Replacement of deficient acetabulum using Burch-Schneider cages

22 patients followed for 2–10 years

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The absence of good bone stock with massive acetabular deficiency has been a major problem in both revision hip arthroplasty and in primary arthroplasty for congenital dislocation of the hip (CDH). 22 patients (24 hips; 21 revision and 3 primary replacements; mean age 58 years) with substantial bone loss underwent acetabular reinforcement with Burch-Schneider cages. Classification of acetabular deficiency was made according to the AAOS system. The surgical procedure involved preparation of acetabulum, filling the defect with bone autografts, placement of the cage with its flanges, fixation with screws on the lateral wall only and placement of a cement and plastic cup. Radiographic loosening with breakage of the screws was observed in only 1 patient. After a mean follow-up of 8 (2–10) years, good stability was acheived in all patients and no mechanical failure was observed. Satisfactory results were observed in all but one of the cases, indicating that effective support of the acetabulum can be achieved using Burch-Schneider cages.

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Deficiency of the acetabular bone stock creates a problem in fixing the acetabular prosthesis in a mechanically optimal location and in avoiding early movement and loosening of prosthesis. (Harris 1982, Berry and Muller 1992, Rosson and Schatzker 1992). Acetabular bone deficiencies are usually encountered either in revisions of cemented total hip arthroplasties with severe osteolysis of the pelvic bone stock (Muller 1981, Wilson et al. 1989) or in primary arthroplasties for CDH where prosthesis placement is on the site of the true acetabulum (Symeonides et al. 1994).

Various methods have been applied including filling the bone defect with large amounts of acrylic cement (Charnley 1979), the use of bulky bone grafts (Harris et al. 1977, D'Antonio et al. 1989), uncemented acetabular components (Hungerford and Jones 1988), application of vitallium mesh with cement (Jasty and Harris 1988), bipolar prostheses (Oakeshott et al. 1987, Wilson et al. 1989), and the use of various acetabular reinforcement rings (Oh and Harris 1982, Muller 1981, Muller and Jaberg 1990). The anti-protrusio Burch-Schneider cage is made of rough-blasted titanium with a superior flange which rests against the ilium with 4.5 or 6.5mm screws and an inferior flange which is driven into the pubic bone.

We used the Burch-Schneider cage to manage serious acetabular bone insufficiency in revision hip arthroplasties, as well as in hip replacement for CDH.

Patients and methods

From 1985 to 1993, Burch-Schneider anti-protrusio cages were used in 24 hips of 22 patients. There were 21 women and the mean age was 58 (43–72) years. 24 cages were placed in 21 revisions of failed arthroplasties due to loosening and in 3 primary arthroplasties in patients with high CDH with acetabular insufficiency.

Bone defects were classified according to AAOS system (D'Antonio et al. 1989). There was 1 hip with a type I bone defect (segmental, one wall deficiency), 3 hips with type II (cavitary, insufficiency of acetabular base), 17 hips with type III (combined) and 3 hips with type IV (pelvic discontinuity with defect between anterior and posterior columns).

Following preparation of the insufficient acetabulum, the type and size of the bone defect was determined. Abundant bone graft was then applied fol-

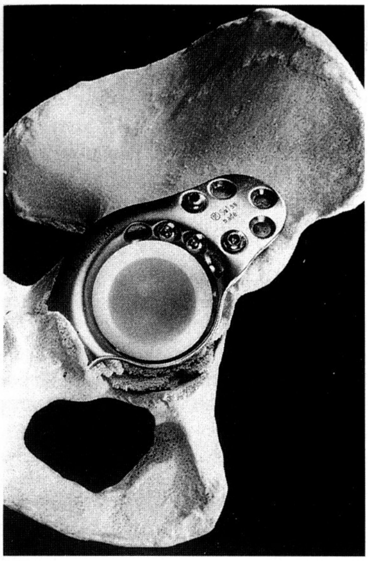

Figure 1. An artificial acetabulum showing placement and reinforcement with a Burch-Schneider anti-protrusio cage with a polyethylene cup.

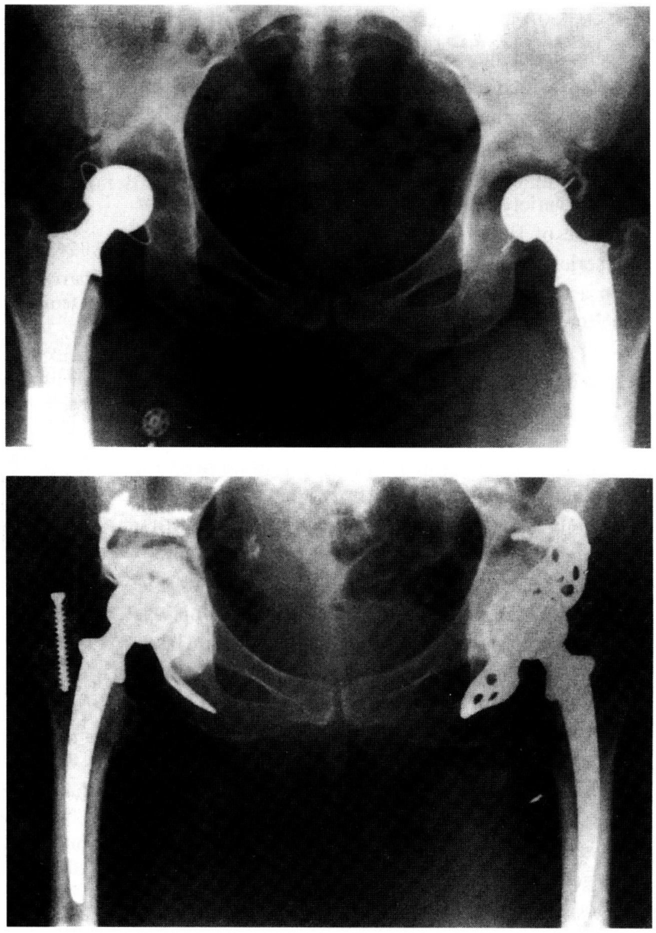

Figure 2. (Top) Bilateral acetabular mechanical failure in a 72 year-old woman. The patient had a grade III deficiency on the right and a grade I on the left. (Bottom) Effective revision and support of the hip with a Burch-Schneider cage at 7 and 8 years postoperatively for the right and left hip, respectively.

lowed by selection and moulding of the proper Burch-Schneider cage. Fixation of one flange of the cage in the ilium was done with 4.5 or 6.5 mm screws, while the inferior flange was driven into the pubic bone (Figure 1).

A polyethylene socket was cemented into the metal cage in the correct orientation. Bone grafts and 3 or 4 screws were used in each case. A left cage was used on the right side of hips with an anterior wall insufficiency to improve acetabular support.

Postoperative management included bed rest for 2 weeks, followed by mobilization with partial weight-bearing using 2 crutches for an additional 6 weeks. Patients were examined clinically and radiographically at 3, 6 and 12 months postoperatively, as well as each year thereafter.

The mean follow-up time was 8 (2–10) years. The following were determined at each follow-up: presence of pain during walking or movement, the need for crutches, and the patient's subjective impression of the clinical outcome, while radiographs were examined for placement of screws and cage, the presence of radiolucent zones around the cement and the incorporation of the grafts. Bending or breakage of the screws, movement of the cage or a radiolucent zone greater than 2 mm were considered as signs of mechanical failure.

Results

Only one patient showed signs of mechanical failure with 2 screws which were broken and bent. No other radiological signs of mechanical failure were observed. Bone grafts appeared to have incorporated in all hips and no signs of graft absorption were observed.

All patients were satisfied with the clinical outcome and the functional results following reconstruction were considered very good. Pain scored 3.2 preoperatively and 4.8 postoperatively (Merle D' Aubigne). No intra- or postoperative complications were encountered, and 21 of the 22 patients were satisfied with their results (Figure 2).

Discussion

Severe deficiency of pelvic bone stock is a major problem which tends to be common in an increasing number of patients who require revision of a failed hip arthroplasty or in difficult high CDH cases. Management of acetabular deficiencies has been attempted by a variety of methods with controversial results. The use of Burch-Schneider anti-protrusio cages in our series gave satisfactory results in almost all cases.

In a similar series, Berry and Muller (1992) used the Burch-Schneider cage in 42 cases, and encountered aseptic loosening in 5 hips after 5 years, 2 of which required reoperation. Rosson and Schatzker (1992) reported mechanical failure in 1 of 20 cases, with no need for revision. In our series, mechanical failure was observed in 1/24 cases, with no need for revision.

In comparison to analogous methods for supporting an insufficient acetabulum, the results using Burch-Schneider cages appear too be much better. A 75% rate of loosening at a mean of 6 years follow-up was observed with the used of wire mesh (Jasty and Harris 1988), and a failure rate of 60% was found with bulky bone grafts after 6 years follow-up (Jasty and Harris 1990). Similarly, other studies have high rates of failure using bipolar prostheses (Oakeshott et al. 1987, Wilson et al. 1989, Brien et al. 1990).

The anti-protrusio cage combines well with pelvic bone grafting or allografts. The shape of the cage permits good protection of the grafts and provides bridging for bone gaps. Although there is risk for graft absorption, particularly of bulky bone grafts (Jasty and Harris 1990), most studies support the usefulness of grafts in these types of cases (Harris et al. 1988, Hedley et al. 1988). No difference in the effectiveness between autografts and allografts has been reported (Berry and Muller 1992, Rosson and Schatzker 1992). We used pelvic bone autografts in all cases with satisfactory incorporation.

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