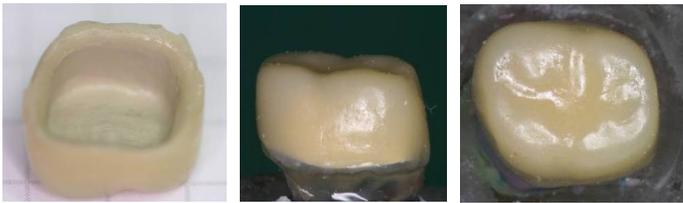


Objectives: The aim of this in vitro study was to evaluate the behaviour of molar single crowns during artificial ageing and fracture strength test. The crowns were made of two different (unfilled/glas reinforced) polyetheretherketone (PEEK) materials.

Material and methods: Circularly prepared abutment teeth of defined size were made of a polymer material (Palapress Vario: Kulzer, G). Their roots were covered with a 0.5mm polyether layer (Impregum: 3M Espe, G) to simulate periodontal mobility. The crown substructures (n = 8 per series) were made either of unfilled or glass reinforced polyetheretherketone (PEEK: Invibio; UK). Substructure morphology was identical for both groups and both were veneered with a microhybrid facing composite (Sinfony: 3M Espe). Abutments and inner crown surfaces were air-abraded (Rocatec Pre: 3M Espe), coated with unfilled light curing composite and adhesively luted with a dual curing composite cement (Heliobond and Variolink2: both Ivoclar-Vivadent, FL). Median/percentiles were calculated and statistically analysed (Mann-Whitney-Test: PASW Statistics 18; USA).

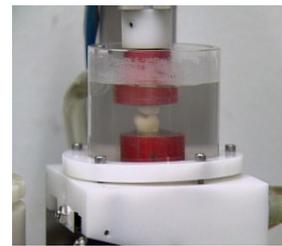
Crown with core made of glass reinforced PEEK



Crown with core made of unfilled PEEK

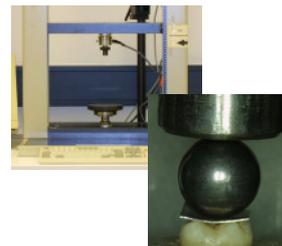


crowns veneered with Sinfony before TCML
basal/buccal/occlusal view



TCML:
1.2x10⁶x50N; 1.6Hz
human antagonistic tooth
occluding the crown center
6000 x 5°C/55°C (2min each)

Monitoring:
damage/decementation



UTM 1446: (Zwick, G):
crosshead speed 1mm/min
steel ball and tin foil
failure definition at 10% loss of
actual loading force

Results: The crowns of both groups showed wear traces but no decementation or damage during TCML. The two groups exhibited different failure pattern. Glass reinforced core crowns had higher fracture force values (3813N(3500N/4416N)) than the unfilled PEEK core crowns (1409N(960N/2300N)) after TCML.

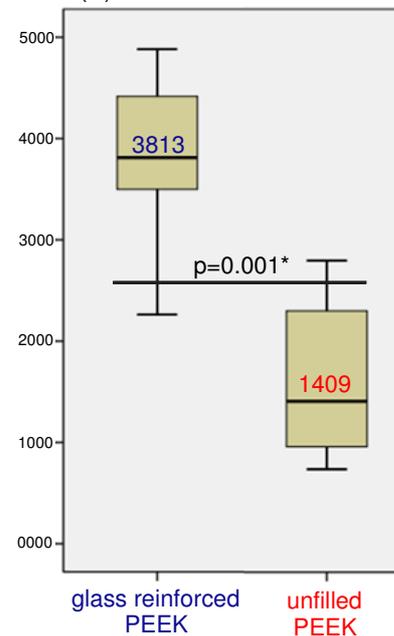
glass reinforced PEEK core fracture force/pattern

F-Max(N)	Failure Pattern
4295	veneering+core
3481	veneering
3844	veneering+core
4882	veneering
4537	veneering
3781	veneering+core
2263	veneering+core
3518	veneering



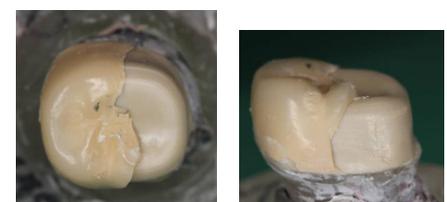
crowns after TCML and fracture test

F-Max(N)



unfilled PEEK core fracture force/pattern

F-crack(N)	F-Max(N)	Failure Pattern
-	2796	veneering
1151	2024	veneering
754	839	veneering
639	1081	veneering
-	2576	veneering
1009	1294	veneering
-	738	veneering
-	1524	veneering



crowns after TCML and fracture test

Conclusion: Regarding 500N in posterior areas as a threshold level for the needed fracture strength, both tested PEEK materials showed sufficient fracture strength when used for molar crown substructures.