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Nail disorders caused by external influences

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Synopsis

Damage to **nails** caused by physical or chemical trauma is outlined. A surprising number of cases are due to the patients themselves either by biting, fiddling with the nails, attempting to remove non-existent parasites and occasionally deliberately to obtain sympathy. Nail cosmetics are generally very well tolerated but deformities occur at times and are described. The wearing of footwear can also cause trouble. Chemical damage is rather uncommon but frequent contact with water or soap and water is responsible for much damage to nails.

Introduction

Many of the commoner nail disorders are due to intrinsic factors and this is especially true of psoriasis, eczema or dermatitis and impaired peripheral circulation. There are, however, many others which are due to trauma in its widest sense and the cause is easily overlooked if not suspected by patient or doctor. Fungal infections are due to invasion from without but are usually part of a more widespread infection and will not be discussed. Chronic paronychia, one of the commonest skin conditions of housewives will be described because it is believed that frequent contact with soap and water is the principal aetiological factor in this disorder.

This paper concentrates on the more subtle forms of trauma such as nail biting, fiddling with the nails, damage due to cosmetics and foot wear, accidental contamination with certain chemicals and the effects of soap and water on the nails and surrounding tissues Direct injury such as trapping of a finger in a car door can cause many forms of damage, temporary or permanent, to the nail but the cause is well known and therefore will not be discussed.

NAIL BITING

This is an extremely common habit and more than one member of a family often indulges in it. Generally the biting is at the tip of the nail resulting in a short ragged nail nibbled right back to the eponychium. Small spicules may be left which form into hang nails and occasionally secondary sepsis develops. One or more often many or all nails are bitten and occasionally one nail is spared for scratching! A common complication is the formation of periungual warts which may affect several fingers. A very similar appearance can be produced by paring down the nails with a razor blade. Many such cases were observed during a short visit to Nigeria some years ago.

Quite a different picture results if biting takes place further back on the nail. Biting may be mainly on the cuticle which becomes ragged and broken and a low grade paronychia is more common. Occasionally biting will actually injure the matrix resulting in a deformed nail easily mistaken for a fungal infection. This type of deformity occurs especially in young children watching an exciting or frightening television programme, and may be confined to one finger.

Recently a young boy was seen who managed to destroy all his finger nails by constant biting so that very little nail remained on any finger. As the patient also had psoriasis it was very easy to attribute the nail damage to psoriasis but the patient freely admitted to the habit. Another young lady admitted to being a nail biter but said one of her nails would not grow. On close questioning she admitted to having done more damage than usual 1 year previously whilst biting and subsequently she picked away tiny portions of nail as they formed. On examination there was almost no nail present but there seemed no reason why it should not grow normally. Fixed dressing was applied which was changed weekly and at the end of 3 months she had a normal nail (*Fig. 1 and 2*).

FIDDLING WITH THE NAILS

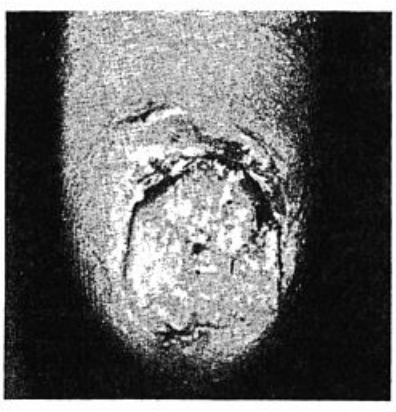
There are a number of other ways in which nails can be damaged by the patient himself. The first is a habit of fiddling with the nails. The patient picks at the cuticle subconsciously usually of the thumb nail with one of his other fingers on the same hand. This produces a rather characteristic deformity of a depression down the centre of the nail and ridges extending from it towards the edges of the nail. (*Fig. 3*). The patient freely admits to the habit but does not realize that it is the cause of the defect.

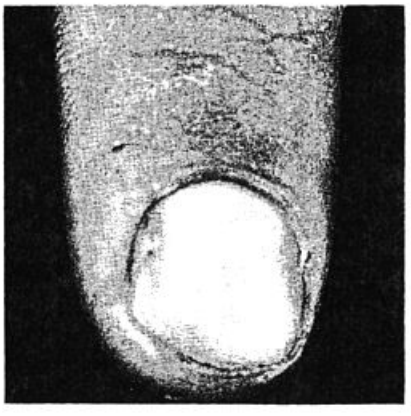
PARASITTOPHOBIA

This very distressing symptom may be confined to the nails and finger tips. The patient is convinced she is infested and this fear may be heightened by being told she has a fungal infection of the nails. The patient is constantly picking pieces off the nails and surrounding tissues and may bring a collection of them with her in a piece of tissue paper. It is almost impossible to convince these patients that they are not infested.

NAIL ARTEFACTS

Deliberate trauma in the form of an artefact is even less common. One child punctured the half moon area of her thumb nail and succeeded in producing infection which progressed to granulation tissue projecting through the hole in the nail. The bandaging which was needed to protect the thumb saved her from taking an exam which she feared she might fail. Another patient admitted deliberately inserting a nail file under her cuticles to produce subacute paronychia. She considered she was being imposed on by her daughter and son-in-law who had taken up residence in her house and expected her to do all the housework. Again the dressings which were required to cover the defects saved her from the housework. She even traumatized some of her toes. This rather gave the game away as chronic paronychia virtually never affects the toes. These patients may get much satisfaction from failures in treatment.





Figures 1 & 2. Nail destroyed by biting and picking off pieces; before and after 3 months occlusive dressings.

Figure 3. Deformity due to fiddling with the nail.

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NAIL COSMETICS

On the whole nail cosmetics are well tolerated and cause little trouble to the nails. One condition which although quite common is not well recognized, is the staining of the nails from nail varnish. Many patients have been observed with this condition but in the great majority it was an incidental finding, the patient having reported with some other skin or nail defect.

The staining is usually quite characteristic starting fairly near the cuticle and extending to the tip and getting progressively darker from base to tip. This indicates that the longer the varnish has been in contact with the nail, the more intense is the staining. The colour is almost always yellowish although the colour of the varnish varies widely. Often the patient is unable to incriminate any particular varnish as she may wear various colours. Calnan (1) traced staining in one patient to a pigment Transparent Yellow Lake 16901 in 1967.

The following investigation was carried out in connection with this type of staining to see if there was any common factor which might explain it. The names of five varnishes which had been the cause of complaint by their users was provided and the pigment composition of each was known. A 5% suspension of each of the dyes in each varnish was provided made up in an otherwise clear base. One of the named varnishes and each of the 5% solutions was tested on individual nails and left in place for one week and then removed. If there was no staining the varnish was reapplied and continued up to a total of 8 weeks. Staining occurred with the named varnish and with the following four colours:— Red 25777 (= D & C Red No. 7); Maroon 26095 (= D & C Red No. 34); Red 26094 (= D & C Red No. 6); Yellow 25776 (= FD & C Yellow No. 5 lake). The last named produced only slight coloration. One of these dyes was present in each of four of the named varnishes and appears to have been the worst offender—it was Red 26094. It seems almost certain that other pigments can leak out of the varnish base and stain the nail. Patients reporting this symptom only represent the tip of the iceberg, others remaining hidden below the varnish. The condition is of course quite harmless and grows out with the nail. Sensitive patients may however be very upset by it and many doctors including some dermatologists fail to recognize the cause of this complaint.

There are other causes of nail staining, nicotine being perhaps the most obvious. This tends to be more selective affecting two or three fingers only and is more intense than varnish staining. Henna hair dye will also stain the nails and is occasionally used for this purpose in some countries. Very occasionally long term tetracycline therapy will stain the nails and finally there is the yellow nail syndrome when all nails, fingers and toes take on a yellow colour. None of these conditions should be confused with staining from varnish.

Nail cosmetics cause remarkably little other damage. A few cases of onycholysis due to the use of nail hardeners containing formaldehyde are seen. The condition is usually limited to the distal one third of several nails and may be a sensitivity reaction. Very occasional cases may be due to a nickel sensitivity, the nickel being derived from metal pellets put in the varnish bottle to help keep the varnish liquid.

False nails if closely attached to the nail may damage the nail surface and more rarely may cause complete disruption of the nail. Cases have recently been seen of damage caused by nail improvers based on dental plate materials. It is probable that the materials sometimes cause a true sensitivity reaction but they may also act as primary irritants inducing local sepsis and possibly even nail loss. This type of reaction was recorded as long ago as 1957 (2) but seems to have been overlooked. It is apparent that nail cosmetics

must be free of sensitizing or irritant properties and must not cause complete occlusion of the surface interfering with the free exchange of moisture between the nail and the atmosphere. Overall, nail cosmetics are very safe as at present marketed.

Over-zealous manicure, pushing back the cuticles, may result in white streaks across several nails (leukonychia striata) (*Fig. 4*).

FOOTWEAR

A number of nail deformities may be attributed to footwear. Simply covering the feet encourages fungal infection, but this is an accepted feature of Western civilization and is unlikely to be abandoned. Open sandals or bare feet are much more sensible and are recommended for those living in hot countries.

Onychogryphosis is sometimes a developmental abnormality but often it starts with minor trauma and the nail thickening is increased as a result of repeated minor trauma from footwear. *Fig. 5* shows that nail hypertrophy can be the result of trauma as the damage here was the result of a single injury.

Shoe fashions change and with the change some differences in nail deformities are encountered. During the relatively short reign of the pointed 'winkle picker' shoes ingrowing nails in young men were very common. With the change to the platform shoe there has been an increase in complaints of shedding of great toe nails. The nail loss is usually preceded by subungual haemorrhage and affects one or both great toes (3). Sometimes the haemorrhage is insufficient to cause actual loss of the nail but haemorrhage under the nail can be very worrying unless the cause is recognized and corrected. Not infrequently we see onycholysis of a large part of one or both great toe nails as a lesser effect of the platform shoe. It seems probable that the platform shoe is too rigid and during walking causes repeated minor trauma to the nail. The 'peep-toe' style of platform shoe does not cause this trouble.

ACCIDENTAL CONTAMINATION WITH CHEMICALS

The nail matrix is really very well protected being covered by the two layers each of epidermis and dermis of the dorsal nail fold. It is rather more exposed distally where it is visible as the half moon and covered only by the nail plate. Substances acting from outside which interfere with the formation of the nail must reach the matrix either by penetrating deeply through the dorsal nail fold or by passing below or through the cuticle and extending along the surface of the nail (4) below the the dorsal nail fold. Damage of this sort has been seen from a weedkiller and from hydrofluoric acid. Paraquat and diquat are dipyridilium compounds which are marketed for home use as granules and are perfectly safe in this form. They are also available to farmers and foresters as a concentrated solution which has to be diluted before use. The makers give instructions that dilution must be done with great care and that protective gloves and face shields should be worn. If, in spite of this, a few drops of the concentrated liquid splash onto the hands it may deform the nails. The change is rather characteristic. A pale band appears across the nail just ahead of the cuticle (*Fig. 6*). This later becomes brownish and a gap appears between the cuticle and the proximal nail fold. This may progress to total loss of the nail.

Two patients have been seen whose nails have been damaged by hydrofluoric acid. The first was engaged in cleaning the outside of old buildings. For this purpose dilute

Figure 4. Leukonychia striata due to pushing back cuticles.

Figure 5. Nail hypertrophy following single injury.

Figure 6. Nail dystrophy due to contamination with paraquat, pale white bard across nail.

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Figure 7. Chronic paronychia.

hydrofluoric acid is sprayed on the surface and then washed off with water. The operators wear protective gloves. On this occasion the glove leaked and the patient became aware of a burning sensation and on removing the glove found that four fingers were wet. He rinsed the hand but the next day he noted that the nails on the four fingers had all become separated from their beds. The damage in this case was not to the matrix. The second patient worked in a laboratory and got splashed with hydrofluoric acid when it was poured down the sink. It is possible that the fluid was more concentrated than in the other patient. In this case both thumb nails suffered damage to the matrix so that there was temporary interference with nail growth. With both paraquat and hydrofluoric acid the degree of contamination was quite minor and they must act as very potent chemicals interfering with keratinization.

EFFECTS OF WATER OR SOAP AND WATER

The normal nail plate probably holds about 15% of water vapour and takes up a good deal more when in direct contact with water. It becomes saturated at about 30% and the nail plate is then opalescent and quite soft. The excess is quickly lost to the atmosphere on removal from water and the nail returns to its normal state. Under very dry conditions the percentage of water in the nail falls below 15% and it then becomes brittle.

A number of things can happen if nails are constantly exposed to water and there is frequent alternate wetting and drying.

The first is loss of the cuticle and progress to chronic paronychia. The first organism to cause damaged encouraged by the moist conditions is often the staphylococcus. This probably helps to destroy the cuticle. Candida, usually Candida albicans, quickly takes over and is difficult to eradicate. Its presence leads to the bolstering of the dorsal nail fold (*Fig. 7*) which is a characteristic of this condition and it may also cause a small amount of pus formation. Gram negative organisms then appear, usually pseudomonas and proteus and these are responsible for the dark discoloration of the nail edge (*Fig. 7*). As a late development the whole nail organ may show shrinkage. The most important part of treatment is to keep the hands dry.

Instead of chronic paronychia or in addition to it the nail may become loosened from the nail bed. Many of the cases of so-called idiopathic onycholysis are probably due to soap and water. The warm moist space below the nail encourages infection and various organisms, fungal and bacterial, may be cultured from the subungual debris. There is often some discomfort and occasionally the nail may become dark green or black due to over growth of Pseudomonas aerugionosa. This may cause great anxiety to the patient. A curious feature of a nail which is loose from its bed is the fact that it grows faster than its neighbours and has to be cut more often.

The third apparent effect of water on the nails is splitting especially into layers. This is very common in housewives especially in winter. It is probably due to repeated wetting and drying causing softening and hardening and leading to loss of adhesion between the nail cells. There is some evidence that the nail is formed in layers and perhaps there is less adhesion between the layers than between individual cells.

Acknowledgments

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