Hydroxyapatite-coated hip prostheses

Difficulties with revision in 4 cases

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The introduction of hydroxyapatite ceramic (HAC) coating on hip implants in 1985 (Furlong and Osborn 1991) was hailed as a major advancement for fixation of uncemented prostheses. A problem that is now becoming evident is the extraction of these securely fixed prostheses for purposes of revision. We report on 4 patients who have had HAC-coated prostheses implanted (2 as revision procedures and 2 at primary hip replacement) who had either continuing pain or a proven infection, so that it became necessary to carry out a revision hip arthroplasty. The prostheses were well-fixed and difficult to remove. A transfemoral, longitudinal osteotomy was used in 3 cases.

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Hydroxyapatite ceramic (HAC) coating on hip implants has been available since the early 1980s (Jarcho 1981), though its widespread use as a coating for hip prostheses did not commence until the mid-1980s (Geesink 1988, Furlong and Osborn 1991). The initial concerns regarding bony ingrowth have proved to be unfounded; largely with increasing evidence from postmortem studies (Bauer et al. 1991, Hardy et al. 1991). Therefore, a problem that has not been addressed in the initial stages of the debate regarding fixation is: How can one remove these well-bonded prostheses from the bone without causing immeasurable damage? The probability that these prostheses will have to be removed from time to time has to be addressed and adequate preoperative planning is necessary. This has been our salutary lesson following the removal of 4 Furlong (Joint-Replacement Instrumentation, London) total hip arthroplasties.

Case 1

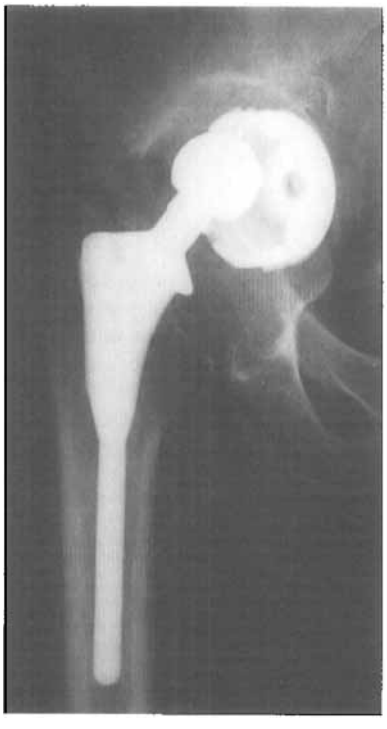
This 63-year-old patient had suffered with rheumatoid arthritis since 1985 and had developed increasing pains in her right hip since 1991. There was marked acetabular protusio. She underwent an uncemented Furlong total hip arthroplasty. A 50 mm screw-in acetabular and 9 mm femoral HAC-coated components were implanted in September 1991. Her pain failed to subside and she was referred to our hip clinic in January 1994. By this time she had 4 cm leg-shortening, pain in the groin and was wheelchair-bound. The radiographs revealed massive osteolysis surrounding the acetabular component and the hip was dislocated and unstable.

A revision was performed through a posterolateral approach. The acetabular component was loose and was removed with ease. However, the femoral component was firmly fixed and all attempts at removal were futile. The femoral component was removed through a longitudinal transfemoral osteotomy to 15 cm from the greater trochanter, to gain adequate access for bone-grafting the acetabulum. 5 morselized femoral heads were used to partially fill the acetabular cavity and a 58 mm Harris-Galante (Zimmer, Warsaw, U.S.A.) cup was fixed with screws having satisfactory fixation. A Wagner (Stratec, Berne, Switzerland) femoral stem (285 mm in length by 16 mm diameter) was inserted in the femur. The joint was stable on reduction and the patient was mobilized and partially weight-bearing 2 weeks postoperatively.

On discharge, she was mobilized with 2 crutches and was pain-free. At her latest follow-up (1 year postoperatively), the femoral osteotomy has not healed completely, but she remains pain-free.

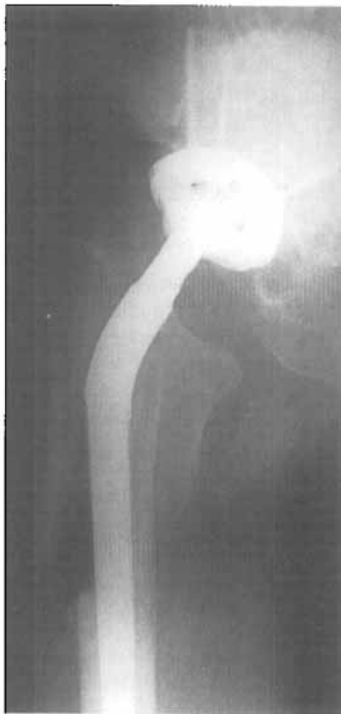
Case 2

This 50-year-old patient had undergone bilateral subtrochanteric osteotomies for proximal femoral dysplasia at the age of 25. She was scheduled for a THA due to degenerative changes. During the removal of the Wainwright spline, a comminuted fracture of the proximal femur occurred. A long-stem (25 cm) unce-



Case 1. This illustrates the dislocated arthroplasty with marked acetabular destruction.

The extracted prostheses. Note the bony ongrowth onto the HAC coating of the stem.



Immediate postoperative radiograph showing the Wagner osteotomy. The acetabulum was bone-grafted with 5 femoral head allografts.

mented Furlong 10 mm femoral component was implanted, through a lateral approach. The acetabular component was a 47 mm screw-in cup. The patient was kept non-weight-bearing for 6 months.

When seen in our hip clinic, she had pain at the previous fracture site and also described start-up pain in the thigh. Her leg was shorter by 3 cm.

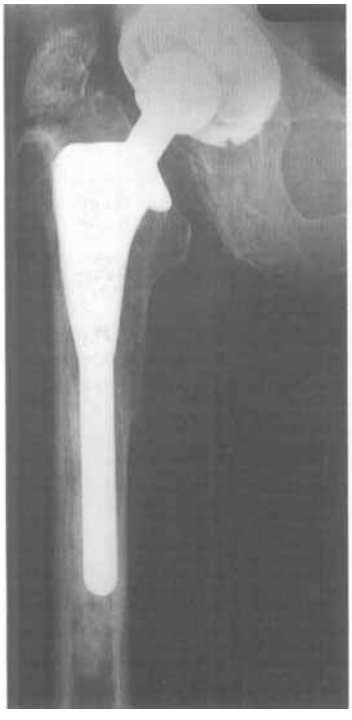
A revision was performed through a posterolateral approach, but it was not possible to extract the femoral component and therefore a longitudinal transfemoral osteotomy was utilized, with the transverse osteotomy being sited through the previous fracture site. The fracture was not united. The acetabular component was removed with some difficulty. The fracture was mobilized and a 265 mm Wagner (Stratec, Berne, Switzerland) stem was inserted. This resulted in normal leg length and soft tissue tension. The acetabular component was revised with a 52 mm Harris-Galante (Zimmer, Warsaw, USA) component.

At 18 months, she remains pain-free and is asymptomatic.

Case 3

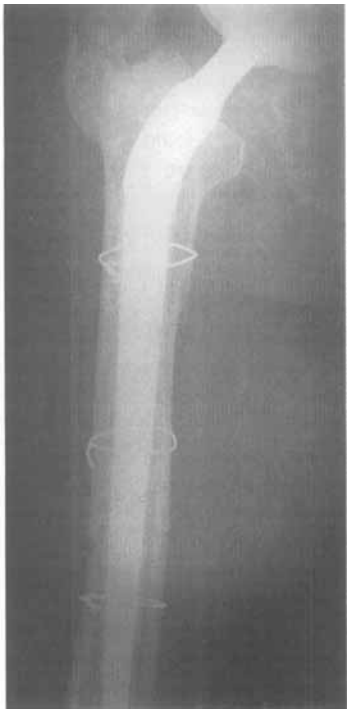
This 73-year-old patient had a primary Charnley THA in 1983. By 1988, she had pain in her hip and the radiographs revealed a radiolucency on the medial aspect of the femoral canal. She underwent a 2-stage revision THA, since the preoperative aspirate had suggested an infection. At the second stage, a 12 mm Furlong stem and a 54 mm screw-in cup were implanted through a lateral approach. A fracture of the greater trochanter occurred during the procedure. Despite this revision, she continued to feel pain.

On referral to our clinic, she was able to walk 45 m and complained of unremitting pain in the thigh and the groin. She underwent a 2-stage revision following a biopsy of the capsule which had confirmed a *Staph. epidermidis* infection. The femoral component was firmly adherent to bone and was removed via a longitudinal transfemoral osteotomy at 20 cm from the greater trochanter. All the residual cement was extracted and the acetabular component removed. 4 weeks later, a 62 mm Harris-Galante (Zimmer, Warsaw, U.S.A.) acetabular, and a 18 mm by 265 mm Wagner (Stratec, Berne, Switzerland) stem were implanted. The hip was stable and she was mobilized partially weight bearing 2 weeks later.



Case 3. This radiograph illustrates the retained cement and the trochanteric fracture.

The extracted prosthesis shows proximal fixation onto the HAC coating.



The immediate postoperative radiograph showing the Wagner stem. We no longer employ cerclage wires to close the osteotomy.

She then suffered a deep vein thrombosis on discharge, but is otherwise symptom-free at 16 months postoperatively.

Case 4

This 62-year-old man was diagnosed as having had ankylosing spondylitis at the age of 18 years. He underwent a primary uncemented left THA, using the Furlong 58 mm CSF acetabular component and a 14 mm femoral stem. Initially he was pain-free, but then he developed a deep infection of the hip with *Staph. aureus*. This led to a sinus discharge from the lateral aspect of the thigh. Despite aggressive antibiotic therapy and a drainage procedure, the infection failed to respond.

On referral, he was noted to be emaciated and in constant pain from the THA. At a 2-stage revision procedure, the hip was dislocated anteriorly and the acetabular component was loose. There was free pus in the joint. The sinus tract was followed to the lateral femoral cortex and excised. Despite the obvious infection, the femoral component was firmly fixed to bone. This was extracted via a transfemoral longitudinal osteotomy at 17 cm from the greater trochanter. He is currently awaiting his second-stage procedure. The wound remains dry and his pain has resolved.

Discussion

These 4 cases show that any prosthesis which is implanted as an arthroplasty may require revision because of unforeseen circumstances. It is of note that the femoral component of the Furlong prosthesis is difficult to remove. The company recommends that the prosthesis should be impacted further to loosen the bond. This, in reality, is not an option as the Furlong femoral component has a calcar-bearing collar. Further, as illustrated by case 4, infection per se may not lead to easy removal of the prosthesis.

Our 4 cases also show clearly that bonding between HAC and bone occurs—in fact, it occurs so well that it can be asked whether a prosthesis requires coating of all the stem or only small areas (e.g., the proximal third of the stem).

The transfemoral approach, popularized by Wagner (1989), is a versatile approach when performed correctly. The healing following this osteoto-

my is rapid and allows the femur to reform, when used in conjunction with a Wagner (Stratec, Berne, Switzerland) distal-loading revision prosthesis. By taking the transfemoral approach, we believe that we preserved the femora from further damage and the use of the coned Wagner prosthesis allowed early mobilization of the patients following these difficult revision arthroplasties.

Acknowledgements

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