Polyethylene cemented cups have been reported to wear and fracture.\textsuperscript{1–4} Metal-backed cemented cups decrease stress at the prosthesis–cement interface.\textsuperscript{5} However, they introduce another interface at which problems can occur. Dissociation of the polyethylene and metal, fracture of the polyethylene or metal and increased wear of the polyethylene have been reported.\textsuperscript{6,7} With the popularization of uncemented cups with a metal shell and polyethylene insert, many of these problems have persisted.\textsuperscript{8–19} We report a case that illustrates another complication of one-piece metal-backed uncemented cups, that of acute fracture of the polyethylene.

**CASE REPORT**

A 64-year-old woman underwent an uncomplicated right total hip replacement. The prosthesis used was a PCA (Howmedica Inc., Rutherford, NJ) one-piece uncemented acetabular component, 46-mm outer diameter, 32-mm inner diameter, with a cemented femoral component. The patient did well for 18 months, when she fell, landing directly on her right knee, and experienced pain in her right hip. Initially, this was painful; however, the pain completely resolved over 3 months. Over the next 3 months she remained pain free but experienced a “clunking” and “vibration” from the joint which worsened before her hip was re-evaluated 2 years postoperatively. On examination at that time there was an audible clunking from the joint with movement, although she had a good, painless range of motion. The leg had shortened by 1 cm. Radiographs were unremarkable except for an asymmetric position of the head within the acetabulum (Fig. 1). At the time of revision, the femoral head was found to be slightly worn. The polyethylene insert was fractured into 4 pieces, which were dissociated from the metal shell (Fig. 2). There was no obvious wear of the insert when the pieces were reassembled. The metal shell of the acetabulum was stable, but upon removal it showed no bone ingrowth. A cemented aceta-
lar component with a 28-mm inner diameter was inserted. She did well postoperatively, and by 1 year she had returned to gentle downhill skiing.

**DISCUSSION**

The diagnosis of problems arising from the polyethylene liner is often difficult because if the hip does not dislocate all that may be seen is a slight asymmetry of the femoral head in relation to the acetabular metal shell, as in this case. Arthrography may be useful, but if the polyethylene is fractured and not extruded past the confines of the metal shell the arthrogram may not be diagnostic.

One factor increasingly appreciated is the thickness of the polyethylene. A cup with a metal backing will have thinner polyethylene for the same outer diameter as an all polyethylene cup. It has been found that stress in the polyethylene increases rapidly with a polyethylene thickness of less than 8 mm. This may lead to increased wear as well as fracturing of the polyethylene. In this case, in which the polyethylene liner was 3.91 mm (outer diameter 46 mm), a single traumatic event occurred, which resulted in acute fracturing of the polyethylene without macroscopic evidence of wear.

It has been recommended that the polyethylene thickness be at least 8 mm. Using a larger cup requires more bone removal and may not be desirable or possible. The second option is to use a smaller femoral head. To minimize volumetric wear, the use of a 32-mm head should be avoided and a smaller head size used. It is important to verify with the manufacturer what head size in combination with which particular acetabular size will lead to a minimum polyethylene thickness of 8 mm. In some cases this may necessitate the use of a 22-mm head.

**SUMMARY**

This case highlights one of the problems of uncemented acetabular components used in total hip replacement. Smaller acetabular components may have a polyethylene liner that is too thin, resulting in higher polyethylene stress and an increased potential for fracture. The authors believe that...
this should be compensated for by using a smaller head size to give a polyethylene thickness of at least 8 mm.

References


