



Objectives:

Zirconia core frameworks with ceramic veneering facilitated the introduction of highly stable metal-free ceramic fixed partial dentures (FPDs). The aim of this *in vitro* study was to compare the fracture resistance and marginal adaptation of computer manufactured Y-TZP zirconia core with Au-alloy framework.

Materials and Methods:



Fig. 1: Model of a tooth embedded in a socket. The root is surrounded with polyether to simulate periodontium.

three-unit situation with 10 mm gap (chamfer preparation, n=24)			
Frame	Cercon (CAM ZrO ₂)	Degudent H (Au-Alloy)	Cercon (control) (CAM ZrO ₂)
Veneer	Ceram S	Duceram Plus	Ceram S
all materials: Degussa Dental, Germany			

adhesive cementation
with Syntac classic/Variolink II

aging with TCML
6000*5°/55°C H₂O 2 min;
1.2*10⁶*50N

marginal adaptation
(SEM)

fracture resistance
(Zwick 1446)



Fig. 2: Adhesive cement Variolink II



Fig. 5: Zwick 1446 universal testing machine to measure the fracture resistance (v=1mm/min).



Fig. 3: One chamber of the Regensburg chewing-simulator (Ego, G) for thermal cycling and mechanical loading (TCML)



Fig. 4: Scanning electron microscopic (SEM) image to determine the marginal adaptation. Upper line: transition FPD/cement; lower line: transition cement/tooth. The measured criteria were perfect margin and marginal gap in %.

Results:

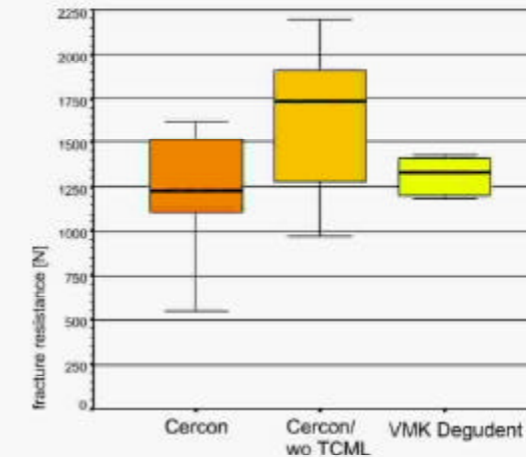


Fig. 6: Boxplot of fracture resistance; medians, 25/75% percentiles and min/max shown

The statistical analysis was performed with the Mann-Whitney U-test ($p < 0.05$). No significant difference in fracture resistance was found between ceramic veneered zirconia and Au-alloy framework after TCML. At both transitions (bridge/cement and cement/tooth) the marginal adaptation was not significantly different comparing the zirconia core with the Au-alloy framework.

Conclusion:

Both types of FPDs showed comparable good fracture resistance and marginal adaptation.

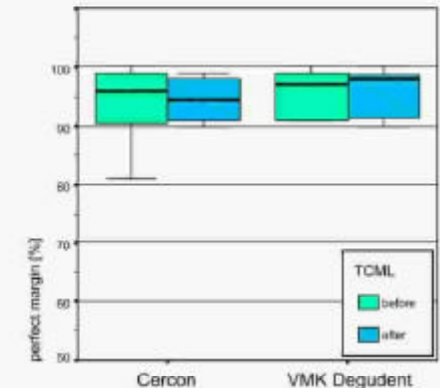


Fig. 7: Boxplot of marginal adaptation at transition bridge/cement; medians, 25/75% percentiles and min/max shown

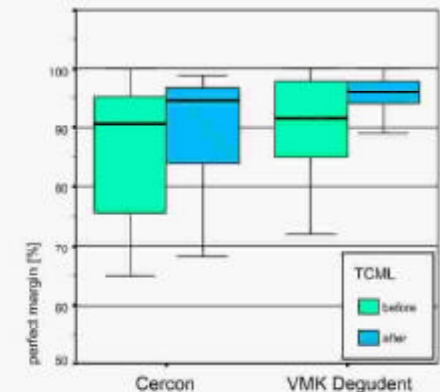


Fig. 8: Boxplot of marginal adaptation at transition cement/tooth; medians, 25/75% percentiles and min/max shown