TISSUE REACTION AND LOOSENING OF CARBON-REINFORCED POLYETHYLENE ARTHROPLASTIES

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The use of carbon fibre implants in orthopaedics is widely reported, but the potential risks associated with their use are less well defined. In its pure form carbon fibre may be spun into ligament and tendon replacements. Incorporated into epoxy resin, it has been used in plates for the internal fixation of fractures. Carbon fibre has also been used to reinforce polyethylene composites for joint replacement, where it is claimed to reduce the plastic deformation of articular surfaces.

The intra-articular use of pure carbon fibre has been questioned because of the synovial reaction produced by carbon filament fragments generated by the gradual disintegration of a ligament (Dandy, Flanagan and Steenmeyer 1982). Some tissue reaction, in the form of carbon staining, also takes place around carbon-reinforced epoxy plates (Howard, Taylor and Gibbs 1985).

Implant failure and abnormal wear have been reported with carbon–polyethylene composites used in knee replacement (Dannenmaier, Haynes and Nelson 1985; Wright et al 1988). We report the findings, at revision for aseptic loosening, in two total hip replacements made of carbon–polyethylene composites.

Case reports. The patients were a rheumatoid 84-year-old woman and an osteoarthritic 89-year-old man, both of whom had had a Müller total hip replacement eight years previously. They both presented after eight years with signs and symptoms of prosthetic loosening.

Both sets of radiographs showed definite loosening of femoral and acetabular components. At revision operations the cups were grossly loose, but intact, with only minimal signs of wear (Fig. 1). Large amounts of amorphous grey-black tissue were present and cultures failed to isolate any organisms.

Histology. Adjacent to the loose components was grey homogeneous fibrous tissue. Histological examination of this showed an atypical foreign-body reaction, with aggregates of plump histiocytes within the collagenous stroma (Fig. 2). Almost all the cells contained tiny intracytoplasmic fragments of non-refractile carbon (Fig. 3). Multinucleate giant cells were relatively sparse.
Discussion. In both cases there was an intense tissue reaction around the composite components. Some tissue reaction would be expected around any loose component, and the giant cell foreign-body response produced by wear particles of high density polyethylene (HDP) has been well documented. However, this is predominantly a foreign-body giant-cell reaction and only the smallest particles of HDP are found within the giant cells.

In our cases, the histological appearances were those of an atypical foreign-body reaction. Giant cells were sparse, and the predominant cells were histiocytes with intracytoplasmatic fragments of carbon. The cups had not worn excessively and were intact, unlike the failed knee replacements reported by Dannenmaier et al (1985) and Wright et al (1988) who also noted the presence of histiocytes.

Bartel, Bicknell and Wright (1986) report that the addition of carbon fibre increases the stiffness of the component, leading to greater stresses when in contact with the metal component. In our cases, ‘normal’ wear had produced a dramatic tissue response, histologically different from that produced by polyethylene alone. This may well have led to the relatively early failure.

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REFERENCES


A FLEXION ADDUCTION METHOD FOR THE REDUCTION OF POSTERIOR DISLOCATION OF THE HIP

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Posterior dislocation of the hip can be reduced by several methods, the most usual being that of Bigelow (Wilson 1982). This requires forcible traction. We report another method of reduction which is simple, relatively atraumatic, and less likely to produce complications.

Method. Under general anaesthesia, the patient is placed supine on the operating table. The surgeon stands on the unaffected side of the patient and lifts the dislocated leg to a position of 90° of flexion and maximum adduction. He then applies traction in the long axis of the femur while an assistant who stands on the other side of the patient stabilises the pelvis with one hand and pushes the head of femur into the acetabulum with the other (Fig. 1). When reduction is achieved the limb is brought into a neutral position and managed in the usual way.

Results. We reduced 20 consecutive hip dislocations with ease, in patients whose age ranged from 20 to 50 years.

The dislocations were type I, with no significant fracture, or type II, with a single large acetabular fragment (Crenshaw 1987). The five hips with a significant associated acetabular fractures were reduced even more easily. One dislocated uncemented Austin Moore arthroplasty was reduced with the minimal use of traction.

We have been able to review 18 of our 20 cases, the shortest follow-up being five years. None showed any evidence of avascular necrosis or of myositis ossificans. Those with significant fractures of the acetabular rim had some minor degenerative changes. We have not used this method for dislocations of type III, IV or V in which.

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