

Introduction:

The aim of this study was to compare the fracture resistance of combined tooth-implant or implant-implant supported three-unit provisional restorations in vitro in a 2-year simulation.

Materials and methods:

Two situations were simulated:

- a) tooth-implant: molars were embedded in a PMMA resin (Palapress Vario, Kulzer, GER) and fixed at a distance of 10 mm to dental exercise implants (ITI-Straumann, Titanium, GER), simulating a combined three-unit tooth-implant supported oral situation with one missing molar tooth. The roots of the teeth were covered with a 1 mm thick layer of a polyether impression material (Impregum, 3M Espe, GER) to simulate the function of the periodontium. Implants were fixed rigidly without polyether.
- b) implant-implant: two implants were fixed rigidly in a distance of 10mm without polyether.



Figure 1: Specimen design

Identical three-unit FPDs (n=8) of provisional fixed partial denture materials (VITA CAD-Temp (VITA, GER) and Protemp™ 4 (3M Espe) were fabricated and luted with the temporary luting cement RelyX™ Temp NE (3M Espe). The restorations were stored for 14 days in distilled water, thermally cycled and mechanically loaded (TCML) in an artificial oral environment (TC: 5°/55°C, 1200x, ML: 240000x50N/1.6Hz). After TCML the FPDs were loaded to fracture at the center of each pontic (steel ball, d=12.5 mm, v=1mm/min; Zwick 1446, GER). The fracture pattern was characterized and medians (25%/75%) were calculated (Mann-Whitney-U-Test; $\alpha = 0.05$).

Results:

In group a) two FPDs of Protemp™ 4 failed during TCML. Median Fracture resistance of surviving bridges (1308N) was not significantly different from VITA CAD-Temp (1539N).

In group b) three VITA CAD-Temp FPDs failed during TCML.

The remaining FPDs provided significantly lower (958N) fracture resistance values compared to Protemp™ 4 (1766N, p=0.019)

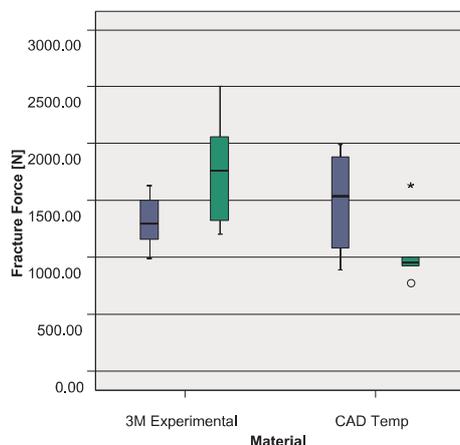
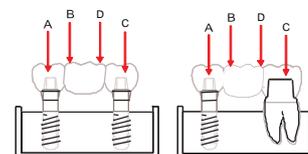


Figure 2: Fracture Results (Median, 25%/75%)

FPD #	Fracture pattern	
	3M Experimental	CAD Temp
1	AC	C
2	A	CD
3	A	D
4	CD	CD
5	C	CD
6	C	CD
7	A	B
8	D	AD
		implant-implant
1	CD	AC
2	D	C
3	D	D
4	ABCD	CD
5	D	AC
6	D	D
7	CD	CD
8	D	CD

Table 1: Fracture Pattern (grey: failure during TCML)



A. Fracture on the implant side
B. Fracture between pontic and implant
C. Fracture on the tooth side
D. Fracture between pontic and tooth.
For the implant-implant situation failure pattern A is equivalent to C and B to D.

Discussion:

After TCML both tested materials showed fracture resistance higher than 960N.

Both materials could be sufficient for a short to medium-term clinical application for implants with some limitations, due to the appearing fractures.

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