nails. Conservative and orthopedic treatments of incarnatus surgical nail pathology are not very effective while Dupuytren's method, Emmert-Schmiden surgeries etc. are very traumatic, disfigure nail bone, distort anatomic and functional unity of a finger [3, 6] and in 2-20% cases (depending on absence or presence of onychocryptosis and fungal agents) cause a relapse [1, 6].

The aim of research is optimal sequence of surgical treatment, local and system therapy after moving away of the staggered nails at destructive polyonychomycosis, complicated by the secondary ingrown nail.

Materials and methods. Over a five-year period (2011-2016) 436 unguis incarnates diagnosis (325 cases of incarnated polyonychomycosis) in 259 men and 177 women aged 12-86 were performed. In 182 patients late relapses of onychocryptosis were confirmed after previous surgeries at other clinics. Conservative treatment was recommended only at early stages of ingrowth [2, 6]. Removal of the affected nails was performed in patients with mycotic lesions (local and systemic fungicide therapies were used). Investigation of the morphogenesis of destructive aspect of the mycotic lesions was carried out [1-3, 5]. The analysis justifies the feasibility of establishing predictive relationships between clinical variants of chronic purulent necrotic infections and combined comorbidity [1, 4, 5]. System therapy of itraconazole to operative treatment (basic onychial defeats sanation) and in a postoperative period was carried out [1, 2]. The applied types of operative treatment of surgical nail pathology may be divided into five main groups: 1 – Emmert-Schmiden type surgeries (marginal excision of nail plate and eponychia with marginal removal of the growing part via partial matricectomy); 2 – Dupuytren's type surgeries

(onychectomy – complete removal of nail plate); 3 – Bartlett type surgeries (local tissue plastic reconstruction); 4 – marginal resection of marginal section of nail plate; 5 – Meleshevych surgery; 6 – our modifications (with previous block-type eponychectomy) [11, 14, 15]. Results of ingrown nail surgical correction have been studied to improve the results of complex treatment.

Results and discussion. Three variants of dermatophytoma are differentiated: front center – with up to 25% eroded nail – 45 cases, subtotal – from 25 to 70% (without capturing the growth plate) – 38 cases, total – from 70 to 90% (with affected growth plate of the nail) – other 15 cases. In all cases, dermatophytoma affected distal and central part of the nail bed. Analysis of subonychia scraping allowed stating the prevalence of red trichophytia [1, 4], where in 74% cases it was associated with mold, in 26% cases it was associated with yeast fungi; in 31% cases – with the bacterial flora [1]. Conglomerate of nail plate and subungual hyperkeratosis and trichophytosis calcinated completely, forming onychogryphosis with deformation [2] and forming secondary recurrent ingrown nail.

Mycotic associated hyponychial panaritium was diagnosed for 16 patients with onychogryphosis (16.33% of the sample), purulent paronychia was diagnosed for 11 patients (11.22%), other 5 patients of this group – eponychial abscess (5.10%), 2 patients have micotical-assotiated phalanx osteomyelitis. In patients with polyonychomycosis, especially in severe destructive forms of subungual hyperkeratosis, was noted large deterioration of microcirculation. Rheographic prevailed spastic type curves ($P < 0.01$). Index open capillaries were reduced by 31%. Patients in both groups mainly were amazed hallucis left foot – in 188 people, at least – the right foot (in the other 133 patients), the presence of pathological ingrown nail plates hallucis both feet [6] and other fingers ascertained in other patients. Patients of the main group carried out a three-day adjuvant systemic fungicide therapy daily intake of 400 mg itraconazole, which continued for the next 4 days (first 2 postoperative days) as

pulse therapy. A similar dose at weekly intervals was carried out following five-day 2-3 cycle pulse [1].

During the five-year period we examined and treated 38 patients with onychogryphosis and diabetes mellitus type 2. We provide the research of the peculiar features of the pathological process to create the optimal scheme of complex treatment of patients with abnormal ingrowth of the nail plate with underlying diabetes mellitus type 2 [4, 5]. Surgery involved 23 patients with ingrown onychogryphosis and underlying diabetes mellitus, diabetic micro and macroangiopathy (prospective material, treatment group), and onychogryphosis and recurrent incarnation of toenail (pathology being clinically dominant and manifesting through pain syndrome) and multiple destructive mycotic lesions of other nail plates of both feet: 14 men and 9 women, 55-80 years old. Removal of affected nails for patients with polyonychomycosis was performed through successive stages at add-back of certain systemic "pulses" with itraconazole. Non-invasive methods of nail resection were preferred in patients with diabetes mellitus [3, 4].

The duration of clinically-manifesting nail mycotic process in all studied cases exceeded 5 years. Removal of trichophytosis nails was performed through onycholysis by separate successive stages where certain "pulses" of therapy were supported with itraconazole [1]. On one side the subungual hyperkeratosis and dermatophytosis caused compression of the central part of the nail, epionychium edges "ingrew" to periungual walls thus recurrent ingrown nail was formed; on the other side, constant compression caused destruction of the central part of the nail bed; this process is typical for 84.32% cases [4-5]. Systemic adjuvant pulse therapy with 400 mg itraconazole was applied during two days till the initial surgical treatment and during first three days of the postoperative period. Remediation of other affected nails in order to prevent from mycosis reinfection was carried out with antimycotic amorolfine 5% lacquer & ciclopirox 8% nail lacquer solution [13].

When combined incarnation of onychomycosis (fig. 1) and acute eponychial abscess, comply with disclosure abscess, excision of abnormal tissue eponychial hypergranulation and focal necrosis; removal of the nail plate, enlarged partial marginal matrixectomy in the ingrowth area.



Fig.1. Onychomycosis, subnail hyperkeratosis, distal subnail dermatophytoma, hypergranulations, destruction of the central part of the nail bed, recurrent ingrown nail.

Intraoperation photo. 52 years old woman. Clinical case

Other patients (control group) used a typical nail removal– operations such as Dupuytren's – complete removal of the nail plate (fig. 2) under the guise of "classical" pulse therapy with itraconazole and terbinafine [1]; in 45 cases this intervention combined with simultaneous excision of the modified cuticle and plastic – operations such as Bartlett (plastic local tissue) and Meleshevich (fig. 3). We have differentiated two types of destructive complicated polyonychomycosis associated with nail incarnation, in which the combined treatment of surgery used onychectomy [2, 3, 6]. Surgical treatment was conducted with regard for pathological changes in eponychial fold according to recommendations for combining surgical treatment and conservative therapy [8,15].



Fig. 2. Subnail hyperkeratosis, the big dermatophytoma, hypergranulations, destruction of the central part of the nail bed and local necroses of dermatophytoma. Removed nails. Postoperation photo. Trichophytil polyonychomycosis, onychogryphosis. 72 years old man. Clinical case



Fig. 3. Lateral subnail hyperkeratosis, nail deformation, the local dermatophytoma, recurrent ingrown nail. Marginal removal of the nails parts and hyperkeratosis (Emert-Meleshevich procedure). Intraoperation photo. 61 years old woman. Clinical case

The disease was characterized by a mild pain syndrome. To destructive and complicated forms of onychomycosis associated with ingrown nail it was attributed subungual hyperkeratosis with onycholysis and the formation of subungual panaritium and purulent mycotic paronychia [12-14].

Pathological changes in the nail plate were in nail hypertrophy and deformation, pathological surface stratifications on the nail bed (brown with decay) and forming of multiple pyogenic bacterial-mycotic foci with abscess formation (in the form of a "honeycomb") [11].

The main pathological structure of destructive onychomycosis is subungual hyperkeratosis, which is characterized by the presence of abnormal excess "keratinization" of the nail, the nail plate is thickened, deformed, grows over the brownish pathological mycotic hyperkeratoid fragile layers on the nail bed [14-16]. In the zone of subungual hyperkeratosis along the distal edge of the nail, visualize the least rigid, softened area, scrape it with a Volkmann's spoon, removing the subungual hyperkeratosis, dermatophytoma (onychomatricoma), separating and lifting the central part of the nail. In the formed channel we introduce a clamp, which fixes the central part of the nail plate; remove in the proximal direction only the central part of the nail, most affected by mycosis. There is going a final fragmentation and stratification of the nail plate leaving fragments fixed in eponychial tissues [14-15]. They are mobilized with a sharp scalpel blade, fixed it with a "Mosquito" type clamp and then conduct their block-like cuttings along with pathologically altered eponychial tissues. Visualize the naked nail bed with the remains of dermatophytic hyperkeratosis in the distal part. The latter are additionally sanified with a Volkmann's spoon, removing pathological elements by scraping [5-10, 15-16].

In the case of onychogryphosis, complicated by compression of eponychial tissues and onychocryptosis, the lateral separation of the nail plate by the raspatorium from the side of "ingrowing" into the eponychial tissues after excision of the eponychium was performed with expanded lateral access. A linear incision was performed through a retronycheal platen, which continued

semilunar in the distal eponychium, carving the latter totally to visualize the edge of the nail [10]. A channel was formed by the raspator, bluntly by successive movements the onychogryphosis changed nail plate was separated in a contralateral direction opposite to the side of the ingrowth. The nail plate was fixed with a clamp and removed. Partial matrixectomy was performed. With mycotic onychogryphosis, complicated by bilateral ingrowing of the nail, the nail plate was cut through its mobilization at the proximal end after the bilateral eponycheotomy was performed with the formation of a retronycheal flap and "exfoliation" bluntly from the side of the growth zone [16].

Upon subonychia scraping analysis of onychomycotic nails with secondary nail incarnation, it was possible to confirm the dominance of dermatophytes (red trichophytia), while one-third of cases were associated with mold and yeast-like fungi. Hyperkeratosis, erosion, and destruction of the central nail with secondary incarnation of the edges were typical for 89.1% of trichophytis cases. Arguing that the removal of the nail plate with antifungal treatment provides positive dynamics of regenerative type cytologic picture and shorter healing onycheotomy wounds 18 – 27 days to 12-25 days, with good early and long-term results. Type of transaction cytograms onycheotomy wounds in the study group on the 10th day of the post-operative period is stated as the regenerative-inflammatory to 24.81%, 75.19% in the regenerative (p=0.031). In these embodiments, the control group was respectively 53.12% and 46,88%. Relapse causes after Meleshevych, Emmert-Schmidten, Bartlett surgeries were technical faults of surgical tools, intraoperative nail bed trauma, faults of post-operative anti-relapse treatments, surgical area trauma, wearing tight shoes, non-compliance with doctor's recommendations as to correction of orthopedic pathology, polyonychomycosis.

Conclusions.

1. The usage of classical methods of surgical treatment of onychopathology in the presence of ingrown nails is determined by the principle that provides indications for the removal of affected nails with more than half

of the affected onychial surface, which makes it impossible to perform resection.

2. For surgical treatment of onychocryptosis, it is advisable to use transeponycheal access to the edge of the nail plate, the effectiveness of which is determined by total elimination of the altered eponychia from ingrowth, the creation of an opportunity for adequate resection, a clear visualization of the growth zone and matrix to perform partial matrixectomy, the possibility of expanding access for revision subonycheal structures, including the distal end of the nail phalanx, sanitation of other nails for prevention of mycotic reinfection was carried out by ciclopirox & amorolfine nail lacquer.
3. In all cases of mycotic onychocryptosis (secondary ingrown toenail) underwent a comprehensive treatment of comorbid pathology, system therapy of itraconazole to operative treatment (basic onychial defeats sanitation) and in a postoperative period was carried out, some patients with combined pathology got 4-5 five-day system "pulses" of 400 mg/day itraconazole therapy.
4. Methods of surgical removal of subnail hyperkeratosis and onychogryphosis complicated with recurrent nail incarnation have been improved considering patho- and morphogenetic properties of destructive polyonychomycosis; removal of the mycotic affected nails of these patients should reasonably be conducted through onycholized structures with simultaneous removal of dermatophytoma, hyperkeratosis, and ingrowth areas with hypergranulation.
5. Surgical intervention at onychomycosis with incarnation of the nail is complemented by excision of pathologically altered eponychia and partial matrixectomy in the area of ingrowth, which prevents the occurrence of late relapses of compression complications.

References

1. Acar E. Winograd Method Versus Winograd Method With Electrocoagulation in the Treatment of Ingrown Toenails. / E. Acar // *J Foot Ankle Surg.* – 2017. – 56(3). – P.474-477.
2. Akkus G. Tinea pedis and onychomycosis frequency in diabetes mellitus patients and diabetic foot ulcers. A cross sectional – observational study. / G. Akkus, M. Evran, D. Gungor [et al.] // *Pak J Med Sci.* – 2016. – 32(4). – P.891-895.
3. Al Ghamdi K.M. Nail tube splinting method versus lateral nail avulsion with phenol matricectomy: a prospective randomized comparative clinical trial for ingrown toenail treatment. / K.M. Al Ghamdi, H. Khurram // *Dermatol Surg.* – 2014.– 40(11). – P.1214-1220.
4. Baraldi A. Human nail plate modifications induced by onychomycosis: implications for topical therapy. / A. Baraldi, S.A. Jones, S. Guesne [et al.] // *Pharm Res.* – 2015. – 32(5). – P.1626-1633.
5. Baran R. New clinical classification for onychomycoses. / R. Baran, R.J. Hay // *J Mycol Med.* – 2014. – 24(4). – P.247-260.
6. Brillowska-Dabrowska A., Saunte D.M., Arendrup M.C. Five hour diagnosis of dermatophyte nail infections with specific detection of *Trichophyton rubrum*. / A.Brillowska-Dabrowska, D.M. Saunte, M.C. Arendrup // *J. Clin. Microbiol.* – 2007. – 45(4). – P. 1200-1204.
7. Chang P. Onychogryphosis: A Report of Ten Cases. / P. Chang, T. Meaux // *Skinmed.* – 2015. – 13(5). – P. 355-359.
8. Chapeskie H. Case Series: soft-tissue nail-fold excision: a definitive treatment for ingrown toenails. / H. Chapeskie, J.R. Kovac // *Can J Surg.* – 2010. – 53. – P.282–286.
9. Demirseren D.D. Relationship between skin diseases and extracutaneous complications of diabetes mellitus: clinical analysis of 750 patients. / D.D. Demirseren, S. Emre, G. Akoglu [et al.] *Am J Clin Dermatol.* – 2014. – 15. – P.65–70.

10. Gupta A. A painless, minimally invasive technique for debulking onychomycotic nails. / A. Gupta, R.S. Jangra, S. Gupta [et al.] // *J Am Acad Dermatol.* – 2017. – 76(1). – P. 17-19.
11. Haneke E. Controversies in the treatment of ingrown nails. / E. Haneke // *Dermatol Res Pract.* – 2012. – 3. – P. 1-12.
12. Kallis P. Onychomycosis and Onychomatricoma. / P. Kallis, A.Tosti // *Skin Appendage Disord.* – 2016. – 1(4). – P.209-212.
13. Monti D. Nail penetration and predicted mycological efficacy of an innovative hydrosoluble ciclopirox nail lacquer vs. a standard amorolfine lacquer in healthy subjects. / D. Monti, U. Herranz, L. Dal Bo [et al.] // *J Eur Acad Dermatol Venereol.* – 2013.– 27(2). – P. 153-158.
14. Rammelt S. Treatment of ingrown toenails. What is an «Emmert plasty»? / S. Rammelt R. Grass H. Zwipp // *Chirurg.*–2003.–Vol.74 N 3.–P.239-243.
15. Vergun A.R. Chronic mycotic-associated surgical nail pathology complicated with ingrown nail (nail incarnation): the analyses of clinical cases and complex treatment. / A.R. Vergun, B.M. Parashchuk, M.R. Krasnyj [et al.] *International Journal of Medicine and Medical Research.* – 2017. – №3 (1). – P.33-40. [Ukr].
16. Yin Z. A meta-analysis comparing long-term recurrences of toenail onychomycosis after successful treatment with terbinafine versus itraconazole. / Yin, J. Xu, D. Luo // *J Dermatolog Treat.* – 2012. – 23(6). – P.449-452.