

1.7 Alumina Ceramic against Polyethylene: A long term follow up

Ph. Hernigou, A. Nogier, A. Poignard and P. Filippini

Abstract

Between 1978 and 1990 the femoral implant was the same in four groups of patients with different function couples: alumina/alumina, (AL/AL); alumina/polyethylene (AL/PE); metal/polyethylene (Me/PE); zirconia/polyethylene (Zir/PE). The aim of this study was to compare survival rate, wear and femoral osteolysis among different couples of friction in patients with the same femoral stem.

For comparison between AL/AL and AL/PE we studied retrospectively 40 hips with a minimum 15 year follow-up (20 hips with an alumina/alumina (AL/AL) couple, 20 hips with an alumina/polyethylene couple (AL/PE). All the patients had the same femoral stem implanted with cement. All the cups (Al or PE) were cemented. The cause of THA was osteonecrosis for all the patients. The area of osteolysis was estimated in square millimeters on the calcar and the femur, using an image analysis program. In the alumina on alumina group the average follow-up was 18 years (range 17 to 19). Among these 20 hips, 8 cups had revision between 5 and 18 years. Among the 12 AL/AL hips without revision no osteolysis was seen before 7 years. At the most recent follow-up (average 18 years) the osteolysis is average 17 mm² (range 0 to 47) in these 12 hips with AL/AL couple. Among the 8 AL/AL hips with cup loosening, osteolysis before revision was average 12 mm² (range 0 to 32). In the AL/PE group the average follow-up is 16 years (range 15 to 17). 2 PE cups had revision at 12 and 13 years. In the 18 AL/PE hips without revision osteolysis was average 106 mm² at 15 years (range 31 to 254 mm²). In the 2 AL/PE hips with cup loosening osteolysis was 215 and 310 mm² before revision. Even with cup loosening, osteolysis was lower in the AL/AL group.

For comparison between AL/PE and Zir/PE we studied hips with the two different ceramics during the same period and with a minimum ten year follow-up. All the patients had the same stem implanted with cement. The polyethylene of the cemented cup was the same. The femoral head was made of dense alumina (Al₂O₃) with a diameter of 32 mm in sixty-two cases and made of yttrium-oxide-partially-stabilized zirconia with a diameter of 28 mm in forty cases. These hips were compared with a Me/PE group. No osteolysis of the calcar was seen before three years; at the fifth year of follow-up, the osteolysis was similar in the two groups. At the lastest follow-up (twelve years), the average wear rate of the alumina group was 0.07 mm/year during the last year; in the zirconia group an increase of the wear rate was observed between the 5th and the 12th year. In the zirconia group the average wear rate was 0.4 mm/year at the twelve year follow-up. The osteolysis was greater in the zirconia group (average 255 mm²) than in the alumina group (average 35 mm²) at the lastest follow-up. The total amount of wear at the most recent follow-up was average 1360 cubic millimeters for the zirconia group and 755 cubic millimeters for the alumina group. In the Me/PE group wear and osteolysis were higher than in the AL/PE group.

On long term follow up, the AL/AL had less osteolysis than the other couples of friction. However the survivorship was better for the AL/PE than for the AL/AL in the very long term (between 15 and 20 years follow up). Zir/PE and metal/PE had increased osteolysis and lower survivorship than AL/PE.

References:

1. Hernigou P., Nogier A.: Femoral osteolysis in hips with alumina/alumina in comparison with alumina against PE. AAOS; mars 2001.
2. Hernigou P., Bahrami T.: Zirconia and alumina ceramics in comparison with stainless-steel heads. J. Bone Joint Surg. Br 2003; 85-B: 504-509.