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FORMATION OF NEW MENISCI AFTER POLYCENTRIC KNEE ARTHROPLASTY

Report of Four Cases, One with a Bucket Handle Tear

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This paper presents four patients with polycentric artificial knee joints in whom reoperation revealed new menisci interposed between the artificial joint surfaces. One of the menisci had a bucket handle tear and was excised. Histological examination showed a fibrocartilage structure with the appearance of a newly formed meniscus. The artificial knees functioned well and the reoperations were performed because of trauma in one patient, because of femoro-patellar problems in one knee, and for conversion of a hemi-arthroplasty to an arthroplasty including all the compartments of the knee joint in two patients.

Key words: Marmor knee; meniscus tear; polycentric knee arthroplasty; meniscus regeneration; St. Georg knee

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Regeneration, at least to some extent, of the knee meniscus after surgical removal is an accepted phenomenon (Smillie 1963, 1974). Excision of an injured meniscus from an otherwise normal knee joint will generally be subtotal. A capsular brim will be left, from which the regeneration can proceed. In knees subjected to polycentric, unicompartmental arthroplasty because of degenerative or rheumatoid arthritis, the menisci are often absent at the time of operation. If they are still present they are radically excised to allow the tibial prosthetic component to be put into place.

Since June 1976 we have reoperated on four patients who had undergone a polycentric knee arthroplasty. Two of the arthroplasties were of the St. Georg "Schlitten" type (Engelbrecht 1971) and two of the Marmor type (Marmor 1973). The reasons for the reoperations were traumatic injuries to the joints or conversion of a

unicompartment to a duocompartment arthroplasty. All four knees showed meniscus-like formations between the artificial surfaces. One of the menisci had a bucket handle tear. This meniscus was excised and could thus be examined histologically.

CASE REPORTS

Case 1. D.A., a 55-year-old woman, had had severe rheumatoid arthritis since 1961, with multiple involvement of the joints. She had had no steroid therapy. Her left knee was unstable, with poor function, and caused severe pain. Because of this she was operated on in December 1975. At operation a fairly inactive synovitis and heavy destruction of the joint surfaces were found, and both menisci were completely eroded away. A Marmor arthroplasty including both joint compartments was performed. Postoperatively she quickly gained good mobility of the joint. She was able to walk well, and had no pain on ordinary walking. However, there was still some pain from the femoro-patellar joint, and both clinically and

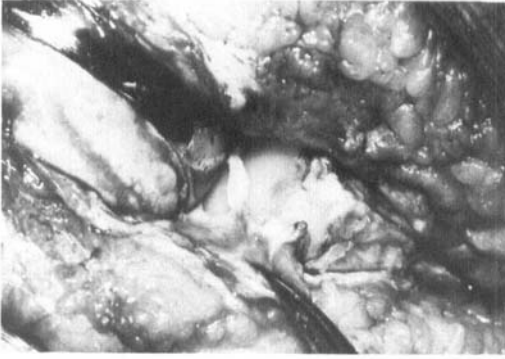


Figure 1. Anterior view of the arthrotomized knee joint showing the St. Georg prosthesis and the bucket handle tear of the new meniscus.

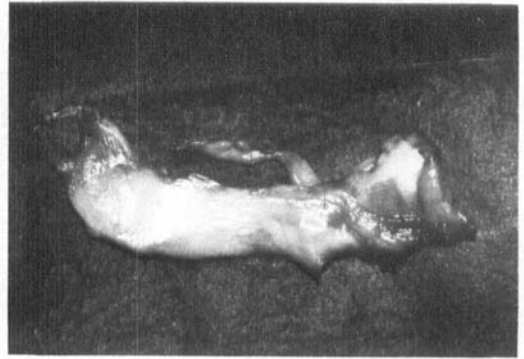


Figure 2. The excised meniscus.

roentgenologically conflict was found between the patella and the lateral femoral prosthesis. An arthrotomy was therefore carried out 6 months after the primary operation, and a hemipatellectomy was performed. It was noted that there were meniscus-like formations between the joint surfaces in both compartments. The newly-formed menisci appeared almost like normal ones. After the reoperation her function was excellent and the knee caused no pain. She has now been followed up for 2 years and in that time has had no trouble with the treated knee.

Case 2. B.M., a 62-year-old woman, sustained an injury to her left knee in 1971, with a depression fracture of the medial tibial condyle. This was treated by open reduction and fixation with screws. Later on an osteotomy had to be performed to compensate for an unacceptable joint position. Increasing pain on weight-bearing followed, and in 1973 a unicondylar St. Georg "Schlitten" prosthesis was inserted in the medial

compartment of the left knee joint. Some instability remained and after a year or two she began to have pain in the knee localized over the lateral compartment. There was no locking of the knee joint. In February 1977 a further operation was performed, at which the knee prosthesis was complemented with a Marmor prosthesis in the lateral compartment. The first St. Georg prosthesis was found to be sitting firmly in position, with no signs of wear. A new meniscus, with a bucket handle tear (Figure 1), had formed between the artificial joint surfaces of the St. Georg prosthesis, and was excised (Figure 2). Postoperatively the patient quickly gained good walking ability and an almost normal range of movement, and had hardly any pain in the knee. The excised meniscus was examined histologically.

Histopathology. The removed material was fixed in 4 per cent buffered formaldehyde, dehydrated and embedded in wax according to routine

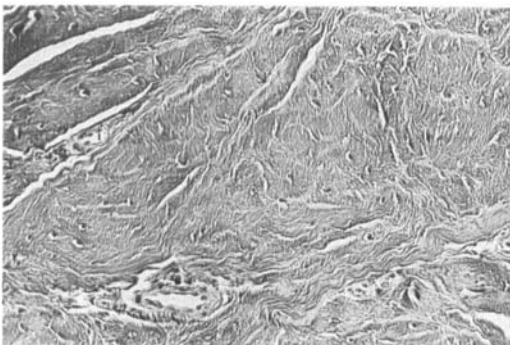


Figure 3. Light microscopy of the new meniscus showing a fibrocartilage built up of cartilage cells surrounded by a dense connective tissue with abundant collagen in parallel wavy bundles.

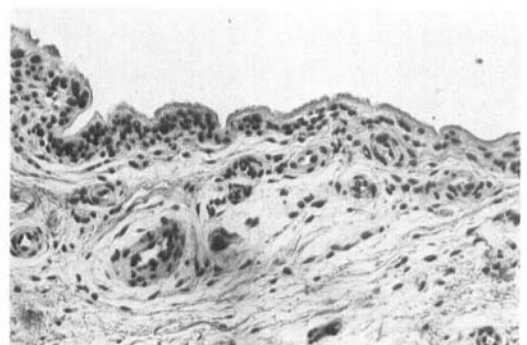


Figure 4. A loose synovial membrane covered the structure, the morphology of which was very much like that of a normal meniscus.

methods. Sections were stained according to van Gieson and with haematoxylin and eosin. The light microscopical findings were those of a fibrocartilage built up of cartilage cells with a scanty matrix surrounded by a dense connective tissue with abundant collagen in parallel, wavy bundles (Figure 3). The structure was covered by a loose synovial membrane (Figure 4) and the morphology was thus almost indistinguishable from a normal meniscus.

Case 3. P.P., a 70-year-old man, sustained in the 1960's an open tibial fracture of the right leg, which had healed after several operations. Because of an idiopathic osteoarthritis in the right knee, a hemi-arthroplasty including the lateral compartment, was performed in March 1974. A St. Georg "Schlitten" prosthesis was used. Unfortunately a slight overcorrection into varus position was made, and pain developed from the medial compartment of the joint. The arthroplasty was therefore complemented with a Marmor prosthesis in the medial compartment 3 years later. A meniscus-like formation was found between the surfaces of the St. Georg prosthesis, which seemed to fit well and to be quite firmly in position. The meniscus showed no signs of injury and was left in place. The function of the knee after the additional arthroplasty was excellent.

Case 4. B.A., a 50-year-old man, had had rheumatoid arthritis since 1969. Multiple joint involvement had resulted in general functional impairment, but he was still working in a workshop. Because of severe pain and derangement of the right knee, a polycentric unicondylar arthroplasty, including both compartments of the knee joint, was carried out in 1976. A Marmor prosthesis was used. Postoperatively the patient was completely free of pain and the knee function was excellent. Six months later a Charnley arthroplasty was performed in the right hip, and the result of this operation with regard to function and freedom from pain was also excellent. Eighteen months after the knee operation a traumatic distortion of the right arthroplastic knee occurred and there were clinical signs of a loose body (bone cement).

An arthrotomy was therefore carried out and the loose body removed. At the arthrotomy it was noted that new menisci had formed between the artificial joint surfaces. They appeared healthy, with no signs of injury, and were left in place. Postoperatively, good joint function was regained.

COMMENTS

The finding of new menisci between the artificial surfaces in polycentric knee arthroplasties indicates a strong capacity for regeneration from the fibrous capsule.

The healthy appearance of the meniscus in all but one of the four cases reported here hopefully indicates that the function of the artificial knee resembles that of the normal knee joint. In polycentric artificial knees with unicondylar components, such as the Marmor or the St. Georg "Schlitten" prosthesis, the possibility of an injury to a newly formed meniscus should be kept in mind if, after a period of good function, signs of mechanical trouble appear and there are no roentgenological indications of prosthetic problems.

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