Head Size in Delta Ceramic-on-Ceramic Total Hip Arthroplasty: a Comparative Registry Study

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INTRODUCTION:

Optimal bearing size in total hip arthroplasty (THA) has not been clearly ascertained, but large diameter ceramic balls may improve function and implant stability, with minimal concerns for wear. Clinically oriented studies on large heads supported the use of bigger diameters to improve stability through optimized jump distance and head-neck ratio: a 4-fold reduction in dislocations occurred increasing the head size to 36 mm and only one dislocation out of 2020 implants (0.05%) was detected with >36 mm heads. However, the Australian and National Joint registries did not demonstrate significant reduction in revision rates with 32 mm heads or larger. Thus, an arthroplasty registry study on Delta COC THAs performed for primary osteoarthritis was designed. Delta ceramic-on-ceramic (COC) THAs were stratified based on head diameter (32, 36 and 40 mm), aiming to assess: 1) survival rates, reasons for revision and hazard ratios for failure; 2) survival rates and hazard ratios for aseptic loosening, dislocation/primary instability, liner failure.

METHODS:

A regional arthroplasty registry was investigated about primary THAs performed in the region from January 1, 2000 through to December 31, 2020. Only THAs performed for osteoarthritis, with cementless implants, and non-modular stems, with Delta-on-Delta bearings were selected. 28 mm head size and monoblock acetabular shells were excluded.

Three cohorts, stratified by head sizes (32,36 and 40 mm), were identified. A total of 13161 primary cementless Delta-on-Delta THAs with modular liners matched the inclusion criteria and were included in the study: 3980 (30.24%) were 32 mm balls, 8327 (63.27%) were 36 mm heads, 854 (6.49%) were 40 mm heads [Table 1]. The mean follow-up was 5.7 years (range: 0-17).

The cohorts were different in terms of age decades ($p<0.001$), sex ($p<0.001$), BMI ($p<0.001$). The three cohorts also differed for surgical approach ($p<0.001$) and cup sizes ($p<0.001$).

RESULTS: The three cohorts achieved similar survival rates ($p=0.99$) and adjusted hazard ratios ($p>0.05$). No revisions for head breakage or metallosis occurred. When revision for cup aseptic loosening was the endpoint, the survival rates of three cohorts ($p=0.08$) and the adjusted hazard ratios ($p>0.05$) were similar. The three cohorts achieved comparable survival rates when revision for dislocation/primary instability was the endpoint ($p=0.08$). When the endpoint was revision for liner breakage, 32 mm cohort showed higher rates of revision ($p=0.01$). No liner failure was detected in the 40 mm cohort.

DISCUSSION AND CONCLUSION:

In Delta COC THAs performed for primary osteoarthritis, 32 mm, 36 mm and 40 mm heads achieved similar 10-year survival rates. No revisions for head breakage of metallosis occurred. Even when specific endpoints were considered, the survival rates of the three head sizes were substantially similar: only more liner failures occurred with 32 mm heads. 40 mm heads did not result in higher revisions rates and demonstrated to be dependable bearing solution at 10 years. However, 40 mm heads did not lower the revisions for dislocations in comparison to 32 mm and 36 mm diameters.