

Introduction:

The aim of this in-vitro study was to investigate the influence of the occlusal crown design (inclination, curvature) on the chipping performance of veneered zirconia molar crowns.

Materials and methods:

The roots of PMMA molars (tooth 46, 1mm deep circular shoulder, Morita, G) were coated with a polyether layer (Impregum, 3M Espe, G) for simulating the periodontal mobility and arranged in resin (Palapress Vario, Heraeus-Kulzer, G). 40 molar copings (n=8 per series) of zirconia (Cercon Base, Degudent, G) were made and veneered with layering ceramic (Cercon Ceram Kiss, Degudent, G). The crowns varied in the design of the occlusal surface.

Three different cusp angles (inclination) were applied:
- **steep (S)**, - **medium (M anatomical)** or - **flat (F)**.

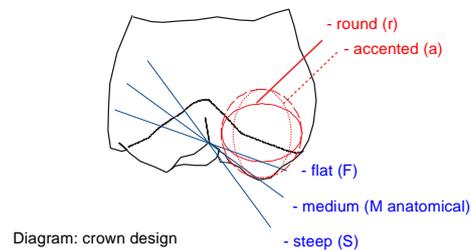
Anatomically formed cusps were combined with different shapes of the cusps (curvature):
- **round (r)** to **accented (a)**.

All crowns were adhesively cemented (Variolink 2, Ivoclar Vivadent; FL).

Identical antagonists were used (CoCr-alloy; Wirobond LFC, Bego, G/ veneering ceramic; Duceragold Kiss, Degudent, G). Crowns and antagonists were transferred to a chewing simulator in a three point contact.

Thermal cycling and mechanical loading [TCML] was performed with:
1,200,000 [ML] à 50N and 6000 [TC] (2min each water cycle of 5°C and 55°C), which are supposed to simulate five years of oral service.

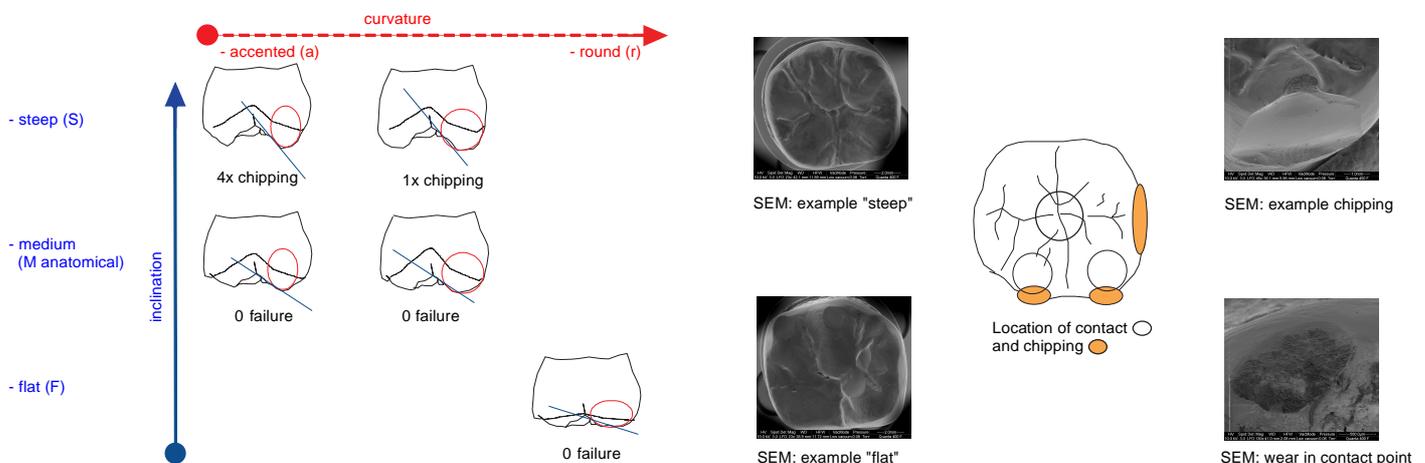
During simulation the restorations were optically controlled for failures (chipping, fracture, etc.). Type and size of crown failure were analyzed in detail by means of SEM (Quanta; FEI-Philips, NL).
Statistics: One-way ANOVA ($\alpha=0.05$).



Regensburg chewing simulator

Results:

With steep cusps, half of the tested crowns showed chipping. No chippings were found for anatomical or flat cusps. Only in combination with steep cusps one crown of the anatomical group failed during simulation.



Discussion:

The **inclination** of the cusps had a strong influence on the chipping rate of molar crowns. Within the limit of this investigation, **curvature** has a small influence on the survival rate.