HARALD NILSONNE:

HALLUX RIGIDUS AND ITS TREATMENT

Hallux rigidus is the designation common in Anglo-Saxon literature for the special process, resembling arthritis deformans, in the metatarso-phalangeal joint of the great toe, which I am here to take up. Hallux rigidus, I think, is a more adequate term for the clinical features of the condition than is the German designation hallux flexus.

It is far from being a rare lesion, notwithstanding the fact that it has received but scanty attention in the literature. It represents a condition of invalidity that is of some importance and well worth a closer study.

Distinction is to be made between primary and secondary hallux rigidus. The latter condition is an ordinary arthritis deformans, quite common in elderly patients with deforming changes in some other of the small joints of the foot, or a local process arising from a trauma of the great toe. The primary hallux rigidus, which I am to treat of exclusively, is a well-defined disease with typical and characteristic clinical features.

My view of this lesion is based on a material comprising 30 cases, chiefly from the last 4 years. 23 out of these are women; and in most of the cases (19) the lesion is bilateral.

As a rule the lesion appears at the age of 12—15 years, with slight difficulti in standing on tip-toe, that is, in the dorsal flexion of the great toe. Rather soon there develops a complex, that resembles the signs of arthritis deformans, marginal enlargement of the metacapitulum, in form of exostoses, especially dorsal and lateral, capslar swelling, increasing rigidity of the basal joint of the great toe. Finally all dorsal flexion is impossible. Often the basal joint of the great toe is in slight plantar

flexion (hallux flexus), and the distal phalanx will then be in compensatory hyperextension.

A series of X-ray plates will be demonstrated which show the characteristic features in the roentgenogram of this lesion.

In cases with hallux rigidus one will always find a very characteristic form of the foot. It is a long narrow foot, most

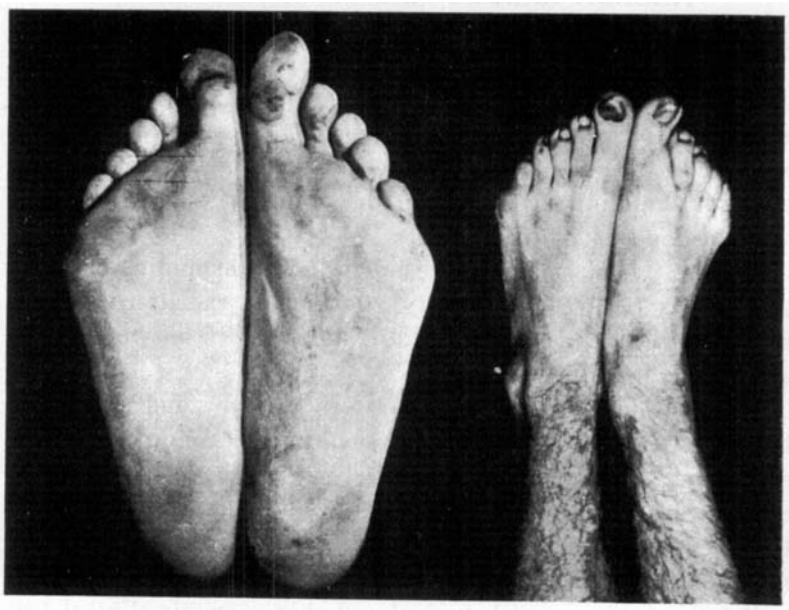

Fig. 1a.

often with a marked falling down of the longitudinal arch; valgus deformity of the great toe is never observed.

The most prominent feature in the form of such a foot is the unusual length of the first metatarsal bone. My attention was called to this fact especially in a case of bilateral hallux rigidus in a young man of 20, who had had difficulty in unrolling of the foot (and standing on tip-toe) since the age of 15 (Fig. 1). Here the dorsal flexion was completely put out of function in both the great toes, which were extraordinarily long. Their length was found to depend on very long first metatarsals. Looking on this plate, I realized clearly the difficulties in the

unrolling of the foot that will arise if the first metatarsal is too long. I studied my hallux rigidus material and found that this excessive length of the hallux was a rather constant feature in all my cases. Then I went through our hallux valgus material and found the same condition in these cases.

Phylogenetically, the first metatarsal and digit constitute

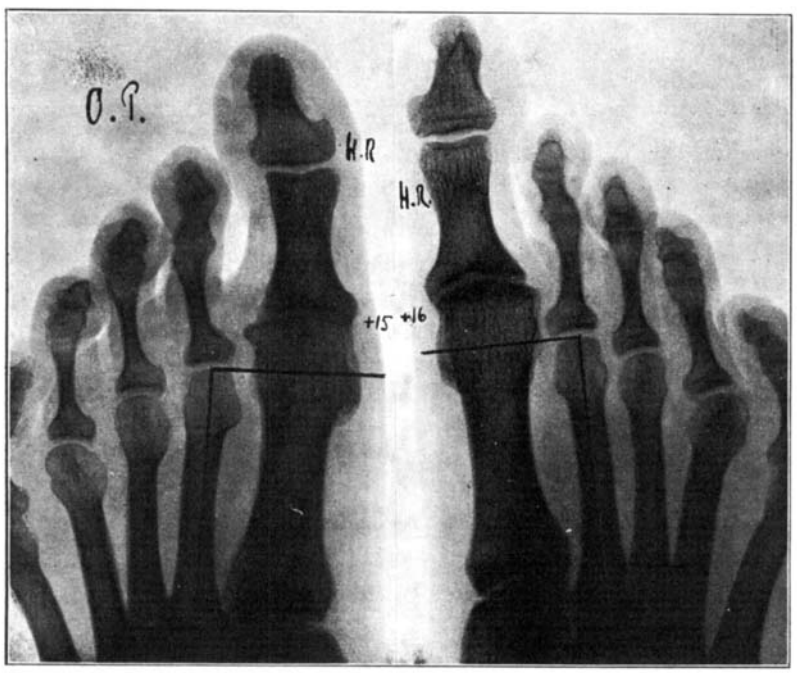

Fig. 1b.

originally a clasping organ. In the apes, the 1. metatarsal bone is considerably shorter than the 2. It is not till late in the evolution that the function of the foot is exclusively one of support, and in this way takes over the work of weight-bearing. With this change in function, the 1. metatarsal is growing to the same length as the 2. metatarsal.

Morton (Journ. of Bone a. Joint Surg. 1927) gives a description of a lesion characterized by the 1' metatarsal being too short, and he calls it metatarsus atavicus. As far as I have been

able to find, *Morton* is the only one who has occupied himself with the relative length of the metatarsal bones.

To get a better understanding of the question of the relative length of the metatarsal bones I have gone through my material of X-ray plates of the foot (already roentgenographed for other

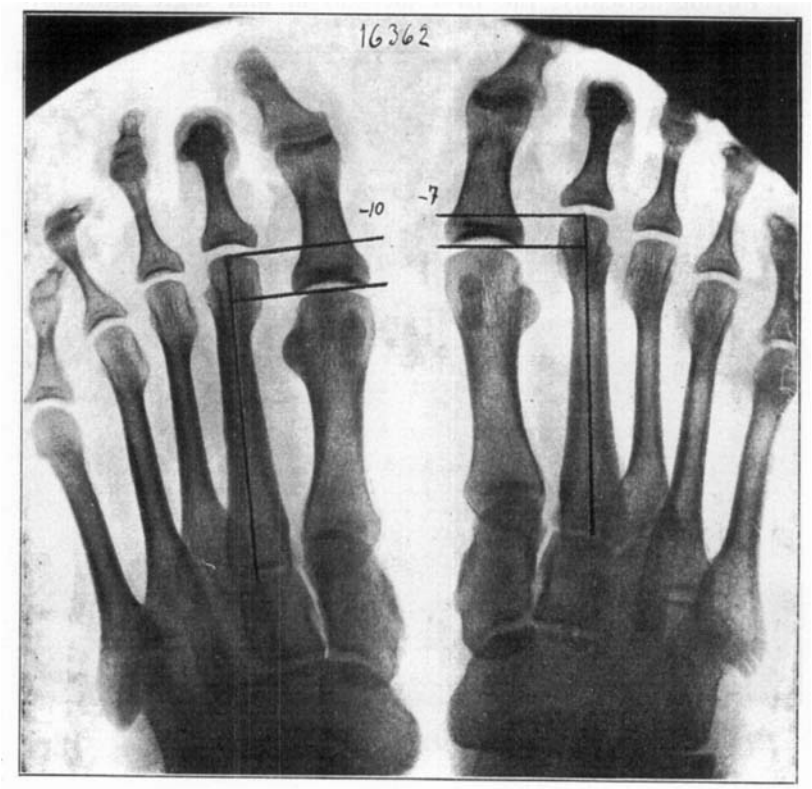

Fig. 2.
Normal foot with pronounced minus-index.

purposes). This material comprises 497 feet, none of which show hallux valgus or hallux rigidus.

I have set up a new standard: *metatarsal index*, index *plus* implying that the metatarsal I is longer than II, index *minus* signifying that metatarsal I is shorter than II, and index *plus-minus* meaning that the length of the two metatarsals is the

same. This measuring system is clearly illustrated by the following pictures (Fig. 2 and 3).

I have tabulated this static material (Fig. 4) which shows that in the majority of normal feet the metatarsal index is minus. A certain degree of metatarsus atavicus *Morton* is thus

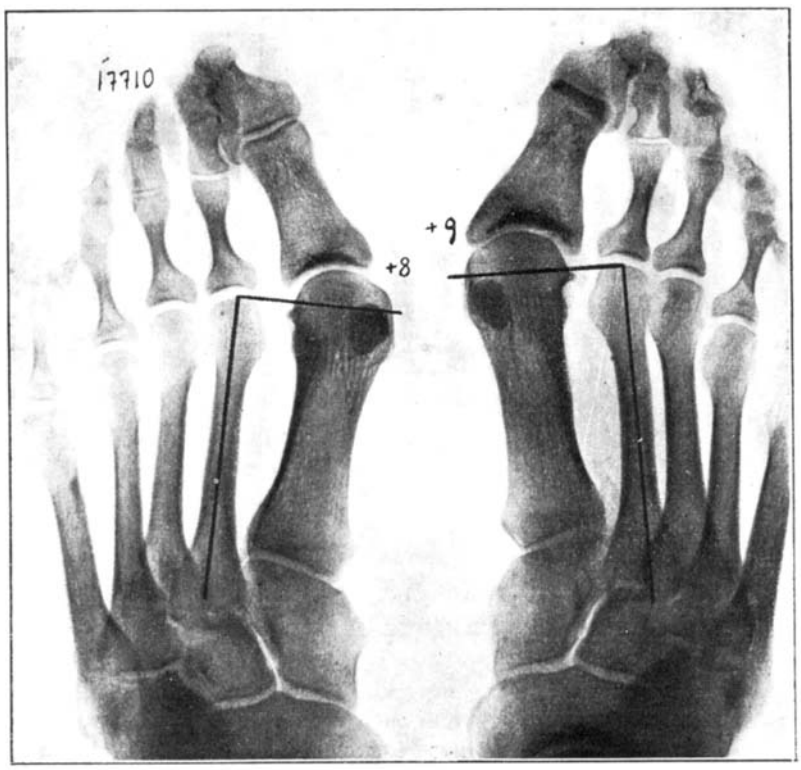

Fig. 3.
Hallux valgus with pronounced plus-index.

the normal condition. In hallux valgus and hallux rigidus, on the other hand, there is as a rule a marked index plus.

Hallux valgus and hallux rigidus, I think, may be considered from a special point of view: they are found in plano-valgus deformity, where the foot in addition shows a disproportion between the metatarsals I and II. These index relations may

not, perhaps, be of decisive importance to the production of these lesions; but undoubtedly, I think, they constitute a significant and heretofore unrecognized factor in the development of hallux valgus and hallux rigidus.

I would like to express my view in this way, that I think that hallux valgus is a preventive reaction against hallux rigi-

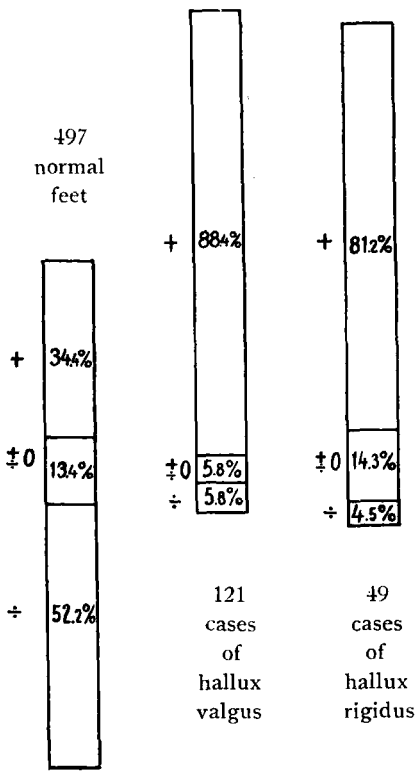

Fig. 4.

dus. In some feet where the dynamic mechanism of the first metatarsal is out of order, the great toe cannot for some reason be abducted so much that a hallux valgus deformity may develop. The result of this will be a flexion contracture of the basal joint with secondary arthritis deformans, in which I look upon the arthritis deformans from the point of view suggested by

Pommer and *Beneke*, i. e., »funktionelle Ueberbeanspruchsnahme«. It is further to be noted that this process develops during the age of growth, for which reason the histological picture of the changes in the metacapitulum I is of a peculiar type (a detailed description of this will be published in an other connection).

As to the treatment of hallux rigidus, I wish briefly to state that if the case is not all too severe one may accomplish quite a lot with foot-plate treatment, although this is only to be considered a palliative measure. An arch-plate with elevation of metatarsal I will raise the joint of the great toe and thus give a certain space for »passive unrolling« of the great toe.

In a couple of cases, under anæsthesia, I have made bloodless correction of the plantar flexion of the great toe; the immediate result of the operation was good, but within ½ year, the contracture position was just as marked as before the correction. In 2 cases I have merely chiselled off the marginal exostoses; but it is my impression that this measure does not leave a permanent result. I have therefore discarded these palliative methods, and in fully developed cases I now perform radical arthroplasty on the basal joint of the great toe.

Here I shall merely say a few words of the technique. The arthroplasty has to be carried out very radically with removal of all capsule tissue; a large part — at least ½ cm. — of the capitulum is resected and on the endoarticular surface (which often shows macroscopic changes as well as microscopic) the resection comprises not only the cartillage, but also op to ½ cm. of the basis of the phalanx. After double fascia lata-covering of the bone ends foot-plaster, with the great toe in slight dorsal flexion. When the operation is completed, the basal joint of the great toe should be perfectly »loose«, and this result is obtained most readily if the joint resection is broad. After the first week, passive motion treatment; and 12—14 days after the operation, the patient begins to walk about a little, which is the best mobilization treatment for the new joint. I have operated 8 cases after this fashion. The first one turned out to be something of a failure, as the resulting

mobility was very slight; and I attribute this to the fact that the resection of the capitulum was not extensive enough. In the other cases, the result has been a joint free of pain, and with ca. 20—30° free dorsal flexion.

DISKUSSION:

Haglund:

In his significant study on the skeleton of the foot, *Nilsonne* has made an observation of great biological interest which is undoubtedly also of considerable practical importance. Still, with regard to the nature of the variations, it seems to me that this study might be carried further. To-day the question has merely involved the level of the metatarso-phalangeal joints in their relation to each other; but it might also be of interest to learn where in the skeleton the underlying variation is to be found. Is it in the length of the metatarsal bones — or in the level of the tarso-metatarsal joints?

Nilsonne:

On account of *Guildal*'s remarks I shall mention that to begin with I tabulated my metatarsal statistics in 2 different series: perfectly normal feet and plano-valgus feet (but leaving out hallux valgus and hallux rigidus). As these series did not show any difference, I tabulated all the cases together, for the sake of simplicity. In measuring on X-ray plates one is naturally liable to mistakes from projection errors; but these are too small, I think, to be of any practical importance. Nor do I think that the metatarsal index will be interfered with when the arch of the foot is falling — the difference will at least be very small. In plano-valgus deformity, as you know, the first and the second foot-rays are both lowered. However, this is a critical comment that is justified, and in further working up my material I shall keep this point in mind.

In my paper I did not mean summarily to discard the previously advanced and accepted theories as to the origin of hallux valgus. I think, however, that the length proportion of the metatarsals implies *an additional factor* to be reckoned with,

and that the study of this question will be worth its while. In my paper, however, hallux valgus was primarily included as a background for the discussion of the development of hallux rigidus, as I look upon these two lesions as elucidating each other to such an extent that one may not be properly discussed with omission of the other.