Acta orthop. Scandinav. 42, 94–101, 1971

County Hospital for Orthopaedic Surgery,
Sorø, Denmark.

INGROWING TOENAIL

Follow-up on 64 Patients Treated by Labiomatricectomy

POUL MOGENSEN

Received 26.v.70

Since 1965 the treatment of ingrowing toenails in the County Hospital for Orthopaedic Surgery, Sorø, Denmark, has been the commonly used wedge resection of the nail wall, nail, and nail bed, including the matrix. This method has been attributed to the hand surgeon Kanavel, but a review of the literature has shown that this is wrong. As early as 1886 Koenig (7) described the method in his textbook, but to whom the primary credit is due is rather obscure. In Anglo-Saxon literature it is called Wattson-Cheyne's operation (Fowler 1958). Like Whitney (1967), I prefer calling the operation a labiomatricectomy, labium referring to the nail wall. The anatomy of the nail is outlined in Figure 1.

In the case of ingrowing nail a pressure necrosis has occurred distally in the nail groove, with inflammatory reaction spreading into the nail wall. The condition occurs only on the toes and almost exclusively on the great toe. A number of external factors and a certain predisposition are contributory. The most important external factor is incorrect cutting of the nails. Often, the corners of the nail are cut off, as on the finger nails. Soft tissue then fills the corner space, and when the nail grows forth in its usual width it collides with this tissue. Frequently, a small spike of nail is hidden in the nail groove; during growth it burrows into the tissue. Tight shoes and stockings and abnormal positions of the toes are also contributory. Trauma to the great toe causing detachment of the nail is often followed by ingrowth when the nail starts growing again. Clark & Dillinger (1947) found the incidence to be four times higher among infantrymen than among sailors. Lake (1951) and Brearley (1958) have reported a higher incidence among young persons, and the patients often had lax soft tissue with a tendency to prominence around the nail. A less common type

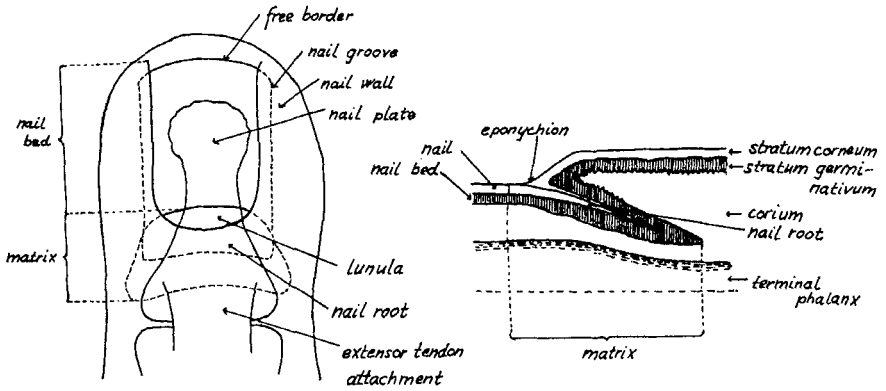

Figure 1. Anatomy of the nail, nail bed and matrix.

among the elderly is an increased transverse convexity of the nail, so that the nail borders turn towards the phalanx. This gives rise to pain and in rare cases to pressure ulceration. Koppel (1968) has described the condition in a case of cartilaginous exostosis on the phalanx and a congenital abnormal inclination of the tip of the terminal phalanx.

If the condition is not treated, infection will supervene. Gradually, the infection will get chronic, forming granulation tissue. Heifetz (1937) divided the disease into three clinical stages: First, reddening and slight swelling of the nail wall, and during this stage the patient is bothered mainly by pain. In the second stage infection and suppuration occur. The nail wall is red and oedematous. In the third stage the condition is chronic, characterized by granulation tissue with hypertrophy of the nail wall. There are periods of flare-up with suppuration. This staging appears practical. The first stages may be treated with conservative measures, whereas the third stage calls for operation.

METHOD

Severe, acute infection must be given time to subside before operation. Chronic infection with granulation tissue is not considered a contra-indication. Our usual preparation is washing with liquid soap for 10 minutes under sterile conditions, both on the day before the operation and on the day of the operation. No antibiotics are administered. The operation is carried out in a bloodless field and under general anaesthesia. First, the nail border on the affected side is

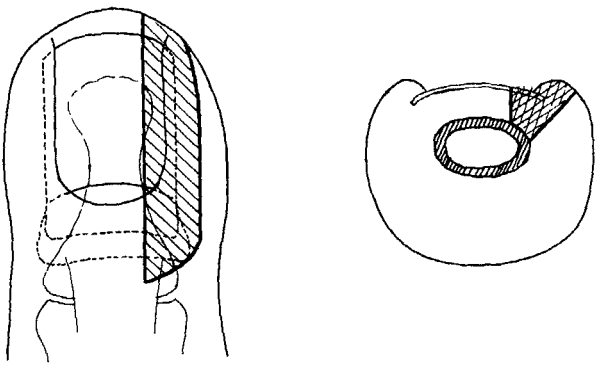

Figure 2. Labiomatricectomy. The incisions.

detached, the nail being undermined in about one-quarter of its width by a flat dissector. The detached nail border is cut off with pointed scissors, as straight as possible, and removed. Thereafter, an incision is applied through the nail bed along the nail border, and the knife is carried up through the proximal nail wall and the underlying matrix to about 1 cm proximal to the eponychion. Distally, the incision reaches to 2–3 mm inferior to the free nail border. Thereafter, a parallel incision is made through the nail wall, turning distally and proximally towards the first incision. The incisions reach the periosteum, and a wedge-shaped piece of tissue is removed, comprising distally the nail bed, nail groove, and nail wall with granulation tissue, proximally the nail matrix with the overlying nail wall (Figure 2). Care is taken to remove the matrix *in toto*. As is apparent from the figure, it extends rather far laterally. Its whitish hue differs distinctly from the reddish colour of the nail bed. A petrolatum gauze meche is applied, and the wound is covered with a sterile dressing. The patient is kept in bed, with elevated foot, until the dressing is removed on the 5th day. The wound edges are pulled together by micropore paper tape, and the wound is left open, or possibly covered with a single layer of gauze. On the 8th–10th day the patient is discharged, but is followed in the out-patient department about once weekly until satisfactory healing has taken place, as a rule after 3 or 4 weeks.

MATERIAL

From 1965 to 1968 a total of 70 patients were admitted with ingrowing toenail. Two were mild cases in the second stage and were treated with chloramine dressings and elevation of the foot; no further treatment was needed. Two had minor

resection of the nail wall without removal of the matrix. Labiomatricectomy was performed in the remaining 66. Of these patients 3 were in the second stage, the remainder in the typical third stage. Operations were performed on 116 nail walls, 67 on the fibular and 49 on the tibial nail wall. Five operations were done on the second and third toe, all the others on the great toe. Bilateral operation was performed on 11 patients. In the case of 29 toes the tibial and fibular nail wall were treated simultaneously.

Out of the 66 patients 27 were females and 39 males. One patient was 22 months of age, one was 10 years, 38 were 11–20 years, 13 were 21–30 years, 7 were 31–50 years, 5 were over 51, the oldest 79. In 35 patients the duration of the disease was less than 6 months, in 5 it was 6–12 months, in 25 it was 1–10 years, and in 6 the complaints had been present for more than 10 years. Four patients had deformities of the nails preoperatively. Two of them exhibited the above-mentioned increased transverse convexity of the nail; both were elderly. One had onychogryposis, and one had a deformity in which the nail tended to grow perpendicularly up from the toe. Furthermore, 5 patients were suffering from other diseases of the foot: hallux valgus, club-foot, rheumatoid arthritis, hyperhidrosis, and epidermophytosis.

Twenty-four patients had previously been treated by ablation of the nail, five of them 3 times. In three of these cases small portions of the nail wall had been resected at the same time.

Three operations were performed under local anaesthesia because of advanced age, bronchial asthma, and obesity.

Postoperative Complications

Suppuration from the wound occurred in 11 patients who were then treated with chloramine dressings, bed rest, and elevation of the foot, either while in hospital or at home after discharge. The infection subsided in 2–14 days except in one patient who also developed symptoms from the other nail wall. Another operation revealed osteitis of the tip of the terminal phalanx on this side. This patient developed symptoms of reflex dystrophy which was greatly regressing 7 months later. At the sites of the labiomatricectomies the findings were satisfactory.

Follow-up

During the period from the operation until the present follow-up study, 6 patients had recurrences with the nail growing out in its entire width and giving rise to a new pressure ulceration with chronic infection. Two of these patients had re-operation elsewhere, three had re-labiomatricectomy here. The 6th patient with recurrence had originally been suffering from onychogryposis and was now treated by total matricectomy by the Zadik method.

Sixty-four out of 66 patients were seen at follow-up. One had died and one refused to be examined. The follow-up period averaged 22 months, range 4–45 months.

Apart from the 6 cases mentioned above, no actual recurrences were found at follow-up. In 17 patients a total of 22 nail spikes, 1–2 mm in length, were found proximally at the eponychion. They did not bother 14 of the patients, but 3 patients said they tore their stockings. There were no other complaints, in particular

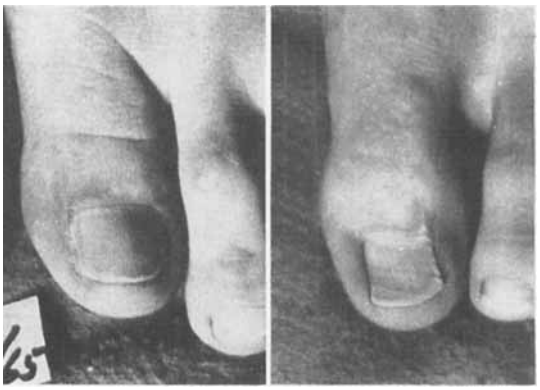

Figure 3. Two typical and satisfactory results following labiomatricectomy, left on the tibial side, right on the fibular side of the great toe.

no pain. Four patients had small keratotic plaques distally in the scar, but they caused no trouble and could incidentally be removed with a nail brush. Two of these patients also had nail spikes without symptoms (Table 1).

As to the 6 re-operated patients, 4 showed entirely satisfactory results, one had a nail spike which tore the stocking, and in one case it was too early to assess the result.

Most of the patients, including 4 of the re-operated ones, were satisfied with the result of the operation. Objectively 39, i.e. 59 per cent, showed a good cosmetic result (Figure 3), with well-shaped nails and nice scars. The others had rather irregular scars, but without any complaints.

Table 1. Results. Recurrences of nail tissues in 64 patients treated with labiomatricectomy on 114 nail walls.

	Number of patients	Number of nail walls	Re-operation labio-matricectomy	Operation by the Zadik method
Regrowth with symptoms	6	6	5	1
Nail spikes with complaints	3	3	0	0
Nail spikes without complaints	14	19	0	0
Keratin plaques	4	4	0	0

DISCUSSION

In a study of healthy police officers, Lloyd-Davies & Brill (1963) found that 20 per cent presented signs of ingrowing toenails. This is, then, a common condition which in its milder forms is usually tolerated by

the patients. In the present material only the most severe cases presented themselves for treatment. The symptoms are derived from the pressure necrosis distally in the nail groove and complications thereof. The object of treatment is to abolish this promptly and to prevent the undesired contact between the nail and soft tissues. The mild cases may be managed by simple conservative measures, such as thinning the centre of the nail, elevating the nail corner by a cotton wool tampon or an adhesive plaster bandage (Søndergaard 1952) while the nail is growing out, possibly supplemented by simple ablation of the nail. On the other hand, the severe cases of stage 2 and all stage 3 cases call for surgical treatment which immediately relieves the condition. It was demonstrated by Quenu (1887) that removal of the matrix prevents outgrowth of the nail, and this is the principle of most of the common methods (Winograd (1929), or modifications thereof by Heifetz (1957), Fowler (1958), and Zadek (1950)). Thompson & Terwillinger (1951) use total removal of the nail bed with simultaneous amputation of the tip of the terminal phalanx. In the present method the nail wall and the matrix with the chronic inflammatory changes are resected. Operations which remove only the nail wall cannot be recommended.

In the present material there were 9 per cent recurrences with outgrowth of the nail in its entire width and a new pressure ulceration. This means that the partial matricectomy has not been done, and we believe that in these cases there has been a technical error for which the method cannot be blamed. The patients who had re-operation in the Department showed a completely satisfactory result. The 17 cases with nail spikes demonstrate the difficulty of removing all the matrix tissue. Even a minute remnant involves a risk of forming a nail spike. On the other hand, there does not seem to be any difficulty in removing the greater part of the matrix, so that the nail does not grow out in its entire width, as the incisions afford a good survey in the area of the matrix. After injury to the nail bed, there will be formation of lamellated tissue plaques differing from normal nail tissue. These plaques consist of keratin (Samman (1959), Rees (1964)). The presence of these keratin plaques in 4 patients shows that the nail bed has not been sufficiently excised.

The two cases of the marked transverse convexity of the nail posed no problems. In advanced cases, however, total matricectomy is worth considering. In onychogryposis the treatment is total matricectomy (Fowler (1958), Townsend & Scott (1966)). In fungal infection a specific treatment must be considered.

The difficulties in the treatment of ingrowing toenail are reflected in the extremely varied recurrence rates. Granberg & Palmer (1962) observed true recurrences and bothersome nail spikes in 30 per cent, and others have reported from 0–85 per cent recurrences with the present method (Keyes (1943), Kurtgahn (1929), Lloyd-Davies (1962)). After operations by the method of Winograd, or modifications thereof, the recurrence rates have ranged from 0–73 per cent. Simple ablation of the nail is followed by recurrence in most cases (Keyes 1934, Lloyd-Davies 1962). On the basis of the present material, with 9 per cent true recurrences and 5 per cent troublesome nail spikes, it seems justified to recommend the method, presupposing that cases of actual recurrence are due to technical errors in the operation and that the nail spikes rarely cause complaints, and if so mild. Postoperative infections were no more common than might be expected after an operation on a severely infected field.

The present material affords no information concerning pathogenetic factors. However, the high frequency in the younger age groups might indicate inexpedient pedicure as a contributory cause.

SUMMARY

Labiomatricectomy is an operation for ingrowing toenail which consists in wedge resection of the nail wall, nail, nail bed, and nail matrix. This treatment was used in 66 cases of ingrowing toenail, affecting in most cases the great toe, in the chronic stage of the disease. Ten showed transient and negligible signs of infection. One patient developed long-lasting osteitis of the terminal phalanx, accompanied by dystrophic changes in the foot. Sixty-four patients were seen at follow-up at the end of an average of 22 months. Within the follow-up period there had been 6 recurrences. All had re-operation, 5 by labiomatricectomy. The explanation of these 6 recurrences is that the matrix had not been removed, and this must be considered a technical error. Nail spikes were present in 17 patients. Fourteen had no complaints, while in 3 cases the spikes tore the stockings. Four patients had keratin plaques in the scar, but without symptoms. The method is recommended for the treatment of ingrowing toenail in its chronic form with granulation tissue in the nail groove.

REFERENCES

Brearley, R. (1958) Treatment of ingrowing toenails. *Lancet* 2, 122–25.

Clarke, B. G. & Dillinger, K. A. (1947) Surgical treatment of ingrown toenail. *Surgery* **21**, 919–24.

Fowler, A. W. (1958) Excision of the germinal matrix: A unified trreatment for toenail and onychogryposis. *Brit. J. Surg.* **45**, 382–87.

Granberg, P. O. & Palmer, B. (1962) Radikalopererade ungvis incarnatus — en efterundersökning. *Svenska Läk.-Tidn.* **59**, 2863–68.

Heifetz, C. J. (1937) Ingrown toenail. *Amer. J. Surg.* **38**, 298–315.

Keyes, E. L. (1934) The surgical treatment of ingrown toenails. *J. Amer. med. Ass.* **102**, 1458–60.

Koenig, F. (1889) *Lehrbuch der Speziellen Chirurgie. Vol. III.* pp. 610–13.

Kurtzahn, (1929) Über die Behandlung den eingewachsene Nagel.*Dtsch. Z. Chir.* **218**, 411–14.

Lake, N. C. (1951) Ingrowing toenail. *Brit. Med. J. I.* 1073–74.

Lloyd-Davies, R. W. (1962) Nailbed ablation. Histological grounds for radical operation. *Brit. J. Surg.* **50**, 44–46.

Lloyd-Davies, R. W. & Brill, G. C. (1963) The aetiology and an output patient management of ingrowing toenails. *Brit. J. Surg.* **50**, 592–97.

Quenu, M. (1887) Ongle incarné. *Bull. Soc. Chirurgie Paris* **13**, 252.

Rees, R. W. M. (1964) Radical surgery for embedded or deformed great toenails. *Proc. roy. Soc. Med.* **57**, 355–56.

Samman, P. D. (1959) The human toenail. Its genesis and blood supply. *Brit. J. Derm.* **71**, 296–302.

Scot, P. R. (1968) Ingrown toenails. *Med. J. Aust.* **55**, 47–51.

Søndergaard, T. (1952) Ungvis incarnatus hallucis. *Ugeskr. Læg.* **114**, 1184–86.

Thompson, T. C. & Terwillinger, C. (1951) The terminal syme operation for ingrown toenail. *Surg. Clin. N. Amer.* **31**, 575–84.

Townsend, T. C. & Scott, P. J. (1966) Ingrown toenail and onychogryposis. *J. Bone Jt Surg.* **48**-B, 354–58.

Whitney, A. K. (1967) An illustrated labiomatricectomy procedure. *J. Amer. podiat. Ass.* **57**, 169–72.

Winograd, A. M. (1929) A modification in technic of operation for ingrown toenail. *J. Amer. med. Ass.* **92**, 229–30.

Zadik, F. R. (1950) Obliteration of the nailbed of the great toe without shortening the terminal phalanx. *J. Bone Jt Surg.* **32**-B, 66–67.