



# Fracture Resistance of Endodontic Treated and Differently Restored Premolars



C. Hölzl, U. Saerbeck, A. Schulz, W. Niedermeier  
 Department of Prosthetic Dentistry, University of Cologne, Germany

## Objectives

The aim of the study was to analyse the influence of different restorations with or without posts on the fracture resistance of endodontically treated and reconstructed premolars.

## Material and Methods

30 extracted human lower premolars were restored using six different methods shown in Tab. 1. The teeth were stressed by thermocycling (5000 times; 5°C-55°C), embedded in a pseudo-realistic model derived from measurements at fresh cadavers (Paladur®, Heraeus Kulzer, Germany; FITT®, SDS-Kerr, Italy), and subjected to a long term occlusal loading procedure (30.000 cycles; 50 N at random in axial and each in 45° oral and vestibular direction). Following this, the teeth were fractured using a Zwick device (45° vestibular direction, feed rate 1mm/min).

| Group  | Post                           | Core                | Restoration                           |
|--------|--------------------------------|---------------------|---------------------------------------|
| CF     | -                              | -                   | mod-composite filling (Admira®, Voco) |
| PCC-MC | Ti-post (ER, Komet)            | composite (Admira®) | full metal crown (Wirobond®, Bego)    |
| PMC-MC | Ti-post (ER, Komet)            | metal (Wirobond®)   | full metal crown (Wirobond®)          |
| PMC    | -                              | -                   | partial metal crown (Wirobond®)       |
| EC     | Ceramic 3 mm (Wolceram®, Wolz) | -                   | ceramic endo-crown (Wolceram®)        |
| CI     | -                              | -                   | ceramic inlay (Wolceram®)             |

Tab. 1: Test groups

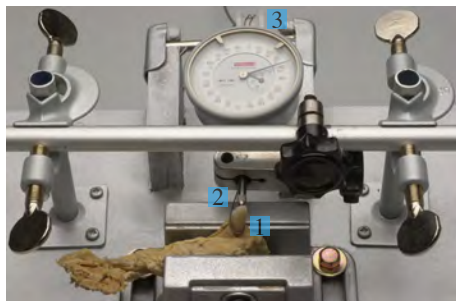


Fig. 1 Measurement of tooth mobility and bone deformation in the lower jaw derived from a fresh human cadaver by loads up to 150N. Static force is applied onto the tooth (1) by means of metal weights using a steel wire (2) led over a roll (3)

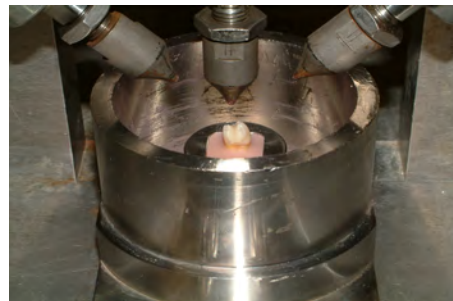
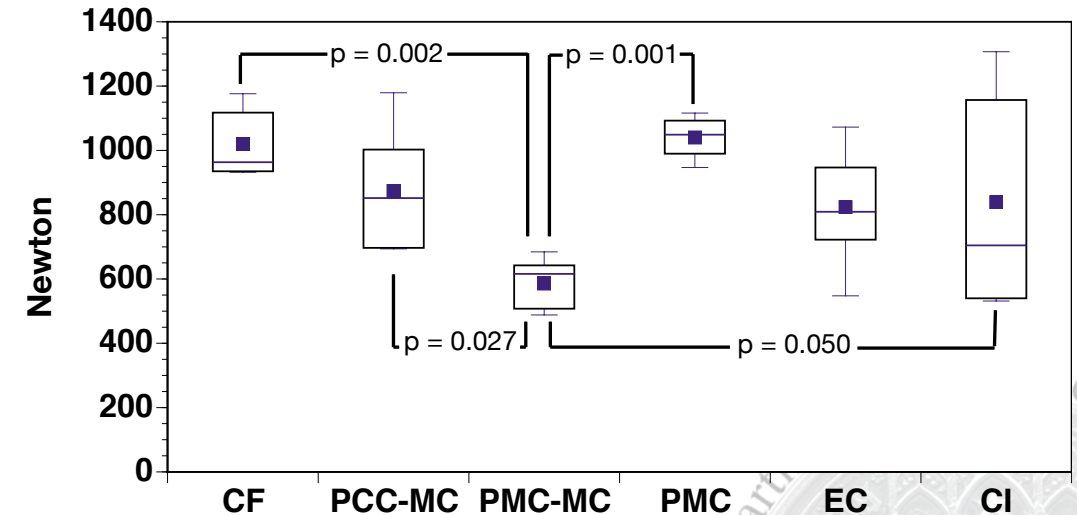


Fig 2. Occlusal loading in the long term loading device

## Results

The mean values of fracture resistance are displayed in Fig. 3. One-way ANOVA ( $\alpha = 0.05$ , Post hoc test according to Fisher's PLSD) revealed significant differences between several test groups (Fig. 3.)



|      | CF     | PCC-MC | PMC-MC | PMC    | EC    | CI    |
|------|--------|--------|--------|--------|-------|-------|
| Mean | 1021 N | 873 N  | 586 N  | 1040 N | 823 N | 839 N |
| SD ± | 110    | 201    | 82     | 67     | 192   | 350   |

Fig. 3 Box plot diagram and mean table of the fracture resistance of the test groups (■ mean, — median)

## Conclusions

Metal post with cast core reconstructions show significantly decreased fracture resistance compared to all other restorative measures of the teeth studied.