

Displacement of a cemented polished tapered stem during closed reduction of a dislocated total hip arthroplasty—a case report

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A 96-year-old woman was admitted with a right dislocated femoral neck fracture. She underwent total hip arthroplasty with a cemented Exeter stem (Howmedica International, Staines, United Kingdom) through a posterolateral approach. The stem was cemented with Simplex bone cement (Howmedica, Rutherford, NJ, USA). No distal plug was implanted to prevent escape of procoagulants to the peripheral venous system (Maltry et al. 1995). The short external rotators and the joint capsule were repaired, using Pellicci et al.'s method (1998). Immediate postoperative radiographs showed a stem in a neutral position, with a homogeneous cement mantle. The polyethylene acetabular cup had 42° of inclination and 29° of planar anteversion (Ackland et al. 1986). The postoperative course was uneventful and the patient was discharged after 6 days, mobilized with a walker. 14 days after surgery, while standing up from the high toilet seat, her hip dislocated. Radiographs showed a postero-superior dislocation with a normal cement-stem interface (Figure 1). We tried to perform a closed reduction without sedation. A click was heard, and the leg-length equalized; however, passive hip motion was still limited and painful. Additional radiographs showed that the joint remained dislocated and that the stem had separated from the cement mantle, and migrated 12 mm proximally (Figure 2). We therefore performed an open reduction. At surgery, failure of the posterior soft tissue repair was seen with the tagging sutures pulled-out from the tendons and capsule. We removed the femoral component. The femoral head, cement mantle, and polyethylene cup were macroscopically intact. The same stem was reimplanted using the cement-within-cement technique (Lieberman et al. 1993) and leaving the stem 5 mm higher to exert more tension on the soft

tissue. Before the cement had hardened, we placed more cement over the stem's shoulder to prevent a new separation, as suggested by Staal et al. (2000) (Figure 3). The arthroplasty was reduced and found to be stable with an adequate soft tissue tension and arch of motion. The postoperative course was uneventful. 12 months after surgery, she had had no further dislocations and radiographs show an intact cement-stem interface.

Discussion

Polished, tapered stems became popular among orthopedic surgeons because of the excellent long-term clinical success rate reported for the Exeter prosthesis, which has been implanted since 1970 (Fowler et al. 1988). The surviving patients from the first 426 Exeter hip arthroplasties were reviewed at an average follow-up of 13 years and had a stem loosening rate of only 1.6% (Fowler et al. 1988).

Displacement of a cemented femoral stem at the cement-metal interface during closed reduction of a dislocation is a rare complication after total hip arthroplasty, only 2 with implanted polished Exeter and CPT stems (Zimmer, Warsaw, IN) having been reported in the literature (Holt 1996, Staal et al. 2000). Despite their vast experience with the Exeter stem, Gie and co-workers have never seen this complication (personal communication 2001).

This may be related to the geometry and surface finish of both stems: the Exeter and the CPT stems are double-tapered, collarless and highly polished designs, that rely on subsidence in the cement mantle under load to maintain stability (Ling et al. 1978, Alfaro-Adrián, 1999).

The adhesion strength at the cement-metal interface is determined by the mechanical interlock



Figure 1. Dislocation of the arthroplasty with an intact metal-cement interface. No cement is present over the shoulder of the stem (white arrow).



Figure 2. After an attempted reduction, the stem separated from the cement mantle.



Figure 3. Postoperative radiograph after open reduction shows an intact cement-metal interface. Cement was placed over the stem's shoulder to prevent a new separation (white arrow).

of the cement and the implant. Crowninshield et al. (1998) evaluated the adhesion strength of 8 metal rods with different surface finishes, which were cemented in a polyvinyl chloride pipe. The polished rods with the lowest average roughness (Ra 0.10 μm), had the lowest adhesion strength (11 N). The Ra coefficient of the CPT and Exeter stems is 0.05 μm , which may predispose them to this complication.

Moreover, some changes were made in the Exeter stem geometry in 1988, including a more prominent shoulder, as in the CPT. This new design makes placement of cement above the shoulder difficult. In a valgus hip undergoing a total hip arthroplasty or in revision cases with deficient trochanteric bone stock, engagement of the tapered stem in the cement is the only restraint preventing displacement. Other polished stem designs have a less prominent, round back shoulder, and cement can be easily placed in this area (CMK, Stratec Medical, Switzerland; C Stem, DePuy, Warsaw, IN; Versys Heritage, Zimmer, Warsaw, IN). To our knowledge no separations have been reported with other polished stem designs.

Theoretically, shrinking of the cement, changes

in the volume of the stem during heating and cooling of the cement, and involuntary movements of the component during hardening of the cement may cause less conformity of the cement-implant interface. However, such phenomena have not been studied.

In our patient, no cement was placed over the shoulder of the stem. Therefore, we believe that the stem became displaced when the femoral head impinged with the acetabular margin during the attempt of reduction.

Surgeons should be aware of this infrequent complication associated with the use of stems having a polished surface finish. Placing cement over the shoulder of the stem may avoid this complication (Staal et al. 2000). Ideally, there should be a continuous cement mantle covering the shoulder of the stem in continuity with the cement mantle in the lateral femur. Interdigitation of the cement in the cancellous bone of the greater trochanter may increase its mechanical strength and prevent displacement of the stem. In revision surgery, insufficient bone stock in the greater trochanter is frequently encountered; therefore, achievement of a continuous cement mantle extending proximally

and covering the shoulder may be difficult. If a dislocation occurs, radiographs should be examined for the presence of cement over the shoulder. If cement is present, closed reduction without fluoroscopy may be attempted. If cement is absent, we recommend closed reduction with sedation and under fluoroscopic control, to monitor possible impingement of the femoral head and displacement of the stem.

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