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HALLUX VALGUS TREATED BY THE McBRIDE OPERATION

A Follow-up

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McBride has described his method for the operative treatment of hallux valgus several times (McBride 1928, 1954, 1967). Its principle (Figure 1) is to alter the balance between the forces of the abductors and adductors of the great toe; at the same time the metatarsals are approximated and the position of the great toe is corrected.

The adducting force upon the great toe is altered by transposing the insertion of the conjoined tendon from the transverse and the oblique heads of the adductor hallucis from the first phalanx of the great toe to the lateral aspect of the first metatarsal head. The original description of the method (McBride 1928) also included transposition of the tendon from the lateral head of the flexor hallucis brevis, but later (1954) McBride altered the technique, warning against damaging the tendon, as this might give rise to a "cock-up toe".

In this method the conjoined adductor tendon is detached and the lateral sesamoid bone excised, since it contributes to increasing the deformity. This facilitates the approximation of the metatarsals which is considered an important link in the operation. McBride (1954, 1967) used either a fascial-periosteal suture applied between the lateral aspect of the first metatarsal neck and the medial aspect of the second metatarsal neck or else a circumferential suture around the necks of both these metatarsals. Joplin (1950) described a modification of the technique of approximating the metatarsals, carrying the conjoined adductor tendon through a drill hole in the first metatarsal and fixing it under tension. He also used the extensor tendon from the fifth toe to reduce the spread of the metatarsals.

The correction of the valgus deformity of the great toe is done by shortening the joint capsule on the medial aspect of the metatarso-phalangeal joint by a plication of the joint capsule after the prominent

medial part of the first metatarsal head has been removed. Thereafter, the great toe is dressed in slight, but not too marked overcorrection.

At the Orthopaedic Hospital, Copenhagen, the McBride method was introduced in 1954, and since then it has been used, with minor modifications, in the treatment of a large number of patients. To assess the results after a suitable observation period, a group of these patients have now been subjected to a follow-up study.

MATERIAL

During the period 1. 4. 1964 to 31. 3. 1967 a total of 107 patients were treated by the McBride operation at the Orthopaedic Hospital, Copenhagen.

Seven patients had to be left out of the material. Three have died, one foreigner cannot be traced; 2 have gone abroad, but have answered by letter that they are satisfied and have no complaints. One patient cannot spare the time for a follow-up examination and refuses to be X-rayed, but states that she is satisfied with the result.

Another 9 patients were excluded for the following reasons: One developed rheumatoid arthritis during the follow-up period. One has had an operation for the sequelae of traumatic contusion. One had sequelae of poliomyelitis. Two had foot deformities as a link in neurological diseases. Two had previously undergone hemiepiphyodesis because of metatarsus varus. Simultaneously with the McBride operation one patient had had fusion of the cuneiform-first metatarsal articulation. During the period in question one patient had re-operation after a previous McBride operation on the same foot; three years later she had a McBride operation on the other foot too. Now she has no complaints.

This leaves 91 patients, two of whom are men.

In 25 cases the operation was carried out on the right foot, in 18 on the left foot, and in 48 cases it was bilateral. Thus, the study comprises 139 feet.

Table 1 gives the age distribution at the time of the operation. The youngest patient was 12 years of age and the oldest 67.

Preoperative complaints: 73 patients reported pain in the bunion, 11 deformation

Table 1. Age distribution at the time of operation.

Age at operation	Total no. of patients	Group 1	Group 2	Group 3
10-19	18	12	3	3
20-29	12	7	3	2
30-39	14	9	3	2
40-49	21	12	5	4
50-59	21	10	7	4
60-69	5	2	2	1
Total	91	52	23	16

of shoes, 6 had only cosmetic complaints, and in one case the complaints are unknown.

METHOD

The operation was carried out in a bloodless field. Two incisions were applied, one in the first interstice and one medially over the bunion. The lateral sesamoid bone was removed in all but 10 patients. The conjoined tendon from the transverse and oblique heads of the adductor hallucis was detached from its insertion on the first phalanx. In 10 patients it was fixed to the lateral aspect of the first metatarsal head, in 18 patients it was anchored to a drill canal in the first metatarsal head, and in 33 patients it was fixed medially, having been carried through a subperiosteal tunnel on the plantar aspect of the first metatarsal neck. In 30 cases this information was not available. The prominent part of the bone was removed in all the patients, and in all cases capsuloplasty was done on the medial aspect of the joint, correcting the great toe. In cases where the adductor tendon was fixed medially or anchored in a drill canal, the approximation of the metatarsals was done by means of this tendon, whereas it is not definitely known how the approximating sutures were applied in cases where the tendon was fixed laterally.

Postoperative Treatment

In 36 cases the sutures were removed on the 14th postoperative day, a walking cast was applied and worn for 3 weeks. The remaining patients were allowed weightbearing immediately after the sutures had been removed, i.e. on the 14th postoperative day in 48 cases and on the 21st postoperative day in 7. Most patients could be discharged after 3 or 4 days in hospital, but for social reasons many were kept until the sutures had been removed.

At the time of the McBride operation 15 patients had surgery for hammer toe on one or more of the small toes. One patient had an operation for varicosities.

Three patients developed superficial inflammation of the wounds which soon healed, but in one of them not until chronic catgut sutures had been rejected.

RESULTS

All 91 patients were examined by the author and all were X-rayed. The follow-up period ranged from 5 to 8 years, mean 6 years 4 months.

In an endeavour to detect the reasons for the difference in operative results, the patients were divided into three groups on the basis of their subjective evaluation of the operation.

Group 1 comprises 52 patients who have no foot complaints and all of whom wear ordinary factory-made shoes. One had cosmetic complaints on account of the varus deformity of the great toe.

Group 2 comprises 23 patients who are satisfied with the operation, but who nevertheless have some foot complaints. All but one wear ordinary shoes, but have difficulties in finding shoes that fit.

One is wearing hand-made shoes because of hammer toes on the small toes.

10 were unable to localize their complaints.

1 had unchanged valgus deformity of the great toe.

4 had complaints because of varus deformity.

1 had pain at the bunion.

6 complained of metatarsalgia, and 2 of them also had complaints because of a persisting bunion.

Group 3 comprises 16 patients who are dissatisfied, but 6 of them only with one foot.

2 have complaints because of persisting valgus deformity, but one of them merely for cosmetic reasons.

2 have complaints because of varus deformity.

3 have complaints because of flexion deformity.

1 has combined varus and flexion deformity.

2 have metatarsalgia as the main complaint.

3 have osteoarthritis complaints from the metatarso-phalangeal joint of the great toe as well as metatarsalgia and hammer toes in the small toes.

3 have had re-operation and will be described in more detail below.

One had preoperatively a valgus deformity of 30°. After the operation this changed to a 5° varus deformity which became accentuated in the course of 8 months to 15°. Then a re-operation was performed by the method of Keller-Brandes. At follow-up the great toes still showed 5 and 10° varus deformity and flexion deformity. The patient is wearing hand-made shoes.

The second patient, who underwent a unilateral operation, had a preoperative valgus deformity of 40°. After the operation varus and flexion deformity developed. Eight months later interphalangeal fusion was performed. The toe is still in varus, pointing dorsally. The patient is wearing ordinary shoes with insoles.

The third patient had preoperatively few complaints, with a valgus deformity of 25–30°. After the operation both great toes were in varus

Table 2. Valgus-varus deformity of the great toe pre-and postoperatively.

	Group 1	Group 2	Group 3
Total no. of feet	74	36	29
Angle preoperatively			
>45°	2	5	2
25-45°	59	24	20
10-25°	13	7	7
Angle postoperatively			
>45°	1	2	1
25-45°	16	8	6
10-25°	40	15	11
0-10°	15	5	1
Varus	2	6	10

position. Nine months later a re-operation was carried out by the Keller-Brandes method. However, the varus deformity persisted, and 3½ years after the primary operation metatarso-phalangeal fusion was performed, but non-union remained on both sides. This patient still has severe complaints, and she has been offered amputation of the left great toe. She is wearing hand-made shoes.

At the physical examination the position of the great toe was assessed, both without weightbearing and during walking, especially during push-off. Active and passive mobility in the metatarso-phalangeal and interphalangeal joints of the great toe were measured. Moreover, the patients were examined for hammer-toe formation in the small toes and for tender callosities under the forefeet.

Table 2, giving the results for each foot, shows the distribution within the 3 groups of valgus and varus deformity of the great toe before and after the operation. The measurement was done on the

Table 3. Postoperative occurrence of reduced ability for plantar flexion and flexion deformity, given for number of feet within each group.

	Group 1	Group 2	Group 3
Total no. of feet	74	36	29
Reduced plantar flexion in proximal joint	10	13	14
Flexion deformity	1	10	7

basis of the X-ray films, but compared with the clinical assessment. It should be mentioned that in patients who exhibited varus deformity, this deformity was accentuated during weightbearing. In the case of the 9 feet which had not been X-rayed preoperatively, the evaluation was based on the clinical record of the valgus angle. After the operation, a shift had occurred towards a lesser valgus deformity, in accordance with the aim. A more outstanding factor, however, was the over-correction that had taken place. This was of increasing relative frequency in the direction of the group with the poorest results. The 3 re-operated patients are included in this analysis, as the re-operations were done because of varus deformity. Moreover, there was in some cases a postoperative valgus deformity of less than 10° . This gives an ungainly cosmetic result because of too great a distance between the first and second toe, although in most cases it has not caused functional complaints.

Table 3 presents the patients' ability for active plantar flexion in the metatarso-phalangeal joint of the great toe. Reduced function is taken to mean cases in which the great toe is 10° short of being flexed to the neutral position in the metatarso-phalangeal joint, i.e. so that the first phalanx is in prolongation of the axis through the first metatarsal bone. Most people with normal feet are able to plantar flex the metatarso-phalangeal joint of the great toe $20-30^\circ$ past the neutral position. In the present material, however, a number of patients were incapable of active flexion beyond the neutral position in the non-operated foot, for which reason the above-mentioned limit was chosen.

In the most severe cases the great toe could not even be brought passively to the neutral position. In Table 3 this is recorded as flexion deformity, this permanent dorsal flexion position in the metatarso-phalangeal joint being accompanied by plantar flexion in the distal joint of the great toe. This causes tenderness and possibly callosity on the dorsal aspect of the distal joint of the great toe due to the pressure from the shoes.

One patient, who had undergone re-operation, stated that the great toe was gradually tending ever more inwards. All the others felt that the great toe was in the same position at follow-up as it had been immediately after the operation. This applied to the correctly placed as well as to the overcorrected and undercorrected great toes.

Tender plantar callosities beneath one or more of the 2nd-4th metatarsal heads had been recorded preoperatively in 51 feet and were present also at follow-up. In 16 feet they were demonstrated at follow-

Table 4. Radiological evidence of osteoarthritic changes in the proximal joint of the great toe pre- and postoperatively, as a percentage of the total number of feet X-rayed within each group.

	Group 1	Group 2	Group 3
Preoperatively	11	11	7
Postoperatively	24	39	25

up without having been recorded preoperatively. In 17 feet they had been recorded preoperatively, but could not be found at follow-up.

Hallux rigidus, i.e. deficient dorsal flexion in the metatarso-phalangeal joint of the great toe during weightbearing, had been recorded in 5 feet preoperatively, but was not found at follow-up. This phenomenon was also not seen in other cases.

X-ray Findings

At follow-up all the feet were X-rayed in the dorsal-plantar, lateral, and slightly oblique views.

Nine feet had not been X-rayed preoperatively.

The frequency of osteoarthritis pre- and postoperatively is presented in Table 4. The signs of osteoarthritis are taken to be a narrowed joint space with marginal sclerosis and possible osteophyte formation. A single marginal exostosis is not interpreted as osteoarthritis. All feet which had exhibited osteoarthritis preoperatively also showed such changes at follow-up. The re-operated feet are not included in the postoperative analysis.

The angles between the first and second and between the first and fifth metatarsal bones were measured in order to investigate in how many cases the metatarsals had been approximated during the opera-

Table 5. Radiological evidence of postoperative reduction of the angle between the first and second metatarsals as well as of the angle between the first and fifth metatarsals, as a percentage of the total number of feet within each group.

	Group 1	Group 2	Group 3
Angle between first and second metatarsal reduced	64	50	54
Angle between first and fifth metatarsal reduced	31	37	21

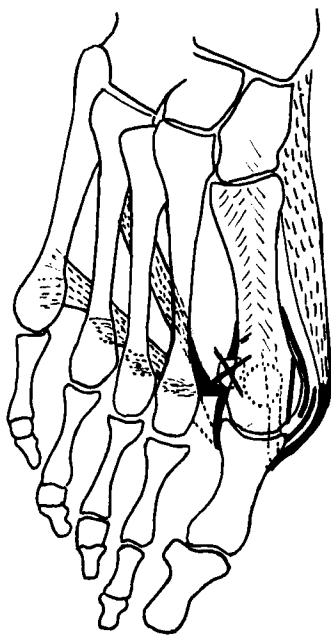


Figure 1. Principle of the McBride operation. The insertion of the adductor hallucis tendon is transposed from the proximal phalanx of the great toe to the lateral aspect of the first metatarsal head. The lateral sesamoid bone is excised. The prominent medial part of the first metatarsal head is chiselled off. The medial part of the joint capsule is shortened by a plication.

tion. The results are shown in Table 5. It should be mentioned that these angles may undergo marked variations due to a slight change in the projection. Therefore, only those cases in which the angles had been reduced by 20 per cent were recorded.

DISCUSSION

Summing up, the operative result may be classified as good (Figure 2) in 72 feet which make up 52 per cent of all operated feet. These are the cases in which the patients have no complaints on account of great toes which are postoperatively in a valgus position of 0–25°.

A fair result was found in 49 feet, corresponding to 35 per cent. These patients had moderate complaints because of the great toes or else the operative result was not quite satisfactory because post-

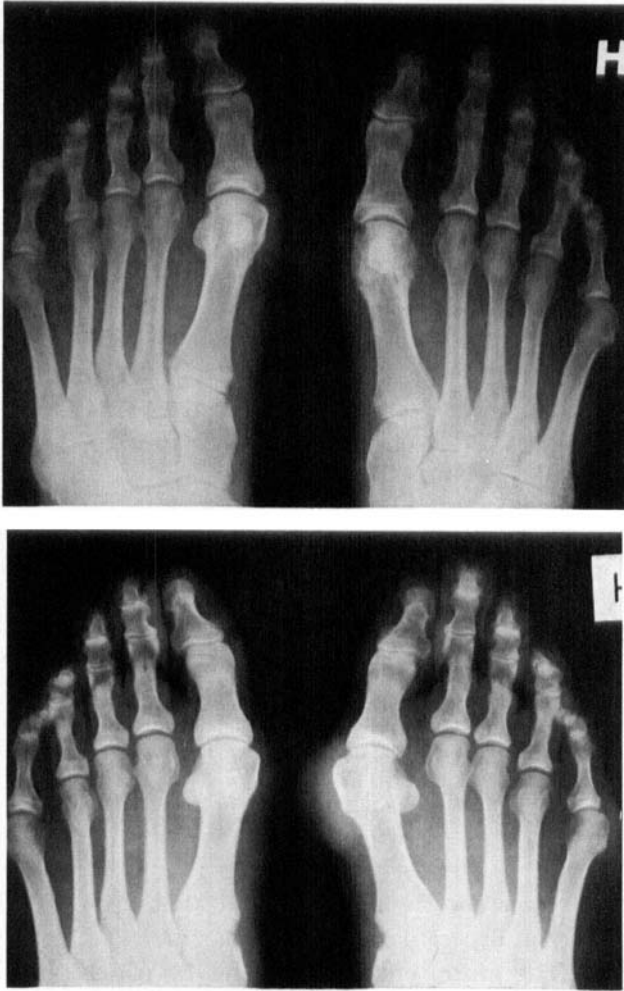


Figure 2. A good result after unilateral operation. A suitable valgus position and good approximation of the metatarsals.

operatively there was a valgus position of $25-45^{\circ}$ or slight varus deformity.

Feet with severe varus or flexion deformity, or a combination thereof, and feet with persisting valgus deformity of 45° or over were designated as poor results. This applied to 18 feet or 13 per cent. The three re-operated patients are included in this group.

Analysis of the results (Table 1) showed that the age at operation

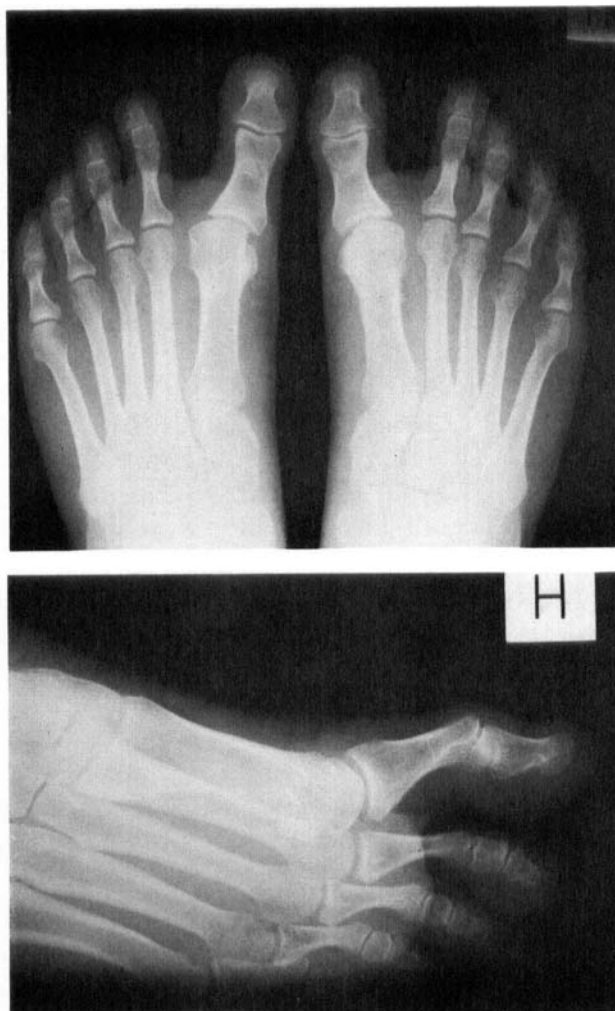


Figure 3. Overcorrection of the great toes and flexion deformity.

was of the same relative distribution in all three groups. The follow-up period averaged 76 months in group 1, 76 months in group 2, and 77 months in group 3.

The times of removing the sutures, the use of a plaster cast, and possible associated operation for hammer toe on the small toes showed a uniform distribution within all three groups.

Minor radiological signs of osteoarthritis proved of no importance to

the operative result (Table 4). In 3 patients there were such severe degenerative changes in the feet pre- as well as postoperatively that this operative method should probably not have been used.

From Table 2 it is apparent that the preoperative degree of the valgus deformity bore no relation to the operation result. The less satisfactory results are seen to be related to the overcorrection and flexion position which had arisen. This concerns primarily the operative procedure itself, as the position of the toe does not change after the operation.

In the present material overcorrection was found in 11 patients, representing 18 great toes (Figure 3). Three patients had re-operation because of varus deformity, without a satisfactory result being obtained, as it proved extremely difficult to correct the toe again. As pointed out by Hawkins (1971), the flexor hallucis longus, with the extensor hallucis longus, will maintain the varus deformity once the great toe has been carried medially to the axis through the first metatarsal bone and the effect of the adductor hallucis has been eliminated. This presumably explains why it was impossible, in two cases, to correct the varus deformity by merely resecting the proximal part of the first phalanx of the great toe. Hawkins (1971) has advocated a method by which the toe may be corrected by transposing the tendon from the abductor hallucis to the lateral aspect of the first phalanx of the great toe.

The varus deformity, which has been just as much of a problem in other series (Jansen 1965, Ahlbeck 1967, Baciu & Scarbura 1969), is due to the fact that apart from removing the adducting factor represented by the adductor hallucis muscle, the operation may injure the lateral tendon from the flexor hallucis brevis during the dissection of the lateral sesamoid bone. In that case the medial part of the flexor hallucis brevis will act as an abductor, if the toe is overcorrected, as a medial shift of the medial sesamoid bone may occur at the same time as the ligament between the medial and lateral sesamoid bone has been severed. Hawkins (1971) therefore suggested omitting removal of the sesamoid bone. In a number of the operative reports from the present material it is mentioned that in the course of the capsuloplasty medially an overcorrection has been attempted, presumably in order to avoid a relapse. This must be considered an error. Hawkins (1971) also stated that too liberal a chiselling of the prominent part of the bone may contribute to overcorrection. However, this occurred in some of the present cases without leading to varus deformity (Figure 4).

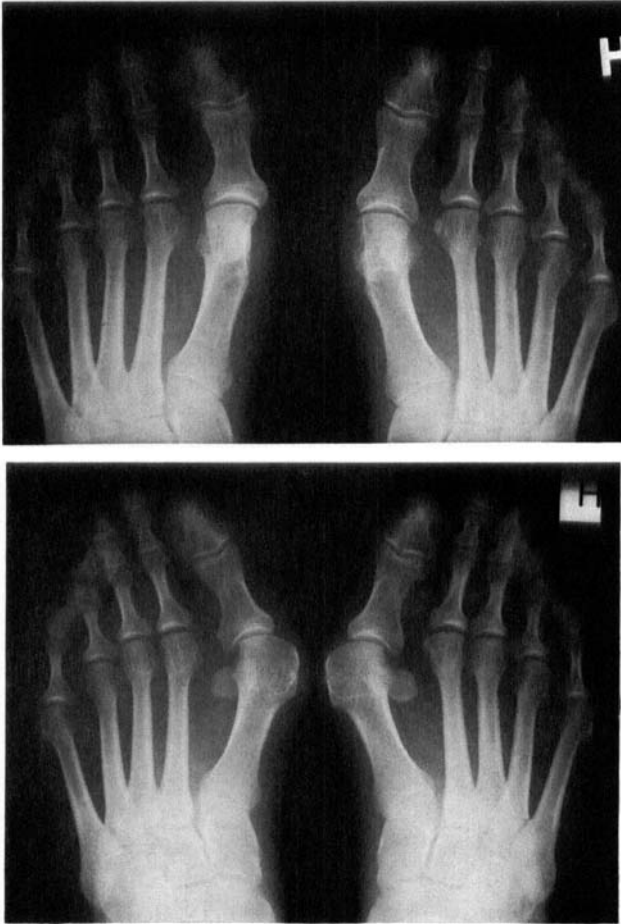


Figure 4. A good result without varus deformity, although too much had been chiselled off the bone prominence.

Accordingly, the alterations of muscle balance must be regarded as the main factor in overcorrection.

Another complication is the flexion deformity which occurred in 18 feet. This has been reported by others too (Jansen 1965, Ahlbeck 1967). In some patients the flexion deformity is combined with a varus deformity, giving the poorest possible result (Figure 3). The flexion deformity is caused by injury to the flexor brevis tendons. When the stabilizing factor is removed from the proximal phalanx of the great toe, the extensor hallucis longus, the extensor digitorum

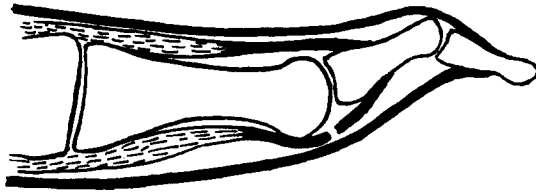


Figure 5. Flexion deformity of the great toe occurs due to the combined action of the extensor hallucis longus and brevis and the flexor hallucis longus, when the stabilizing effect of the flexor hallucis brevis has been eliminated.

brevis, and the flexor hallucis longus will contribute to pulling the great toe into a flexion position (Figure 5). As already mentioned, the lateral part of the flexor hallucis brevis tendon may be damaged during the dissection of the sesamoid bone. If the medial part of the flexor hallucis is damaged too, the flexion deformity will arise. Possibly, no actual damage to the medial tendon is needed, since as already mentioned it may become displaced after removal of the sesamoid bone, thus losing its plantar flexing effect. In the present material the conjoined adductor tendon had in several cases been carried beneath the plantar aspect of the first metatarsal neck, without any evidence that these patients, in particular, had sustained damage to the flexor brevis tendons. On the other hand, varus or flexion deformities were not demonstrated among the 13 feet in which the sesamoid bone had not been removed.

The clinical significance of approximating the metatarsal bones is in some doubt on the basis of the present material. Radiologically it could be demonstrated that the metatarsals had been approximated in about half the cases (Table 5). The result of these goniometric studies was related to the finding of tender callosities under the forefoot, especially in patients whose callosities apparently disappeared after the operation, but it was not possible to demonstrate a relationship. Moreover, the result of the radiological goniometry was related to the varying operative technique. Although the values are too uncertain for actual assessment, it is striking that among the 16 feet in which the tendon was fixed laterally radiography showed approximation of the metatarsals in only one case. Perhaps this indicates that the medial placement of the abductor tendon is the most effective method.

On the basis of the present material it may be concluded that the McBride operation for hallux valgus has afforded many good results, but also a few poor ones which may be blamed on the operative

technique, as the toe remains in the position in which it has been placed at operation. Overcorrection and injury to the flexor tendons must be avoided by using a careful technique, since otherwise the disability may become greater than that of the original problem. The sesamoid bone should not be removed unless it is severely dislocated that it prevents approximation of the metatarsals. However, the clinical significance of approximating the metatarsals has not been elucidated.

SUMMARY

A follow-up study was conducted on a series of 91 patients, representing 139 feet subjected to the McBride operation for hallux valgus. Average follow-up period was 6 years.

The operative result was classified as good in 72 feet, or 52 per cent of all operated feet, as fair in 49 feet, or 35 per cent, and as poor in 18 feet, or 13 per cent.

An analysis showed the poor results to be due primarily to a deficient operative technique, other factors—i.e. the patient's age, the severity of the preoperative valgus deformity, and minor radiological signs of osteoarthritis—being of no significance.

In the operation overcorrection should be avoided, and so should damage to the flexor hallucis brevis tendons. It is advisable not to remove the lateral sesamoid bone except in a very few cases in which it is so dislocated as to prevent approximation of the metatarsals. The clinical significance of approximating the metatarsals is in doubt.

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