ORIGINAL ARTICLE

Clinical characteristics and treatment outcomes of patients undergoing nail avulsion surgery for dystrophic nails

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Objective To evaluate the clinical characteristics and treatment outcomes of patients undergoing surgical nail avulsion.

Design Retrospective study.

Setting Two dermatology centres in Hong Kong.

Patients A total of 32 patients with nail diseases who underwent 33 nail avulsion procedures were reviewed from case records.

Main outcome measures Age, gender, co-morbidities, disease duration, clinical features, histopathology and fungal culture of nail plate, nail bed specimen for fungal culture in appropriate cases, and postoperative outcome.

Results The mean age of the patients at the time of nail avulsion was 54 (range, 27-86) years. The most frequent preoperative findings were thickened nails (23 specimens, 70%) and discolouration (20 specimens, 61%). Onychomycosis was the most common pre-consultative diagnosis (20 specimens, 61%). Prior to nail avulsion, topical or systemic treatment had been tried in more than half of the cases. Histopathology of the avulsed nails confirmed onychomycosis in 24 (73%) of specimens. The clinical cure rate was 88% and the mycologic cure rate was 100%. The procedure was well tolerated without significant complications. Relapse was only noted in three (9%) of the patients having nail avulsions. The time for full re-growth ranged from 5 to 10 months.

Conclusions Total nail avulsion is an effective management option for patients whose diagnosis of onychomycosis was doubtful, and constitutes a treatment armamentarium especially for patients with single or oligo-onychomycosis.

Introduction

Nail disease is commonly encountered in daily dermatology practice. The spectrum of such diseases is wide. Due to the inherent hard keratinous nature of the nail plate that hinders close inspection and application of medicaments, surgery plays an important role in managing various nail disorders. Common surgical nail procedures include nail matrix and nail bed biopsies, nail avulsion, excision matricectomy, and nail fold biopsies.[1-3]

Onychomycosis of toenails is one of the most common problems encountered in dermatological practice. It has a significant impact on quality of life, and includes psychosocial (such as embarrassment) and physical (such as pain and difficulty in wearing shoes) problems.[4] This is also of importance for the estimated 55% of patients who have single nail onychomycosis, according to one study.[5] In cases of single nail disease, prolonged systemic therapy is not desirable due to associated side-effects, costs of therapy, and lack of compliance.[6] On the other hand, nail avulsion is the option for cases resistant to topical and systemic therapy. Avulsion of the involved nail plate as an adjunct to topical management of onychomycosis has been evaluated in the past, but yielded varying degrees of success.[7-9]

Patients at particular risk of surgical complications following nail surgery include those with diabetes mellitus, peripheral vascular disease, or connective tissue disorder.[3] With good knowledge of nail anatomy, preoperative assessment and postoperative care, nail surgery is generally well tolerated and serious complications are uncommon.

Key words
Antifungal agents; Nail diseases; Nails; Onychomycosis; Skin neoplasms

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為失養性趾甲患者進行趾甲拔除術的臨床特徵和治療結果

目的 評估進行趾甲拔除術的患者的臨床特徵和治療結果。

設計 回顧研究。

安排 香港兩間皮膚科中心。

患者 從病例紀錄回顧為32名趾甲疾病患者進行的33個趾甲拔除術。

主要結果測量 患者的年齡、性別、共病、病程、臨床特徵、趾甲的病理組織學和其存有的真菌培養、部分趾甲床存有的真菌培養，以及術後結果。

結果 患者進行趾甲拔除術的平均年齡為54（介乎27-86）歲。術前最常見的病徵為趾甲變厚（23個樣本，70%）和趾甲顏色異常（20樣標本，61%）。甲癬是最常見的轉介前診斷（20個樣本，61%）。超過一半病例在趾甲拔除術前曾接受全身或局部抗真菌治療。病理組織學分析顯示，在被拔除的趾甲樣本中，24（73%）個確診為甲癬。臨床治療率是88%，真菌治療率則為100%。此手術為容易接受的治療方法，患者也沒有出現明顯的後遺症，當中只有3名患者（9%）出現復發。趾甲再生需時5至10個月。

結論 對甲癬診斷存疑的患者，全趾甲拔除術為有效的治療選擇；對單趾甲或少數趾甲甲癬患者而言，此項手術也可為其提供完善的治療方案。

In this review, we analyse the different characteristics of patients attending our dermatology clinics, who received nail avulsion for a single nail problem. Its aims were to identify the characteristics of patients most benefited from the procedure.

Methods

Patient inclusion

All patients having nail avulsion performed in Tuen Mun Social Hygiene Clinic and Lek Yuen Social Hygiene Clinic during the inclusive period January 2002 to November 2008 were reviewed. The former clinic is the only public dermatology referral centre in the New Territories West, whereas the latter clinic was the referral centre in the New Territories East and operated till 2004. The indications for nail avulsion included: (1) uncertain diagnosis, (2) proven onychomycosis but failure to respond to prolonged topical and/or systemic therapy, and (3) patient reluctance or medical contra-indications to use systemic antifungals. The procedure was not regarded as contra-indicated for patients with peripheral vascular disease, systemic diseases (such as diabetes mellitus), or in persons receiving immunosuppressive therapy.

Nail avulsion

The standard nail avulsion procedure was performed by a qualified dermatologist and one dermatology trainee. Briefly, a digital anaesthetic block was delivered by injecting a small amount of plain 2% lignocaine to achieve anaesthesia. No tourniquet was used. The nail was freed from the nail bed and nail matrix by a nail elevator. Hypertrophic nail bed tissue was trimmed and sent for fungal culture. Postoperative haemostasis was achieved by plain petrolatum gauze. After discharge, the patient was asked to take analgesics and returned for review in 1 week. Topical and/or systemic antifungals were started once pathology or culture confirmed onychomycosis. All nail plate specimens were sent for histopathology and fungal culture. Nail bed tissue, if available, was sent for fungal culture.

Statistical analysis

Excel spreadsheets were used for tabulation of data. Descriptive statistics were performed. The data logged included age, gender, medical co-morbidities, duration of the problem, symptoms, signs, the pre-consultation diagnosis and treatment, as well as the preoperative investigations and results. In addition, the indications for avulsion, nail histopathology, nail plate culture, nail bed biopsy culture, postoperative complications, postoperative treatment, time for full nail plate growth, and outcome of the nail disease (clinical and mycologic cure rate) were recorded.

Results

Patients' characteristics

A total of 33 nail avulsions in 32 patients were performed, of whom five were male and 27 were female. The mean age of the patients receiving the surgery was 54 (range, 27-86) years, and the disease duration ranged from 1 to more than 10 years. None of the patients had diabetes mellitus, peripheral vascular disease, or a connective tissue disease.

Symptoms and signs

The most frequent complaint was a thickened nail (n=23 specimens, 70%), followed by discolouration (n=20, 61%). Disfigurement/deformity (11 specimens, 33%), pain (9, 27%) and onycholysis (n=5, 15%) were reported by fewer patients (Table 1). The big toe was the commonest affected site in our sample (n=16, 49%) and other sites included the second toe (n=7, 21%) and fingernails (n=10, 30%). On physical examination, thickening, discolouration and onycholysis of varying degrees were recorded. Nearly all samples (n=32, 97%) had distal and lateral subungual onychomycosis (DLSO). Only one sample (3%) was diagnosed to

have superficial white onychomycosis (SWO). No patient was diagnosed as having traumatic onychitis.

Pre-consultative diagnosis and treatment

Onychomycosis was the most common pre-consultative diagnosis (n=20, 61%). The second most frequent clinical diagnosis was dystrophia (n=10, 30%) while onychogryphosis was the least common (n=3, 9%) [Table 1]. Various topical treatments such as Lotrimin lotion (Schering-Plough, Kenilworth, US), Loceryl nail lacquer (Galderma, Lausanne, Switzerland) or Batrafen nail lacquer (Sanofi-Aventis, Paris, France) had been tried in many of these patients (n=24, 71%). A few patients had not received any topical treatment (n=8, 24%) and only three (9%) had received systemic therapy.

Preoperative investigations and results

Fungal elements were found in nine (27%) of clipped nail specimens and 10 (30%) yielded positive fungal cultures. Only four (12%) specimens were found to be positive in both routine microscopy and fungal culture (Table 1). Overall, 14 (42%) nail specimens were positive for fungi.

Postoperative investigations and results

Fungal hyphae compatible with onychomycosis were reported in 24 (73%) of the nail specimens submitted for histopathology. Nail plate fungal cultures were positive in 17 (52%) of the nail specimens, and nail bed culture in 18 (55%) [Table 1]. The most common organism grown was *Trichophyton rubrum* (Table 2). Less common diagnoses included traumatic onychitis (n=4, 12%), spongiotic onychitis (n=4, 12%), and onychogryphosis (n=1, 3%).

Postoperative complications and treatment

The only complications reported were postoperative pain for which analgesics were prescribed, light-headedness, and minor wound discharge, which all resolved with conservative treatment. Only two patients were prescribed systemic antifungals. Most of the patients in whom onychomycosis was confirmed received topical antifungal treatment postoperatively.

Outcome

In our patients, the time for nail plate re-growth varied from 5 to 10 months. The patients (6 of whom defaulted) were followed up for 1 year post-surgery. Clinical cure was defined as a nail specimen previously confirmed to have onychomycosis by histopathology that resulted in an almost complete or completely normal nail appearance. This was achieved in 21 (88%) of the nail specimens. Mycologic cure was defined as absence of fungi noted at microscopy and after culture of clipped nail specimens. The mycologic cure rate was 100%. In the eight follow-up clipped nail specimens (from 8 patients) sent for microscopy and culture, three patients who had nail avulsion had a relapse of onychomycosis about 1 year later, whereupon they received topical antifungal therapy.

TABLE 1. Characteristics and outcomes of patients undergoing nail avulsion surgery (n = 33)

Characteristic and outcome	No. (%) of nail specimens
Symptoms and signs	
Thickened nail	23 (70)
Discolouration	20 (61)
Disfiguration/deformity	11 (33)
Pain	9 (27)
Onycholysis	5 (15)
Pre-consultative diagnosis and treatment	
Onychomycosis	20 (61)
Dystrophic nail	10 (30)
Onychogryphosis	3 (9)
Preoperative investigation and result	
Positive fungal element	9 (27)
Positive fungal culture	10 (30)
Both positive fungal element and culture	4 (12)
Postoperative investigation and result	
Positive fungal hyphae on histopathology	24 (73)
Positive nail plate fungal culture	17 (52)
Positive nail bed culture	18 (55)
Traumatic onychitis	4 (12)
Spongiotic onychitis	4 (12)
Onychogryphosis	1 (3)
Outcome	
Clinical cure rate (n=24)	21 (88)
Mycologic cure rate (n=8)	8 (100)

TABLE 2. Culture pathogens

Pathogen	No. isolated	
	Nail plate (n=17)	Nail bed (n=18)
Trichophyton rubrum	13	16
Trichosporon asahii	1	0
Candida parapsilosis	2	2
Candida guilliermondii	1	0

Discussion

Dystrophic toenails and discolouration are the most sensitive signs for onychomycosis (occurring in 99% and 92% of affected nails, respectively),

whereas onycholysis is less frequent (found in 70% of affected nails).[10] Institution of systemic treatment should be undertaken with caution if a diagnosis of onychomycosis is solely based on clinical judgement, as it has a relatively low positive predictive value (18% for abnormal toenails, 19% for discolouration, and 18% for onycholysis; Table 3).

Microscopy for fungal elements and fungal culture should be performed before the initiation of systemic treatment. Since treatment needs to be administered in the long term, enough time must be allowed for the nail to grow out completely before such treatment can be designated as successful. On the other hand, toenails take around 12 months and fingernails about 6 months to grow out; therefore a therapeutic trial is difficult to justify. In other words, if the diagnosis is not confirmed and improvement does not occur, it is not possible to tell whether this represents treatment failure or an initial incorrect diagnosis. However, the laboratory test has limited reliability (sensitivity of 59% and specificity of 80%).[10] Moreover the success of such tests depends upon the quality of the sample collected, the experience of the microscopist, and the ability of the laboratory to discriminate among pathogenic organisms, saprophytic organisms, and contamination of the culture plate. Knowing that dermatophyte onychomycosis is primarily a disease of the nail bed rather than of the nail plate, subungual debris taken from the most proximal part of the infection is likely to yield the best results. In DLSO, material can be obtained from beneath the nail with a small dental scraper. In SWO, the surface of the infected nail plate can be scraped and material examined directly. If the nail is onycholytic, then it can be cut back and material can be scraped off the underside of the nail as well as from the nail bed. As much material as possible should be submitted to the laboratory, because of the relative paucity of fungal elements within the specimen. Nevertheless, due to its relatively low local prevalence (16.6%),[11] the diagnosis of onychomycosis may be missed more than half of the time. In our review, only 14 (42%) nail specimens were positive for fungi.

Although dermatophyte onychomycosis is slowly progressive, some practitioners persist in viewing it as a trivial cosmetic problem that does not merit treatment. In elderly patients, however, the disease can give rise to important complications such as cellulitis, which can further compromise the limb, particularly in those with diabetes or peripheral vascular disease. While such complications may not be common, they can be disastrous. Moreover, onychomycosis is a surprisingly significant cause of medical consultations and of absence from work. Consequently, the disease should not be considered trivial, there being sound grounds for treatment to prevent complications, quite apart from public health considerations and quality-of-life issues. Nevertheless, systemic therapy may not be effective in all patients, some of whom have a poor response.[12]

How can we tackle patients in whom systemic therapy is not indicated or who present with dystrophic toenails but negative microscopy and culture for fungi? Total nail avulsion may be an alternative treatment modality, because periodic acid–Schiff stain of histopathological specimens is the most sensitive test for onychomycosis (92%).[13,14] Besides confirming or refuting a clinical suspicion, removal of the most diseased toenail is therapeutic.

Total nail avulsion is the removal of the entire nail plate. Traditionally, one of the most common indications for total removal of the nail plate was to allow clear visualisation and exploration of the nail bed, nail matrix, and the proximal and lateral nail folds before obtaining a biopsy. On the other hand, in some cases of onychomycosis, it is also an adjunctive treatment as it reduces the fungal mass.[15]

There are two basic approaches for total nail avulsion: the usual distal approach and the more difficult proximal approach.[16-18] In our cases, we performed the procedure using the distal approach to facilitate the diagnosis and treatment of single nail disease. Postoperative complications were rare. The most common complaint was a short period of postoperative pain for which analgesics were prescribed. During re-growth of the toenail, topical antifungal treatment was sufficient in the majority of cases; systemic therapy was deemed necessary for patients with multiple nail involvement. The

TABLE 3. Sensitivity, specificity, positive predictive value, and negative predictive value of signs and investigations for onychomycosis

	Sensitivity	Specificity	Positive predictive value	Negative predictive value
Abnormal toenails	99%	7%	18%	3%
Discolouration	92%	18%	19%	8%
Onycholysis	70%	35%	18%	8%
Potassium hydroxide test	80%	72%	37%	5%
Fungal culture	59%	82%	40%	9%
Periodic acid–Schiff stain	92%	72%	40%	2%

time required for full nail plate re-growth ranged from 5 to 10 months. Clinical cure was achieved in nearly 90% of patients; only three patients suffered a relapse during the 1-year follow-up after the surgery. Possible risk factors for relapse include age range of 40 to 50 years, longer duration of disease, and severe disease at presentation. Traumatic and spongiotic onychitis were only diagnosed after nail avulsion surgery, because this diagnosis is clinically difficult to differentiate from other pathology.

Regarding limitations, this review was retrospective, which may have biased our data collection. Moreover, no quality-of-life assessment was performed, which could well give more meaningful data on patient satisfaction. A prospective cohort with a standardised protocol and data entry might yield more accurate and useful information.

In conclusion, our study has shown that surgical nail avulsion is a safe and effective management strategy for the diagnosis and treatment of dystrophic nails, especially when onychomycosis is suspected and laboratory confirmation is lacking. In most of the patients, normal nail re-growth could be achieved within 5 to 10 months.

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