Modern Cementless Acetabular Cups in Total Hip Arthroplasty Performed for Primary Osteoarthritis: a Comparative Registry Study

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INTRODUCTION:
There is a paucity of literature comparing the survival rates of acetabular cups with different material and surface finishing in total hip arthroplasty (THA) performed for primary osteoarthritis in sizeable populations at mid-to-longterm follow-ups. Mostly, there is a lack of comparative studies including the most recent evolutions of sockets. Thus, a registry study on different acetabular cups in THAs performed for primary osteoarthritis was designed. We sought to assess the survival rates and the hazard ratios for failure of the cups considering different endpoints: 1) overall cup failures, 2) cup aseptic loosening, 3) periprosthetic infection. We hypothesized that newly developed cups could achieve better survival rates and lower hazard ratios for failure than second-generation sockets.
METHODS:
A regional arthroplasty registry was queried to identify all cementless hemispherical acetabular cups in THAs performed for primary osteoarthritis performed in the region between January 2000 and December 2021. The inclusion criteria for this query were: patients residing in the region, THA for primary osteoarthritis, Delta-on-Delta bearings, head sizes 32 mm and 36 mm. Exclusion criteria were: diagnoses other than primary osteoarthritis, bearings other than Delta-on-Delta bearings, head sizes inferior to 32 mm or larger than 36 mm. Only the most implanted cementless cups were considered and were grouped according to material and surface finishing into three cohorts: 3D printed cups (I), ultraporous tantalum or titanium coated sockets (II), second-generation sockets (III). 15,737 cups were included in the study: 9,862 sockets (62.7%) in cohort I, 2,067 implants (13.1%) in cohort II, 3,808 implants (24.2%) in cohort III. The demographics differed among the three cohorts about sex ($p<0.001$), mean age at implant ($p<0.001$), age decade at implant ($p<0.001$), BMI class ($p<0.001$). The distribution of the implant features differed among the three cohorts: additional screw fixation ($p<0.001$), single taper implants ($p<0.001$), cementless stems ($p<0.001$), head size ($p<0.001$), cup size ($p<0.001$).
RESULTS: The three cohorts achieved comparable general 10-year survival rates ($p=0.62$). In I and II cohorts, the survival rates of the single cups were analogous ($p=0.86$ and $p=0.31$), but not in cohort III ($p=0.004$). The hazard ratios for overall failure adjusted for age and sex were similar among the cohorts. Regarding cup aseptic loosening, the three cohorts had similar rate ($p=0.48$) and similar adjusted hazard ratios. With periprosthetic hip infection as endpoint, the survival rates and the adjusted hazard ratios of the three cohorts were comparable ($p=0.68$).
DISCUSSION AND CONCLUSION:
All the sockets achieved dependable performances at 10 years. Some differences were observed among single cups only in the second-generation sockets. All the three cohorts provided comparable survival rates, even with different endpoints (overall failures, cup aseptic loosening, periprosthetic hip infection). Moreover, the hazard ratios for failure (general and specific endpoints) were analogous in the three different cohorts. Thus, newly developed cups failed to demonstrated superior 10-year outcomes with respect to more conventionally fabricated cups, but no additional concerns emerged.