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EXPERIENCE OF FLATT FINGER JOINT PROSTHESES

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INTRODUCTION

Restoration of function in damaged finger joints has always been a challenge to surgeons and a problem which they are anxious to solve, because finger-joint function is of such great importance to the total function of the hand and thereby to the rehabilitation of hands damaged by trauma or by disease. Grafting of joint surfaces or whole joints has been reported, in some cases with good results (*Graham* 1954).

Like alloplasty of the knee and hip joints, it has recently been attempted to insert endoprostheses into finger joints, in traumatic cases (*Brannon* 1959) as well as in rheumatoid arthritis (*Flatt* 1961, 1963). It seems logical to try this procedure, especially in patients with rheumatoid arthritis, because the strain upon their hands is slight and the prostheses might therefore be expected to hold. If such alloplasty could be successful, it would be an ideal treatment, since—as *Flatt* puts it—this combines the stability of arthrodesis with the mobility of arthroplasty.

In the Department of Hand Surgery of the Orthopaedic Hospital, Copenhagen, we have tried insertion of finger joint prostheses, using the model and technique of *Flatt*.

MATERIAL AND METHODS

Our material is but small and rather heterogeneous, so that it cannot form the basis of a regular analysis. Brief case histories will be given, and the experience which can be deduced from these cases will be discussed.

The operations were performed only upon the metacarpophalangeal joints of the index, middle, ring, and little fingers, on the indications listed by *Flatt:* (1) gross joint destruction, (2) palmar or ulnar dislocation of the joint, (3) ulnar drift com-

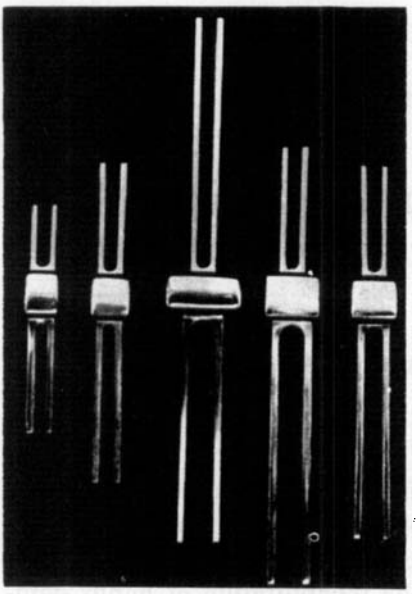

Figure 1. A finger joint prosthesis in the modification of Flatt (from Flatt: The Care of the Rheumatoid Hand, 1963).

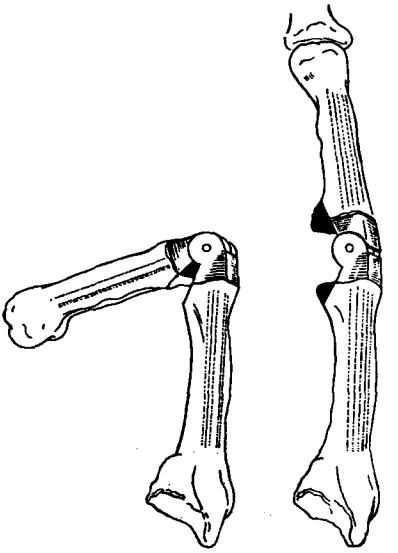

Figure 2. The position of the prosthesis illustrated schematically (from the same publication).

Figure 3.

Figure 4.

Figures 3 and 4. Destructions by old arthritis in the metacarpophalanged joint of the ring finger.

Figure 6.

Figure 5.

Figure 7.

Figures 5, 6 and 7. Same patient as Figures 3 and 4. A Flatt prosthesis has been inserted.

Figure 8.

Figure 9.

Figures 8 and 9. Same patient as Figures 3–7, 2½ years after the operation. Now, distinctly visible bone resorption around the prosthesis.

Figure 10.

Figure 11.

Figures 10 and 11. Destruction and dislocation in the metacarpophalangeal joint because of rheumatoid arthritis.

bined with joint destruction or palmar dislocation. In addition, the operation was carried out on patients with mono-articular affections.

Figures 1 and 2 are from Flatt's book "The Care of the Rheumatoid Hand" from 1963. They illustrate the type of prosthesis used and its position in schematic form.

The operations are usually easy to perform through a transverse incision dorsally over the metacarphophalangeal joints. A plaster cast is applied and left on for two weeks, whereupon energetic training is started.

CASE HISTORIES

Case I (1631/64).

A 44-year-old woman with sequelae after long-standing arthritis of the metacarphophalangeal joint of the ring finger (Figures 3 and 4), with pain and restricted mobility. A Flatt prosthesis was inserted without difficulty, but no mobility was obtained in the prosthesis, so that one month later the screw was loosened. The finger was rapidly trained, and the patient was free from pain immediately after the operation (Figures 5, 6, and 7). Six months later the result was good, subjectively as well as objectively, including the X-ray appearances. Two and a half years after the operation the result was still good clinically, but X-rays now showed definite bone resorption around the prosthesis (Figures 8 and 9).

Figure 12.

Figure 13.

Figures 12 and 13. Same patient as 10 and 11. A Flatt prosthesis has been inserted into the metacarpophalangeal joints of the index and long fingers, and a Wainio arthroplasty has been done on the ring and little fingers.

Case II (rec. 284/64).

A woman, aged 46, with rheumatoid arthritis of 2 years' duration. Never treated with cortisone. Symptoms from both wrists and from the metacarpophalangeal joint of the right index finger. Operation revealed severe destructions in this joint with ample granulation tissue, which showed microscopic evidence of rheumatoid arthritis. A Flatt prosthesis was inserted without difficulty. However, as the resection had not included a sufficient portion of the volar corners of the bones, flexion was somewhat restricted, 170/130. The patient was relieved of pain immediately after the operation. At follow-up 9 months later, she was fully satisfied with the result, but X-ray showed some bone resorption around the prosthesis. At follow-up 2½ years after the operation the patient was still satisfied and free from pain, function was good, and objectively the mobility was unchanged. However, X-ray showed slowly progressive bone resorption around the prosthesis.

Case III (rec. 7824/52).

A man, aged 46, with rapidly progressive rheumatoid arthritis of 9 years' duration. He was on cortisone medication. His right hand, which was most severely affected, showed typical changes of the metacarpophalangeal joints with destruction, dislocation, and ulnar drift (Figures 10–11). Flatt prostheses were inserted, with some difficulty, into the metacarpophalangeal joints of the index and middle fingers, and the ring finger was treated by Wainio arthroplasthy using the method which

Figure 14. *Figure 15.*

Figures 14 and 15. Same patients as Figures 10–13 two years after the operation. The prosthesis in the metacarpophanlangeal joint of the index finger has been removed because of infection, and there is definite bone resorption around the prosthesis in the ring finger, with penetration of the cortex.

Figure 16. *Figure 17.*

Figures 16 and 17. Same patient as 10–15, four years after the operation. There has been only slight progression of the bone resorption around the prosthesis.

Figure 18.

Figure 19.

Figures 18 and 19. Severe deformities in the metacarpophalangeal joints because of rheumatoid arthritis.

Flatt described in 1963 (Figures 12–13). Infection developed in the index finger, and the prosthesis in this site had to be removed 6 months after the operation. In the 3rd finger the prosthesis was working well. The patient was relieved of pain immediately after the operation, and the training was fairly easy. At follow-up 2 years after the operation the patient was fully satisfied with the result, and objectively, too, the result was good: The ulnar drift was abolished and the metacarpophalangeal joints on the long, ring, and little fingers could be moved 150/115. Comparison of the joints with Flatt prostheses and those with Wainio arthroplasty showed active flexion to be the same, while active extension was somewhat poorer in the prosthesis joint than in the Wainio joints, but, the stability was better in the prosthesis joint. The second metacarpophalangeal joint, in which the Flatt prosthesis had been removed, was ankylosed in the position of function. X-ray revea'ed resorption around the prosthesis (Figures 14–15). Four years after the operation the patient was still fully satisfied, free from pain, and function was unchanged, but X-ray showed progressive bone resorption around the prosthesis (Figures 16 and 17).

Case IV (rec. 8413/63)

A man, aged 62, with rheumatoid arthritis of long duration involving nearly all joints, with very severe deformities of the hands with extensive destructions and dislocation in the metacarpophalangeal joints (Figures 18–19). Prolonged, intensive cortisone therapy. Flatt prostheses were inserted into the metacarpophalangeal joints of the index and the little finger, and Wainio arthroplasty was done on the middle and ring fingers of one hand (Figures 20–21). The immediate result was good. with relief of pain and improved function. At follow-up, 1 year after the operation, the patient was very pleased with the result. For instance, he could lift

Figure 20.

Figure 21.

Figures 20 and 21. Same patient as 18–19. Flatt prostheses have been inserted in the metacarpophalangeal joints of the index and little fingers. Waino arthroplasty has been done on the long finger and ring finger.

a cup which he had not been able to do for many years, and he asked to have a similar operation done on the other hand. Objectively, the result was also satisfactory, considering how severely affected the hand had been before the operation. The patient could clench the hand fairly tightly. He could extend the fingers normally in the proximal and distal interphalangeal joints, the extension was 130° in the metacarpophalangeal joints of the index and little finger (with the prostheses) and 170° in the middle finger and the ring finger (treated by Wainio arthroplasty). However, X-ray showed bone resorption around the prostheses, especially in the little finger, with penetration of the cortex (Figures 22–23). At follow-up 2½ years after the operation the patient was still pleased with the hand, mobility was unchanged, but X-ray showed progressive resorption around the prostheses. The other hand had been treated by the same procedure, but this hand proved very difficulty to train, and at follow-up, 18 months after the operation, the result was unsatisfactory. True, the patient had been relieved of pain, but function was poor, with no active mobility in the metacarpophalangeal joints, neither in those treated by prostheses nor in those treated by arthroplasty. X-rays showed no bone absorption around the prostheses, presumably because they had not been moved.

Case V (rec. 16861/62)

A woman, aged 54, with a long history of severe rheumatoid arthritis treated for a long time with cortisone. Owing to severe changes in the hands, with destructions and dislocations in the metacarpophalangeal joints, Flatt prostheses were inserted into the index and little fingers, and Wainio arthroplasty was done on the long and ring fingers. The immediate result was good, the patient was relieved of pain

Figure 22.

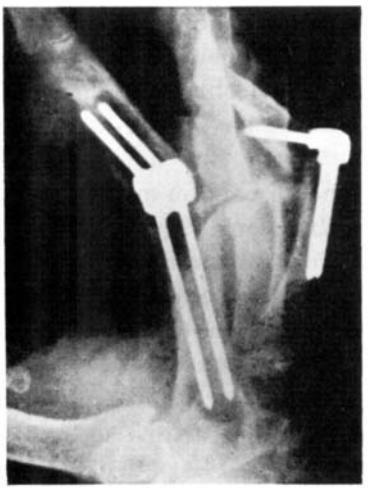

Figure 23.

Figures 22 and 23. Same patient as 18–21, one year after the operation. Pronounced bone resorption around the prostheses with penetration of the cortex.

and training was started, but in one month swelling and tenderness appeared at the site of the metacarpophalangeal joint of the index finger. However, this reaction responded to penicillin therapy. Six months after the operation, the patient was still free from pain, but function was poor, and X-ray showed bone resorption around the prostheses. The patient has failed to appear for continued follow-up in spite of repeated requests.

Case VI (rec. 594/57)

A woman, aged 63, with a long history of rheumatoid arthritis involving many joints. Repeated courses of cortisone therapy. Owing to destruction and dislocation in the metacarpophalangeal joints a Flatt prosthesis was inserted into the index finger and Wainio arthroplasty was done on the long, ring, and little fingers. It proved rather difficult to train the fingers. At follow-up, 6 months later, the patient reported tenderness of the metacarpophalangeal joint of the index finger when she used it, but otherwise the joint was practically free from pain. Mobility was 170/105, and X-ray showed some bone resorption around the prosthesis. At follow-up, 2 years after the operation, the clinical result was still quite good, but on the X-ray films the absorption around the prosthesis was found to have slowly progressed.

DISCUSSION

Thus, 6 patients had 11 Flatt prostheses inserted. In one case the prosthesis had to be removed because of infection, while in another case of infection the symptoms yielded to penicillin. The patients on cortisone therapy, because of rheumatoid arthritis, showed radiological

signs of bone resorption around the prostheses as early as 6 months after the operation except in the case of 2 prostheses where no mobility had been obtained. The best result was obtained in the patient who did not have rheumatoid arthritis, and who had also not received cortisone. But now—2½ years after the operation—X-ray showed bone absorption around the prosthesis in this case, too.

Brannon (1959) used his prosthesis in traumatic cases. Like others, he found bone resorption, with consequent loosening of the prosthesis, to be the main complication. He tried to obtain better fixation by a couple of staples, but the follow-up in those cases was not long enough to allow assessment of the late results.

Flatt inserted his prostheses into a large number of patients with rheumatoid arthritis. In his paper from 1963, his material had increased to 140 patients. His results are striking, and he has very few complications. True, he *has* observed bone resorption around some of the prostheses, but he does not attach any major importance to it. According to Flatt, this complication is more common among patients who do not have rheumatoid arthritis, because they use their hands more. This is at variance with the observations made in the present material, in which the bone resorption appeared earliest in the rheumatoid patients, especially those on cortisone. It is likely that cortisone promotes this bone resorption.

In other words, the use of endoprostheses in the finger joints involves considerable complications. Apart from infection, *Flatt* (1963) mentioned sloughing of the overlying soft tissues and various technical errors. In the present author's opinion by far the most serious complication is the inevitable bone resorption which must be interpreted as the precursor of loosening of the prosthesis. All these complications might lead one to abandon the procedure entirely. It is a fact, however, that the patients are relieved of pain after the operation, that the training is relatively easy and need not be long, that function becomes good, and that these gains will persist for up to 4 years after the operation in spite of radiological evidence of bone resorption around the prostheses. With the present technique the method must be reserved for old patients with pain and severe deformities.

If the Flatt prostheses are to be used for wider indications, they have to be fixed better. As already mentioned, Brannon tried staples, but the prostheses might possibly be fixed with acryl cement such as the McKey-Ferard prosthesis in the hip. But the experience with the Judet prostheses argues one somewhat hesitant in using acryl.

CONCLUSION

Endoprostheses inserted into finger joints give good primary results—relief of pain and good function—when inserted into traumatized or rheumatoid joints. The main complication is bone resorption around the prosthesis with subsequent looseness. This complication is most common in patients with rheumatoid arhritis, especially if they are on cortisone. The method must therefore be reserved for old patients with pain and severe deformities, in whom it is important to obtain relief from pain and improved function, even though the result can be maintained for only a few years. If a means of fixing the prosthesis better can be found, the indications might be extended.

SUMMARY

Flatt finger joint prostheses were inserted into 11 joints of 6 patients. Infection occurred around 2, one of which had to be removed. All the patients were relieved of pain immediately after the operation, and function was good in all but one. The main complication was radiologically demonstrable bone resorption around the prostheses with subsequent loosness. This absorption appeared earliest in rheumatoid patients on cortisone. It is pointed out that in its present form the method can be used only for old patients with pain and severe deformities. If a better fixation method should be found, the indications might be extended.

RESUME

Des prothèses Flatt des articulations des doigts ont été insérées dans 11 articulations, chez 6 malades. Une infection s'est produite dans deux cas; il a fallu retirer la prothèse dans l'un de ces cas. Tous les malades ont été soulagés de leurs douleurs immédiatement après l'opération et la fonction a été bonne sauf dans un cas. La complication principale est l'absorption osseuse démontrable radiologiquement autour de la prothès d'où il résulte un certain relâchement. Cette absorption apparaît très tôt chez les malades rhumatisants traités au cortisone. Il est souligné que dans sa présente forme cette méthode est seulement applicable aux malades âgés ayant des douleurs et de graves déformités. S'il est possible de trouver une meilleure méthode de fixation, l'indication pourra être étendue.

ZUSAMMENFASSUNG

Flatt's Fingergelenksprothesen wurden in 11 Gelenken von 6 Patienten angebracht. Infektion entstand bei zweien davon, von denen eine entfernt werden musste. Alle Patienten waren von ihren Schmerzen unmittelbar nach der Operation befreit, und die Funktion war bei allen, abgesehen von einem, gut. Die Hauptkomplikation war röntgenologisch nachweisbare Knochen absorption um die Prothese mit nachfolgender Lockerung. Diese Absorption zeigte sich am frühesten bei Patienten, die Cortison Medikation erhielten. Man hebt hervor, dass die Methode zur Zeit nur bei alten Patienten mit Schmerzen und schweren Deformiteten verwendbar ist. Wenn eine bessere Fixationsmethode gefunden wird, kann die Anzeigestellung erweitert werden.

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