

## Fracture strength of posterior inlay FPD: FRC and all-ceramic.

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### I. Introduction:

The aim of this in vitro study was to examine the fracture strength of three-unit posterior fixed partial inlay dentures (FPID) made of fibre-reinforced composite (FRC) and all-ceramic (AC).

### II. Materials and Methods:

Freshly extracted human third molars were positioned pairwise in PMMA resin (Palapress, Kulzer, G) with a distance of 10 mm to represent a molar gap. Preparation was performed resulting in inlay cavities with finishing lines completely in enamel. Of each material 8 three-unit FPID (Fig. 1) were made following the manufacturers instructions. The FPID were luted adhesively in combination with the recommended dentin adhesive/cement (Tab. 1).



Fig. 1: example FPID

framework	FibreKor(FK) unidir. glassfibre	Connect(C) polyethylenfibre	Vectris(V) threedir. glassfibre	Empress2(E2) all-ceramic
facing	ConquestSculpture (CS) composite	belleGlass(BG) composite	Targis(T) composite	
manufacturer	JenericPentron, USA	Girrbach, G	Ivoclar-Vivadent, FL	Ivoclar-Vivadent, FL
adhesive luting	Bond1/Lutelt!	SyntacClassic/Variolink II		

Tab. 1: Materials and manufacturers

After thermal cycling and mechanical loading (TCML) in an artificial oral environment (Fig. 2) the FPID were mechanically loaded until failure in the centre of the pontic (Fig 3). The FPID were examined radiologically and optically to describe the forms of fracture. Median and percentiles (25/75%) were calculated. Statistical analysis was performed using Mann-Whitney-U-Test and Kruskal-Wallis-Test ( $p \leq 0.05$ ).

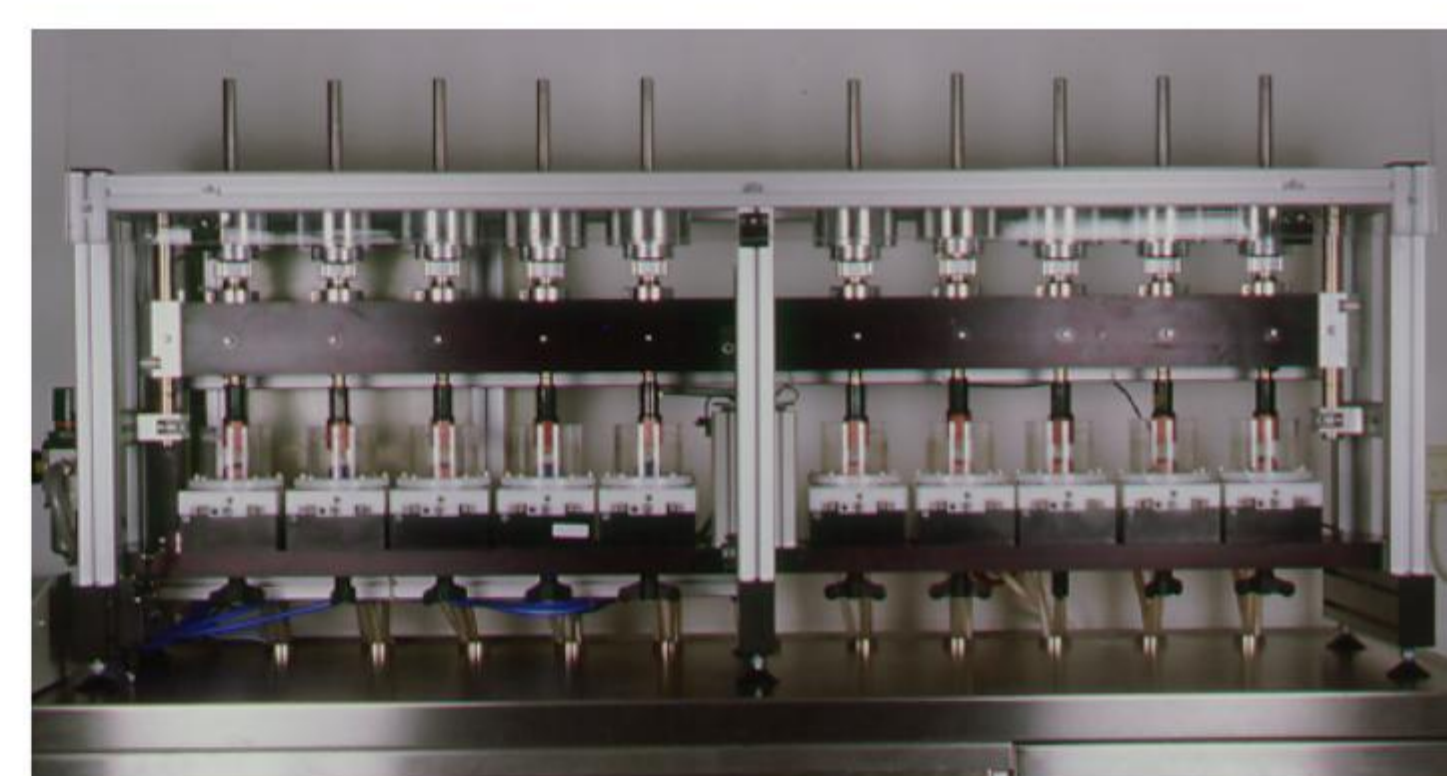


Fig. 2: Artificial oral environment (6000x5°C/55°C H<sub>2</sub>O, 2 min each cycle; 1.2x10<sup>6</sup>x50N, 1.66Hz)

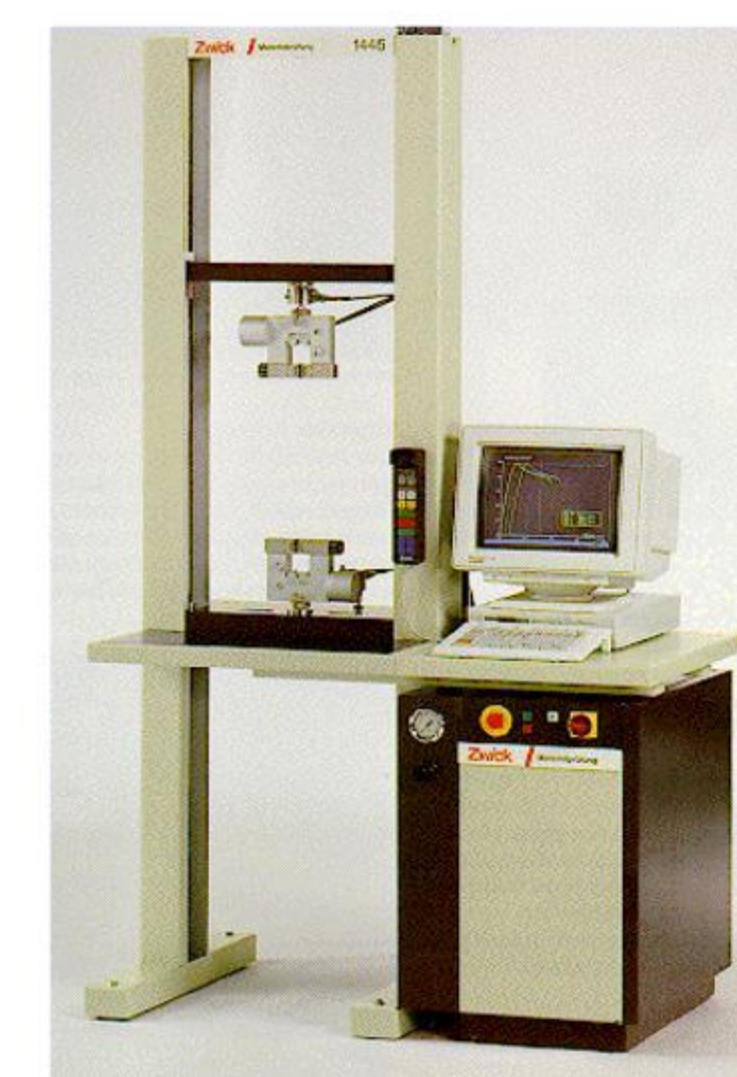


Fig. 3: UTM 1446; Zwick, G (v=1mm/min)

### III. Results:

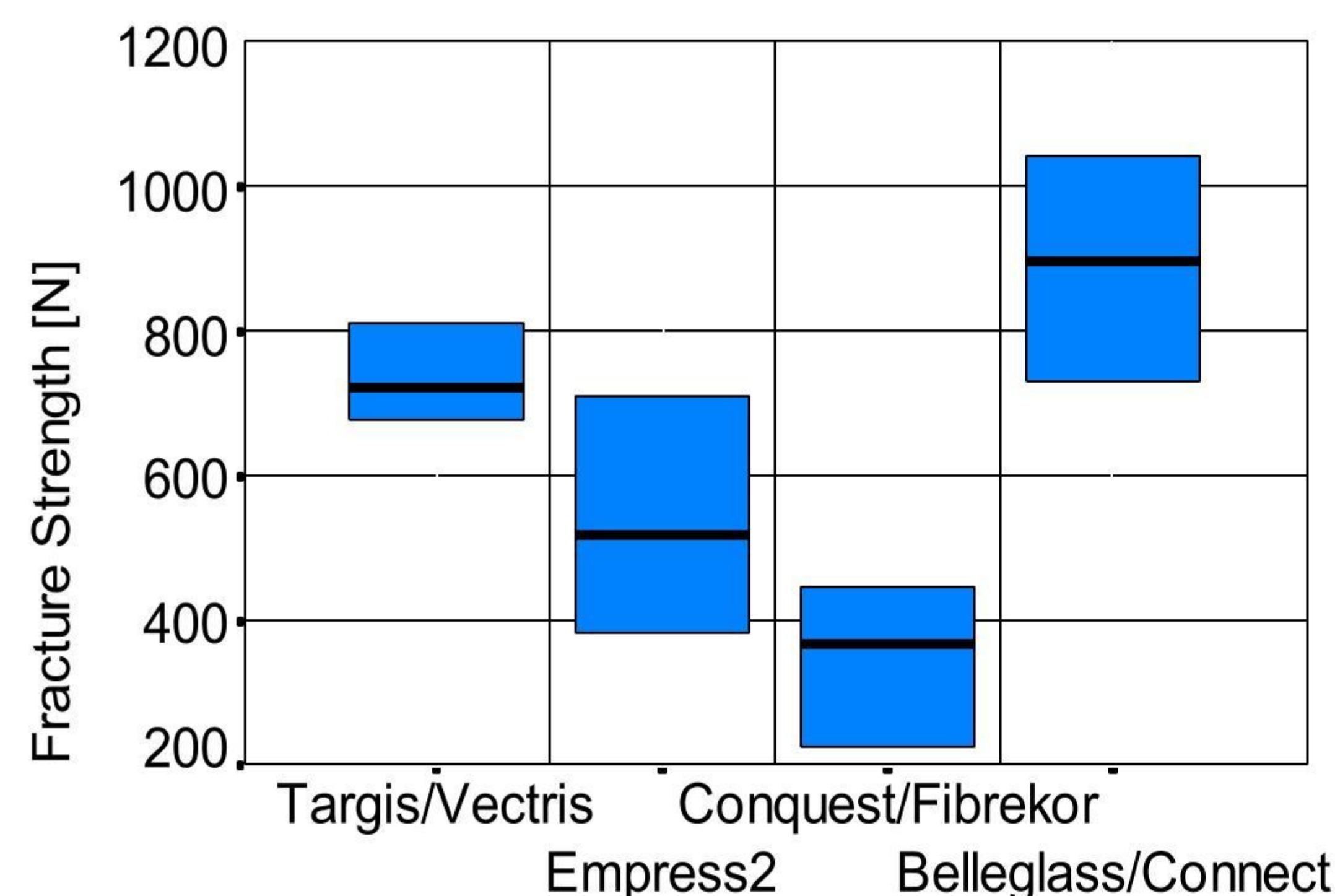


Fig. 4: fracture strength

p	T/V	C/BG	CS/FK	E2
T/V	-	0.1275	0.0008	0.0829
C/BG	-	-	0.0008	0.0117
CS/FK	-	-	-	0.0460

Tab. 2: Statistics (p-values)

The fracture strength results are shown in Fig. 4 and Tab. 2. For the FRC no discernible damage at the frameworks occurred (Fig. 5), failure may be attributed to fractures of the facing materials. The all-ceramic FPD mainly fractured at the connector between pontic and abutment (Fig. 6).

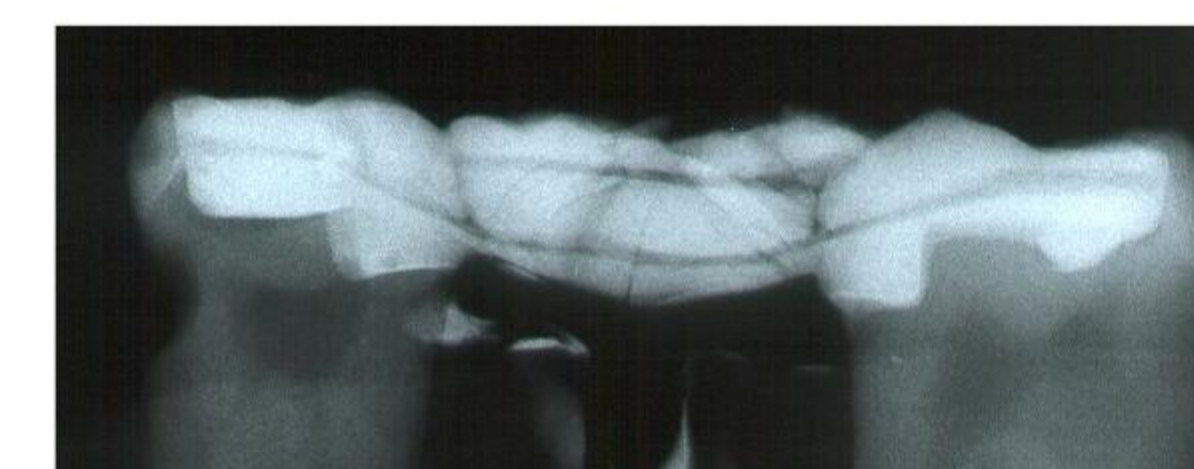


Fig. 5: FRC FPID



Fig. 6: all-ceramic FPID

### IV. Conclusion:

Assuming maximum chewing forces of 500N on posterior teeth Connect/belleGlass, Vectris/Targis and -with restrictions - Empress2 showed sufficient fracture strength. The FibreKor/ConquestSculpture-combination may only be regarded as a longterm-provisional solution because of unsatisfactory results.