KNEE REPLACEMENT: A CLINICAL REVIEW

by

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THE first successful knee arthroplasty was reported in 1861, but from then until the 1940s arthroplasty of the knee was of the interposition type using either autogenous tissue or a foreign non-metallic material between the joint surfaces. Results of this operation were at best poor and unpredictable when compared to arthrodesis, the alternative procedure for degenerative arthritis. Arthrodesis sacrificed movement in order to achieve a predictable clinical result which was very acceptable to both patient and surgeon. Arthrodesis achieved complete pain relief, a stable limb, opportunity to correct deformity and a low complication rate. Metallic interposition arthroplasty began in the 1940s, but again results remained poor. Infection both immediate and delayed was a frequent and devastating complication. Prostheses loosened due to poor bone to metal fixation, high friction forces in the metal on metal joint, and the inherent constraints designed to prevent excessive movement. All these complications hampered early attempts to develop a successful alternative to the stiffening procedure.

Relief of pain, stability and a low operative morbidity still makes arthrodesis of the knee a valuable treatment for degenerative arthritis. A stiffened knee, however, is a severe handicap in modern transport and it is impossible for patients to get in and out of small cars or ride on buses without great difficulty. In the last decade new skills and knowledge have been acquired from the highly successful total hip replacement. We now have a better understanding of the biomechanics of the knee joint both natural and prosthetic, and the factors which will allow successful fixation of the metal and plastic polymers to living bone. Metal and plastic interposition arthroplasty of the knee thus promises to become a viable alternative to arthrodesis in terms of pain relief, stability and low complication rate, but with the important bonus of movement. As a result of these advances, knee arthroplasty using metal on plastic joints cemented to bone were commenced on a trial basis at the Withers Orthopaedic Centre in 1974. A trial of this type of operation was essential to test the proposition that with modern technology the arthroplasty had become a safe and feasible alternative to arthrodesis. The high rate of complication, especially infection, recorded in the American literature was worrying and some reviews even quoted an amputation rate as the final sequela to infection. It was mandatory that the operation was closely monitored and restricted in the first few years in this province in order that an unacceptable number of disasters did not occur. This paper reports the results of the first four years of total knee replacements of this type. Two types of arthroplasty were used and they will be discussed separately.
THE MARMOUR KNEE

Material and Method

The Marmour knee was used as a unicompartmental tibio-femoral resurfacing arthroplasty in those cases of arthritis where the damage was predominantly in only one compartment of the joint. All those patients with unicompartmental destruction who were being considered for arthrodesis between 1974 and 1978, were offered the operation described by Marmour (1977).

Nineteen replacements were carried out in eighteen patients, one patient had a bilateral replacement. The average age was 64 years (range 42 to 78 years). Fifteen patients had osteoarthritis, two had rheumatoid arthritis and one patient had post-traumatic arthritis. There were nine male and nine female patients.

Results

The patients were assessed retrospectively using the British Orthopaedic Association Knee Function Assessment Chart. The average follow-up was 36 months (range 12 months to 50 months). All patients were available for review. Fifteen patients were enthusiastic when asked about their assessment of the operation, one patient was satisfied and two were disappointed. One of the two disappointed patients had a very obvious loose femoral component which was causing severe pain on weight bearing and he was awaiting revision, the other patient was disappointed because of the very poor range of movement after the operation (30° to 80°). Twelve patients had no pain whatsoever, five had mild pain not interfering with activity or sleep and one had severe pain—the patient with the loose component. One patient was unable to walk at review due to bilateral fractured femurs and one patient had to use two crutches—again the patient with the loose component. Twelve patients had some limitation in walking outdoors, however, eight of these did not use a walking aid. The results of the movements recorded are shown in Tables 1 and 2. No patients were found to have extensor lag and only one patient had more than five degrees of varus angulation. No patients showed any sign of wear of articular surfaces on follow-up X-rays and there was no evidence of any synovial reactions. Only one patient had a delay in wound healing and there were no infections. Two patients required manipulation of the knee under general anaesthetic post-operatively. Two patients developed clinical deep venous thrombosis, but neither had evidence of pulmonary embolism. One patient had an early loosening of the femoral component and is awaiting revision, while another fell 12 feet onto concrete and fractured the tibia beneath the tibial component, this replacement has been successfully revised.

Table 1

*Flexion Contracture following Marmour Knee*

| Flexion Contracture | No. of Arthroplasties |
|---------------------|-----------------------|
| none                | 15                    |
| <10°                | 3                     |
| 30°                 | 1                     |

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TABLE 2
Maximum Flexion after Marmour Knee

| Maximum Flexion | No. of Arthroplasties |
|-----------------|-----------------------|
| >100°           | 13                    |
| 81-100°         | 2                     |
| 61-80°          | 1                     |
| <60°            | 3                     |

Conclusion

This preliminary report is encouraging when it is realised that only the worst cases were considered for operation. However the indications for the unicompartamental operation have still to be decided and this is a matter of great debate in the literature (Laskin, 1978). Our initial results indicate that we should continue the trial but realise that a long term review is essential to evaluate late loosening, wear and reactive synovitis to particles of plastic polymer. Degeneration in the other compartment must be carefully assessed in the light of encouraging results in bi- and tricompartamental replacement arthroplasties.

THE GEOMEDIC KNEE

Material and Method

The geomedic knee replacement replaces both femoral condyles with a vitallium metal component and the tibial plateau with high density polyethylene. Both components are cemented in place and there is opportunity to correct varus and valgus angulation (Coventry et al, 1972 and Riley, 1973). All patients with degenerative arthritis who were being considered for arthrodesis between 1974 and 1978 were offered this operation if both compartments were degenerated.

Sixty eight replacements were carried out in sixty two patients, six were bilateral. The average age was 62.5 years (range 41 to 78 years). There were thirteen male and forty-nine females. Forty-four patients had rheumatoid arthritis and eighteen patients had osteoarthritis.

Results

Nine patients were not reviewed. Four patients had died of unrelated causes. Two patients were lost to review, one believed dead. The remaining three patients had infected prosthesis which had to be removed. Two had successful arthrodesis, the other had a fibrous union which causes mild pain but is stable. The remaining fifty-three patients have a mean follow-up of three years (range 1 to 4½ years).

When asked for their assessment of the knee forty-seven patients were enthusiastic, three were satisfied and the three failures were, of course, disappointed. In forty-two of the knees there was no pain, sixteen knees had mild pain not interfering with activities or sleep. Ability to walk was assessed but due to the great number of patients who had other weight bearing joints involved there was not significant improvement in walking distance after the operation. Thirteen patients were still...
using crutches to get about. The flexion deformity and maximum flexion are summarised in Tables 3 and 4. No patient had extensor lag and there were no patients who had a residual varus or valgus angulation of more than ten degrees. Review radiographs did not reveal any evidence of wear and no patients had synovial thickening. Three patients did notice that the replacement did give way on them when walking. This was a rare occurrence but enough to warrant a walking aid for confidence. In these cases the knee was clinically unstable in the anterior drawer test.

**Table 3**

*Flexion Contracture following Geomedic Knee*

| Flexion Contracture | No. of Arthroplasties |
|---------------------|-----------------------|
| none                | 31                    |
| <10°                | 16                    |
| 11-20°              | 3                     |
| 21-30°              | 5                     |
| >30°                | 3                     |

**Table 4**

*Maximum Flexion after Geomedic Knee*

| Maximum Flexion | No. of Arthroplasties |
|-----------------|-----------------------|
| >100°           | 27                    |
| 81-100°         | 19                    |
| 61-80°          | 7                     |
| <60°            | 5                     |

Eleven patients had a delay in wound healing and five patients developed clinical deep venous thrombosis. There were no cases of pulmonary embolism. Four patients required manipulation under anaesthetic and in one of them the tibial component became loose. This patient had a successful revision.

**Conclusion**

The geomedic replacement was under trial in the worst possible knees. There were three failures due to infection, but two of these were successfully salvaged by arthrodesis, another by fibrous union. There was an understandably greater incidence of delay in wound healing and deep venous thrombosis due to the great number of patients with rheumatoid arthritis. The goals of the operation were fully met and the great majority of patients had relief of disabling pain, stiffness and deformity. It is interesting that despite the ligamentous destruction found in the rheumatoid knees only three were clinically unstable. Again the trial was a success but a long term follow-up is essential to assess wear, late loosening and plastic
synovitis. The trial compares very favourably with those reported so far (Skolnick et al, 1976; Ilstrup et al, 1976).

SUMMARY

The initial results of nineteen Marmour and sixty-eight Geomedic knee replacements are reported. In view of the low complication rate in both groups and the high degree of patient satisfaction it is concluded that modern knee replacement should be considered in those patients with advanced degenerative arthritis.

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