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УДК 616.596-002.828-008.811.9+616.577-002.36+616.596-007.44 DOI 10.11603/2415-8798.2018.2.9116

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DESTRUCTIVE COMPLICATED POLYONYCHOMYCOSIS AND NAIL INCARNATION: CLINICAL AND BIOCHEMICAL PARALLELS (CASE SERIES)

Summary. Causes of unsatisfactory outcomes of ingrown nail and mycotical pathology complex treatment were insufficiently studied for approaches to preventing relapses. The need for complex research on surgical nail pathology is primarly determined by a large number of clinical observations of uncomplicated and complicated cases, especially relapses. The mycotic paronychia and the chronic subungual abscess are compressed along the nail edge. Not all surgical procedures that have been successfully treated paronychia you can apply for the correction of ingrown nail. Late compression relapses with monoonychocryptosis are 5–18 %, and with ingrown nail combined with onychomycosis – 30–70 %, which is also confirmed by our previous studies. Fungal infections of the nails (onychomycosis) in combination with ingrowth remain one of the most serious problems of dermatology and dermatological surgery. In domestic 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.

The aim of the study – optimal sequence of surgical treatment, local and system antimycotic therapy, clinical and biochemical parallels after moving away of the incarnated nails at trichophytosis and destructive polyonychomycosis, complicated by the secondary ingrown nail for some patients with the complicated defeat of nails.

Materials and Methods. Over a five-year period 436 unguis incarnates diagnosis (among them 325 cases of incarnated multifocal mycotical-assotiated nail pathology – the main group, included sub-selections of patients with diabetes mellitus and metabolic syndrome) in 259 men and 177 women 28–86 years old were performed. Adequate system therapy of patients with comorbid diabetes mellitus and metabolic syndrome was carried out. 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. 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. The analysis justifies the feasibility of establishing predictive relationships between clinical variants of chronic purulent necrotic infections and combined comorbidity.

Results and Discussion. 363 cases of destructive purulent-necrotic superficial chronic, combined and combined lesions of the distal phalange of the toes with nail plate ingrowth were studied in patients aged 12–75 years, 236 men and 127 women operated in surgical departments were investigated. All surgical procedures are performed correctly according to local protocols. Nosological forms of lesions are associated with some degree of onychocryptosis, according to the dominant clinical manifestations of ICD 10 were divided into sub-samples – actually onychocryptosis, dermatophytosis and candidal onychomycosis with incarnation of the nail. Other 73 patients with uncomplicated mycosis some conservative treatment were performed correctly according to local protocols. Analysis of subonychial scraping allowed stating the prevalence of red trichophytia, where in 74 % of 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 "pulses" of itraconazole 400 mg/day. We studied some indicators in the lipid profile, which were significantly higher in both groups of patients, $p < 0.01$ for both groups; noted the positive correlation between the level of total cholesterol and leptin ($p < 0.01$). The concentration of high-density lipoprotein cholesterol in patients of the main group – (5.2±0.1) mmol/L compared with patients in control group – (2.8±0.2) mmol/L. The average content of nitrogen oxide in the study group (metabolic syndrome) was higher than that in healthy patients – (15.1±0.9) mcmol/L, $p < 0.05$. Patients of the main and the comparison groups with type 2 diabetes mellitus with ingrown polyonychomycosis experienced considerable decreasing HOMA-index of β-cells function and increasing HOMA-index of insulin resistance (8.11±1.1) in the main group and (2.2±1.2) in the control group). The late unsatisfactory results of the complex treatment of destructive onychomycosis associated with incarnation (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 comprehensive treatment of comorbid pathology, system therapy of itraconazole to operative treatment (basic onychial defeats sanation) and in a postoperative period was carried out, some patients with combined pathology got 4 seven-day system "pulses" of 400 mg/day itraconazole therapy. Sanation of other nails for prevention of mycotic reinfection was carried out by ciclopirox or amorolfine lacquer. We recommend using more radical and effective three-component surgical methods: nail resection or removal of the nail plate, supplemented by excision of pathologically altered eponycheal tissues and partial marginal matrixectomy in the area of ingrowth. In patients, the low-impact methods of excision of the nail and partial marginal matricectomy by mechanical carving and coagulation with the further dermatophytoma scraping off with the Volkmann spoon were embedded and applied.

Key words: destructive onychomycosis; recurrent ingrown nail; antimycotic therapy; surgical nail removal; biochemical changes.

INTRODUCTION 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 [3-5, 8, 9]. In the 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 [5, 6, 9, 10]. Fungal infections of the nails (onychomycosis) in combination with ingrowth remain one of the most serious problems of dermatology and dermatological surgery. In the foreign literature, we have not found complex studies on the principles of evidence-based medicine [9, 13] aimed at

studying surgical treatment of ingrown nails [11, 12] (taking into account nosological forms, clinical and morphological options, applied complex treatment methods). Extension to the opposite side of the fingernail, which is uncommon, is called a run-around abscess [7–10]. In these cases, the paronychia is compressed along the nail edge, trapping the abscess [2, 5, 7]. All procedures that successfully treat paronychia separate it from the hard nail [1, 5]. 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 [11, 12]. The relevance of the problem of the ingrown nail (onychocryptosis, unguis incarnatus) in urgent outpatient purulent surgery is caused by the increased frequency of its occurrence, chronicity, complications, not uncommon early and late postoperative relapses [10–12]. Frequent variants of nail lesions are nail incarnation and destructive onychomycosis, which account for more than half of all calls for medical care for onychial pathology [3-6]. Late compression relapses with monoonychocryptosis are 5–18 %, and with ingrown nail combined with onychomycosis – 30–70 % [12], which is also confirmed by our previous studies. It was also confirmed that in 60–70 % of cases of incarnation with the formation of eponychial hypergranulations, their contamination with the mycotic mixed flora is observed [6]. The pathogenetic links leading to increase of the probability of occurrence and development of feet mycosis and onychomycosis for diabetic patients include the pathology of cardiovascular and nervous systems, disruption of glycolysis, resulting in lower energy supply of skin cells and changes in metabolism, skin dysfunction, determining rapid progression and chronic mycosis. Some patients who have the complicated mycotic surgical nail pathology have the endothelial dysfunctions, which are some factors from clinical corrections [1, 3, 13]. The study involves peculiarities of treatment, some indicators of lipid exchange of patients with diabetes mellitus, metabolic syndrome accompanied by destructive onychomycosis and secondary nail ingrowth. If the infection also involves the eponychium as well as the lateral fold, it is called an eponychia [7, 11-13]. Conservative and orthopedic treatments of incarnatus surgical nail pathology are not very effective while Dupuytren's method, Emmert-Schmiden surgeries [7, 11] 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 onychocryptosis and fungal agents) cause a relapse [12].

The aim of the study – optimal sequence of surgical treatment, local and system antimycotic therapy, clinical and biochemical parallels after moving away of the incarnated nails at trichophytosis and destructive polyonychomycosis, complicated by the secondary ingrown nail for some patients with the complicated defeat of nails.

MATERIALS AND METHODS Certain peculiar features of the clinical course and comprehensive treatment have been studied, including surgical removal of the nails for patients with onychocryptosis and polyonychomycosis associated with ingrown nail incarnation. Results of ingrown nail surgical correction have been studied to improve the results of complex treatment. Over a five-year period 436 unguis incarnates diagnosis (from them 325 cases of incarnated multifocal mycotical-assotiated nail pathology – the main group, included sub-selections of patients with diabetes mellitus and metabolic syndrome) in 259 men and 177 women 28–86 years old were performed. Adequate system therapy of patients with comorbid diabetes mellitus and metabolic syndrome was carried out. In 182 patients late relapses of onychocryptosis were confirmed after previous surgeries at other clinics. Conservative treatment [12–14] was recommended only at early stages of ingrowth. Removal of the affected nails was performed in patients with mycotic lesions [1, 3, 5, 7, 12] (local and systemic fungicide therapies were used). Investigation of the morphogenesis of destructive aspect of the mycotic lesions was carried out. The analysis justifies the feasibility of establishing predictive relationships between clinical variants of chronic purulent necrotic infections and combined comorbidity. The comparison group comprised 239 cases of monofocal incarnated complicated onychomycosis. If the infection is limited to less than half of the nail (197 cases – control group), a single incision placed to drain the paronychium and to elevate the proximal eponychial fold for excision of the one-third of the nail is satisfactory [5, 7]. System therapy of itraconazole [6, 13, 14] to operative treatment (basic onychial defeats sanation) and in a postoperative period (all incarnation polyonychomycotic cases) and basic system therapy of hepatoprotectors and correction of comorbid pathology (60–86 years old patients) was carried out. All patients with the diabetes require a complex of conservative treatment: correction of the level of glycemia; antibiotic therapy; systemic antimycotic therapy of infusion of crystalloid solutions and rheopolyglucin; pentoxifylline (Trental, Agapurin), solcoseryl (actovegin), xanthinal nicotinate, analgesics, berlition. The use of the vasodilator complex is also indicated in the presence of other obliterating diseases of the arteries. Data were analyzed with descriptive statistical methods (means ± standard deviations). Independent samples t-test was used to compare biochemical parameter levels and clinical variables between the test and control groups. Surgical treatment was performed according to the standard algorithm given pathological eponychial changes in patients with primary advantage of providing low-impact methods of excision of the nail [1–3] with access via onycholisation structure and wedge resection of the nail. When combined incarnation of polyonychomycosis and acute eponychial abscess, comply with disclosure abscess [3, 7, 10], excision of abnormal tissue eponychial hypergranulation and focal necrosis [10–13]; removal of the nail plate, enlarged partial marginal matrixectomy in the ingrowth area [7, 11, 12]. Paired samples the correlation was used in the test group for comparisons before and after treatment. Authors have no conflict of interest to declare.

RESULTS AND DISCUSSION 363 cases of destructive purulent-necrotic superficial chronic, combined and combined lesions of the distal phalange of the toes with nail plate ingrowth were studied in patients aged 12–75 years, 236 men and 127 women operated in Surgical Departments of Communal Clinical Hospital No. 4, Clinical Polyclinic No. 2 and No. 5 in Lviv, were investigated by the retrospective and prospective methods. All surgical procedures are performed correctly according to local protocols. Nosological forms of lesions are associated with some degree of onychocryptosis, according to the dominant clinical manifestations of ICD 10 were divided into sub-samples – actually onychocryptosis, dermatophytosis and candidal onychomycosis with incarnation of the nail [1, 3, 5, 10]. Other 73 patients with uncomplicated mycosis some conservative treatment were performed correctly according to local protocols. Conservative

treatment is indicated only at uncomplicated ingrown nail. The main, common in clinical practice, methods of surgery are removal of the nail plate and marginal resection of the nail. Also practiced as a supplement to main interference excision of abnormal eponychium tissue and the partial marginal matrixectomy – partial boundary excision matrix nail in ingrowth by its mechanical excision or coagulation of diatermokauter [7, 10, 12], CO_2 (carbon dioxide) laser [3, 7, 10, 11], chemical – alkalis, acids or phenol [1, 5, 10]. Surgical treatment was conducted with regard for pathological changes in eponychial fold according to recommendations for combining surgical treatment and conservative therapy [2, 6, 8, 9, 13, 14]. Upon subonychial scraping analysis of onychomycotic nails with secondary nail incarnation, it was possible to confirm the dominance of dermatophytes (red trichophytia) [9], while one-third of cases were associated with mold and yeast-like fungi [3, 4, 6, 10]. Other patients (control group) used a typical nail removal – operations such as Dupuytren's – complete removal of the nail plate under the guise of "classical" pulse therapy with itraconazole (adjuvant pulse therapy with 400 mg itraconazole); in 45 cases this intervention combined with simultaneous excision of the modified cuticle and plastic – operations such as Bartlett (plastic local tissue) and Emert-Meleshevich procedure [11, 12]. We have differentiated two types of destructive complicated polyonychomycosis associated with nail incarnation, in which the combined treatment of surgery used onychectomy.

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; in 31 % cases – with the bacterial flora. Conglomerate of nail plate and subungual hyperkeratosis and trichophytosis calcinated completely, forming onychogryphosis with deformation and forming secondary recurrent ingrown nail. Mycotic associated panaritium was diagnosed for 16 patients with onychogryphosis (16.3 % of the sample), purulent paronychia was diagnosed for 11 patients (11.2 %), other 5 patients of this group – eponychial abscess (5.1 %), 5 patients have mycotical-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 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 4 postoperative days) as pulse therapy [2, 8, 9, 13, 14]. A similar dose at 2 weekly intervals was carried out following 7-day 4 cycle pulse. Methods of surgical treatment of uncomplicated onychogryphosis 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 [12]. Removal of affected nails for patients with polyonychomycosis was performed through successive stages at add-back of certain systemic "pulses" with itraconazole. 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 [2, 6, 14]. Removal of other trichophytosis nails was performed through onycholysis by separate successive stages where certain "pulses" of therapy were supported with itraconazole [6, 8, 9]. Along with antimycotic therapy and correction of comorbid pathology the following procedures were carried out: cutting pathologic eponychial tissues, hypergranulations and necroses; removing nail plate with partial marginal matrixectomy in the ingrowth area. Stepping 1–2 mm medial to the edge pathologically altered eponychium performed through linear opening retronychium, then by retro- and eponychium tissue dissection continued semilunar distally on pathologically modified eponychium. Nail resection made using the proposed access – common excision of diseased eponychium, complemented with a view to preventing the occurrence of early recurrence of the partial marginal matrixectomy (edge excision nail matrix, growing zone in the ingrowth by mechanically resection and coagulation) is optimal at onychocryptosis without manifesting related nail lesions. Non-invasive methods of nail excision and marginal nail resection were preferred in patients with diabetes mellitus [4, 10]. Chronic purulent-necrotic inflammation, in a number of cases (3–7 % of the partial sample according to the results of prediction), due to the effect of an additional factor (trauma), can go to the stage of acute eponychium abscess. Three variants of dermatophytoma are differentiated: front center – with up to 25 % eroded nail – 85 cases, subtotal – from 25 to 70 % (without capturing the growth plate) – 48 cases, total – from 70 to 90 % (with affected growth plate of the nail) – other 35 cases. In all cases, dermatophytoma affected distal and central part of the nail bed. In these patients, the secondary ingrowth of the nail was diagnosed due to the compression of hyperkeratoid masses and the dermatophytoms of the central part of the mycotic altered nail determined its deformation and was accompanied by the incarnation of the edges of the nail into the eponychium. In these same sub-tubes, an increase in the frequency of complicated and combined onycheal lesions was noted. The pathogenesis of secondary incarnation in patients with onychomycosis is sufficient and can represent from 1 to 4 simultaneously existing "vicious circles" (Circulus vitiosus), which creates certain difficulties for full-scale complex treatment and requires an individualized approach for surgical correction and management of the postoperative period. The applied 6 types of operative treatment of surgical nail pathology may be divided into 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).

Over the five-year period we examined and treated 98 patients of 52–86 years old with incarnated onychogryphosis (fig. 1), 67 men – 68.37 % of the sample and 31 women – 31.63 %, 38 of them had diabetes mellitus and 24 had metabolic syndrome.

Conglomerate of nail plate and subungual hyperkeratosis and trichophytosis calcinated completely, forming onychogryphosis with deformation (fig. 2) and forming secondary recurrent ingrown nail. Methods of surgical treatment of

Figure 1. Trichophytial polyonychomycosis, subnail hyperkeratosis, incarnated onychogryphosis, mycotical-assotiated phalanx osteomyelitis. Diabetes mellitus type 2. 61 years old woman. Clinical case.

Figure 2. Surgical nail pathology, subnail hyperkeratosis, the big dermatophytoma, hypergranulations and local necroses. Intraoperation photo. Incarnated trichophytial polyonychomycosis, onychogryphosis. 81 years old woman. Clinical case.

uncomplicated onychogryphosis 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. 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 [1, 3, 5, 10] with underlying type 2 diabetes mellitus.

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. Other 15 people with onychogryphosis of the first toe (hallux) and fungus of other nails were included to the control group. The duration of clinically-manifesting nail mycotic process in all studied cases exceeded 5 years. We prospectively examined 93 patients with metabolic syndrome, associated with surgical nail pathology, destructive polyonychomycosis and secondary ingrown toenails [10, 13, 14].

We studied lipid metabolism that manifested biochemical change indicators in the lipid profile (total cholesterol, high-density lipoprotein cholesterol, low-density lipoprotein cholesterol; leptin), as well as their relations, which were significantly higher in both groups of patients (main and control group), p <0.01 for both groups; noted the positive correlation between the level of total cholesterol and leptin (p <0.01). The concentration of high-density lipoprotein cholesterol in patients of the main group – (5.2±0.1) mmol/L compared with patients in control group – (2.8±0.2) mmol/L. The average content of nitrogen oxide in the study group (metabolic syndrome) was higher than that in healthy patients – (15.1±0.9) mcmol/L, p <0.05. The processes of destruction of the nail in patients with trichophyton polyonychomycosis metabolic syndrome is much faster and are characterized by a more pronounced morphological variants of mycotic nail destruction [10] that determine the occurrence of secondary ingrowth and attachment with intercurrent flora with the emergence of dermatophythoma with centers of decay and necrotic foci in the nail bed, determined disturbances in lipid exchange, insulin resistance, lipid blood spectrum changes that were considerably higher in both groups of patients (main and comparison groups), p<0,01 for both groups in comparison with the control group. Lipid blood spectrum and nitric oxide level were determined before and after pharmacotherapy along with continuous correction of intercurrent and comorbid pathology.

The objective criterion of insulin resistance was the HOMA-IR index (the Homeostasis Model Assessment) involving glucose and insulin levels [4] on an empty stomach divided by 22.5 coefficient. Patients of the main and the comparison groups with polyonychomycosis and trichophytic subungual hyperkeratosis with secondary ingrown nail experienced considerable decreasing HOMA-index of β-cells function and increasing HOMA-index of insulin resistance (8.1±1.1) in the main group, (5.9±2.1) in the comparison group and (2.2±1.2) in the control group, p<0.01). Significantly decreased of HOMA-index of β-cell function and increase of HOMA-index of insulin resistance (10.2±1.9) in treatment group and (4.1±1.1) in the control group, p <0.01) were detected for patients with type 2 diabetes mellitus (treatment group) with polyonychomycosis and trichophytosis onychogryphosis, with recurrent incarnation of the nail edge. Elevated total cholesterol over 5.2 mmol/l was detected for all patients of the main group, i.e., (7.3±0.1) mmol/l, and (5.5±0.1) mmol/l for the half of the control group; there was also confirmed the deviation of laboratory parameters of low and high density lipoprotein cholesterol.

All patients underwent a treatment of comorbid pathology, corrected using the systemic antimycotic therapy and terbinafine antifungal liniments, ciclopirox & amorolfine nail lacquer [2, 6, 14] and surgical methods for removing nail plates (Fig 3).

Figure 3. Subnail hyperkeratosis, the big dermatophytoma, destruction of the central part of the nail bed and local necroses of dermatophytoma. Hallux nail plate mobilization and removing. Intraoperation photo. Trichophytial polyonychomycosis, onychogryphosis. 78 years old man. Clinical case.

On one side the subungual hyperkeratosis and dermatophytosis caused compression of the central part of the nail, eponychium 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. Mycosis-associated acute purulent pathology was confirmed for some patients of treatment group (34.21 % of the total sample, 52 % cases) and for patients of the control group (13.16 % of the total sample, 30 % cases) correspondingly. Remediation of other affected nails in order to prevent from mycosis reinfection was carried out with antimycotic amorolfine 5 % lacquer and ciclopirox 8 % nail lacquer solution. Removal of other trichophytosis nails was performed through onycholysis by separate successive stages where certain "pulses" of therapy were supported with itraconazole [2, 8, 9, 13].

Methods of surgical treatment of uncomplicated onychogryphosis 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 [7, 10, 12]. In the presence of eponychium hypergranulation and focal necrosis performed resection or removal of the nail plate after eponychium access. We prospectively examined 93 patients with metabolic syndrome, associated with surgical nail pathology, destructive polyonychomycosis and secondary ingrown toenails. 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 relapse [7, 12–14] in the background of onychomycotic lesion. Thus, the errors of surgical technique account for more than half of the causes of secondary reonychocryptosis.

Hyperkeratosis, erosion, and destruction of the central nail with secondary incarnation of the edges were typical for 89.1 % of trichophitis cases. Operative treatment consisted of nail excision or nail plate removal. Excision of pathologically changed epochonial tissues and partial marginal matrixectomy in the ingrown area were used as anti-relapse measures. The presence of multiple deformities of the edge of the nail plate: serration or (and) tent-shaped deformation of the nail or (and) the stratification sites and onycholysis indicates a significant of relapse and is a direct indication for the performance of partial matrixectomy as an additional anti-relapse component [10, 12]. In view of the foregoing, we believe that the objectivity of assessing the risk of recurrence of ingrowth largely depends on the severity of the pathological changes in the edge of the nail plate, to a lesser extent – from pathological changes in eponycheal tissues. The increase in the partial percentage of recurrence of onychocryptosis determines the necessity to perform marginal matrixectomy in the area of ingrowth as a separate anti-relapse component [11, 12].

Arguing that the removal of the nail plate with antifungal treatment provides positive dynamics of regenerative type cytologic picture and shorter healing onychectomy wounds 18–27 days to 12–25 days, with good early and long-term results. Type of transaction cytograms onychectomy wounds in the study group on the 10th day of the post-operative period is stated as the regenerative-inflammatory to 24.8 %, 75.2 % in the regeneration ($p<0.05$). In these embodiments, the control group was 53.1 % and 46.9 %, respectively.

It was also confirmed that in 60–70 % of cases of incarnation with the formation of eponychial hyperglandations, their contamination with the mycotic mixed flora is observed. The late unsatisfactory results of the complex treatment of destructive onychomycosis [7] associated with incarnation (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 (table), the refusal to perform simultaneous surgical interventions on deeply placed structures in case of combined mycotic-associated lesions,

Table. Estimation of influence degree of various factors on the recurrence of the ingrown nail (occurrence of reonychocryptosis) after surgery

Factors of recurrence	Significance level, p
The variant of primary applied surgical intervention	0.002
Technical disadvantages of surgical treatment	0.0465
Wearing tight shoes in the early postoperative period	0.0175
Finger injury after surgery	0.004
Uncorrected orthopedic pathology	0.0147
Presence of a purulent process	0.008
An untreated or medically inadequately prophylacted onychomycosis	0.029

ineffective pre- and intraoperative prophylactic actions to prevent spreading mycotic infection to deeply placed structures.

Relapse causes after Meleshevych, Emmert-Schmiden, 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, noncompliance with doctor's recommendations as to correction of orthopedic pathology, polyonychomycosis. We believe that preference should be given to less traumatic removal of nails through onycholysis, particularly after such treatment the patients with diabetes mellitus had healing time of operative wound (crust formation) equal to 16–23 days (average healing duration is19 days) and had the indices approaching the control group; indices of the patients with diabetes and "classical" nail removal (onychectomia) were 24–30 days (average healing duration is 26 days), indices of the control group were 14–22 days (average healing duration is 18 days).

Actions for preventing the growth of the nail edge in eponycheal tissues and its recurrence is the correct circumcision of the nails; wearing comfortable spacious shoes; timely treatment of diseases that can lead to deformations of the nail plate and its bed. Late compression relapses with monoonychocryptosis are 5–18 %, and with ingrown nail combined with onychomycosis – 30–70 %, which is also confirmed by our previous studies.

CONCLUSIONS 1. 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 sanation) and in a postoperative period was carried out, some patients with combined pathology got 4 seven-day system "pulses" of 400 mg/day itraconazole therapy.

2. We recommend using more radical and effective three-component methods: nail resection or removal of the nail plate, supplemented by excision of pathologically altered eponycheal tissues and partial marginal matrixectomy in the ingrowth area.

3. With the combination of trichophytic hyperkeratosis and incarnation, excision of pathologically altered eponycheal tissues with the removal of the nail plate was performed. With a combination of mycotic nail injury and pathological ingrowth of the nail plate, complicated by a sharp eponycheal abscess – an incision of the abscess; excision of a pathologically altered eponycheal tissues; removal of the nail plate; partial marginal matrixectomy – partial excision of the nail matrix and the growth zone of the nail plate in the area of ingrowth.

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. Sanation of other nails for prevention of mycotic reinfection was carried out by ciclopirox & amorolfine nail lacquer.

5. Significantly decreased of HOMA-index of β-cell function and increase of HOMA-index of insulin resistance (10.2±1.9) in treatment group and (4.1±1.1) in the control group, p <0.01) were detected for patients with type 2 diabetes mellitus (treatment group) with polyonychomycosis and trichophytosis onychogryphosis, with recurrent incarnation, elevated total cholesterol over 5.2 mmol/L was detected for all patients of the main group, i.e., (7.3±0.1) mmol/L, and (5.5±0.1) mmol/l for the half of the control group; there was also confirmed the deviation of laboratory parameters of low and high density lipoprotein cholesterol.

6. That preference should be given to less traumatic removal of nails through onycholysis, particularly after such treatment the patients with the type 2 diabetes mellitus had healing time of operative wound (crust formation) equal to 16–23 days and had the indices approaching the control group.

Prospects for further research – optimization of treatment of mycotic ingrown nails, associated with purulent complications and some endocrinological pathology.

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Received 04.04.18

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ДЕСТРУКТИВНИЙ УСКЛАДНЕНИЙ ПОЛІОНІХОМІКОЗ І ВРОСТАННЯ НІГТІВ: КЛІНІКО-БІОХІМІЧНІ ПАРАЛЕЛІ (КЛІНІЧНІ СПОСТЕРЕЖЕННЯ)

Резюме. Причинами незадовільних результатів комплексного лікування вростого нігтя і мікотичної патології є недостатньо вивчені підходи до профілактики рецидивів. Необхідність комплексного дослідження хірургічної патології нігтя детермінується перш за все великою кількістю клінічних спостережень неускладнених та ускладнених випадків, особливо рецидивних. Грибкова пароніхія і піднігтьовий хроніоабсцес призводять до компресії краю нігтя. Не всі хірургічні процедури, за допомогою яких успішно лікують пароніхію, можна застосувати для корекції вростого нігтя. Пізні рецидиви монооніхокриптозу становлять 5–18 %, а вростого нігтя в поєднанні з оніхомікозом – 30–70 %, що також підтверджують наші попередні дослідження. Грибкові інфекції нігтів (оніхомікози) в поєднанні з вростанням залишаються однією з найсерйозніших проблем дерматології та дерматохірургії. У вітчизняній літературі є значна кількість робіт, присвячених патології нігтьової пластини, однак хірургічним аспектам оніхології чомусь відводиться мінімальна, другорядна роль.

Мета дослідження – оптимізація послідовності хірургічного лікування, локальної та системної антимікотичної терапії, дослідження деяких клініко-біохімічних паралелей перебігу інкарнацій нігтів при трихофітії і деструктивному поліоніхомікозі, вторинних ускладнень вростого нігтя; у деяких пацієнтів з ускладненими ураженням нігтів.

Матеріали і методи. За п'ятирічний період діагностовано 436 вростань нігтів (з них 325 випадків врослих мікотичних нігтів – поліоніхомікотичної патології – основна група, що включала субвибірки пацієнтів із цукровим діабетом та метаболічним синдромом) 259 чоловіків та 177 жінок віком 28–86 років. Проводили адекватну системну терапію коморбідних станів у пацієнтів із цукровим діабетом та метаболічним синдромом. У 182 хворих після попередніх операцій в інших клініках було стверджено пізній рецидив оніхокриптозу. Консервативне лікування було рекомендовано тільки на ранніх стадіях вростання. Видалення уражених нігтів було виконано у пацієнтів із мікотичними ураженнями (також були використані місцеві та системні методи лікування, фунгіциди). Проведене симультанне дослідження морфогенезу деструктивних аспектів мікотичних уражень. Аналіз обґрунтовує доцільність вивчення прогностичних зв'язків між клінічними варіантами хронічних гнійно-некротичних інфекцій у контексті коморбідності.

Результати досліджень та їх обговорення. Досліджено 363 випадки деструктивних гнійно-некротичних хронічних поверхневих, комбінованих та поєднаних уражень дистальної фаланги пальців ніг із вростанням нігтів у пацієнтів віком 12–75 років, 236 чоловіків та 127 жінок, оперованих в хірургічних відділеннях. Усі хірургічні процедури виконували адекватно, згідно з місцевими протоколами. Нозологічні форми ураження, пов'язані з тим чи іншим варіантом оніхокриптозу, відповідно до домінуючих клінічних проявів за МКХ-10 поділили на підгрупи – власне оніхокриптоз, дерматофітоз і кандидозний оніхомікоз з інкарнацією нігтя. Іншим 73 пацієнтам з неускладненим мікозом консервативне лікування було проведено правильно відповідно до місцевих протоколів. Аналіз піднігтьових зішкрібів дозволив констатувати переважання червоної трихофітії, у 74 % випадків – у комбінації з цвілевими, в 26 % випадків – з дріжджовими грибами; у 31 % випадків – з бактеріальною флорою; застосовували 4 поступові "пульс"-терапії ітраконазолом, 400 мг/добу. Ми вивчали деякі біохімічні зміни ліпідного профілю, а також їх поєднання, які були значно вищими в обох групах пацієнтів, $p<0,01$ для обох груп. Відзначали позитивну кореляцію між рівнем загального холестерину і лептину ($p<0,01$). Концентрація холестерину ліпопротеїдів високої щільності у пацієнтів основної групи – (5,2±0,1) ммоль/л порівняно з пацієнтами контрольної групи – (2,8±0,2) ммоль/л. Середній вміст оксиду азоту в досліджуваній групі (метаболічний синдром) був вищим, ніж у здорових пацієнтів – (15,1±0,9) мкмоль/л, $p<0,05$. Пацієнти основної групи з цукровим діабетом 2 типу і групи контролю з врослим поліоніхомікозом та трихофітним піднігтьовим гіперкератозом характеризувалися зниженням HOMA-індексу функцій β-клітин і збільшення HOMA-індексу резистентності до інсуліну (8,1±1,1 в основній групі, 5,9±2,1 в групі порівняння та 2,2±1,2 в контрольній групі). Стверджено, що пізні незадовільні результати комплексного лікування деструктивного оніхомікозу з інкарнацією нігтя (виникнення рецидивів вростання) найчастіше детермінуються технічними помилками оперативного втручання (неадекватний вибір методу та об'єму резекції, травматичне проведення оніхектомії, невиконання парціальної матриксектомії), ігноруванням патогенетичних і морфогенетичних факторів деструктивного оніхомікозу, відмовою від одномоментного хірургічного втручання на глибоко розміщених структурах при поєднанні грибковоасоційованих уражень, неефективними до- та інтраопераційними профілактичними заходами попередження поширення грибкової інфекції на глибокі тканини пальця.

Висновки. У всіх випадках мікотичного оніхокриптозу (вторинного вростого нігтя) здійснено комплексне лікування коморбідної патології, застосування системної терапії ітраконазолом до оперативного лікування (базова санація) і в післяопераційному періоді було проведено у деяких хворих із поєднаною патологією семиденну чотирициклову систему "пульс"-терапії 400 мг/добу ітраконазолу. Санація інших нігтів для профілактики грибкових реінфекцій була проведена лаком циклопіроксом або аморолфіном. Ми рекомендуємо використовувати найрадикальніші й ефективні трикомпонентні методи хірургічного втручання: резекція нігтя або видалення нігтьової пластини, що доповнюється видаленням патологічно змінених епоніхеальних тканин і частковою прецизійною парціальною маргінальною матриксектомією в ділянці вростання. У пацієнтів були ефективно впроваджені й застосовані методики малотравматичного видалення нігтьових пластин через оніхолізовані структури і парціальної маргінальної матриксектомії механічним висіканням та коагуляцією із подальшим видаленням дерматофітоми зі санацією ложкою Фолькмана.

Ключові слова: деструктивний оніхомікоз; рецидивний врослий ніготь; антимікотична терапія; хірургічне видалення; біохімічні зміни.

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ДЕСТРУКТИВНЫЙ ОСЛОЖНЕННЫЙ ПОЛИОНИХОМИКОЗ И ВРАСТАНИЕ НОГТЕЙ: КЛИНИКО-БИОХИМИЧЕСКИЕ ПАРАЛЛЕЛИ (КЛИНИЧЕСКИЕ НАБЛЮДЕНИЯ)

Резюме. Причинами неудовлетворительных результатов комплексного лечения вросшего ногтя и микотической патологии недостаточно изучены подходы к профилактике рецидивов. Необходимость комплексного исследования хирургической патологии ногтя детерминируется прежде всего большим количеством клинических наблюдений неосложненных и осложненных случаев, особенно рецидивных. Грибковая паронихия и подногтевой хрониоабсцес приводят к компрессии края ногтя. Не все хирургические процедуры, с помощью которых успешно лечат паронихию, можно применить для коррекции вросшего ногтя. Поздние рецидивы моноонихокриптозу составляют 5–18 %, а вросшего ногтя в сочетании с онихомикозом – 30–70 %, что также подтверждают наши предыдущие исследования. Грибковые инфекции ногтей (онихомикозы) в сочетании с врастанием остаются одной из самых серьезных проблем дерматологии и дерматохирургии. В отечественной литературе имеется значительное количество работ, посвященных патологии ногтевой пластины, однако хирургическим аспектам онихологии отводится минимальная, второстепенная роль.

Цель исследования – оптимизация последовательности хирургического лечения, локальной и системной антимикотической терапии, исследования некоторых клинико-биохимических параллелей течении инкарнаций ногтей при трихофитии и деструктивном полионихомикозе, вторичных осложнений вросшего ногтя; у некоторых пациентов с осложненными поражениями ногтей.

Материалы и методы. За пятилетний период диагностировано 436 врастаний ногтей (из них 325 случаев вросших микотичных ногтей – полионихомикотичной патологии – основная группа, включавшая субвыбирки пациентов с сахарным диабетом и метаболическим синдромом) 259 мужчин и 177 женщин в возрасте 28–86 лет. Проводили адекватную системную терапию коморбидных состояний у пациентов с сахарным диабетом и метаболическим синдромом. В 182 больных после предыдущих операций в других клиниках было утверждено поздний рецидив онихокриптоза. Консервативное лечение было рекомендовано только на ранних стадиях врастания. Удаление пораженных ногтей было выполнено у пациентов с микотическими поражениями (также были использованы местные и системные методы лечения, фунгициды). Проведенное симультанное исследования морфогенеза деструктивных аспектов микотических поражений. Анализ обосновывает целесообразность изучения прогностических связей между клиническими вариантами хронических гнойно-некротических инфекций в контексте коморбидности.

Результаты исследований и их обсуждение. Исследовано 363 случая деструктивных гнойно-некротических хронических поверхностных, комбинированных и сочетанных поражений дистальной фаланги пальцев ног с врастанием ногтей у пациентов в возрасте 12–75 лет, 236 мужчин и 127 женщин, оперированных в хирургических отделениях. Все хирургические процедуры выполняли адекватно, согласно местным протоколам. Нозологические формы поражения, связанные с тем или иным вариантом онихокриптоза, согласно доминирующих клинических проявлений по МКБ-10 разделили на подгруппы – собственно онихокриптоз, дерматофитоз и кандидозный онихомикоз с инкарнацией ногтя. Другим 73 пациентам с неосложненным микозом консервативное лечение было проведено правильно в соответствии с местными протоколами. Анализ подногтевых соскобов позволил констатировать преобладание красного трихофитии, в 74 % случаев – в сочетании с плесневыми, в 26 % случаев – с дрожжевыми грибами; в 31 % случаев – с бактериальной флорой; применяли 4 постепенные “пульс”-терапии итраконазолом, 400 мг/сут. Мы изучали некоторые биохимические изменения липидного профиля, а также их сочетания, которые были значительно выше в обеих группах пациентов, $p<0,01$ для обеих групп. Отмечали положительную корреляцию между уровнем общего холестерина и лептина ($p<0,01$). Концентрация холестерина липопротеидов высокой плотности у пациентов основной группы – (5,2±0,1) ммоль/л по сравнению с пациентами контрольной группы – (2,8±0,2) ммоль/л. Среднее содержание оксида азота в исследуемой группе (метаболический синдром) был выше, чем у здоровых пациентов – (15,1±0,9) мкмоль/л, $p<0,05$. Пациенты основной группы с сахарным диабетом 2 типа и группы контроля с вросшим полионихомикозом и трихофитным подногтевым гиперкератозом характеризовались снижением HOMA-индекса функций β-клеток и увеличение HOMA-индекса резистентности к инсулину (8,1±1,1 в основной группе, 5,9±2,1 в группе сравнения и 2,2±1,2 в контрольной группе). Утверждено, что поздние неудовлетворительные результаты комплексного лечения деструктивного онихомикоза с инкарнацией ногтя (возникновение рецидивов врастания) чаще детерминируются техническими ошибками оперативного вмешательства (неадекватный выбор метода и объема резекции, травматическое проведения онихектомии, невыполнение парциальной матриксектомии), игнорированием патогенетических и морфогенетических факторов деструктивного онихомикоза, отказом от сиюминутного хирургического вмешательства на глубоко расположенных структурах при сочетании грибковоассоциированных поражений, неэффективными до- и интраоперационными профилактическими мерами предупреждения распространения грибковой инфекции на глубокие ткани пальца.

Выводы. Во всех случаях микотического онихокриптозу (вторичного вросшего ногтя) осуществлено комплексное лечение коморбидной патологии, применение системной терапии итраконазолом к оперативному лечению (базовая санация) и в послеоперационном периоде было проведено у некоторых больных с сочетанной патологией семидневная четырециклова система “пульс”-терапии 400 мг/сутки итраконазола. Санация других ногтей для профилактики грибковых реинфекций была проведена лаком циклопироксом или аморолфином. Мы рекомендуем использовать самые радикальные и эффективные трехкомпонентные методы хирургического вмешательства: резекция ногтя или удаления ногтевой пластины, дополняется удалением патологически измененных эпонихеальных тканей и частичной прецизиозной парциальной маргинальной матриксектомией в области врастания. У пациентов были эффективно внедрены и использованы методики малотравматического удаление ногтевых пластин через онихолизированы структуры и парциальной маргинальной матриксектомии механической высечкой и коагуляцией с последующим удалением дерматофитомы с санацией ложкой Фолькмана.

Ключевые слова: деструктивный онихомикоз; рецидивирующий вросший ноготь; противогрибковая терапия; хирургическое удаление; биохимические изменения.