

# In-Vivo Tibial Fit Analysis of Customized, Patient-Specific TKA Versus Off-the-Shelf TKA

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## INTRODUCTION

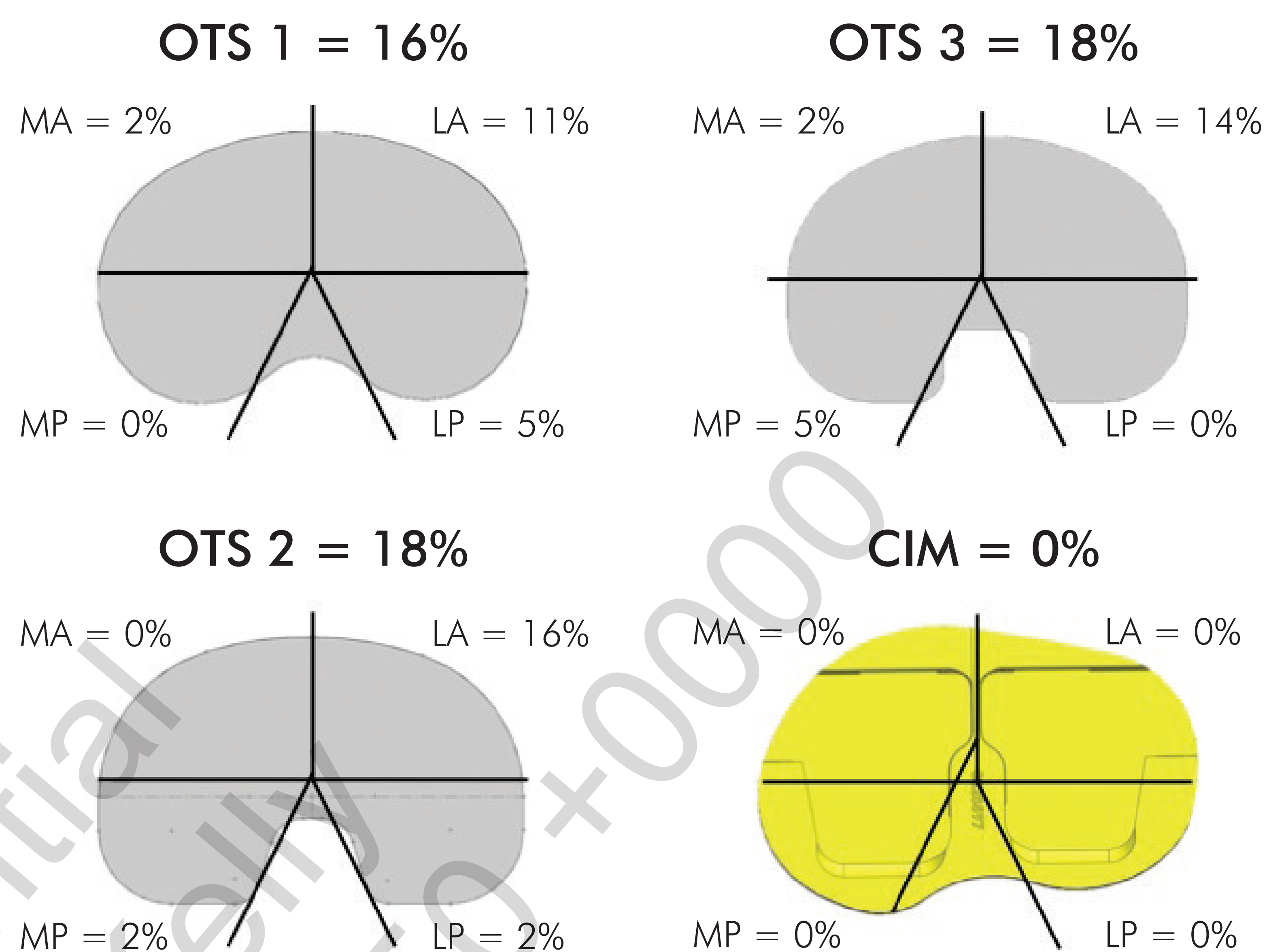
The purpose of this study was to intra-operatively compare tibial fit of a customized, patient-specific TKA implant to that of off-the-shelf (OTS) TKAs in the same patient.

## METHODS

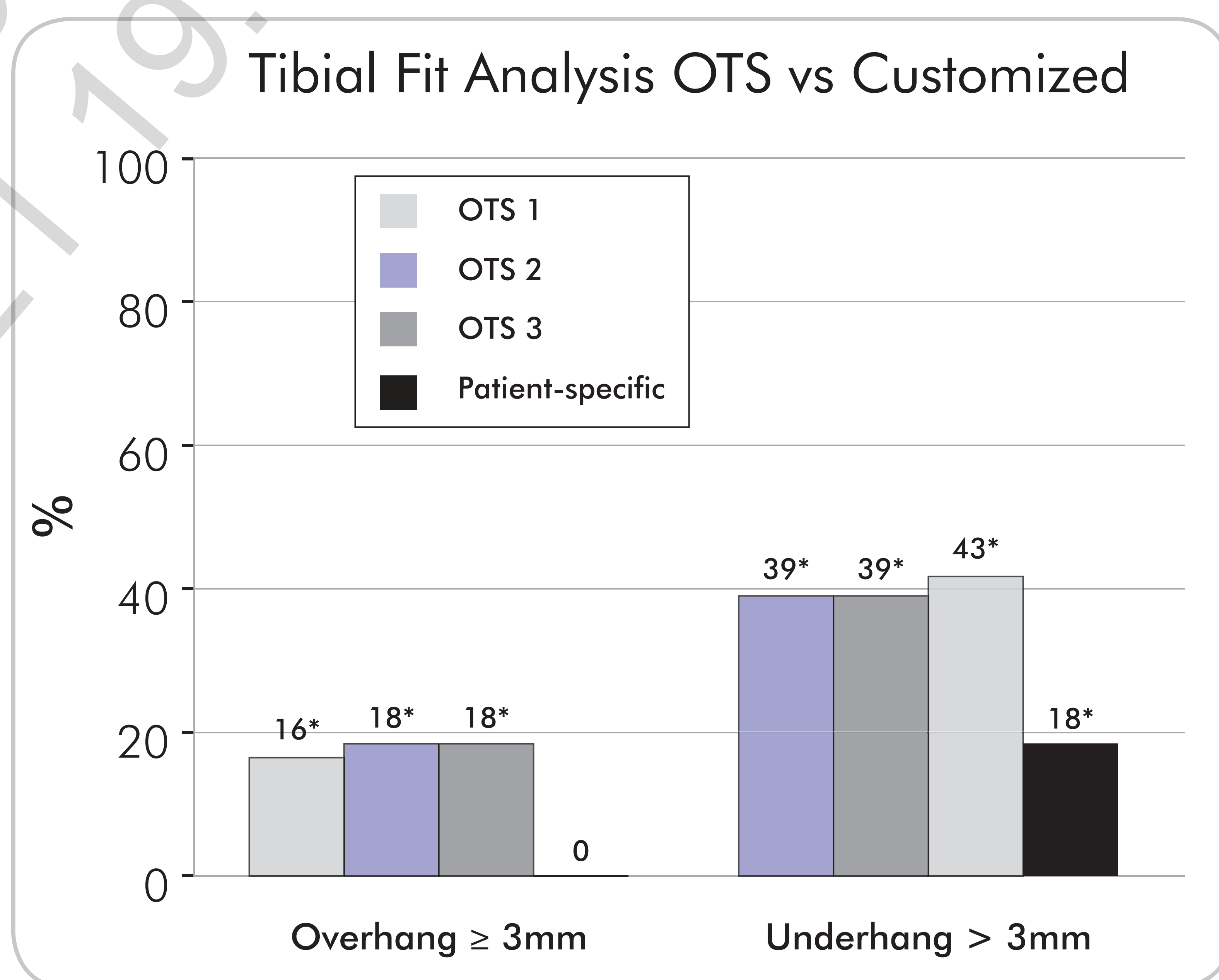
- 44 patients undergoing customized TKA surgery were compared to OTS TKAs to assess tibial tray fit intra-operatively.
- After tibial preparation, a series of tibial trials from 3 OTS-TKA designs were fit, while maintaining proper rotational alignment.
- Implant fit (overhang/underhang) for the best-matched trial of each OTS-TKA was recorded in four tibial zones.
- Once all measurements were completed, the customized tibial tray was implanted, and measurements were repeated.

## RESULTS

Analysis revealed that the surgeon routinely had to undersize the tibia with the OTS implants to prevent overhang of the cortical bone in order to maintain proper rotational alignment. In spite of this preference, significant overhang of  $>3\text{mm}$  of the tibial component in any one zone was seen in 16% of OTS 1 TKAs and 18% of both OTS 2 and OTS 3 TKAs. None (0%) of the CIM TKA trials, experienced tibial tray overhang of  $>3\text{mm}$  (Figure 1), which was found to be statistically significant. Setting the threshold for overhang to  $>1\text{mm}$  did not affect the results for the CIM TKA, with none of the patients in the CIM TKA group experiencing overhang  $>1\text{mm}$ . For the four zones analyzed, underhang of the tibial component  $>3\text{mm}$  was seen in 18% of CIM TKAs (Figure 2), and an average 40% in the 3 OTS groups (39%, 39% and 43% for OTS-1, 2 and 3 respectively). These differences were also found to be statistically significant, with a lower percentage of patients experiencing underhang with the CIM TKA trials when compared to each of the 3 OTS groups. Additionally, there were individual cases among the OTS groups where significant overhang and underhang was seen for the same tibial trial or underhang was evident in more than one zone. There were no such cases with the CIM tibial trays. In the 3 OTS groups, underhang was most frequently seen in the postero-medial zone, while the antero-lateral zone was the most frequent zone experiencing overhang.



**Figure 1:** Distribution of overhang in the medial anterior, lateral anterior, medial posterior, and lateral posterior zones among the four groups.



**Figure 2:** Distribution of underhang and overhang between the four groups analyzed. \* indicates statistical significance.

## DISCUSSION

Results show that customized TKAs significantly improve tibial fit when compared to OTS TKA. This could play an important role in reducing knee pain and patient dissatisfaction, resulting from overhanging components, soft-tissue impingement as well as implant loosening due to poor tibial bone support and resultant subsidence.