INFLAMMATORY ARTHRITIS AFTER FAILURE OF SILICONE RUBBER REPLACEMENT OF THE RADIAL HEAD

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The management of radial head fractures complicated by ligamentous disruption remains a matter of controversy. The use of a silicone radial head implant to provide temporary stability is thought to help to protect the ligaments during healing.

The reported complications of long-term implantation of a silicone replacement include fracture, dislocation, synovitis, lymphadenitis and subchondral resorption. We now report one case in which an inflammatory process resulted in generalised cartilage degeneration. This has not previously been noted.

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Fracture of the radial head is the most common elbow fracture in the adult (Gordon and Bullough 1982). Many are treated conservatively, but some Mason 2 and all Mason 3 fractures require an operation (Mikic and Vukadinovic 1983). The surgical options include internal fixation, excision or excision and replacement of the head. The use of a silicone rubber replacement is claimed to maintain the physiological position of the radius (Mayhall, Tiley and Paluska 1981; Swanson, Jaeger and La Rochelle 1981; Gerard, Schernburg and Nerot 1984; Maguire, Coscia and Lynch 1987).

The senior author (BFM) believes that radial head implants should rarely be used, and then only as temporary spacers when there is instability after unavoidable excision of the head (Maguire et al 1987). The advantage of such a use probably outweighs any disadvantages. The failure of silicone rubber radial head implants by fracture or dislocation has been described (Mayhall et al 1981; Morrey, Askew and Chao 1981). After implant failure, bone resorption has been reported around silicone finger-joint implants (Carter, Benton and Dyser 1986; Derkash, Niebauer and Lane 1986; Vahvanen and Viljakka 1986), and wear particles have been implicated as causing synovitis and subchondral bone cysts (Piemer et al 1986; Trepman and Ewald 1991). In such cases silicone particles have also been found in regional lymph nodes (Gordon and Bullough 1982). Silicone synovitis has been described both clinically and radiographically, but to our knowledge there have been no reports of degeneration of the ulnohumeral joint secondary to chronic silicone-induced inflammation.

CASE REPORT

A 51-year-old woman presented eight years after sustaining a radial head fracture in her left, non-dominant elbow, which had been treated by a silicone replacement.

Five years after this replacement she began to have activity-related aching in the elbow, with anterior arm pain and discomfort in her radial forearm. Radiographs showed narrowing of the joint space (Fig. 1). The silicone prosthesis was removed and found to be intact except for some wear of its articulating surface. After excision, pain in the elbow continued to progress until it severely limited the patient's everyday activities. Two years after removal of the silicone prosthesis she was evaluated by us.

She denied any symptoms of elbow instability or loss of motion, but many of the activities of daily living were limited by pain despite the use of anti-inflammatory drugs. She denied pain in any other joint. Her elbow was slightly swollen with grade 1+ synovitis, and the range of motion was from 0° to 140° with no instability. Her right elbow was normal as were her ESR and the differential WBC. Tests for antinuclear antibody and rheumatoid factors were negative. Radiographs (Fig. 2) showed symmetrical loss of joint space with no change in the bone architecture.

We performed a resurfacing elbow replacement, but because of the ulnar subluxation and malalignment, the radial head could not be replaced. At that operation the grey-pink synovium was boggy and swollen and the bone of the coronoid and of the trochlea was eburnated. Bacterial
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Fig. 1a
Fig. 1b

Radiographs of the left elbow, five years after the insertion of a silicone rubber radial head for a fracture. The ulnohumeral joint is reasonably normal.

Fig. 2a
Fig. 2b

Radiographs taken two years after removal of the radial head implant. There is symmetrical loss of articular cartilage but only minimal formation of subchondral cysts.

cultures were negative. Histological examination showed a pseudosynovium with an intense foreign-body histiocytic giant-cell reaction (Fig. 3). Examination under polarised light showed abundant refractile particles which were also stained by Oil-Red-O, and suggested the presence of silicone rubber particles. SEM showed that there was particulate debris within the giant cells, ranging in size from 50 to 100 μm (Fig. 4). More rarely, there were aggregates and shard-like fragments which measured over 1000 μm (Fig. 5). Analysis by mass spectroscopy confirmed that the particulate debris was composed of a silicone rubber polymer.

The patient made a good recovery with almost complete relief of pain.

DISCUSSION

Silicone rubber implants have been inserted in various parts of the body for over 30 years (Nalbandian 1983). This material was once considered to be completely inert, but clinical synovitis has been described in many joints after long-term implantation (Swanson et al 1981; Morrey 1985; Carter et al 1986; Derkash et al 1986; Vahvanen and Viljakka 1986; Maguire et al 1987; Trepman and Ewald 1991).

In 1982 Worsing, Engber and Lange considered that a silicone rubber implant ‘articulating with a degenerated incongruous joint surface may give rise to microscopic particles of silicone elastomer’. It now seems likely that this
can happen even in non-degenerated joints in which the implant is subjected to cyclical loading. Synovitis appears to be initiated by the generation of small particulate debris which is taken up by macrophages. An inflammatory cascade is triggered by macrophages containing this indigestible particulate matter. Histological and histochemical studies of these changes after hip replacement suggest that a similar, if not identical, reaction occurs with all particulate debris, including polymethylmethacrylate and polyethylene (Maguire et al 1987).

The unique feature in our case is that the inflammatory...
process caused chondrolysis and apparently degenerative arthritis of the ulnohumeral joint. This change has not been seen before by us or to our knowledge, reported by others. A general condition is excluded by the lack of symptoms in any other joint and normal laboratory studies. It is known that radial head excision may cause degenerative arthritis in the long term, but this is normally characterised by a spur at the medial joint line and the development of osteophytes, the joint space being maintained (Morrey, Chao and Hui 1979).

In this patient, synovitis appears to have been caused by particulate debris from the prosthetic radial head and to have continued to progress even after the removal of the implant. This suggests that silicone rubber particles can trigger an inflammatory ‘digestive process’ that can cause generalised loss of articular cartilage and lead to disabling arthritis. It is of interest that subchondral cysts which are commonly seen in other cases of silicone synovitis, were only minimal in our case.

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REFERENCES


