

Nail Growth

Thirty-five Years of Observation

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• A 35-year observation of the growth of my nails indicates the slowing of growth with increasing age. The average daily growth of the left thumbnail, for instance, has varied from 0.123 mm a day during the first part of the study when I was 32 years of age to 0.095 mm a day at the age of 67.

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Although there may have been Egyptian specialists thousands of years ago who had an interest in the health and disease of the nails, there was no recognized tutelary deity of Greece or Rome who had as his special province the care of the nails. Sir Thomas Clifford Allbutt pointed out that astrologists believed strange forces of the stars ruled the hair and the nails, at least the nails of the toes:

In the West the great outbreak of astrology and of sorcery white and black, was deferred to the thirteenth and later centuries when it was kindled or fanned by the Arabs and Frederick II, by Arnold of Villanova and Peter of Abano. The belief in this later period, that not the several limbs and viscera only, but even the hair of the head and the nails of the toes, were under the punctilious rule of the stars, was independent of the tradition of Galen, or of any others of the professors of Graeco-Roman medicine, regular or irregular. Alchemy, although often published under great names of antiquity, as of Democritus, is nearly all of it later than Greek.¹

According to James Boswell in his *Life of Samuel Johnson*, the illustrious Dr Johnson used to beguile the shining and solitary hours with all sorts of miscellaneous observations:

My readers will not be displeased at being told every slight circumstance in the manner in which Dr Johnson contrived to amuse his solitary hours. He sometimes employed himself in chymistry, sometimes in watering and pruning a vine, sometimes in small experiments, at which those who may smile, should recollect that there are moments which admit of being soothed only by trifles.*

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*In one of his manuscript Diaries, there is the following entry, which marks his curious minute attention: "July 26, 1768. I shaved my nail by accident in whetting a knife, about an eighth of an inch."²

I could find nothing more in Boswell's *Life of Samuel Johnson* to suggest any subsequent observation. Johnson scholars whom I have asked have found no evidence that he recorded the time it took to grow out the nail or if he made further comment. The wonder is not whether he forgot it but that he recorded the possibility of learning a little more.

The famous Johann Christian Reil of Halle in 1792 described, in his "Blemishes of the Nail in Those Convalescing From a Malignant Fever," the following phenomenon:

Many persons have come to me convalescing from a malignant fever, to whom it has occurred that their nails become thoroughly white in the manner of hairs. This blemish exists in a minor degree at the root of the nails of the hand and feet of all persons in a white line, they are noted in crescents which move after the fever in parallel crescents until, after many months, they have progressed to the tips of the nails and break off.³

This appears to be the original observation of what is called Mees' lines but was actually described much later. I have observed a furrow under similar circumstances.⁴

OBSERVATIONS

More than 37 years ago, rather casually, I began to study the rate of growth of my nails, fingernails and toenails. The stimulus that set me on this course I have related in several articles, the first of which appeared in 1953.⁴⁻⁷

The kind of pleasure and understanding that I get from studying natural history has long vanished from most contemporary teaching institutions that have become part of intensive care units, which are supposed to save the residual intellectual machinery of medical students. The teeming mass of hope and pain, technical virtuosity, and depersonalization called a "health center" delivers packets of what is termed "medical care." The capacity to look remains, but the capacity to see has all but vanished. Teachers and students forget that the ability to palpate is not the same as the ability to feel.

As a gentle countercurrent, I set forth here this most recent five-year installment of the observations of the

growth of my left thumbnail. It is a very long record of the growth of human deciduous tissue. Its duration has little precedent in clinical medicine or human natural history. Still, the nail provides a slowly moving keratin kymograph that measures age on the inexorable abscissa of time.

DECIDUOUS TISSUES

There are many deciduous tissues in humans and in animals. They have a variety of functions. Hair and nails live out their short existence, then are replenished or replaced. Hair often "falls just like the leaves do fall." Many men and some women become bald relatively early in life. This provides activity for enterprising wigmakers. The springy, elasticity of the skin seems to be deciduous. At least the diminution of the elasticity of the skin on the face accounts for the flourishing activity of face-lifters.

Among the deciduous tissues, the most spectacular is the placenta, that almost unbelievable trading ground between the mother and child in utero, where barter and exchange at an unconscious level goes on with a faithfulness hardly ever seen in extrauterine life. The placenta, so small at the beginning, grows rapidly, and is summarily discarded.

A digital nail furnishes not a digital computer, but a digit, a finger or a moving tape offering all sorts of opportunities for observation. As the nail grows, clear, secular trends are recorded. The impetus to study nail growth is analogous to the curiosity that leads observers to look at tree rings, the baleen plate of the whale, or the growth of the tooth of the bear.

The scars we bear inside and out mark certain experiences, accidents, disasters, illnesses, and troubles in a way that does not change. If, from the day of birth until the day of death, a person never cut a fingernail, it would grow to a length of several feet. The totally subservient state of mind that lets a person become a slave to the protection of such a delicately attached structure is typical of royalty, the wealthy, or the daft. Mandarins are said to have achieved distinction by practically curtailing the use of their fingers, hands, and arms because of their development of long nails. In correspondence with E. A. Spriggs, MD, in Newcastle upon Tyne, England (June 1, 1978), I learned that the indoor and outdoor record for long nails at the present time is held by 41-year-old Shridhar Chillal, whose champion thumbnail is 56.25 cm long.

NONDECIDUOUS TISSUES

Egbert and Luque* noted that bears' teeth are useful for calculating their age. These observers gave me a number of references, as well as photocopies of essays, on determining the age of the grizzly and the Alaskan brown bear. It seems that each year a ring or anulus of cementum is laid down in the teeth of growing bears. The ring occurs inside the growing tooth, which becomes elongated. This differs from the cortical development of tree rings in which the rings consecutively form on the outside of one another. The process comes to a halt when the bears retire to their dens to drowse or hibernate. Thus the age of a bear is reckoned as the number of anuli plus one. This number is positively correlated with the zygomatic breadth. The layering of the cementum, its correlation with the magnitude of the zygomatic width, and the fact that holing up in a den stops growth allows an analogy to tree rings. Trees that grow in the tropics where there is no cool season either have no rings or poorly developed ones, which makes wood such as mahogany and ebony much sought after. Because of its size, the third molar of the Alaskan brown bear has been used to calculate its age. Thus nondeciduous tissue, which continues to grow and lay down a layer of cementum,

provides, like the hooves of animals, the hair or nails of human beings, and the baleen plate of the whale, a historic record of a creature's biographical events.⁸⁻¹¹

Dutch workers have made detailed studies of periodic waves of thickening and growth of the baleen plate in the blue whale and the fin whale.¹² They can thereby estimate not only a whale's age, but in the female whale, ovulation and pregnancy. Whole epochs of a whale's life can thus be reconstructed just as whole epochs of a region can be estimated by a study of the rings of its trees.

Studying the whalebone today substantiates Melville's remarks in *Moby Dick*:

In the central blinds of bone, as they stand in their natural order, there are certain curious marks, curves, hollows, and ridges whereby some whale men calculate the creature's age, as the age of an Oak by its circular rings. The certainty of this criterion is far from demonstrable yet it has the savor of analogical probability.

Paleopathologists have found that, just as with bears, the ancient dinosaurs had annual rings of growth that are clearly discernible in their teeth, so age may be estimated. Probably not enough such remains will ever be found to give a clear idea of ancient climates.

I have not observed seasonal differences or differences influenced by activity in my nails. My observation that during a sharp attack of mumps my nail growth ceased completely was, to my knowledge, the first such observation made with a before, during, and after comparison.

METHODS

The rate of fingernail growth can be measured in a number of ways. A mark may be made at a specific place on the nail, and the length of time it takes to move with the growth of the nail plate to the free margin is a measure of the rate of growth. An indelible stain such as that made by nitric acid, a hole drilled in the nail, or a line scored with a sharp file may be made, or clippings may be weighed and measured. I make an indentation with the little file commonly employed to open small glass vials. On the first day of each month, I file a transverse groove just at the edge of the free margin of the cuticle, being careful not to push it back or interfere with it within a week or two after marking the nail. The end is recorded when the mark has just reached the free margin of the nail, exactly 1.45 cm from the start.

Early in my observations, I measured nail clippings by linear growth and by weight. With careful calculations I found that anywhere from 25% to more than 50% of the nail had been used up by unnoticed attrition. Not only does the length of the nail wear away but the dorsal surface also wears down. If a fingernail is trimmed with scissors and not filed, sharp angles can be felt, since scissors simply takes away bites. Without filing, these sharp points disappear in a day or two from unnoticed wear and tear.

FINDINGS

When I first began to measure the rate of nail growth, I scored marks on all my nails. Within a few months I found that each nail had its own pace. This was clearly distinguishable even by the rather crude method that I used. Some nails grew rapidly; some, in an intermediate phase, less rapidly; and some, slowly. The differences were small but regular. There was consistency in the variation, so if I applied a ratio I could tell by measuring one nail what the others were doing, and this I did on several occasions. In simple terms, toenails grow more slowly than nails of the hand, and the nail of the middle finger grows more rapidly than the nails of either the thumb or the little finger or the other two middle fingers. By measuring one nail, the rate of growth can be calculated for all. Since I am right-handed, I settled on the measurement of the rate of growth of my left thumbnail. Out of approximately 450 months, I have forgotten to mark the nail only twice and have not

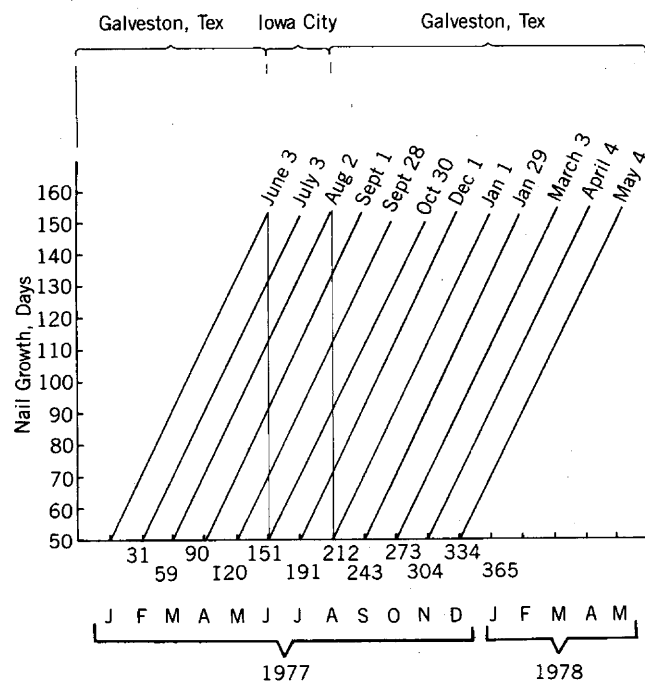
forgotten at any time since 1950. This might suggest that obsession does compensate for the vagaries of an aging memory.

Small objects that move or grow slowly can be studied by much simpler methods than, for instance, those required by geologists, who study the effects of the slow shifting of land masses on tectonic plates. A mark must be made at a fixed place, on a fixed date, and the time it takes the mark to advance to another fixed point must be registered. Various nail polishes, or walnut juice, or nitric acid would do the same thing but they would not be as simple. I made a little tattoo in my thumbnail to use as a benchmark in case the cuticle seems to recede or advance. The rate of growth of the nail is determined by the number of days the mark takes to arrive at the free edge. The nail still measures the same distance from cuticle to free edge, 1.45 cm, as it did 37 years ago. I have not observed one common sign of aging, the recession of the pulp from the nail bed, which, if significant, would give an appearance of a shortened growth time. With age, there is an increase in the number and size of linear ridges that run the length of the nail and in their extreme forms they may be quite annoying, particularly if they develop precociously.

Some readers may fail to realize that growth of the nail goes on over a period of months and years, so influences throughout the period may affect the rate. Therefore, I have introduced an addition (Fig 1) to my continuous graph (Fig 2) to make this point more clearly. I listed geographical movements that lasted any significant length of time by the month. The point is: influences that cause a deceleration in the rate of growth leave effects for some time unless a compensatory change causes an acceleration of growth.

After the decided slowdown as illustrated by the "mumps" mark in Fig 2, there was a compensatory speed-up, for if just the previous rate of growth had been resumed, the change during the time I had the mumps

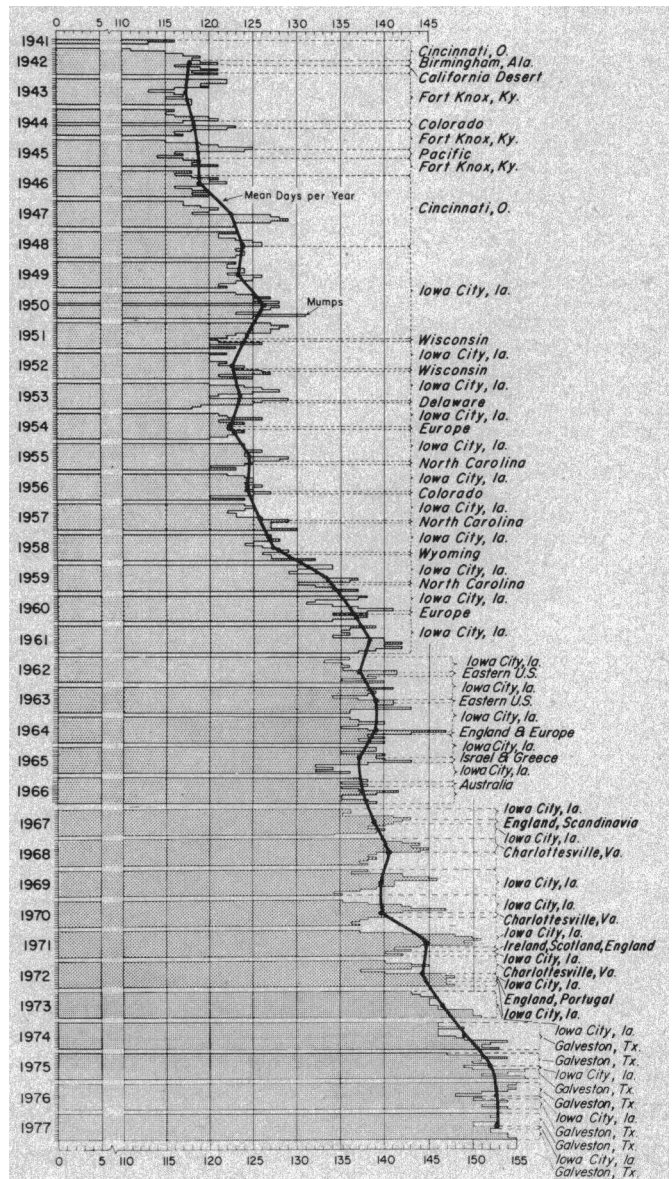
Fig 1.—Effect of geographical movements on nail growth. Abscissa is cumulative number of days by month. Diagonal dates are exact day that nail mark (made on first of month) grew out completely.



would have been reflected until the part of the nail scored during that period had completely grown out.

The patients of Dauber who had psoriasis volunteered that their nails grew faster with the disease than they had before.¹³ Dauber studied 37 subjects without psoriasis, 33 patients with psoriasis who had clinically normal nails, and 21 patients with psoriasis who had pitting of all fingernails. He used a method similar to mine except that his reference scratches were made 3 mm from the base of the nail or where the lunula reached the height of its arch, if it was visible. The people he studied ranged from 9 to 88 years of age. His findings indicated that the nails of the patients with psoriasis grew faster than those of the people without psoriasis, and the nails of those with pitting grew even faster than the nails of the patients with psoriasis whose nails were not obviously affected. The nails of the right hand grew faster than those of the left and the middle fingernail grew faster than the nails of either the thumb or little finger, the second and fourth fingernails

Fig 2.—Nail growth over period of 36 years. Abscissa gives total days of growth. Growth is indicated by number of days required for mark (made just below cuticle) to reach edge of underlying matrix.



showing intermediate growth. There was a distinct decline in the rate of growth with age in all three groups.

In an article published in September 1974, I¹ made a fairly extensive review of studies of nail growth and made some observations on other deciduous tissues. The following statements hold true. Nails grow faster in children than in adults. Rate of nail growth diminishes with progressing age. Hyperemia or a substantially warm environment makes nail growth accelerate. Biting the fingernails increases the rate of growth approximately 20%, probably because the frequent manipulation of the nail stimulates the circulation of the germinal area in the nail root. Immobilization, such as that caused by hemiplegia or having a limb or digit in a plaster cast, greatly slows growth. Pregnancy increases it, perhaps by as much as a third. Those who live in climates with sharp changes of temperature tend to have a faster rate of growth during the warm seasons and a slower rate during the cold seasons. Ischemia is associated with a marked slowdown in the rate of nail growth.¹¹

The few observations I have made on clubbed nails indicate that they may grow faster than is usual, but I have not compared a clubbed nail with a normal nail in a person with single digit or unilateral clubbing. In some instances, clubbed fingernails seem to grow no faster than normal.

The notion is embedded in folklore that hair and nails grow after death. I have had occasion to make careful

measurements that are related to bone rather than to soft tissue. During the processes of protein coagulation and surface desiccation following death, changes in cutaneous hydration cause a distinct shrinking of the skin. The skin pulls away from the nail at the free margin, giving the illusion of a linear progression of the nail of a millimeter or more. The same is true of the hair. If a person has, or was, shaved shortly before or within a day of death, the beard will seem to have grown after death. Here again the overwhelming evidence is that retraction and contraction of the skin makes each little bristle stand out a bit; it is not growth but an increased protrusion of the shaft of the hair that makes it appear to have grown.

The average length of time it has taken my nail to grow from the mark to the free edge has been, in 1973, 146 days; 1974, 149 days; 1975, 152 days; 1976, 153 days; 1977, 153 days. Thus, there has been a gradual but steady slowdown in the rate of growth, although no significant change has occurred in the years 1975 through 1977.

COMMENT

I have added five more years to my record of nail growth. It had remained fairly steady through 1975, 1976, and 1977, taking approximately 153 days from start to finish. During the incomplete year of 1978, the rate has slowed down a trifle, perhaps by a day.

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