



Immediate Microleakage in Direct and Indirect Restorative Procedures

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OBJECTIVE

The main purpose of this study was to evaluate the immediate microleakage in enamel and dentin margins, associated with polymerization shrinkage of resin-composite restorative materials, in both direct and indirect restoration of class II preparations.

MATERIALS & METHODS

Standardized class II cavities with **ENAMEL AND DENTIN** margins were made in proximal surfaces of human molars. Teeth were randomly divided into four study-groups and either restored with a **DIRECT** or **INDIRECT** protocol¹ (Table 1).

All specimens were stored at a 37°C heat chamber in a basic fuchsin bath, accordingly to ISO 11405 regulation. Results were analyzed with a stereoscopic microscope and classified according to the same ISO regulation for micro leakage analysis. Protocol steps are summarized in Table 2.

Table 2: Protocol summary

Inlay Adhesion Protocol		Indirect Restorative Protocols		Direct Restorative Protocols		
Inlay Prep: Sand blasting (10 s) Orthophosphoric acid 37,5%, (1min) (Fig. 1-A) Ultrasonic cleaning (4 min) Silane coupling agent (Fig 1-B) Optibond TM FL (Fig 1-C)	Cavity Prep: Sand blasting (10 s) Orthophosphoric acid (30 s) Drying Optibond TM FL without curing	IDS Protocol²: Immediately after cavity prep: Optibond TM FL, light cured Gliceryn gel application Adicional curing (10s)	Group C: Optibond TM FL adhesive protocol Grandio TM SO Inlay (Fig 1-D) 55° heated Z100 TM composite Light curing (40s/side) Gliceryn gel cover Light curing	Group D: Optibond TM FL adhesive protocol Grandio TM SO Inlay (Fig 1-D) Bifix TM QM resin cement Light curing (40s/side) Gliceryn gel cover Light curing	Group A: Optibond TM FL adhesive protocol 3M Filtek Z250 TM 2mm-increment direct placement	Group B: Optibond TM FL adhesive protocol VOCO X-Tra Fil TM 4mm Bulk-Fill direct placement

Table 1: Materials used in each restorative procedure

Group	Restorative Procedure	Material
A	Microhybrid composite direct restoration	Filtek TM Z250
B	Bulk Fill direct restoration	VOCO [®] X-Tra Fil
C	Inlay luted with 55°C heated composite	VOCO [®] Grandio TM SO Filtek TM Z100
D	Inlay luted with dual-cure resin cement	VOCO [®] Grandio TM SO VOCO [®] Bifix TM QM

PROTOCOL SUMMARY

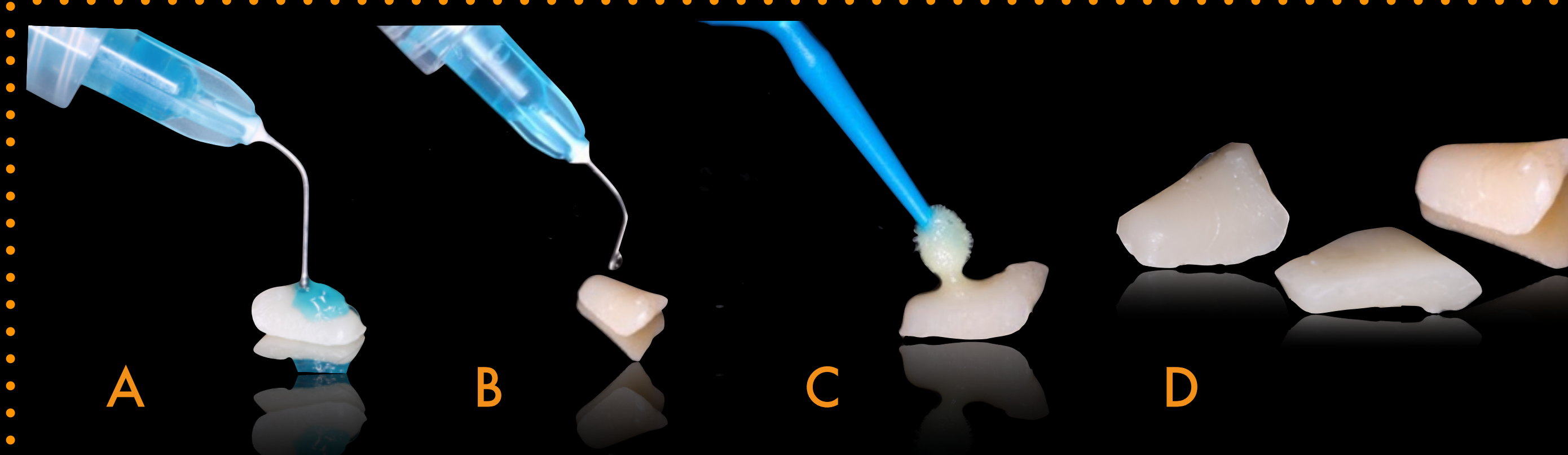


Figure 1: A - Inlay surface etching; B - Silane application on inlay surface; C - Optibond FL adhesive application on inlay surface; D - Composite inlays

RESULTS

Results show no statistical differences amongst leakage levels, whether in dentin or enamel margins or in direct or indirect restorative procedures. **DIRECT VS INDIRECT PROCEDURES** - There seems to be a tendency for less leakage in indirect procedures when compared to direct procedures in enamel margins (2,5% vs 7,5%, $p = .294$) (Figure 2). In dentin margins, similar results also reveal a tendency for less leakage in indirect procedures when compared to direct procedures (22,5% vs 35%) (Figure 3).

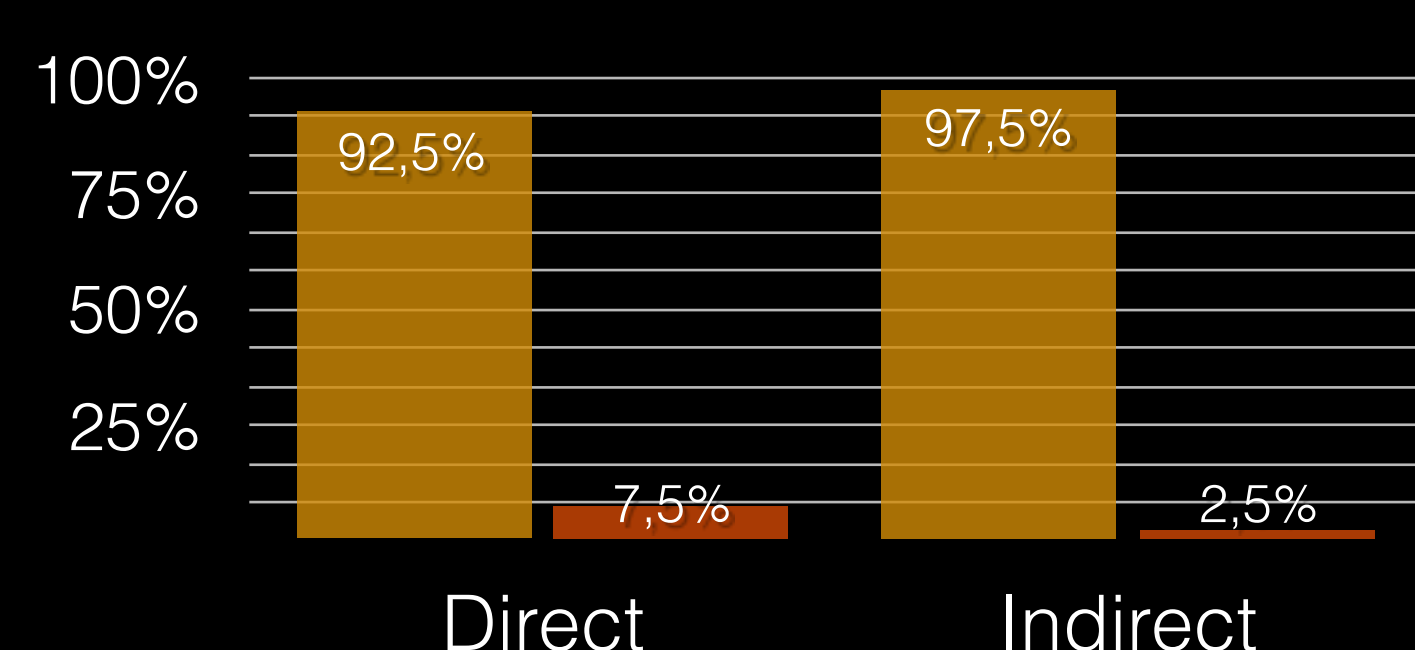


Figure 2: Leakage percentage in direct and indirect procedures in enamel margins

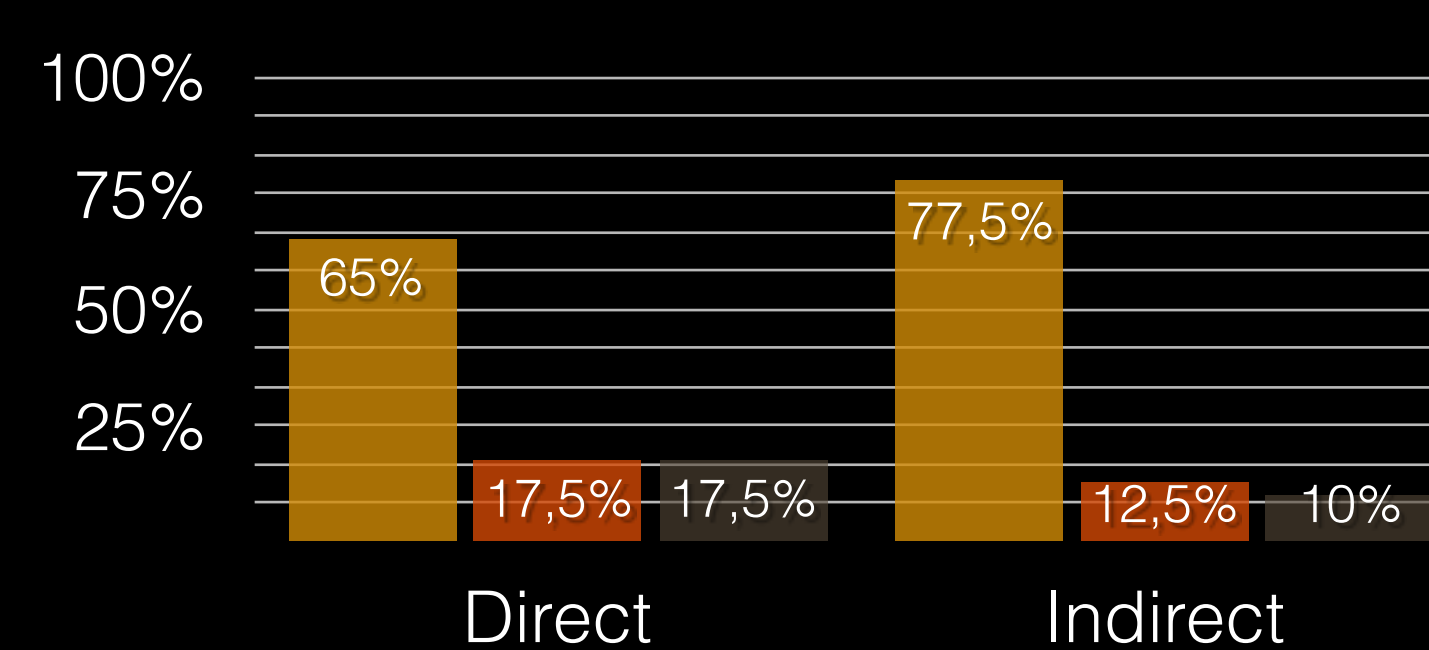


Figure 3: Leakage percentage in direct and indirect procedures in dentin margins

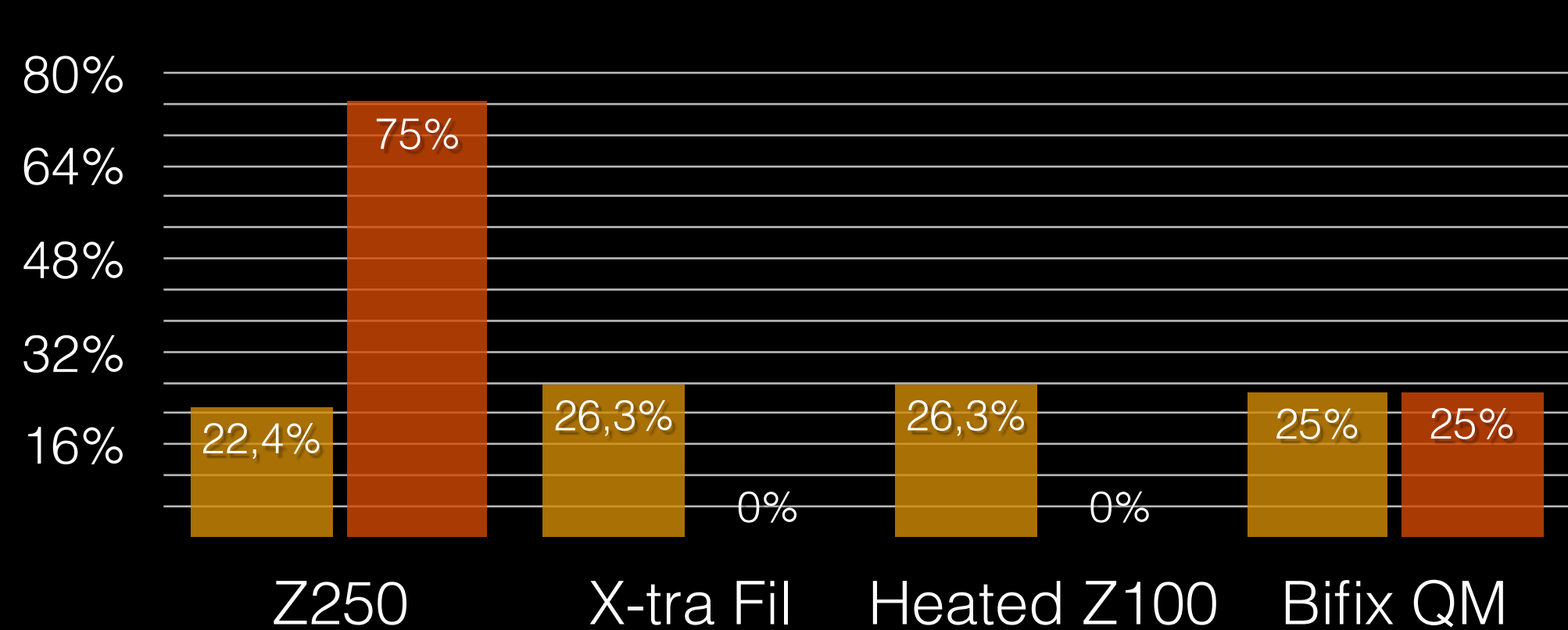


Figure 4: Leakage percentage in enamel margins

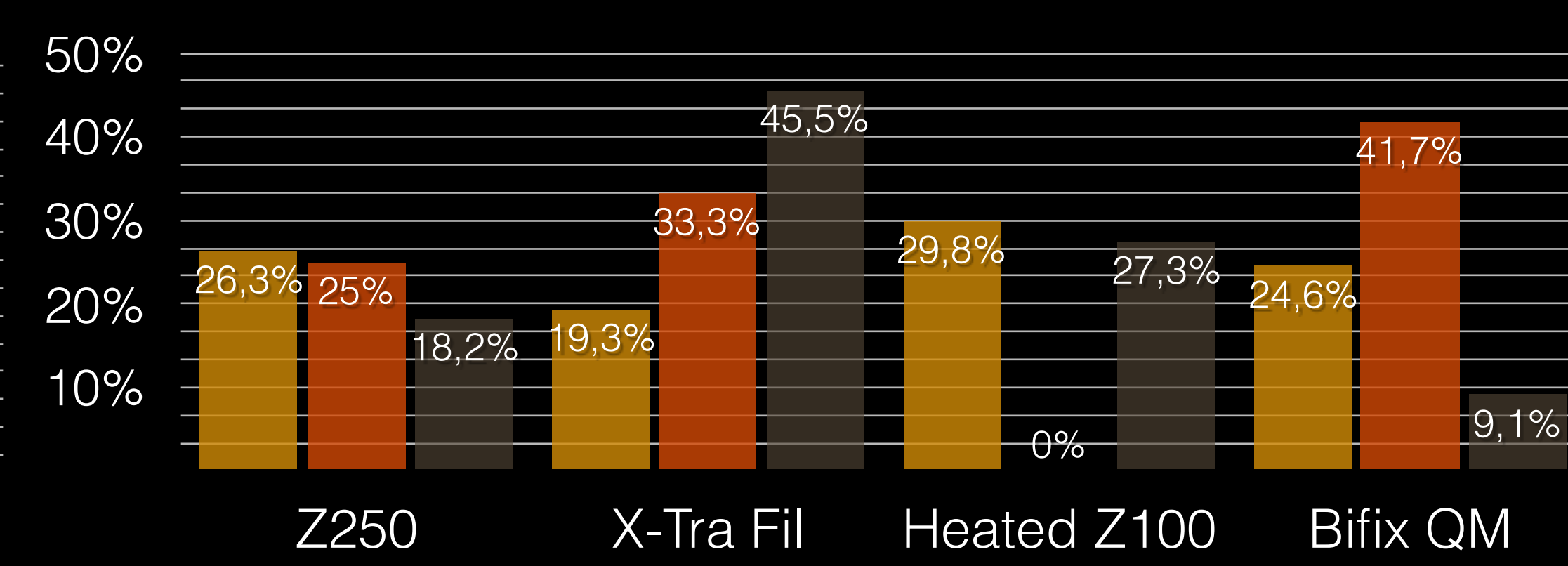


Figure 5: Leakage percentage in dentin margins

ENAMEL MARGINS - Enamel leakage results revealed a tendency for less leakage in Bulk Fill composite in the direct groups; composite luted inlays also seem to acquire better marginal adaptation (Fig. 4).

DENTIN MARGINS - Differently from enamel, dentin margins revealed a tendency for lower scoring in micro hybrid composite when compared to Bulk-Fill composite. The indirect techniques revealed less infiltrated samples when luted with 55° heated Z100 composite ($p=.166$)(Fig. 5).

Data were statistically analyzed by using Pearson's Qui-square independence test and Fisher's exact test, at a significance level of 5%.

CONCLUSIONS

All the groups were affected by microleakage and immediate gap formation. It is predictable that polymerization shrinkage may produce immediate gap formation and micro leakage to some extent, reducing the quality and long-term success of the restorative treatment. Nonetheless, no statistical differences were found.

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