

Dear reviewers,

Thank you for taking the time to consider our article entitled “Acetabular cup size trends in total hip arthroplasty.” I have made adjustments to our article based on your comments. These are explicitly addressed below:

1. I suggest that you include in the Methods section whether the surgeons always used the same cup model or whether they changed the cup type one or more times during the observation period. It is a common experience that constantly changing the cup type from one patient to the other never leads to a good acetabular implantation, because the specific characteristics of the cup are also a crucial part of the learning process. I recommend to add this aspect to the discussion.

In the methods section there is now a line that reads “Baseline demographics and implant sizes were recorded. The manufacturer and product details for each cup used were noted.” This is also addressed in the discussion section “During our analysis we noted the following two cups systems to be in use; Trident Acetabular System (Stryker, Michigan, United States) and Pinnacle Hip Solutions (De Puy Synthes, Massachusetts, United States). These components were used by all four surgeons. None of the practices examined exclusively used one acetabular cup for the duration of the study. Even with this heterogeneity we found a significant trend to smaller cup sizes.”

2. I further suggest that you add these two publications to your reference list, which provide good information on where the cup fixation forces in press-fit cups act. They also show what the pressure distribution looks like in the implant/bone interface and they reveal that the fixation quality depends not only on the socket, but above all on the biomechanical properties of the acetabular bone, which could partially explain the observed gender differences: Widmer KH, Zurfluh B, Morscher EW. Load transfer and fixation mode of press-fit acetabular sockets. *J Arthroplasty*. 2002 Oct;17(7):926-35. doi: 10.1054/arth.2002.34526.

The discussion section now addresses the importance of press fit and the bony anatomy that makes up the acetabulum. “Another hypothesis as to why the trend was more pronounced for males is the biomechanical properties of the pelvis that allow for press fit cup designs. In vitro testing has demonstrated that stable cup fixation is best achieved by buttressing against the three bones that comprise the acetabulum(10). Female pelvises are known to be smaller and deeper than their male counterparts(11). Given that the peripheral acetabular bone stock is of critical importance to stability, we speculate that the more inexperienced surgeon may use larger cups for male subjects in an effort to ensure adequate fixation in their shallower acetabula.

3. Widmer KH, Zurfluh B, Morscher EW. [Contact surface and pressure load at implant-bone interface in press-fit cups compared to natural hip joints]. *Orthopedist*. 1997 Feb;26(2):181-9. doi: 10.1007/s001320050084. The latter, unfortunately only published in German, indicates to which locations within the acetabulum the forces of a press-fit cup should preferably be transmitted. This study also provides clear guidelines as to which acetabular surfaces should be visually inspected during the milling process and where the load-bearing surfaces of the acetabular bone are located

and, consequently, where the subchondral bone should be preserved. On the other hand, this also underlines that preoperative geometric planning alone and its intraoperative implementation using navigation or robotic tools is probably not sufficient, but always requires intraoperative visual control.

The discussion also now provides commentary on how ideally cups should be seated. It also explains the process that surgeons should undergo to ensure cups are seated correctly. “For surgeons who are still acquiring arthroplasty skills and techniques, it should be noted that uncemented cups ideally transmit forces through the acetabulum in a similar topographical distribution to the native hip joint.(7) Knowledge of these three load bearing surfaces should also for bone stock preservation and emphasises the need for intraoperative visual control.”

We the authors would once again like to thank you for considering our submission. If there are any more comments that need clarification please let us know.

Kind regards,
Daniel McKenna

JOURNAL EDITORIAL BOARD COMMENTS TO AUTHORS

It is a very interesting paper which reports the increasing surgeon experience to be associated with an ever decreasing acetabular cup size for the first time. However, the following questions should be answered before accept for publication. 1. The shape and subchondral bone quality of the acetabular can also influence the degree of reaming in addition to the cup design. 2. It will be more reasonable if the arthroplasty be divided into two different cup design groups, 3. The decrease in cup size to be more evident with decreasing or increasing surgeon experience? 4. In figure 1, Surgeon A performed 10 years arthroplasty, it seems abnormal that the cup size becomes less and less without any plateau. Surgeon C only performed 5 years arthroplasty, the cup sizes he used are much less compared to that of surgeon A, which does not support the conclusion.

Dear Editor,

Thank you for taking the time to review our manuscript and thank you for your comments. We have replied to the comments below:

1. The shape and subchondral bone quality of the acetabular can also influence the degree of reaming in addition to the cup design. 2. It will be more reasonable if the arthroplasty be divided into two different cup design groups,

Our original data collection was focused on acetabular cup sizes used. We noted the manufacturer of each cup, however the specific type of cup used was not noted. For example in the Stryker system we did not note if hemispherical or peripheral self locking cups were used. Again in the De Puy system the specific cup design was not recorded. As a result we examined the overall trend and deemed cup design to be a confounding factor which could be targeted in future studies. This lack of consistency in cup design is acknowledged in the discussion and it is mentioned as one of our primary limitations. It is for these reasons that the arthroplasties have not been divided in to two groups based on cup manufacturer.

3. The decrease in cup size to be more evident with decreasing or increasing surgeon experience?

The decrease in cup size is more evident with increasing surgeon experience. This was an error in wording in the manuscript and has been corrected accordingly.



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4. In figure 1, Surgeon A performed 10 years arthroplasty, it seems abnormal that the cup size becomes less and less without any plateau. Surgeon C only performed 5 years arthroplasty, the cup sizes he used are much less compared to that of surgeon A, which does not support the conclusion

For the purposes of analysis each surgeon served as their own control. Some surgeons prefer larger cups than others. The average size of cup that each surgeon chose when relatively inexperienced was deemed to be their baseline preference. It was the trend with time, regardless of whether the surgeon prefers large or small cups, that was of primary interest. In this regard all surgeons trended towards smaller cups from their baseline. A paragraph outlining this has been included in the methods section.

If there are any more issues or questions with the submission please do not hesitate to contact me.

Kind regards,

Daniel McKenna