Total hip arthroplasty with Boneloc®

Loosening in 102/157 cases after 0.5–3 years

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We report the outcome of 177 consecutive primary Charnley total hip arthroplasties inserted with Boneloc® cement between November 1991 and November 1993. There were 107 women and 70 men. The mean age at the time of the operation was 71 years. 11 patients (13 hips) died during the follow-up period and 3 patients were too weak to attend a follow-up examination. Of the 161 remaining hips, 4 had been revised because of deep infection. The mean follow-up time for the remaining 157 hips was 2 (0.5–3) years. 24 hips had been revised and 6 are waiting for revision because of stem loosening. Of the remaining 127 hips, 72 showed radiographic signs of stem loosening and 2 hips were probably loose. Osteolysis was seen around the femoral component in 56 hips.

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Boneloc® was introduced to the Norwegian market 1991 and marketed as a cold-curing and less toxic bone-cement. The cement was packed in an integrated mixing and delivery system, which prevented air inclusions and gave a homogeneous mixture without environmental pollution (Jensen et al. 1990, 1991, Darre et al. 1992, Nimb et al. 1993).

We have performed Charnley hip arthroplasties at Halden Hospital for many years, using modern cementing techniques and with good results. The only change in the procedure was the introduction of the Boneloc® bone cement at our hospital in November 1991. We report our short-term results with Boneloc®.

Patients and methods

Between November 1991 and November 1993, 177 consecutive primary Charnley arthroplasties were done with Boneloc® (Polymers Reconstructive A/S, Farum, Denmark). 12 patients were operated on bilaterally. The average age of the patients was 71 (44–87) years. 107 patients were women and 70 were men. 12 patients had been operated on previously with intertrochanteric osteotomy in 7, pinning because of femoral neck fracture in 4, and acetabular roof-plasty in 1. Of the remaining 157 hips to be evaluated, the diagnosis at the time of the operation was arthrosis in 132 hips, dysplasia in 18, Perthes' disease in 3, osteonecrosis following hip fracture in 2, and rheumatoid arthritis in 2.

All femoral components were fixed with Boneloc®; in 167 hips the acetabular component was fixed with Boneloc® and in 10 with Simplex® cement. The direct lateral Hardinge approach was used (1982). The cementing technique included intramedullary lavage, locking of the femoral medullary canal with a polyethylene plug, and drying the canal with a hydrogen peroxide-soaked sponge (Harris et al. 1982, Harris and McGann 1986). The cement was delivered with a cement gun and filled in a retrograde manner and it was pressurized before the stem was inserted. A cefalosporine was given as prophylaxis against infection.

Excluded from the follow-up examination were 18 patients (20 hips); 11 patients (13 hips) had died, 4 hips had been revised because of deep infection and 3 patients considered themselves too weak to participate. The radiographs were evaluated according to Johnston et al. (1990) and the filling of the intramedullary canal with cement was estimated.

The severity of the osteolysis was described as extensive, if the lesions occupied at least 6 zones or had an area of more than 10 cm^2, intermediate if the lesions occupied 3, 4 or 5 zones or had an area of 2.5–10 cm^2 and mild if the lesions occupied one or two zones or had an area of less than 2.5 cm^2 (Goetz et al. 1994). Subsidence was measured by drawing a longitudinal line through the center of the distal two thirds of the prostheses, three lines were then drawn at right angles to this: one to a fixed point on the collar of the prosthesis, one to the tip of the trochanter and one to the most prominent point on the lesser tro-

74-year-old man. Postoperatively and after 11 months. Typical Boneloc® loosening with subsidence, radiolucency between the stem and cement in zone 1, change in position towards a varus position and osteolysis around the tip of the femoral stem.

chanter. The magnification was calculated by measuring the size of the femoral head.

Definite femoral loosening was defined as radiographic evidence of migration of the component (a change in the alignment of the component or more than 2 mm of subsidence) and the precence of any cement fracture and/or radiolucent line at the cement-prosthesis interface not present on the initial postoperative radiographs (Harris and McGann 1986, Mulroy and Harris 1990). An acetabular component was considered definitely loose only if it had migrated. Vertical and horizontal migrations of the cup were evaluated by measuring the distances from perpendiculars drawn from the hip center to the line joining the two teardrops; if this line was difficult to obtain, the line joining the top of both obturator foramens was used.

Results

The stem was put in neutral position in 131 hips, in varus position in 22 hips and in valgus position in 4. The cementing technique was good, with complete "white out" in 145 hips. Radiographic signs of stem loosening were observed in 102 hips and, in addition, 2 stems were possibly loose.

67 stems (43%) had a subsidence of more than 2 mm. A cement fracture occurred in 28 hips. A change in the position of the stem into a varus position occurred in 46 hips and into a valgus position in 1. Radiolucency between the stem and cement was observed in 96 hips and the gap was present in zone 1 in 92 hips.

Osteolysis around the stem was present in 57 hips. In 12 hips, the osteolysis was extensive and all these stems were loose. 26 hips showed intermediate osteolysis and, among these, 24 stems were loose and 2 possibly loose. 19 hips showed mild osteolysis, with 16 loose and 3 not loose. 71 hips showed calcar round-off or calcar resorption. In 31 hips, hypertrophy of the femoral cortex was present. The hypertrophy was in 29 hips localized to zone 3 or 5. The most typical pattern of loosening of the femoral stems was radiolucency between the stem and cement in zone 1, osteolysis in zones 3, 4 or 5, subsidence more than 2 mm and a tilt into a varus position; this pattern was found in 28 hips. The acetabular component showed very few changes. No cup had migrated. 43 cups showed radiolucency between cement and bone in zone 1, 7 in zone 2 and 4 in zone 3. Radiographic signs of possible cup loosening were present in 13 hips; in 3 hips the cup was probably loose, but none was definitely loose.

Discussion

We used a well documented prosthesis with an up-to-date cementing technique and postoperative radiographs showed that the cementing was adequate. An aseptic loosening rate of 3–5% is to be expected after 10 years with conventional bone cement. There is only one factor in the management of our patients which has not been documented, and that is the bone-cement. We attribute our catastrophic results to the use of Boneloc®. Thanner et al. (1995) reported an increased stem subsidence in the first postoperative year, when Boneloc® had been used in a radiostereometric comparison with Palacos®. A high loosening rate has also been observed by Suominen (1995) and Riegels-Nielsen et al. (1995). The occurrence of osteolysis in one third of the patients after only 2 years is exceptional and the osteolysis was rapidly progressing. The cement-fractures were mostly localized to Gruen zone 3, and this was also where the osteolysis was most commonly found. It is possible that cement fragmentation has induced this resorption of bone.

We found a high incidence of loosening of the acetabular component in the revisions which have been performed so far, although there was no clear radiographic indication of this. We therefore recommend the revision of both components.

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