FROM THE ORTHOPÆDIC HOSPITAL, AARHUS, DENMARK
(FORMERLY SURGEON CHIEF: P. G. K. BENTZON, M.D.)

SOME VIEWS ON THE SURGICAL TREATMENT OF HALLUX VALGUS

By

H. B. MYGIND

In order to be able to evaluate the various surgical procedures used in the treatment of hallux valgus, the clinical and pathological features of the disease must be reviewed.

The condition is most common among females, a preponderance of 90 %. Most of these women acquire the deformity in late childhood. Their hands and feet become soft and weak, and the joints hypermobile. It does not seem unlikely that the underlying cause is an inherited connective-tissue disorder. Hallux valgus is so commonly familial in this group of patients that it must be considered an inherited disease.

The most striking objective findings are a bunion over the metatarsophalangeal joint of the great toe and valgus position of the toe. Closer inspection, however, reveals more profound changes in the fore part of the foot. Viewed from above during weight-bearing, the fore part shows increased breadth. X-rays show that the spread of the metatarsals is due essentially to a varus deformity of the first metatarsal. The long axes through the first and second metatarsals, which normally form an angle of 6° to 7° with each other, now form a much wider angle, 12–15°.

X-rays show, moreover, subluxation of the metatarsophalangeal joint of the great toe, the proximal phalanx being dislocated lateral to the joint surface of the capitulum and the lateral sesamoid bone displaced into the interstice between the first and second metatarsals. At a valgus angle exceeding 35°, the sesamoid bone is tilted; the edge is visible in the interstice as a narrow, oval shadow. In such a case, the great toe turns on its long axis in pronation.

In mild cases the subluxation of the metatarsophalangeal joint, with the dislocation of the lateral sesamoid bone into the interstice,

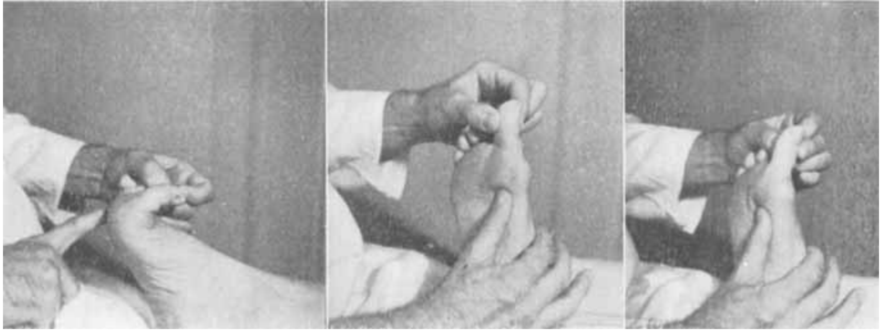

Fig. 1. Marked dorsal flexion of the toe during plantar flexion of the fore part of the foot.

Fig. 2. Limited dorsal flexion upon dorsal flexion to 90° in the ankle.

Fig. 3. Pronation of the toe and prominence of the bunion on forced dorsal flexion of the toe.

is only slight in the absence of weight-bearing. Radiography shows that the dislocation takes place during weight-bearing, while the bone slips back below the caput during rest. (Fig. 4–5).

One might advance the hypothesis that the dislocation of the sesamoid bone is the main ætiological factor in this condition. It takes place only in the above-mentioned type of female with relaxed ligaments. Because of the shoes we wear, weight-bearing is carried out with faintly contracted muscles, as the sole is not exposed to any irritant from the ground. The sesamoid bones, therefore, do not become properly fixed when weight-bearing is relieved, and are therefore more easily dislocated. We need only recall the mobile state of the patella when the quadriceps is relaxed. The dislocation of the sesamoid bones occurs because of a rupture in the fascia surrounding the head of the first metatarsal. Dissection of the foot reveals a weak site in the connective tissue on a level with the bunion, presumably the site of the rupture.

As regards the functional disturbances in the fore part of the foot and the toes, especially the great toe, *the subluxation is the main feature* which causes profound changes in the movement of the metatarsophalangeal joint. Normally, the function of this joint is that of a simple hinge joint the axis of which passes horizontally through the capitulum. In the presence of subluxation, the axis of this movement is more oblique, in the valgus position, depending on the valgus angle of the toe. In addition to the hinge movement, determined by this axis, the toe performs a rotation in the valgus direction, the axis of which passes vertically through the capitulum, so that the valgus angle

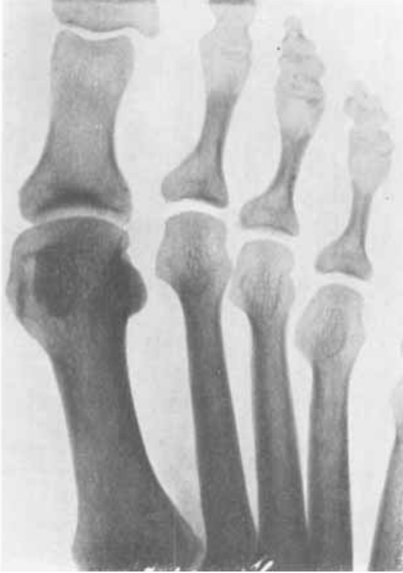

Fig. 4.
Radiograph showing the sesamoid bones in situ in mild hallux valgus.

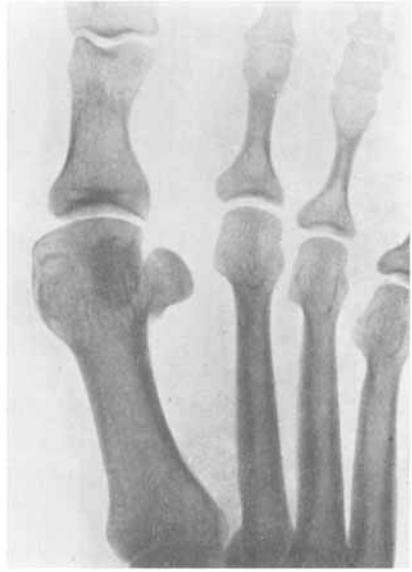

Fig. 5.
Radiograph showing the same foot during weight-bearing. The lateral sesamoid bone has been displaced and is visible *on edge* in the interstice.

is increased on dorsal flexion of the toe. Furthermore, the toe rotates on its long axis in pronation. This may be distinctly seen on passive dorsal flexion of the toe. It will be observed also that the dorsal flexion of the toe depends on the flexion of the fore part of the foot. On considerable plantar flexion of the fore part of the foot, such as occurs with a high-heeled shoe, the dorsal flexion of the toe is free, and the valgus position described above is not very marked. On dorsal flexion of the fore part of the foot to about 90°, passive dorsal flexion of the toe can only amount to 10–15°. If the dorsal flexion is forced, the toe is pronated and the valgus position increased, enlarging the bunion, and the metatarsal bone is turned into the varus position and pronation. (Fig. 1–3).

This "deleterious mechanism" takes place each time weight-bearing is relieved, the bunion rubs against the leather of the shoe, the varus tendency of the first metatarsal is increased, and the metatarsocuneiform joint of the great toe becomes ever looser.

The diminished dorsal flexion of the toe in right-angled flexion of the fore part of the foot is an important factor. It may be called

functional hallux rigidus. It is presumably due to a shortening of the plantar fascia and the flexor hallucis brevis combined with elevation of the first metatarsal which increases the relative shortening of the plantar soft parts.

Another main feature is the *insufficient power of flexion* in the great toe. It has been considerably reduced, almost down to 0, in all the patients examined. The weakening is a consequence of the subluxation and the oblique traction exerted by the tendons owing to the valgus position of the toe.

The bone does not put up the necessary resistance to the pull of the muscles. Instead of flexion in the metatarsophalangeal joint, an increased valgus position is brought about.

The *third main feature* is the abolition of the medial weight- supporting segment of the foot. This is an active point of support, maintained by muscular power, pulling the toe and the head of the first metatarsal into plantar flexion. The muscles involved are the flexor hallucis brevis and longus, the peroneus longus, and the abductor and adductor hallucis. The capitulum is pulled dorsally and into varus position, as the insufficient flexors are unable to keep the toe pressed towards the ground when weight-bearing is relieved. The weight must then be carried by the other parts of the fore-foot, especially the capitula of the second, third, and fifth metatarsals. This is clearly apparent upon inspection of the sole. Callosities may be seen on these capitula, whereas the ball of the great toe is smooth without any signs of weight-bearing.

Unlike the great toe, the lateral toes are not supposed to exert great force in the shift in weight-bearing. Gradually, there will be a tendency to subluxation, particularly in the second metatarsophalangeal joint, and finally the capitulum will be forced in a plantar direction through the joint capsule, always medial to the flexor tendon. And even though this does not happen, the patient will gradually develop more or less severe pain in the fore part of the foot. The middle toes often assume the hammer toe position, partly due to the narrow space in the shoe itself resulting from the valgus position of the great toe, but also because they are not suited to carry a heavy weight, as only the pulp is in contact with the ground. The pressure will affect this site and under the capitulum.

When the great toe is normal, pressure is brought to bear on the entire plantar aspect, as the toe is in contact with the ground, and flexion in the distal joint is impossible when weight-bearing is relieved.

The surgical treatment of hallux valgus is supposed to preserve the mobility of the metatarsophalangeal joint and to correct the valgus

position by reducing the subluxation in the metatarsophalangeal joint. This re-establishes the hinge movement and the power of flexion, making the ball of the great toe the medial point of support as before. Consequently, the pain in the fore part of the foot is mitigated. The bunion disappears as soon as the subluxation is reduced.

Simple straightening of the toe is impossible, but it is necessary to shorten the metatarsal bone. Follow-up of patients who have undergone an arthroplasty of the metatarsophalangeal joint with shortening of the metatarsal by about 2 cm reveals the great toe to be in the hammer toe position. The metatarsophalangeal joint is in dorsal and the distal phalanx in plantar flexion. The explanation is that the flexor hallucis brevis is insufficient, as its origin and insertion have been approximated too much. The muscle is too short to compensate for the shortening of the bone. Therefore, the proximal phalanx is in dorsal flexion. The distal phalanx is in plantar flexion, because the flexor hallucis longus, owing to its length, is better suited to compensate for the shortening.

The partial decapitation of the arthroplasty abolishes the medial point of support, shifting the weight to the capitula of the second and third metatarsals.

The insufficiency of the toes and the abolition of the medial point of support account for the severe pain in the fore part of the foot following arthroplasty.

The surgical shortening should preferably not exceed ¾ cm for which the flexor hallucis brevis is usually able to compensate.

The so-called Schede operation consists in a simple chiselling away of the medial part of the capitulum (the "exostosis"), but the toe is not straightened, and the subluxation persists. The abnormal movement in the joint continues and increases the valgus position of the toe "with each step".

The late results of the Schede operation have also shown that the improvement lasts only a few years; at the end of three or four years, the symptoms recur and the valgus deformity of the toe is increased.

The most attractive procedure, anatomically as well as functionally, is an osteotomy of the first metatarsal. The distal end of the bone is cut obliquely from the lateral towards the distal and medial aspect. The medial part of its distal end is cut, while a tip is preserved on the lateral and plantar aspect to be fitted into a recess made in the dorso-medial part of the opposing surface of the capitulum. This corrects the valgus position of the toe at the same time as the subluxation in the metatarsophalangeal joint is reduced. Simultaneously, the bunion disappears, the breadth of the fore part of the foot is diminshed,

and the medial point of support is re-established, as the capitulum has been shifted towards the plantar aspect.

The movement of the metatarsophalangeal joint is again a hinge movement, the power of flexion has been partially restored, so that the toe again takes part in the movement of walking with normal weight-bearing.

SUMMARY

On the basis of a follow-up study of patients who had undergone operations for hallux valgus, the author submits theoretical considerations regarding the surgical treatment of this condition. It is pointed out that surgery must correct the deformity by abolishing the subluxation in the metatarsophalangeal joint. This re-establishes the hinge movement in the joint. The flexion power of the toe improves and the medial point of support of the foot is maintained.

The necessary shortening of the first metatarsal, ½–¾ cm, must not be exceeded, as insufficiency of the flexor hallucis brevis will result.

RESUME

Sur la base du réexamen de malades qui ont été opérés pour hallux valgus, l'auteur soumet des considérations théoriques sur les conditions du traitement chirurgical. Il est souligné que l'intervention chirurgicale doit corriger la déformité en abolissant la subluxation de l'articulation métatarsophalangienne. Ceci rétablit le mouvement de pivotement de l'articulation. Le pouvoir de flexion de l'orteil est amélioré et le point médial de support du pied est maintenu.

Le racourcissement nécessaire du premier métatarsien, ½ à ¾ de cm. ne doit pas être dépassé, car il en résulterait une insuffisance du fléchisseur hallucis brevis.

ZUSAMMENFASSUNG

Auf Grund von Nachuntersuchungen von Patienten, an denen eine Operation wegen Hallux valgus vorgenommen worden war, legt der Verfasser einige theoretische Betrachtungen über die Behandlung dieses Zustandes vor. Er hebt hervor, dass die Deformitet durch die Beseitigung der Subluxation im Metatarsophalangealgelenk korrigiert werden muss. Dies stellt den Scharniermechanismus des Gelenkes wieder her. Die Beugefähigkeit der Zehe bessert sich und der mediale Unterstützungspunkt des Fusses bleibt erhalten.

Die notwendige Verkürzung des ersten Metatarsus, ½–¾ cm, darf nicht überschritten werden, da andernfalls eine Insuffizienz des Flexor hallucis brevis entstehen würde.

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