



Clasp Fatigue Study Review

Deformation and retentive force following in vitro cyclic fatigue of cobalt chrome and aryl ketone polymer (AKP) clasps¹

Authors: Marie A, Keeling A, Hyde TP, Nattress BR, Pavitt S, Murphy RJ, Shary TJ, Dillon S, Osnes, Wood DJ.
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Background: Cobalt chrome (CoCr) is perceived as the most popular material for tooth supported RPDs, but clasps constructed from this material have limitations, including work hardening, distortion, and eventual fracture of clasp arms when stressed beyond their elastic limit.²⁻⁷ Clasps that loosen from everyday wear may be adjusted to improve retention, however, this increases the risk of work hardening and fracture. High-performance polymers such as Ultaire® AKP have the potential to engage and disengage undercuts without being stressed beyond their limit.

Objective: Assess the retentive force and deformation over time of individual clasps made from CoCr and Ultaire® AKP while utilizing two different paths of insertion (POI).

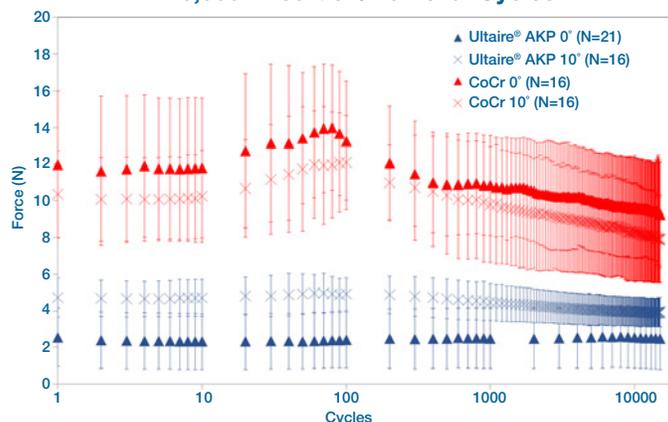
Methods: CoCr and Ultaire® AKP clasps were manufactured in their standard, respective processes, digitally scanned prior to testing, then cycled 15,000 times to simulate five years of use over an e.max analogue crown in artificial saliva. Cycled clasps were evaluated using the ideal POI (0°) and an off-axis POI (10°) to simulate real-world experiences with RPDs. Retentive load was measured *in situ*, as a function of cycles. Clasps were rescanned to assess deformation.

Results: Ultaire® AKP clasps showed significantly less permanent deformation and a more consistent retentive force than CoCr clasps in both POIs tested.

- Ultaire® AKP demonstrated less clasp-to-clasp variability
- Ultaire® AKP clasps did not work harden and showed consistent retention over the duration of testing
- CoCr clasps work hardened and loosened after only 100 cycles, the equivalent of 25 days in use

Conclusion: Ultaire® AKP demonstrated less clasp distortion compared to cobalt chrome. Clasps that maintain their retention and shape over time reduce the failure rate caused by fatigue and fracture.

Clasp Retention Force Over 15,000* Insertion/Removal Cycles



Distortion Results of Pre- and Post-Cycled Scans

Active Clasp Insertion Path	0°		10°	
	Ultaire® AKP	CoCr	Ultaire® AKP	CoCr
Mean Distortion (mm)	0.030 ± 0.024	0.105 ± 0.095	0.019 ± 0.016	0.319 ± 0.195

*Roughly equivalent to five years, assuming eight insertion/removal acts each day.

References:

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