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Introduction

- AI technologies are emerging as powerful tools that can revolutionize traditional practices.
- By harnessing the capabilities of machine learning, computer vision, and data analytics, AI offers innovative solutions for diagnosis, treatment planning, and the design of dental prosthetics.
- This study aims to compare the accuracy of margin detection and crown contour design from digital impressions between two AI-based CAD software and experienced dental technicians.

Materials and methods

- One hundred anonymized digital models were retrieved from OSU's student clinic database.
- Each model was duplicated and allocated to one of three groups: **Dental technicians(Dental manager,3shape), Automate, and Dentbird.**
- CAD software corresponding to each group was used to design a zirconia restoration.
- Four prosthodontists** qualitatively evaluated the clinical acceptability of margin detection and crown contour.
- Margins were assessed on **four sides—buccal, mesial, distal, and lingual**—using a score of 1 (acceptable or <0.3 mm cervically) or 0 (short or >0.3 mm cervically).
- Restoration contours were evaluated based on **placement, buccal/lingual/occlusal morphology, mesial/distal contact, and occlusion**, with scores of 2 (no modification needed), 1 (minor modification), or 0 (major modification).
- Data was analyzed using **one-way ANOVA** followed by Tukey's post-hoc analysis.

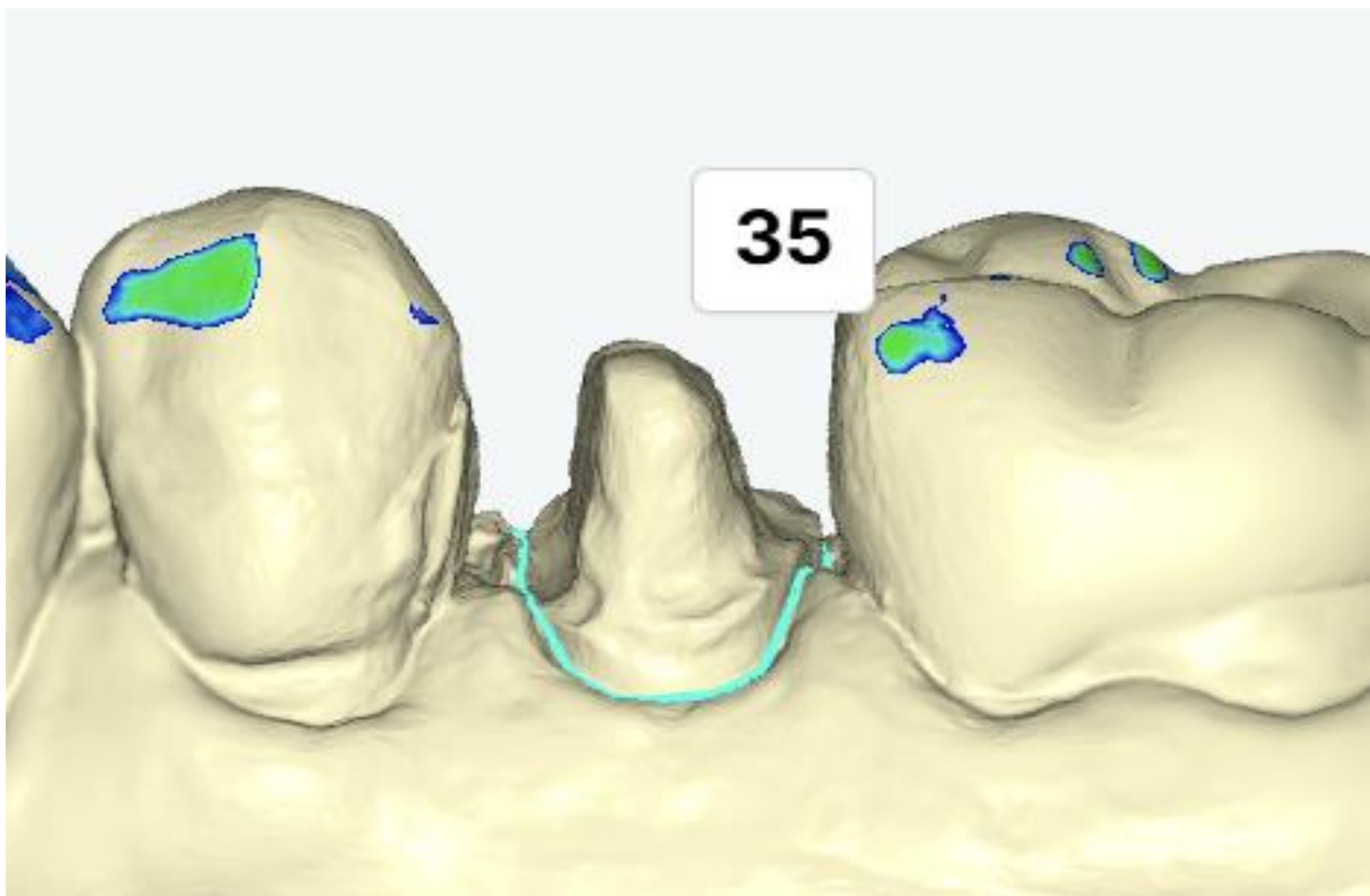


Fig 1: Margin detection using Dentbird software

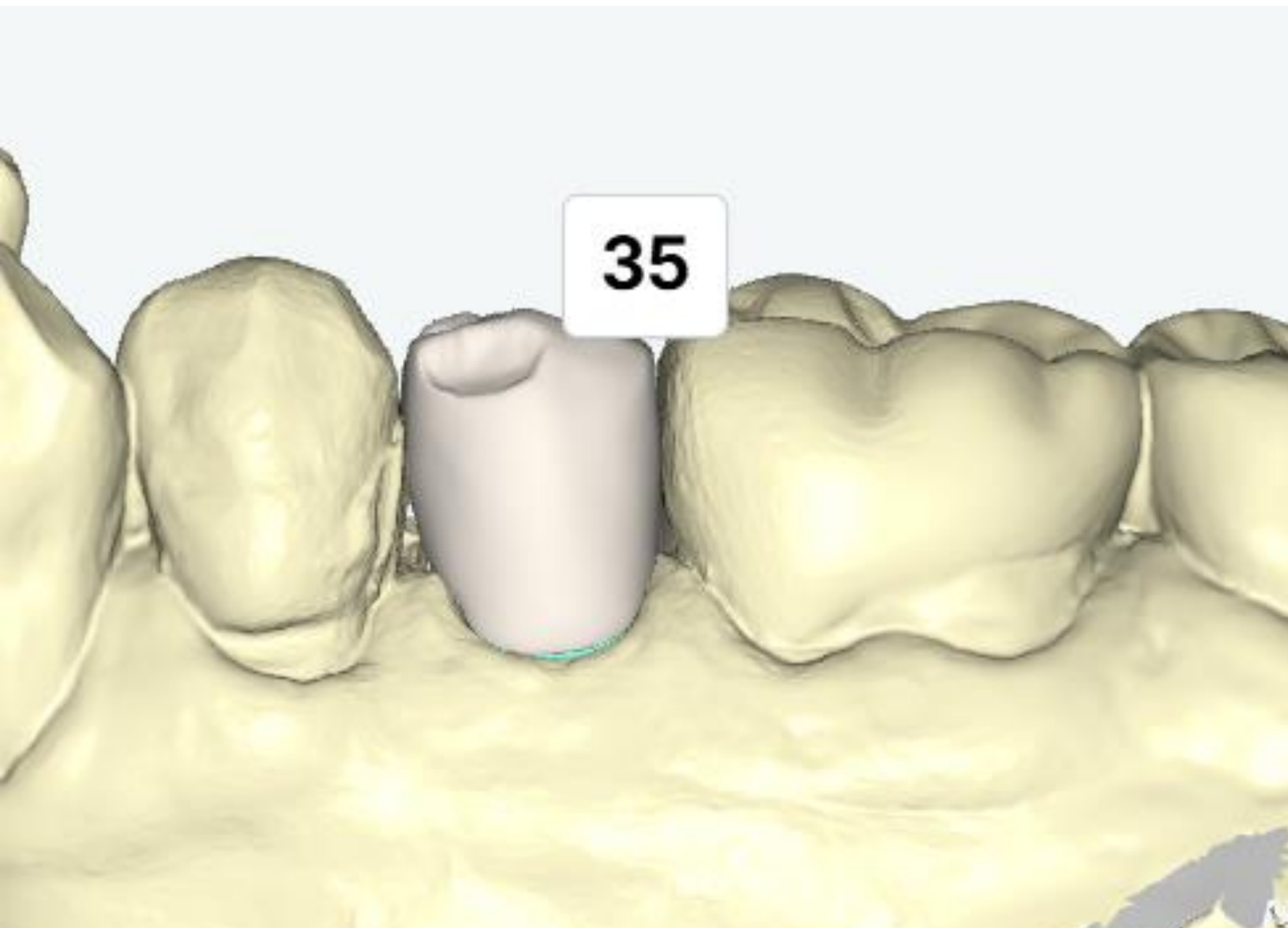


Fig 2: Crown design using Dentbird software

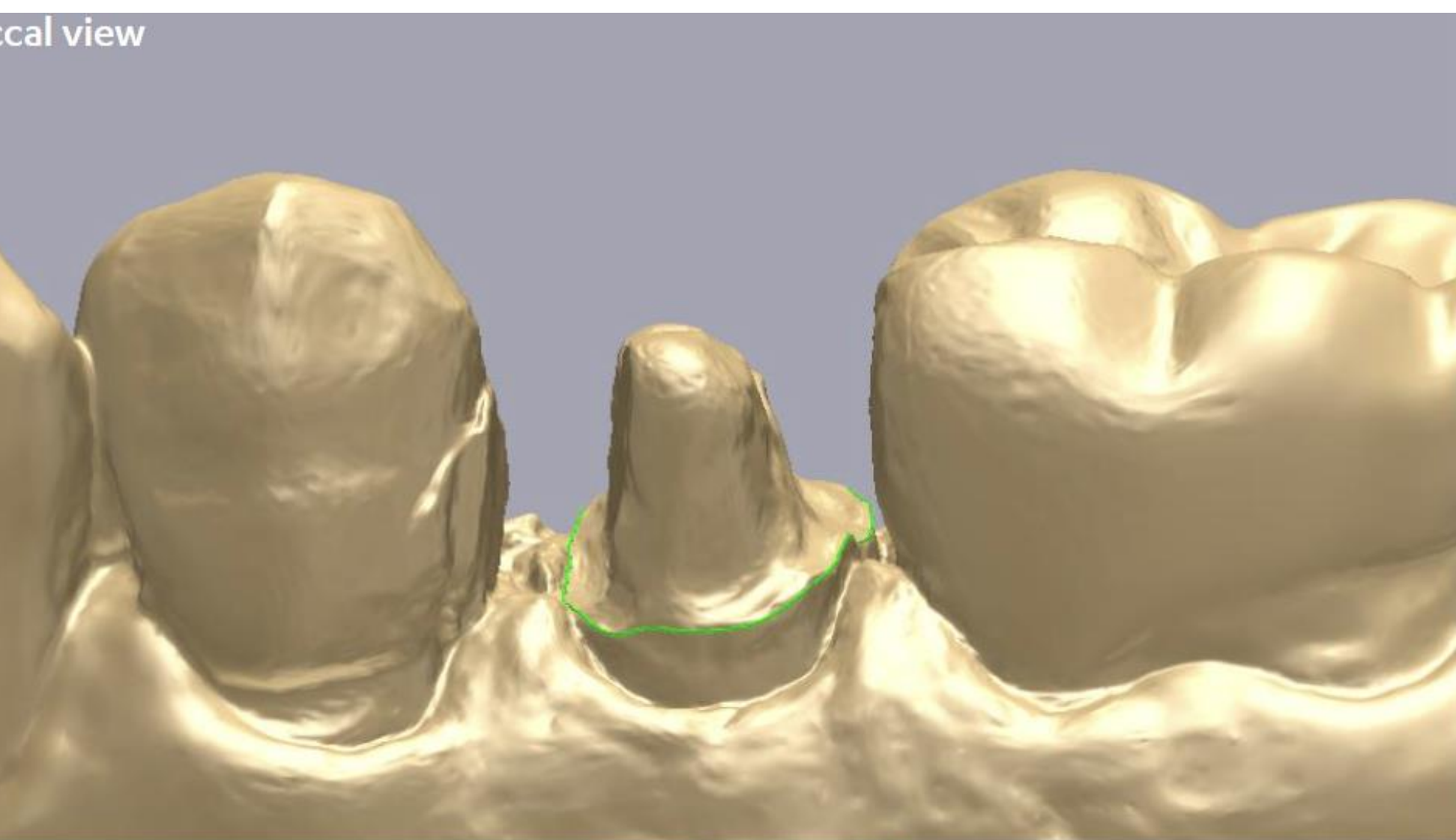


Fig 3: Margin detection using Automate software

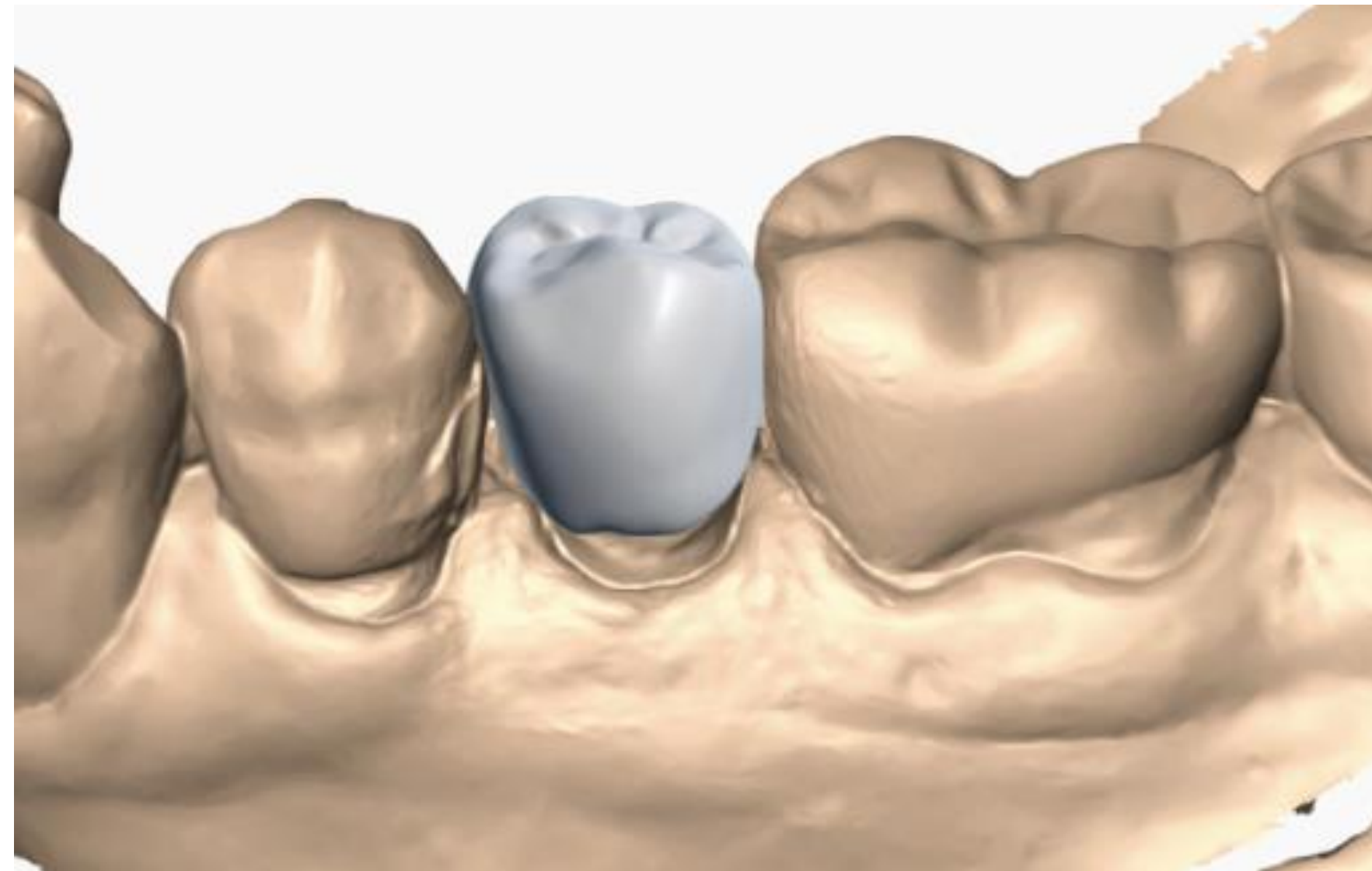


Fig 4: Crown Design using Automate software

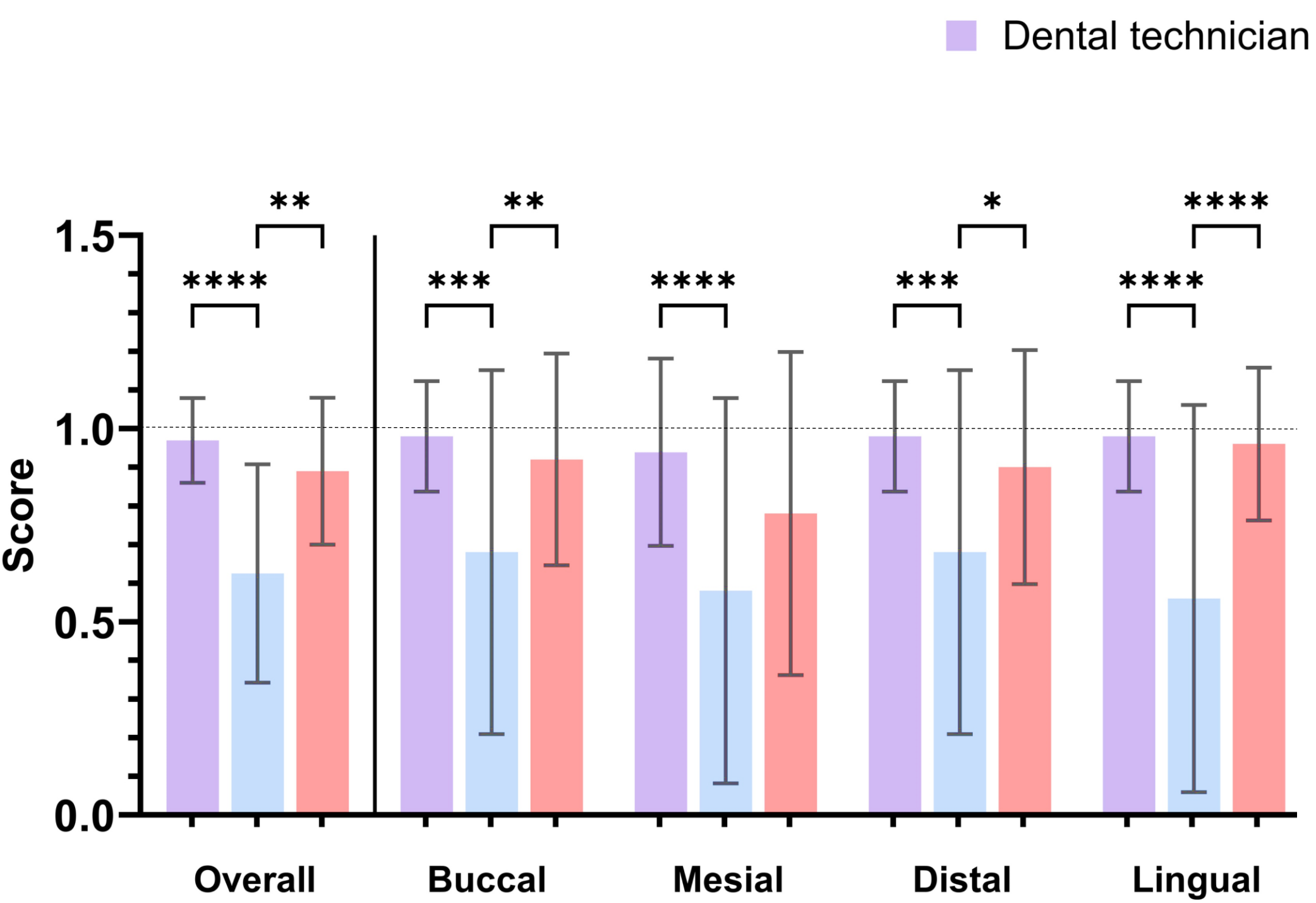


Fig 5: Bar showing results for margin detection

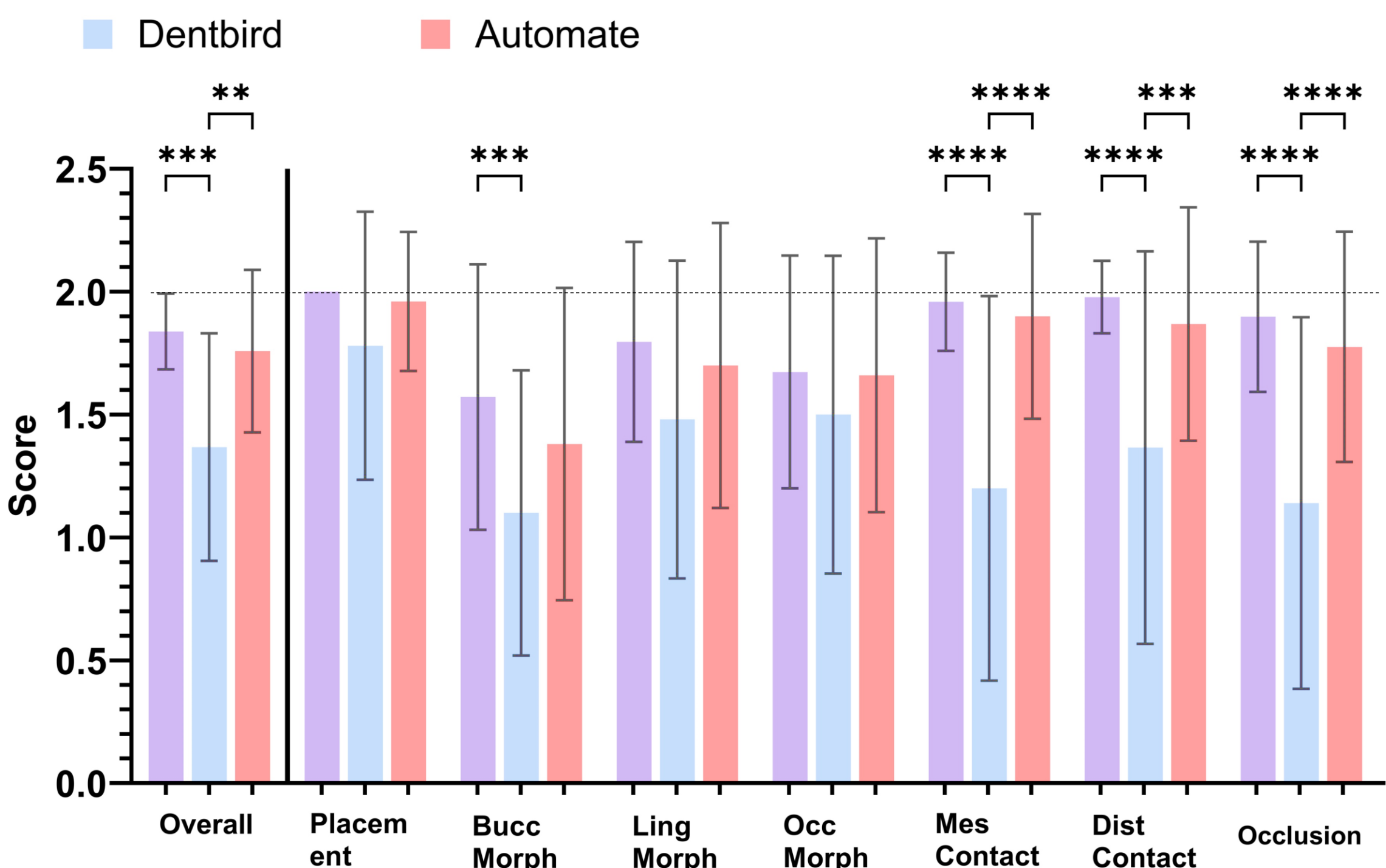


Fig 6: Bar showing results for crown design

Results

- The mean margin acceptability scores for the commercial lab, Dentbird, and Automate were 0.96 ± 0.11 , 0.62 ± 0.28 , and 0.89 ± 0.19 , respectively.
- The mean crown contour acceptability scores were 1.84 ± 0.15 , 1.37 ± 0.46 , and 1.76 ± 0.33 , respectively.
- Significant differences** were found in margin and crown contour acceptability between **Dentbird** and **Automate** software, with **no significant difference** between the **dental technician** and **Automate**.

Discussion

- Dentbird's lower scores in both margin and crown contour acceptability suggest that it may not meet the same standards as the other methods, possibly indicating challenges in the algorithm's ability to produce designs that align with accepted clinical parameters.
- There was **no significant difference** in acceptability scores between the **dental technician** and **Automate**. This suggests that Automate may be effectively replicating the expertise of skilled dental technicians in certain respects.

Conclusion

- The ability of AI to achieve results comparable to human technicians may reflect advancements in its design algorithms.
- Future research should further explore the underlying factors contributing to the differences observed between Dentbird and Automate.

References

