



Direct and Indirect Composite Onlays on Fracture Strength of ETT



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Objective: Endodontically treated teeth (ETT) are highly prone to fracture due to the loss of tooth structure. Preserving the remaining tooth structure is of crucial importance to prolong the restoration. Onlays, partial coverage restorations, requires less tooth reduction than full-coverage restoration. Resin composite and ceramic are usually used in esthetic areas. However, the advantages of resin composite over ceramics are the preservation of remaining tooth structure, lower cost, and ease of handling. The objective of this study was to compare the effect of different direct and indirect composite onlay materials on the fracture load of endodontically treated teeth.

Methods: One direct composite resin (Filtek™ Z250 [Z250]) and two indirect composite resins (SR Nexco [NC] and Ceramage [CM]) were used to fabricate onlay restorations. Forty maxillary premolars were divided into five groups (n=8). Group 1 was left intact (INT; positive control). The remaining premolars received class II MOD cavity preparation and conventional root canal treatment. Group 2 was restored with temporary zinc oxide-based sealing compound and polymer-reinforced zinc oxide eugenol intermediate restorative material (IRM; negative control), whereas groups 3-5 were prepared onlay cavities, restored with composite core build-ups (a short fiber-reinforced composite resin, EverX Posterior) and direct or indirect composite onlays. Before the fracture test, all specimens were immersed in distilled water at 37°C for 24 hours. Each specimen was subjected to compressive load at a 45-degree angle to the long axis of a tooth with a crosshead speed of 0.5 mm/min until fracture using the universal testing machine. The fracture load was measured and statistically analyzed using One-way ANOVA and Tukey's HSD test ($\alpha=0.05$).

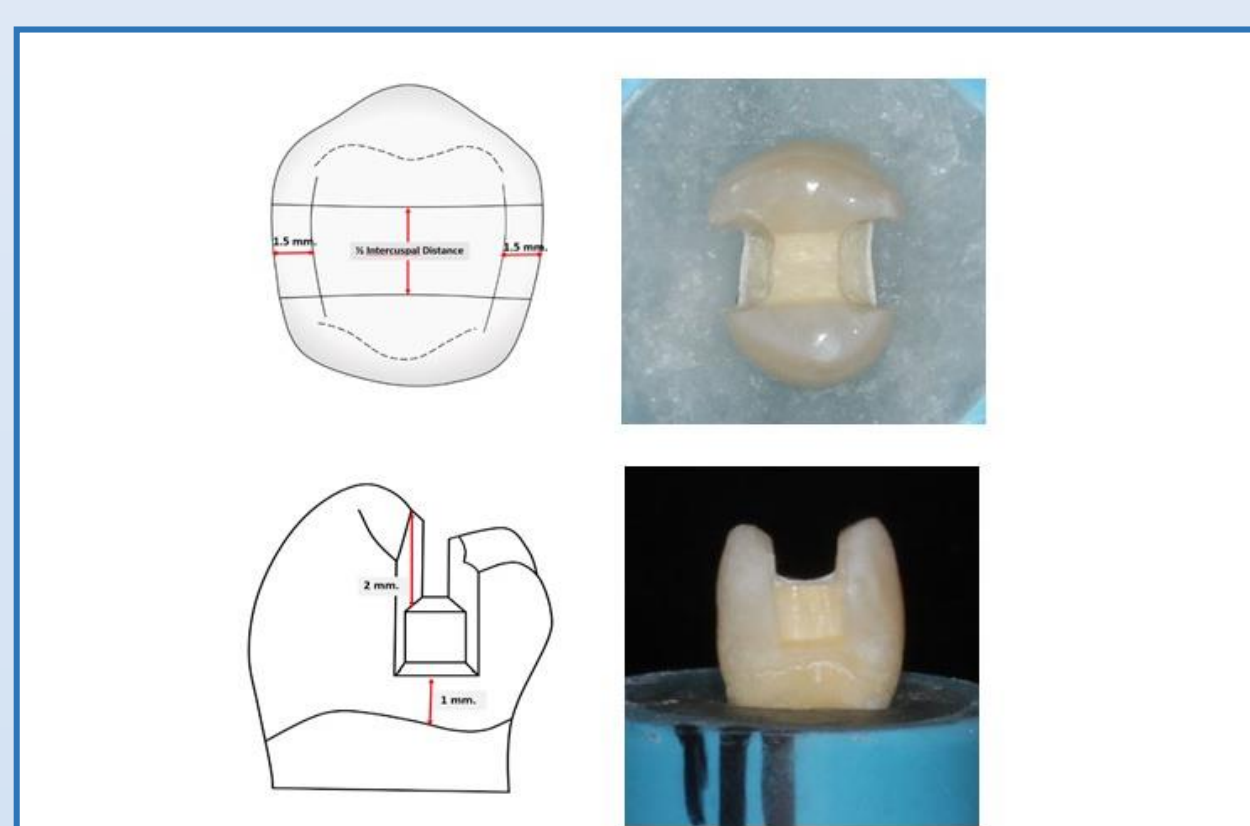


Fig 1. Mesio-occluso-distal cavity preparation

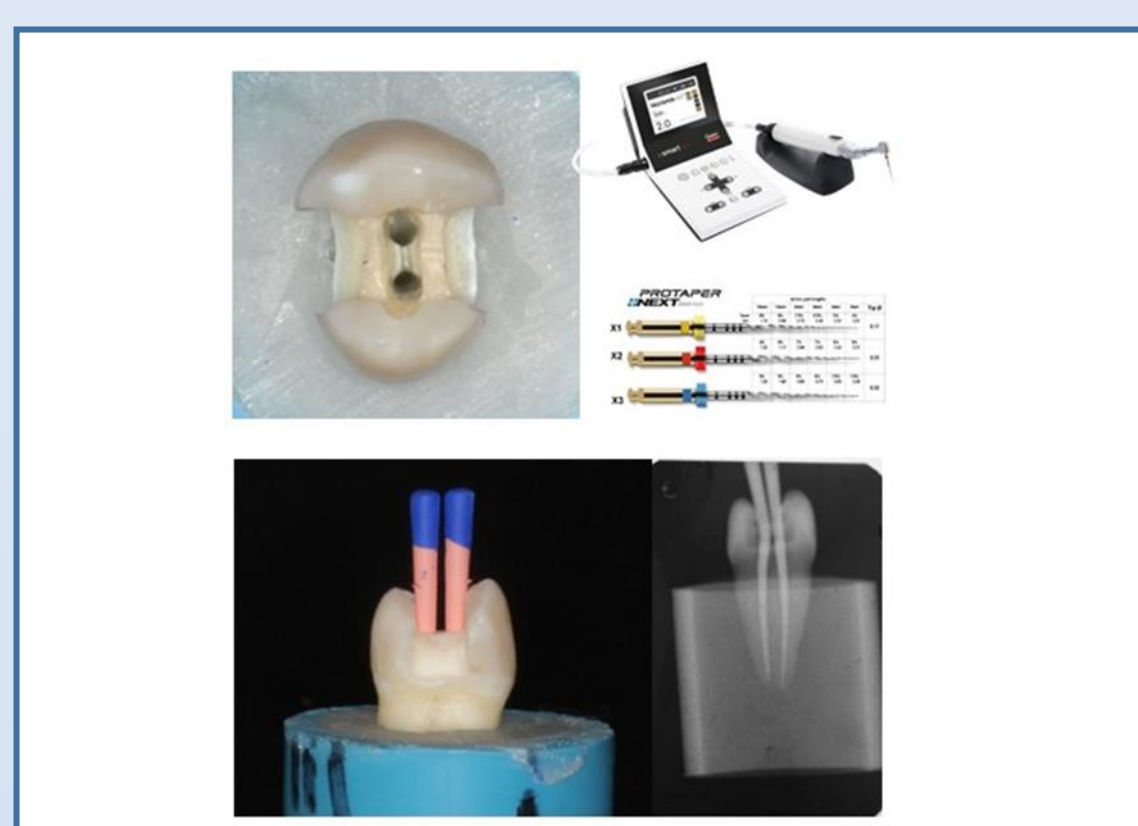


Fig 2. Endodontic procedures

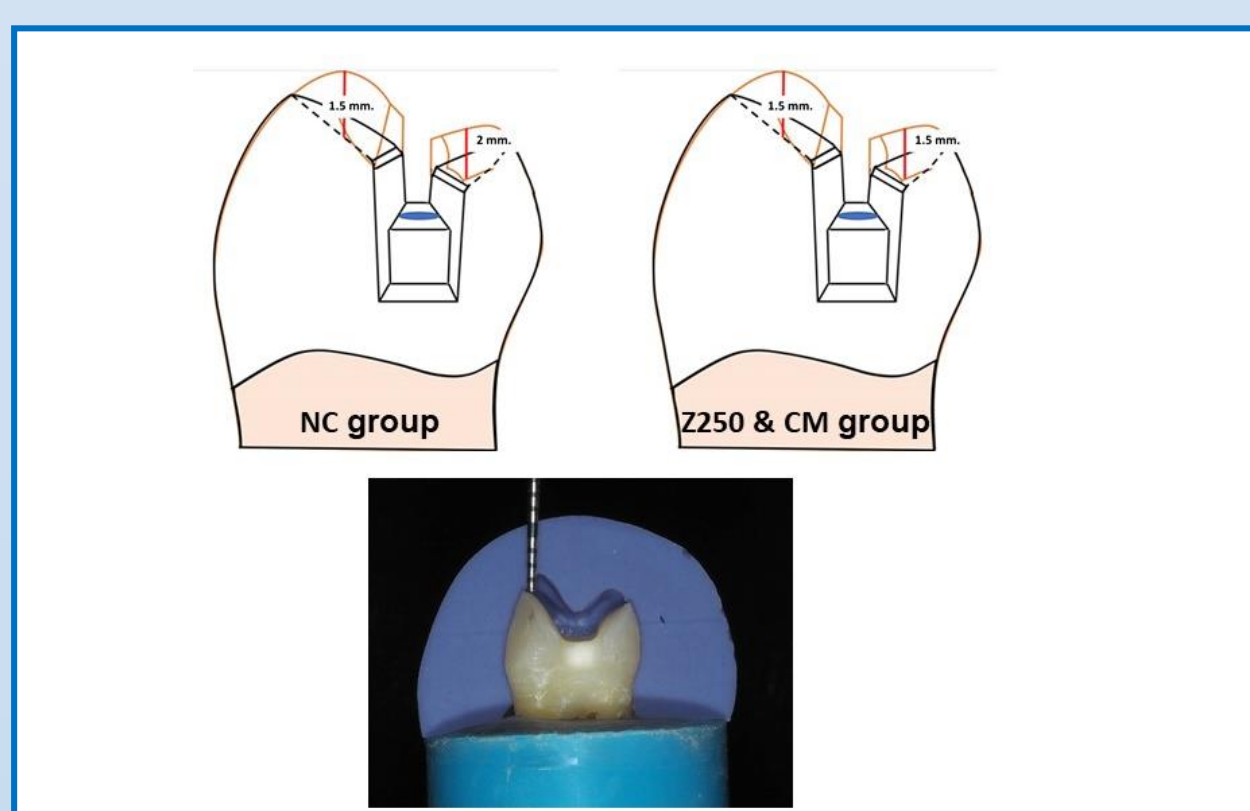


Fig 3. Onlay preparation

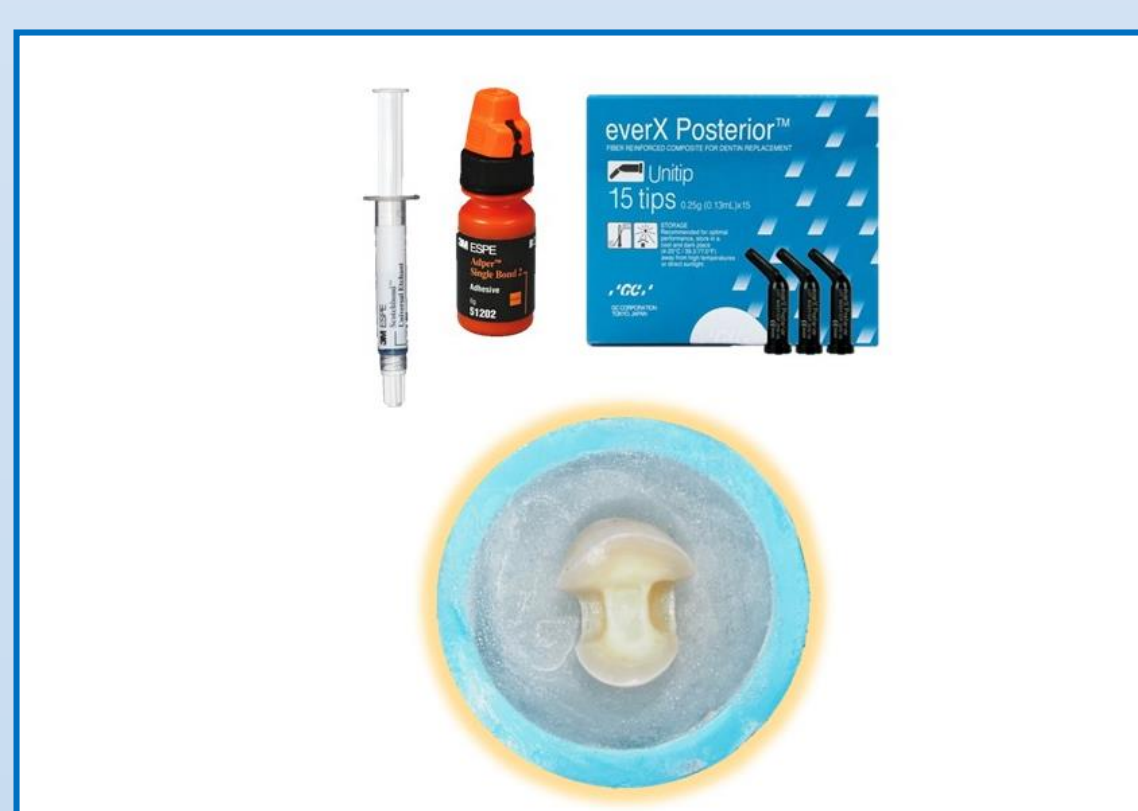


Fig 4. Composite core build-up

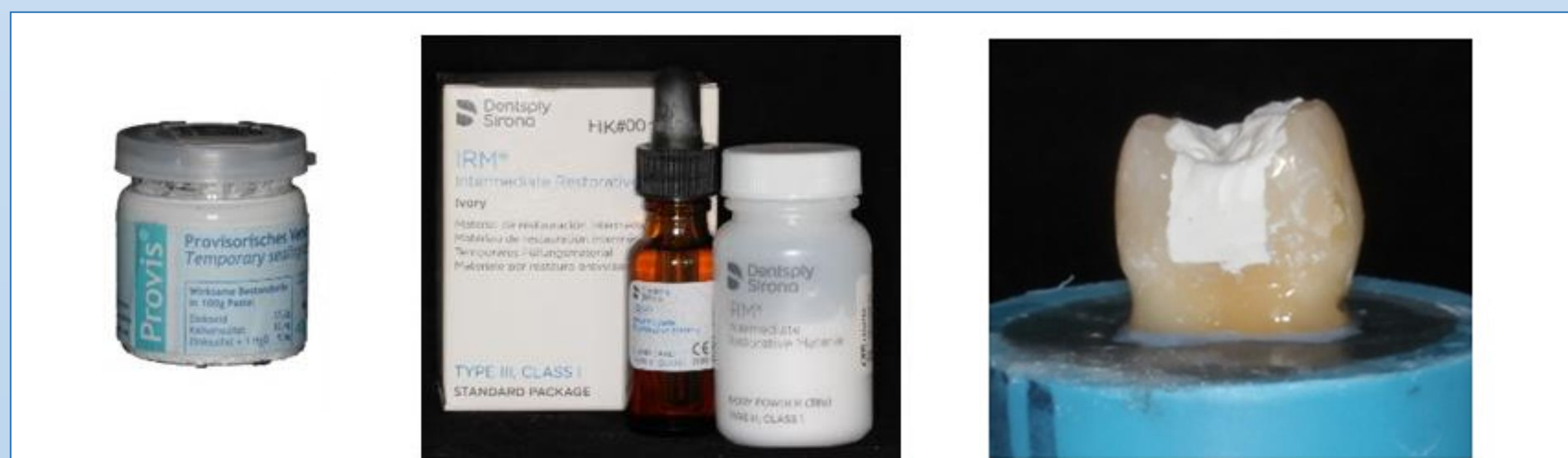


Fig 5. The IRM (negative control) group



Fig 6. The Z250 group

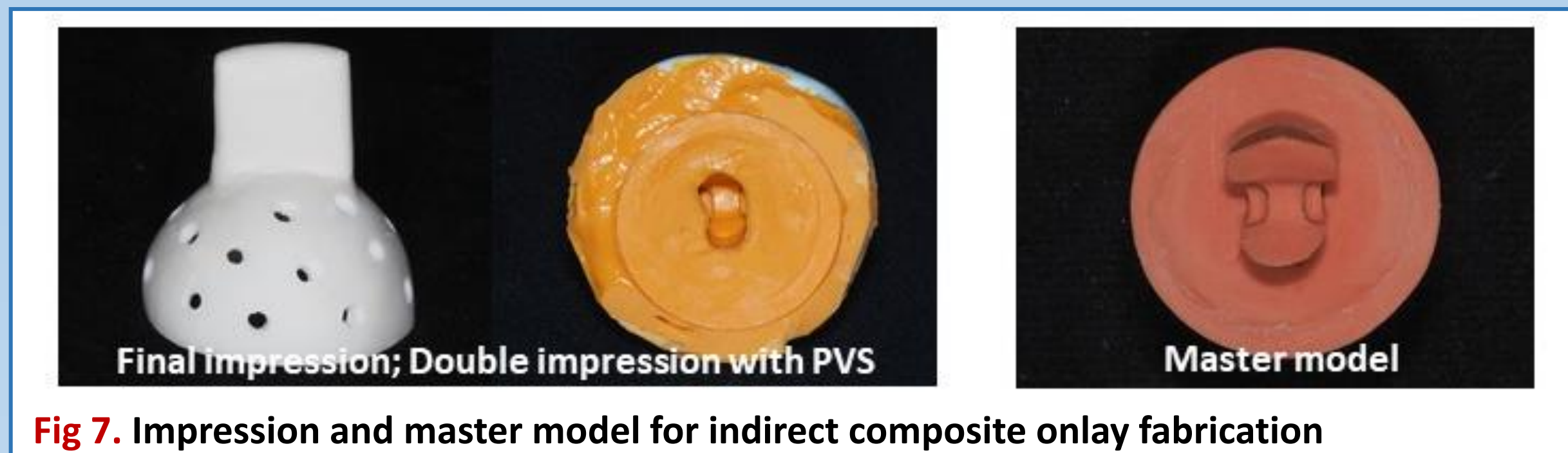


Fig 7. Impression and master model for indirect composite onlay fabrication

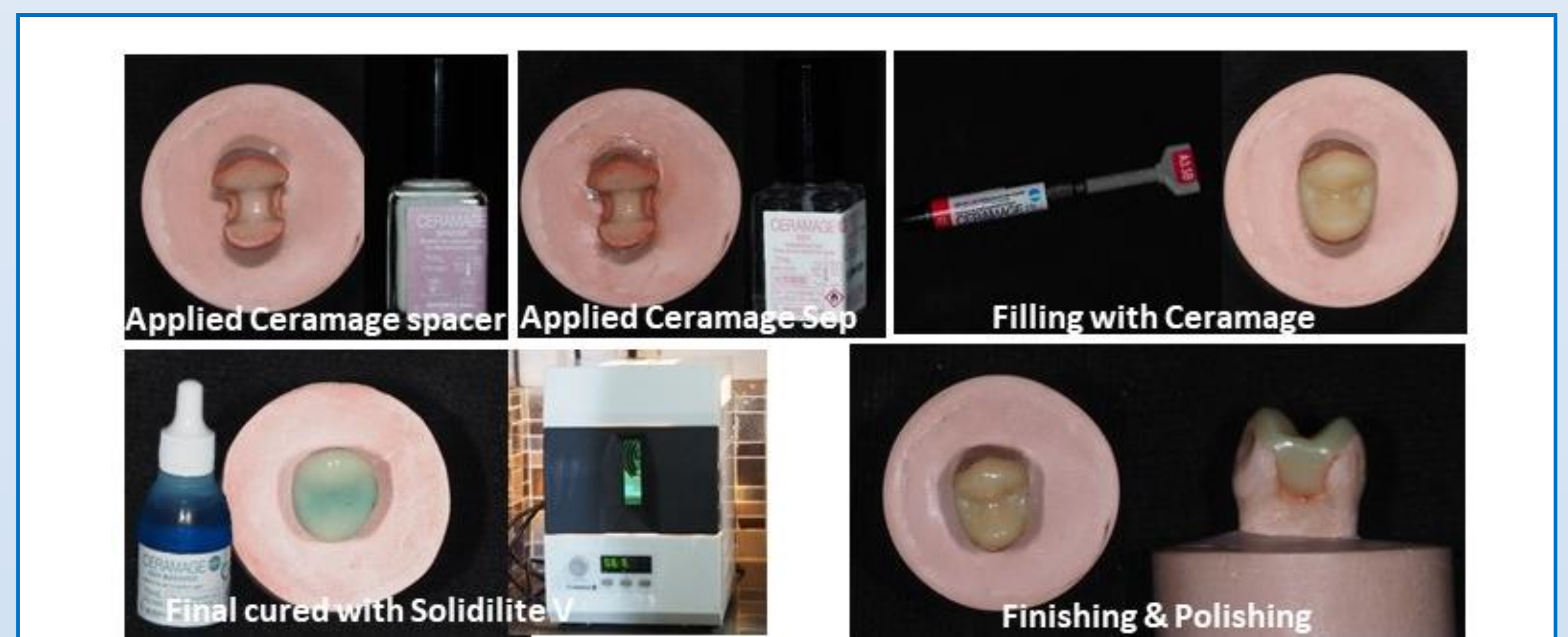


Fig 8. Fabrication of Ceramage onlay

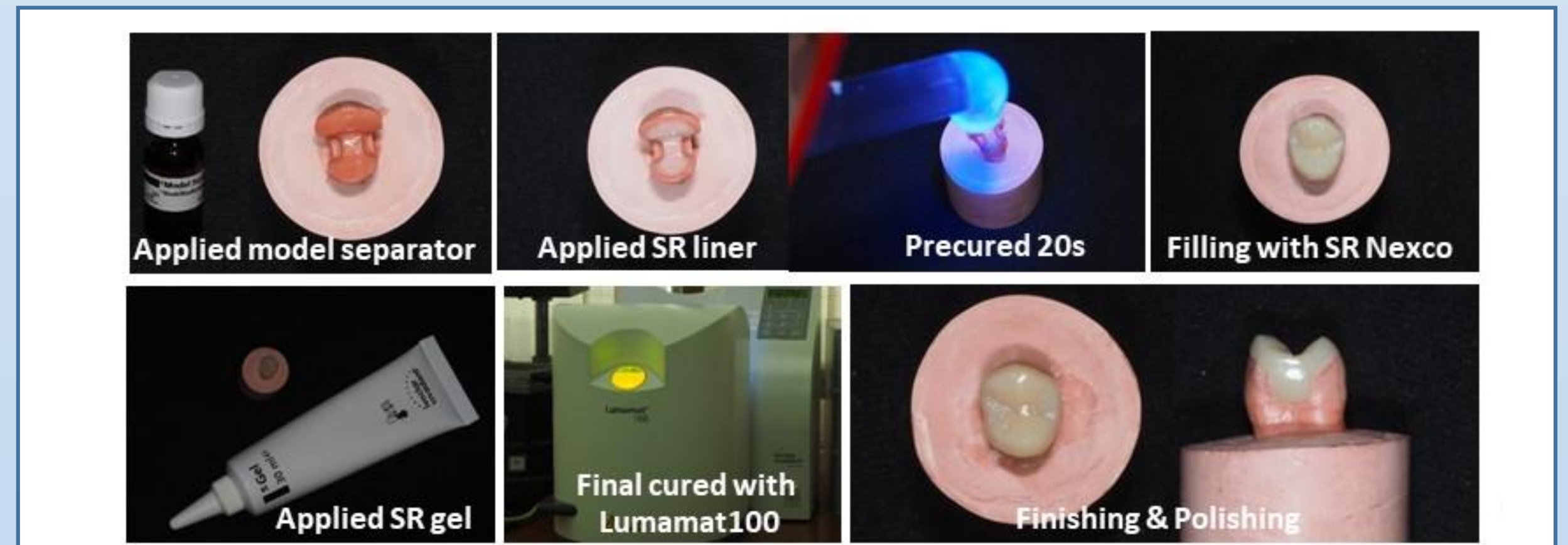


Fig 9. Fabrication of SR Nexco onlay



Fig 10. The indirect composition onlay groups

Results:

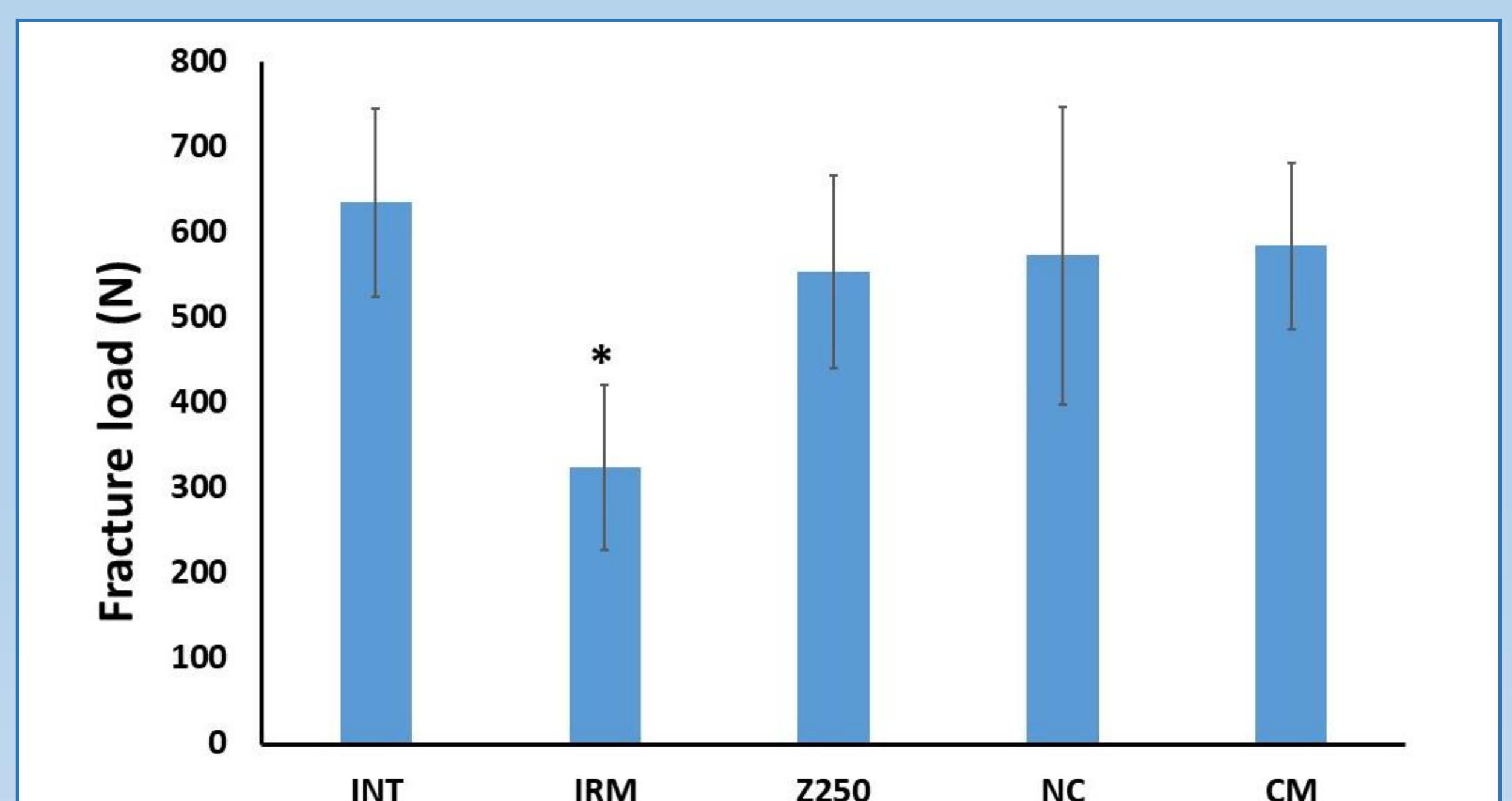


Fig 11. The mean of fracture strength (Newtons) in all groups

The mean of fracture load (mean±SD) was 635.63±110.54 N, 324.41±96.42 N, 554.39±112.68 N, 573.04±174.30 N, and 584.95±97.64 N for INT, IRM, Z250, NC, and CM, respectively. One-way ANOVA analysis with Tukey's HSD test showed no significant difference in the mean of fracture load among the intact teeth group and all experimental groups ($p>0.05$). The IRM group has the lowest fracture strength, which differed statistically from the other groups ($p<0.05$).

Conclusion: Endodontically treated maxillary premolars restored with Filtek™ Z250, SR Nexco or Ceramage onlays have fracture strength comparable to intact teeth.

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No conflicts of interest in this study.