

## DESTRUCTIVE COMPLICATED ONYCHOMYCOSIS WITH NAIL INCARNATION: CASE SERIES, COMPLEX SURGICAL TREATMENT

**Summary.** Frequent variants of nail lesions are onychocryptosis (nail incarnation) and destructive onychomycosis, which account for more than half of all calls for medical care for onychial pathology. As it is known, among the nosological forms of destructive purulent-necrotic chronic and combined pathology of the distal phalanges of the toes, the ingrown nail constitutes a significant number of uncomplicated and complicated cases.

**The aim of the study** – optimal sequence of treatment, local and system therapy after the IN surgical removal for some patients with the complicated mycotic incarnation defeat of nails.

**Materials and Methods.** Over five-year period (2011–2016) 325 cases of incarnated onychomycosis were performed. In 182 patients late relapses of onychocryptosis were confirmed after previous surgeries at other clinics. The analysis justifies the feasibility of establishing predictive relationships between clinical variants of chronic purulent necrotic infections and combined comorbidity.

**Results and Discussion.** Dupuitren's method, Emmert-Schmiden surgeries etc. are very traumatic, disfigure nail bone, distort anatomic and functional unity of a finger and in 2–20 % cases (depending on absence or presence of combined pathology – onychocryptosis and fungal agents) cause a relapse. In 22.58 % of the sample, the disease occurred against the background of obliterating diseases of arteries of the lower extremities of atherosclerosis in 60 and diabetes in 22 patients. Despite the significant risk of complications, preference should be given to the resection of the affected nail. The peak frequency of observations of destructive trichophytic lesions with ingrowing of the nail was clinically in patients 40–50 years old and 50–60 years old. Primarily, the left foot hallux was affected – in 58.68 % of the sample, less frequently in the right foot – in 39.94 %, the presence of abnormal ingrowth of the nail plates of the hallux of both feet was detected in 1.38 %. System therapy of itraconazole to operative treatment (basic onychial defeats sanitation) and in a postoperative period was carried out. In patients with obliterating diseases of the arteries of the lower extremities, it is often possible to detect a combined lesion: pathological growth of the mycotic affected nail plate. 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 cases. The late unsatisfactory results of the complex treatment of destructive onychomycosis associated with incarnation (occurrence of compression relapses) are first determined by the technical errors of the operation interventions (inadequate selection of the method and volume of resection, traumatic performance of onychectomy, failure to perform partial matrixectomy).

**Conclusions.** The implementation of the system therapy of itraconazole to operative treatment (basic onychial defeats sanitation of mycotic incarnation), blocklike eponychectomy is optimal and is the main primary access of ingrown nail treatment, the possibility of expanding access for resection / removing, revision subonycheal structures. Partial marginal matrixectomy ensures that the nail plate does not grow in the area of resection, is recommended in all cases of ingrowth (under conditions of mycotic contamination – by diathermocoagulation) as the main antirelapse action, is a composite of three-component surgical interventions that reduce the number of postoperative relapses of clinical observations.

**Key words:** destructive onychomycosis; ingrown nail; antimycotic therapy; surgical removal.

**INTRODUCTION** Operations for the pathological incarnation of the nail plate in the eponychium account for a significant percentage of surgical interventions are performed in the outpatient surgical departments [1-4, 16]. The most often, the toe (hallux) of the left foot is affected [2, 3, 16]. As it is known, among the nosological forms of destructive purulent-necrotic chronic and combined pathology of the distal phalanges of the toes, the ingrown nail (IN) constitutes a significant number of uncomplicated and complicated cases [5–7]. Frequent variants of nail lesions are IN, i.e., onychocryptosis (incarnation of the nail) and destructive onychomycosis, which account for more than half of all calls for medical care for onychial pathology [2, 3, 7]. IN, as a surgical disease, is quite common among all age groups, but mostly young people are affected; occupies one of the leading places among other necrotic-purulent processes not only in the frequency of occurrence, but also in the number of days of incapacity for work [10–14, 16]. The importance of this problem is primarily concerned with the prevalence of destructive onychomycosis, red dermatophytosis (*Trichophyton rubrum*, syn.: *T. purpureum*, *T. rubidium*), which is a major factor of fungal infections and onychomycosis, is highly contagious, virulence, the ability to affect any skin

and cause relatively soon plural nail infections [8, 9, 15, 17], relapse "ingrowth" is observed in 3–35 % of cases [10, 13, 14]. As it is known, among the nosological forms of destructive purulent-necrotic chronic and combined pathology of the toes distal phalanges, the IN constitutes a significant number of uncomplicated and complicated cases [1, 10, 15]. Frequent variants of nail lesions are ingrowth, i.e., onychocryptosis (incarnation of the nail) and destructive onychomycosis, which account for more than half of all calls for onychial pathology medical care [13].

**The aim of the study** – optimal sequence of treatment, local and system therapy after the IN surgical removal for some patients with the complicated mycotic incarnation defeat of nails.

**MATERIALS AND METHODS** Over a five-year period (2011–2016) 325 cases of incarnated onychomycosis 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 [1, 10]. Removal of the affected nails was performed in patients with mycotic lesions (local and systemic fungicide therapies were used) [3-5]. Investigation of the morphogenesis of the mycotic lesions destructive aspect was carried out.

The analysis showed the feasibility of predictive relationship between clinical variants of chronic purulent necrotic infections and comorbidity. System therapy of itraconazole to operative treatment (basic onychial defeats sanation) and in a postoperative period was carried out.

In patients with obliterating diseases of the lower extremities arteries, it is often possible to detect a combined lesion: pathological growth of the mycotic affected nail plate. Despite the significant risk of complications, preference should be given to the resection of the affected nail [1, 10].

However, when expressed concomitant changes (if more than half of pathological detachment of the IN plate or onychogryphosis, making it impossible to perform resection edge) are necessary carrying out the complete removal of the nail. The operation should be supplemented by excision of pathologically altered eponychium tissues and partial marginal matrixectomy: edge excision and diathermocoagulation growing zone and nail matrix in ingrowth area.

**RESULTS AND DISCUSSION** The results of complex treatment of the patients on nail trichophytosis, associated with IN; submitted of depending on a nail plate and eponychial changes are presented in the publication. Nosological forms of lesions are associated with some degree of incarnation, according to the dominant clinical manifestations of ICD 10 (Tab. 1) were divided into sub-samples – onychocryptosis, dermatophytosis and candidal onychomycosis with incarnation of the nail.

The peak frequency of observations of destructive trichophytic lesions with ingrowing of the nail was subungually in patients 40–50 years old and 50–60 years old. Primarily, the left foot hallux was affected – in 58.68 % of the sample, less frequency was of the right foot – 39.94 %, the presence of the nail plates abnormal ingrowth of the hallux in both feet was detected in 1.38 %. In 22.58 %, the disease occurred against the background of atherosclerotic arteries obliteration of the lower extremities in 60 and diabetes in 22 patients.

Three variants of dermatophytoma are differentiated: front center – 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 cases. In all cases, dermatophytoma (onychomatricoma) affected distal and central part of the nail bed. Conglomerate of nail plate and subungual hyperkeratosis and trichophytosis calcinated completely [14, 16, 17], forming onychogryphosis with deformation and forming secondary recurrent ingrown nail [6, 8, 13, 14]. In patients with polyonychomycosis, especially in severe destructive forms of subungual hyperkeratosis, large deterioration of microcirculation was noted. Conservative and orthopedic treatment of surgical incarnatus nail pathology are not very effective, Dupuitren's method, Emmert-Schmiden surgeries etc. are very traumatic, disfigure nail bone, distort anatomic and functional unity of a finger [1–5] and determine a relapse (depending on absence or presence of onychocryptosis and fungal agents) [1, 5, 10, 15]. This disease is characterized

by chronic pathological compression of the edge of the nail plate of the eponychium and the development of chronic purulent inflammation in it, often with the formation of necrosis and hypergranulation [1-3, 5, 7]. Therefore, we identified 3 variants of the type of changes: type I – infiltrative inflammation, type II – acute eponychium abscess, type III – chronic inflammation with the formation of focal necrosis and hypergranulation. However, there is a clinically probable continuity and intermittency of individual nosological forms and clinical variants of nail lesions, which significantly expands the "spectrum" of diagnostic and technical surgical labor. We investigated the variants of nail changes with onychocryptosis with deformation of the nail plate and bed. Also, a clinical classification of destructive onychomycosis and an index of an outgrowth is proposed to optimize the description of cases of surgical onychopathology, in particular – associated with mycotic lesion. The pathogenesis of IN in patients with onychomycosis is sufficient and can represent from 1 to 4 existing "vicious circles" (Circulus vitiosus) simultaneously [4, 5, 8, 10, 13], which creates certain difficulties for full-scale complex treatment and requires an individualized approach for surgical correction and management of the postoperative period [2, 4, 8, 9].

Patients with such combined pathology got 4–5 five-day system "pulses" of 400 mg/day itraconazole therapy [9, 12, 17] with using hepatoprotectors and correction of comorbid pathology [8-11]. Provided adequate surgical treatment, in addition to standard decompression stage (complete removal of the nail plate), contained anti-recurrent component to prevent from repeated ingrowth. Non-invasive methods of nail excision and IN resection were preferred in patients with diabetes mellitus. Analysis of subonychia scraping allowed stating the prevalence of red trichophytia, where in 74 % of cases it was associated with mold, in 26 % of cases it was associated with yeast fungi; in 31 % of cases – with the bacterial flora. The left pathologically altered sections of the nail plates should be treated with antifungal lacquer [6, 9, 11], ciclopirox 8 % / amorolfine 5 % solution nail lacquer.

Stepping 1–2 mm medial to the edge pathologically altered eponychium performed through linear opening retro-nychia, then by retro- and eponychium tissue dissection continued semilunar distally on pathologically modified eponychium [1, 13, 15]. The latter carves en block, along with purulent, necrotic, fibro-modified soft tissues, hypergranulation. Visualize the edge of the nail plate and carry out its mobilization and resection of the nail along its entire length or complete removal of the nail plate (Tab. 2).

We have proposed a method of surgical access for performing resection of the nail with complicated onychocryptosis, which is a blocklike eponychectomia and is used as an accessory access with a nail that is complicated with ingrown. Along with antimycotic therapy and correction of comorbid pathology the following procedures were carried out: cutting pathologic eponychial tissues, hypergranulations and removing nail plate with partial marginal matrixectomy by diathermocoagulation in the ingrowth area. At the initial excretory

**Table 1. Cases of ingrown nail: distribution of nosological forms of onychal lesions**

Nosological forms	Clinical observations	Total number of cases	Percentage in the sample
L 60.0 Onychocryptosis	Uncomplicated	167	46.01 %
	Complicated, combined and joint	86	23.69 %
B 35.1 Nail dermatophytosis	Complicated, combined and joint	71	19/56 %
B 37.2 Candidal onychomycosis	Complicated, combined and joint	39	10.74 %

Table 2. Ingrown nail surgical treatment in the presence of comorbid mycotic pathology

Changes of eponychial tissues	Existing accompanying nail diseases	Existing accompanying nail diseases and the background – arteries of the lower extremities
	Methods of surgical treatment	
Insignificant serous infiltrative inflammation	Minimum volume – RNP. Optimal volume – RNP + EPET, or RNP + PMMAI.	Minimum volume – RN. Optimal volume – RN + PMMAI.
Acute eponychial abscess	Minimum volume – RNP + abscess disclosure + EPET. Optimal volume – RNP + EPET + abscess disclosure + PMMAI.	Minimum volume – RN + abscess disclosure + EPET. Optimal volume – RN + EPET + abscess disclosure + PMMAI.
Chronic eponychial inflammation with formation of necrosis and hypergranulation	Minimum volume – RNP + EPET. Optimal volume – RNP + EPET + PMMAI.	Minimum volume – RN + EPET. Optimal volume – KPH + EPET + PMMAI.

Notes: RNP – removal of the nail plate; RN – resection of the nail; EPET – excision of pathologically altered eponychial tissues; PMMAI – partial marginal matrixectomy in the area of ingrowth.

removal of pathologically altered eponychium tissues, the ingrown edge of the nail plate is visualized, it allows the macroscopic evaluation of its morphological changes and determines the optimal volume of nail resection / nail removal. 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. 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, 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 of the nail, most affected by mycosis. We confirm that a full-fledged surgical treatment of IN should be a decompressive (by performing a resection or the nail removing to eliminate the pathological compression of eponychial tissues) and have a prophylactic (to prevent the occurrence of recurrences of ingrowth) anti-relapse component [1, 7, 10].

With mycotic changes, complicated by bilateral IN, the nail plate was cut through its mobilization at the proximal end after the bilateral onychectomy was performed with the formation of a retronycheal flap and "exfoliation" bluntly from the side of the growth zone [7]. Three-component surgical treatment (resection or extirpation of the nail, supplemented by excision of pathologically altered eponychial tissues and precision partial matrixectomy [1-3, 5] by diathermocoagulation) is the most effective for surgical correction of IN, since there is almost no occurrence of "ingrowth" relapse; therefore it can be considered as radical [2, 3, 10, 15].

The refusal to conduct partial matrixectomy (38 % of the partial sample) and traumatic performance of the onychectomy (29 %), have the highest frequency among the causes

of IN recurrent in the background of onychomycotic lesion [13-15]. Thus, the errors of surgical technique account for more than half of the causes of secondary reonychocryptosis [1, 5, 10]. The late unsatisfactory results of the complex treatment of destructive onychomycosis associated with IN (occurrence of compression relapses) are determined by the technical errors of the operation interventions (inadequate selection of the method and volume of resection, traumatic performance of onychectomy, failure to perform partial matrixectomy), disregard of pathogenetic and morphogenetic factors of destructive onychomycosis, the refusal to perform simultaneous surgical interventions on deeply placed structures in case of combined mycotic-associated lesions, ineffective pre- and intraoperative prophylactic actions to prevent spreading mycotic infection to deeply placed structures.

**Conclusions.** In all cases of mycotic onychocryptosis (secondary ingrown toenail) underwent a complex 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 system "pulses" of itraconazole therapy. The implementation of the blocklike onychectomy is the main primary access of incarnation, the possibility of expanding access for resection / removing, revision subonycheal structures. Partial marginal matrixectomy ensures that the nail plate does not grow in the area of resection, narrowing the nail and preventing its ingrowth, is performed by mechanical excision, which is characterized by relative technical severity of performance and poor visual control through pronounced bleeding. The usage of partial matrixectomy is recommended in all cases of ingrowth (under conditions of mycotic contamination – by diathermocoagulation) as the main antirelapse action, is a composite of three-component surgical interventions that reduce the number of postoperative relapses of clinical observations.

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#### ДЕСТРУКТИВНИЙ УСКЛАДНЕНИЙ ОНІХОМІКОЗ ІЗ ВРОСТАННЯМ НІГТЯ: АНАЛІЗ СЕРІЇ КЛІНІЧНИХ ВИПАДКІВ, КОМПЛЕКСНЕ ХІРУРГІЧНЕ ЛІКУВАННЯ

**Резюме.** Частими варіантами хірургічної патології нігтів є оніхокриптоз (інкарнація нігтя) та деструктивний оніхомікоз, що становлять більше половини усіх звернень за медичною допомогою при оніхеальній патології. Як відомо, серед нозологічних форм гнійно-некротичної деструктивної хронічної та комбінованої патології дистальних фаланг пальців, вrostання нігтя становлять значну кількість неускладнених і ускладнених випадків.

**Мета дослідження** – конкретизувати оптимальну послідовність комплексного лікування, включаючи локальну та системну терапію, операційні втручання у пацієнтів із захворюваннями нігтів, ускладненими мікотичною інкарнацією.

**Матеріали і методи.** За п'ятирічний період (2011–2016 рр.) було діагностовано 325 випадків інкарнованого оніхомікозу. В 182 пацієнтів було підтверджено пізні рецидиви оніхокриптозу після попередніх хірургічних втручань в інших клініках. За допомогою клінічного аналізу встановлено наявність взаємозв'язків між клінічними варіантами хронічної гнійно-некротичної інфекції та комбінованих процесів на тлі коморбідності.

**Результати досліджень та їх обговорення.** Підтверджено, що хірургічні операції за методиками Dupuitren, Emmert-Schmidten та інших є дуже травматичними, дисфігурують і деформують нігтьову пластину та спричиняють функціональні порушення, в 2–20 % випадків (залежно від відсутності або наявності комбінованої патології – оніхокриптозу та оніхомікозу) виникають рецидиви. У 22,58 % випадків інкарнація виникла на тлі облітеруючого ураження артерій нижніх кінцівок: атеросклерозу в 60, цукрового діабету – в 22 пацієнтів. Враховуючи ризик ускладнень у хворих із вираженою фоновою облітеруючою патологією артерій, перевагу надавали резекції ураженого нігтя. Пікову частоту спостережень трихофітних уражень клінічно підтверджено у групах пацієнтів 40–50 і 50–60 років. Уростання нігтя лівого галюкса було виявлено у 58,68 % вибірки, правого рідше – у 39,94 %, наявність вrostання нігтів галюксів обох стоп – у 1,38 % субвибірки. Системну терапію ітраконазолом застосовували до операційного лікування (базової санації уражених нігтів) та в післяопераційний період. У пацієнтів з облітеруючою патологією артерій нижніх кінцівок часто виявляли комбіноване ураження: патологічне вrostання мікотично уражених нігтів. Підтверджено три варіанти дерматофітоми: фронтальна (передня) центральна – до 25 % ерозування нігтя (45 випадків), субтотальна – від 25 до 70 % (без ураження росткової зони нігтя) (38 випадків), тотальна – від 70 до 90 % (з ураженням росткової зони нігтя) (інші випадки). Пізні незадовільні результати комплексного лікування деструктивного оніхомікозу, поєданого з вrostанням (виникнення компресійних рецидивів), перш за все визначаються технічними помилками операційних втручань (невідповідний вибір методу та обсягу резекції, травматичне виконання оніхектомії, неповноцінне виконання парціальної матриксектомії).

**Висновки.** Упровадження превентивної системної терапії ітраконазолом у процесі етапів операційного лікування (базової санації оніхеальних уражень та вогнищ мікотичної інкарнації), блокоподібної епоніхектомії як основного доступу до уражених країв нігтів є оптимальними та, на нашу думку, первинними заходами комплексного лікування, остання створює можливість розширення доступу для резекції/видалення нігтьових пластин, ревізії та санації субоніхеальних структур. Парціальна маргінальна матриксектомія звужує ніготь, попереджуючи рецидив, рекомендована в усіх випадках (за умов мікотичної інкарнації – методом діатермокоагуляції) як первинний антирецидивний захід; є фрагментом трикомпонентних хірургічних втручань, що дозволяє зменшити кількість повторних післяопераційних вrostань.

**Ключові слова:** деструктивний оніхомікоз; врослий ніготь; антимікотична терапія; хірургічне видалення.

**ДЕСТРУКТИВНЫЙ ОСЛОЖНЕННЫЙ ОНИХОМИКОЗ С ВРАСТАНИЕМ НОГТЯ: АНАЛИЗ СЕРИИ КЛИНИЧЕСКИХ СЛУЧАЕВ, КОМПЛЕКСНОЕ ХИРУРГИЧЕСКОЕ ЛЕЧЕНИЕ**

**Резюме.** Частыми вариантами хирургической патологии ногтей является онихокриптоз (инкарнация ногтя) и деструктивный онихомикоз, составляющие больше половины всех обращений за медицинской помощью при онихеальной патологии. Как известно, среди нозологических форм гнойно-некротической деструктивной хронической и комбинированной патологии дистальных фаланг пальцев, врастания ногтя составляют значительное количество неосложненных и осложненных случаев. **Цель исследования** – конкретизировать оптимальную последовательность комплексного лечения, включая локальную и системную терапию, операционные вмешательства у пациентов с заболеваниями ногтей, осложненными микотической инкарнацией.

**Материалы и методы.** За пятилетний период (2011–2016 гг.) было диагностировано 325 случаев инкарнированного онихомикоза. В 182 пациентов были констатированы поздние рецидивы онихокриптоза после предыдущих хирургических вмешательств в других клиниках. С помощью клинического анализа установлено наличие взаимосвязей между клиническими вариантами хронической гнойно-некротической инфекции и комбинированных процессов на фоне коморбидности.

**Результаты исследований и их обсуждение.** Хирургические операции по методикам Dupuitren, Emmert-Schmidten и других очень травматичные, деформируют ложе и ногтевую пластину, вызывают функциональные нарушения, в 2–20 % случаев (в зависимости от отсутствия или наличия комбинированной патологии – онихокриптоза и онихомикоза) возникают рецидивы. В 22,58 % случаев инкарнация возникла на фоне облитерирующего поражения артерий нижних конечностей: атеросклероза в 60, сахарного диабета – в 22 пациентов. Учитывая риск осложнений у больных с выраженной фоновой облитерирующей патологией артерий, предпочтение отдавалось резекции пораженного ногтя. Пиковая частота наблюдений трихофитийных поражений клинически подтверждена в возрастных группах пациентов 40–50 и 50–60 лет. Вростание ногтя левого галлюкса было обнаружено в 58,68 % выборки, правого реже – в 39,94 %, наличие врастание ногтей галлюксов обеих стоп – в 1,38 % субвыборки. Системная терапия итраконазолом применялась к оперативному лечению (базовой санации пораженных ногтей) и в послеоперационном периоде. У пациентов с облитерирующей патологией артерий нижних конечностей часто обнаруживали комбинированное поражение: патологическое врастание микотически пораженных ногтей. Диагностировали три варианта дерматофитомы: фронтальная (передняя) центральная – до 25 % площади узурации ногтя (45 случаев), субтотальная – от 25 до 70 % (без поражения ростковой зоны ногтя) (38 случаев), тотальная – от 70 до 90 % (с поражением ростковой зоны ногтя) (другие случаи). Поздние неудовлетворительные результаты комплексного лечения деструктивного онихомикоза, сочетанного с врастанием (возникновение компрессионных рецидивов) в первую очередь определяются техническими ошибками оперативных вмешательств (неправильный выбор метода и объема резекции, травматическая онихеотомия, неполноценное исполнение парциальной матриксотомии).

**Выводы.** Внедрение превентивной системной терапии итраконазолом в процессе этапов операционного лечения (базовой санации онихеальных поражений и очагов микотической инкарнации), блоковидной эпонихеотомии как основного доступа к пораженным ногтям являются оптимальными и, по нашему мнению, первичными мерами комплексного лечения; последняя создает возможность расширения доступа для резекции/удаления ногтевых пластин, ревизии и санации субонихеальных структур. Парциальная маргинальная матриксектомия сужает ноготь, предупреждая рецидив, рекомендованная во всех случаях (в условиях микотической инкарнации – методом диатермокоагуляции) как первичное антирецидивное мероприятие; является фрагментом трехкомпонентных хирургических вмешательств, позволяет уменьшить количество повторных послеоперационных врастаний.

**Ключевые слова:** деструктивный онихомикоз; вросший ноготь; антимикотическая терапия; хирургическое удаление.