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# In Which Patients Should a Custom-Made Acetabular Implant (Triflange Cup) Be Used?

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**In which patients should a custom-made acetabular implant (triflange) be used?**

**Recommendation:** Custom-made acetabular implants (triflange) are a reasonable option for the reconstruction of the acetabulum in patients who have severe uncontained acetabular bone loss, with or without pelvic discontinuity.

**Level of Evidence:** Limited.

**Delegate Vote:** Agree: 90%, Disagree: 4%, and Abstain: 6%.

## Rationale

The increasing number of patients who have severe acetabular bone loss has led to the frequent use of various options for definitive reconstruction including the use of custom-made acetabular implants (CMAIs) [1,2]. The purpose of this umbrella review was to evaluate the outcome of patients who had undergone

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reconstruction via CMAI, with the intention of identifying the appropriate indications for these implants.

Various types of studies describing the results of the use of CMAIs have been published over the past 2 decades [3–5]. Using the search strategy, 187 records were initially identified. After removing 46 duplicates, the titles and abstracts of 141 studies were screened, and a full-text review of 15 studies was carried out. The full-text review resulted in the exclusion of another 12 studies. Ultimately, only two systematic reviews and one meta-analysis were included in the review [6–8], and a brief analysis of the relevant studies is presented here.

In the majority of studies, the indications for the use of CMAIs were acetabular defects classified as Paprosky types IIIA and IIIB or American Academy of Orthopaedic Surgeons types III and IV [6–8]. A systematic review by De Martino et al. [6], including 17 studies, reported a complication rate of 29% and a reoperation rate of 17.3% with the use of CMAIs. The most common complications after the use of CMAIs were dislocations (11%), followed by periprosthetic joint infections (PJIs) (6%), nerve injuries (3.8%), and wound complications (2.7%). Reoperations were performed most often due to dislocation (6.4%), and PJI (5.5%). Aseptic loosening of CMAIs was noted in 1.7% of cases.

In their systematic review, Chiarlone et al. [7] pooled the results of 18 studies and reported a complication rate of 29%, a reoperation rate of 19.3%, and a rerevision rate of 5.2%. Again, the main reason for reoperation was dislocation. The aseptic loosening rate of CMAIs was 2.6%; PJI and aseptic loosening constituted the main reason for the removal of CMAIs.

In a systematic review and meta-analysis, Broekhuis et al. [8] combined the results of 33 studies. The rate of implant-associated infections was 24%, reoperation for any reason was 15%, and implant failure was 12%. An association of results with the generation of CMAIs was identified, and implant failure rates were higher for the earlier generation. The results were also correlated with the length of follow-up and the study start date. Improved postoperative functional outcomes were reported in all reviews [6–8].

Based on the available data, it appears that CMAIs have resulted in much better function and greater satisfaction in patients who have severe acetabular bone loss, with or without pelvic discontinuity. Gaining experience with the use of CMAIs, both on the part of surgeons and the part of engineers involved in implant development, appears to contribute to improved results.

However, the use of CMAIs is associated with some issues. There is a high cost associated with these implants and often protracted time delays necessary for their design, manufacture, and delivery. In addition, based on the experience of many surgeons, there is often a need for intraoperative refinements in order for the custom-made device to fit properly. On occasion, more bone may need to be removed, or alternatively, the device modified to achieve an optimal fit. Recently, with more experience and with corresponding engineering advances, these issues appear to have abated to some extent. Nevertheless, there is a need for further research to evaluate the cost-effectiveness of CMAIs as well as to better define the indications for their use. In conclusion, currently acceptable indications for the use of CMAIs include acetabular defects classified as Paprosky types IIIA and IIIB or American Academy of Orthopaedic Surgeons types III and IV, with or without pelvic discontinuity.

## CRediT authorship contribution statement

**Alisagib A. Dzhavadov:** Writing – original draft, Formal analysis. **Wei Huang:** Writing – review & editing. **Huiwu Li:** Writing – review & editing. **Syed Shahid Noor:** Writing – review & editing. **Javad Parvizi:** Writing – review & editing. **Alisina Shahi:** Writing – review & editing. **Neil P. Sheth:** Writing – review & editing. **Kevin Tetsworth:** Writing – review & editing. **Rashid M. Tikhilov:** Writing – review & editing. **Jorge A. Villafuerte:** Writing – review & editing. **Luigi Zagra:** Writing – review & editing.

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