AGGRESSIVE GRANULOMATOUS LESIONS AFTER HIP ARTHROPLASTY

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We reviewed 19 patients who presented with aggressive granulomatosis around the femoral stem after hip replacement. All had experienced stress pain and had required revision arthroplasty on average 8.8 years after the primary operation. Fifteen patients were men and four were women; none had rheumatoid arthritis. One patient had an uncemented Moore hemiprosthesis; the others all had cemented total hip replacements.

When first detected, the granulomatous lesions were multifocal in 13 patients. The first granuloma was in the region of the lesser trochanter in 10, and near the tip of the stem in only two. Speed of growth varied but on average there was doubling of the area on anteroposterior films in 2.2 years (range 6 months to 4.6 years).

Aggressive granulomatous lesions in replaced hips are a distinct condition, different from simple loosening or infection; the lesions may grow rapidly, so revision surgery is indicated soon after diagnosis.

Recently a number of patients have been reported with localised aggressive resorption of bone around the cemented femoral component of a total hip replacement. In the first report, Harris et al (1976) reported four such patients with tumour-like bone resorption after hip replacement, and described this condition as a benign, non-inflammatory, adverse tissue reaction. The condition usually leads to loosening of the prosthesis, and other authors have reported radiographic and histological investigations (Reinus et al 1985; Scott, Riley and Dorfman 1985; Jasty et al 1986; Griffiths, Burke and Bonfiglio 1987).

Aggressive granulomatous lesions after hip arthroplasty appear to be a separate entity which can be differentiated from simple implant loosening. Our study aimed to determine and analyse the natural history and radiographic outcome.

MATERIALS AND METHODS

We report 19 patients who required revision of a hip replacement for aggressive granulomatosis between 1982 and 1986 at the Orthopaedic Hospital of the Invalid Foundation, Helsinki. During that period 417 patients required revision arthroplasty for all causes.

We defined aggressive granulomatosis as the radiographic appearance of large, focal and usually ovoid lytic areas around the prosthesis in the definite absence of infection. The lytic areas do not correspond in outline to the general shape of the cement around the prosthesis and sometimes appear to grow rapidly.

Of the patients, 15 were men and four women. Their mean age at the time of primary arthroplasty was 56.2 years (range 36 to 76). Eighteen of the patients had the granulomatosis after primary hip surgery and one after a revision arthroplasty. In 15, the hip arthroplasty had been for primary osteoarthritis, in two for congenital acetabular dysplasia, in one for old tuberculosis and in one after a traumatic fracture of the femoral neck. This latter patient had an uncemented Moore hemiprosthesis, the other 18 had had cemented total hip replacements of various types. The cement around the femoral component had been inserted digitally, without an intramedullary...
Figure 1 – Diagram of the zones around the stem of a prosthesis. In 10 patients, granulomas were first detected in zone 7 around the lesser trochanter and in two around the tip of the stem.

Figure 2 – Radiograph of a 70-year-old man two years after total hip replacement for primary osteoarthritis. There are ovoid granulomas in all zones, replacing 42% of the planimetric area of bone around the cemented prosthesis. This is an example of fast granulomatous growth.

Figure 3 – A 70-year-old woman six weeks after a cemented total hip replacement for primary osteoarthritis.

Figure 4 – Two years later, the hip was painful under stress and radiographs showed granulomatous lesions at lesser trochanter level and medial to the mid part of the stem.

Figure 5 – At three years postoperatively, the granulomas have increased in size and there is a further focus lateral to the mid stem.
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Our radiographic evaluation included radioplani-metry (Planix 5.6, Tamaya Technics Inc, Japan) to record the size of granulomas on anteroposterior films, related to the different zones around the femoral stem (Fig. 1). In five cases the granuloma was examined histopathologically.

RESULTS

The first clinical sign of a granuloma was usually stress pain, which led to radiographic examination and detection of the lesions around the stem of the prosthesis (Figs 2 to 9). In 13 patients, the granulomatous lesions were multifocal at first diagnosis, 12 had lesions around the upper stem (zones 1, 2, 6 and 7 in Figure 1); 10 of these appeared to have started in the region of the lesser trochanter (zone 7). There were granulomas around the lower part of the stem in 11 and around the tip in two.

On the first radiographs which showed the granulomas, the planimetric area of the lesions around the upper stem (zones 1, 2, 6 and 7) averaged 5.4 cm² (range 1.7 to 18.6), and around the lower stem 4.8 cm² (range 1.1 to 16.7). For the whole proximal femur the area averaged 9.1 cm² (range 2.8 to 22.5 cm²).

Revision arthroplasty of these hips was performed on average 8.8 years (range 9 to 14) after the primary hip operation and on average 14 months (range 4 to 30) after aggressive granulomatosis had first been diagnosed. During the period between diagnosis and revision, one patient had a spontaneous femoral fracture around the mid part of the femoral stem. This patient was a 61-year-old woman who had had a Lubinus-type prosthesis inserted for primary osteoarthritis 13 years earlier.

Figure 6 – A 53-year-old man three months postoperatively. Figure 7 – Six years after operation, granulomas are seen at lesser trochanter level and around the distal part of the stem. Figure 8 – At 10 years, these granulomas had become very large. The hip was painful, but at revision, the prosthesis was stable in its new position.

Figure 9 – Radiograph 12 years after insertion of an uncemented Moore prosthesis. At revision ovoid granulomas were found.

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In some cases, the granulomas grew rapidly in size; in the 14 patients with adequate radiographs radioplani-
metry showed doubling of the area of the lesions in an
average of 2.2 years (range 6 months to 4.6 years) (Fig.
10). Eight of the 10 patients who had first presented with
granulomas in the region of the lesser trochanter only
had massive multifocal granulomatosis by the time of
revision. Nine patients showed measurable sinking of
the stem (average 9 mm, range 3 to 23 mm) and five
patients had some varus tilting of the prosthesis. One
patient also had the radiographic appearance of granu-
ломas around the acetabular component.

At the revision operations, 14 stems were found to
be loose; the others were judged to be firm. All
histopathological specimens showed collagen deposition,
with a large number of histiocytes and giant cells
containing microscopic cement particles. None of the
patients showed elevation of ESR or CRP levels, and all
intra-operative bacterial cultures were negative.

DISCUSSION

Fewer than 50 cases of aggressive granulomatosis around
cemented hip prosthesis have been reported (Harris et al
1976; Bell et al 1983; Reinus et al 1985; Scott et al 1985;
Jasty et al 1986; Griffiths et al 1987). These accounts
confirm that in some patients aggressive granulomatous
lesions may lead to rapid bone lysis around apparently
stable cemented arthroplasties in the absence of sepsis or
malignant disease.

On the basis of this review of the literature, these
lesions appear to be rare complications of hip replace-
ment. We found, however, that 4.6% of our revision
arthroplasties of the hip had radiographic evidence of
these lesions. One of our main findings is that aggressive
granulomatosis should be recognised as an established
entity, which differs in character from localised bone
resorption caused by infection or mechanical failure
(Carlsson, Gentz and Linder 1983).

The cause of aggressive granulomatosis is debatable.
Five of our patients still had firm fixation of the femoral
stem at revision, arguing against mechanical causes.
Fragmentation of the cement mantle and failure of
implant fixation have been blamed (Harris et al 1976),
but our series does not confirm this, especially as one of
our patients had a cementless Moore prosthesis. Charm-
ley (1979) considered that acrylic cement was relatively inert,
causing little tissue response as long as there is sound
fixation. It seems possible, however, that some patients
may develop a foreign body reaction to acrylic cement,
and possibly to a metallic implant. The reported
histopathological appearance of the granulomas has been
uniform: histiocytes of varying size, numerous giant cells,
and local areas of eosinophilic necrotic debris including
microscopic particles of cement (Harris et al 1976; Bell
et al 1983; Reinus et al 1985; Griffiths et al 1987). The

cause of this histiocytic response in certain patients with
technically well-implanted and even firmly fixed
prostheses is still unclear. Wear of cement caused by
micromotion, and patient-specific hypersensitivity are
hypothetical trigger mechanisms. The synovium-like
biomembrane around the cement is known to have the
capacity to produce prostaglandin E$_2$ and collagenase;
these may mediate the resorption of bone (Goldring et al
1983).

Most previous studies are based on few cases (Harris
et al 1976; Reinus et al 1985; Jasty et al 1986; Griffiths
et al 1987) and show an equal incidence in men and women.
We found a clear predominance of men, 15 of 19 patients.
In addition, though about half of our primary replace-
ments are in patients with rheumatoid arthritis, we have,
to date, seen no evidence of aggressive granulomatosis in
these patients.

The speed of the growth of granulomas varies:
previous authors have described revision arthroplasties
from about 2 to 6 years after the primary operation. In
our series the speed of growth of the lesions was
unpredictable, some doubling their size in a few months,
while others grew very slowly. All our patients had pain
as the first clinical sign but in some at that time the
granulomas were already fairly large. Lesions may be
multifocal, and the region of the lesser trochanter
appeared to be a common site.

Since the lesions sometimes grow rapidly and there
may be risk of spontaneous fracture, patients should be
considered for revision arthroplasty soon after the diagnosis has been made. At present we treat patients with aggressive granulomatous lesions by revision arthroplasty, using uncemented titanium prostheses and bone grafting.

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