INGROWING TOE NAILS: IS THERE A NAIL ABNORMALITY?

A PROSPECTIVE STUDY

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Ingrowing of the nail of the hallux has been ascribed to an abnormality of the shape of the nail; our prospective study was planned to test this association. Twenty-three consecutive patients and 23 age-matched controls were assessed by caliper measurement and standard photographs, before a first operation for ingrowing toenail. We found no differences in shape between the toenails of the patients and those of the controls, both groups showing great variation. Our results suggest that the ingrowth is not commonly associated with an abnormal shape of the nail.

Many different theories have been proposed to explain the aetiology of ingrowing toenails. They can be classified according to whether the primary fault is considered to be in the nail itself or in the soft tissues at the sides of the nail (Clarke and Dillinger 1947; Lake 1951; Cozen 1970; Lathrop 1977; Hendricks 1979; Miller 1985). It has been suggested (Zechel 1970) that more clinical trials are required to give a better understanding of the cause; these might help prevention and rationalise treatment. Our study was designed to determine whether symptomatic ingrowing is related to an abnormality of the nail.

PATIENTS AND METHOD

A total of 23 consecutive patients who required a primary operation for ingrowing great toenails were assessed.

Figure 1 An above-nail view of a toenail showing measurement of deviation of the longitudinal axis. Figure 2 End-on view of a toenail.

Non-Caucasian patients were excluded to avoid ethnic variation and the age range was restricted to 10 to 30 years to avoid cases of early onychogryphosis. A matched control series was selected, using the next patient of the same sex and age group admitted to the surgical wards for another diagnosis who had no history of ingrowing toenails.

Patients and controls had the breadth of the free end of both great toenails measured with a caliper. In addition the nails were photographed from above and end-on; these were all taken by one photographer using a standard technique to produce black-and-white prints at three times magnification. From the above-nail photo-
graphs the deviation of the longitudinal axis of the nail was measured (Fig. 1) and the nail-cutting technique was assessed. From each end-on view a tracing was made of the transverse curvature of the nail to avoid bias from the appearance of the soft tissues (Figs 2 and 3). The medial and lateral angles of curvature were measured, the ratio of height to breadth was recorded and the tracing was assessed for asymmetry. In addition, each tracing was paired with its control and two surgeons experienced in the treatment of ingrowing toenails were asked to choose which of each pair was traced from an ingrowing toenail. Unpaired shuffled tracings were also ranked in order of curvature by one observer. The reproducibility of the techniques was confirmed by taking five end-on views of one toe.

**RESULTS**

The 23 patients (21 men, 2 women) had 28 symptomatic toes, the lateral fold being affected alone in 19 toes; in eight both lateral and medial folds were involved. Thirteen patients and 15 controls had cut back the corners of their nails. Eight patients and four controls had a family history of ingrowing toenails. Comparison of the measurements made from the five views of one toe showed a coefficient of variation of less than 10%.

Caliper and photographic measurements. We found no significant differences between right and left great toenails and were able to group the affected and unaffected nails regardless of their side. In bilateral cases we excluded the less affected side to avoid possible bias, and then compared each nail with its paired control.

We found no significant difference in the breadth, the medial angle, the lateral angle, the height–breadth ratio or the longitudinal axis between affected nails and their controls (Table I) or between the 18 unaffected nails of patients and their controls. All groups included a large range of medial and lateral angles and variations in curvature (Fig. 3). The longitudinal axis of the nail tended to deviate laterally in all cases (median values, 9° for affected nails and 7° for controls). One third of affected nails had an asymmetrical curvature; but so did one third of the controls, the greatest height usually being medial to the midpoint (Table I).

The visual assessment of the side of an affected nail from paired tracings was no better than by chance; this also applied to the patients' unaffected nails. When nails were ranked by amount of curve there was a tendency for affected nails to be flatter but this was not significant (Table II).

**Table I.** Comparison of worst affected and control nails

<table>
<thead>
<tr>
<th></th>
<th>Affected nails (n = 23)</th>
<th>Control nails (n = 23)</th>
<th>Significance of difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Median</td>
<td>Range</td>
<td>Median</td>
</tr>
<tr>
<td>Breadth of nail (mm)</td>
<td>16.5</td>
<td>18.21</td>
<td>16.0</td>
</tr>
<tr>
<td>Medial angle (degrees)</td>
<td>36.0</td>
<td>25.77</td>
<td>44.0</td>
</tr>
<tr>
<td>Lateral angle (degrees)</td>
<td>37.0</td>
<td>23.63</td>
<td>41.0</td>
</tr>
<tr>
<td>Ratio of height to breadth</td>
<td>0.21</td>
<td>0.14–0.35</td>
<td>0.21</td>
</tr>
<tr>
<td>Deviation of longitudinal axis (degrees)</td>
<td>9</td>
<td>3–18</td>
<td>7</td>
</tr>
<tr>
<td>Asymmetric curve</td>
<td>7</td>
<td></td>
<td>8</td>
</tr>
</tbody>
</table>

**Table II.** Results of ranking the tracing of nails from the most curved to the least curved. Comparisons with controls of the affected and the unaffected nails of patients

<table>
<thead>
<tr>
<th></th>
<th>Affected nail (n = 23)</th>
<th>Unaffected nail of patient (n = 18)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient's nail more curved</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>Control nail more curved</td>
<td>15</td>
<td>11</td>
</tr>
<tr>
<td>Tracing lost</td>
<td></td>
<td>2</td>
</tr>
</tbody>
</table>

**Statistics.** Nail measurements were compared using Wilcoxon's rank sum test for paired data. The chi-square test was employed for the analysis of asymmetry and a binomial test of proportion for the results of visual assessment.
DISCUSSION

The photographic method gave a reproducible measure of nail curvature, and even though in some severe cases the edge of the nail was buried by soft tissues its position could be deduced. Our series, like others, included more male than female patients and the lateral nail fold was much more commonly affected (Scott 1971). We have also demonstrated the great variation in the curvature of the nail in control toes (Fig. 3). The view that cutting back the corner of the nail causes ingrowing (Kopell, Winokur and Thompson 1966; Murray and Bedi 1975) is not upheld by our study. We found no association with increased side-to-side curvature (Vandenbos and Bowers 1959; Lloyd-Davies and Brill 1962-63), or with flattening (Lapidus 1972) as measured or assessed visually. Lateral deviation of the axis of nail growth, with asymmetric curvature causing the lateral side of the nail to dive steeply into the nail fold, has also been blamed (Fowler 1957-58). Our study revealed no difference in the axis of growth or in the frequency of asymmetrical nails between affected and normal, while we found that the medial side of the nail was steeper than the lateral in most of the asymmetrical nails. This study has failed to demonstrate any abnormality of the nail in patients with symptomatic ingrowing toenails, and suggests that treatment should not be based on the correction of a nonexistent nail deformity.

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REFERENCES