

Pull-out/knock-off resistance of zirconia/Cobalt-Chromium copings luted on titanium-abutments

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Objectives:

The impact of fast and slow working forces was investigated on the pull-out resistance of zirconia or cobalt-chromium (CoCr) copings luted with five different cements using an axially tensile (slow move off-force) and a knock-off test (fast move off-force) (Fig. 1 and Tab. 1).

Material and Methods:

240 titanium-implant-dummies with 4°, 6° or 8° taper-degree abutments, respectively, were milled. 360 zirconia and 360 CoCr copings (all with same surface roughness) were constructed. They were assigned in subgroups of 8 specimens each. After 24h (water storage 37°C) and thermal cycling (TC) the pull-out test (Fig. 1, Fig. 2) was performed using an universal testing machine (Zwick), the knock-off test (Fig. 1, Fig. 3) using the KaVo-Corona-Flex device. TC: 6,000 cycles, 5/55°C, 8.3d lasting) (Fig. 1, Fig. 2). In addition, the effects of slow and fast move-off forces as well as the effects of aging, taper and material were evaluated. Cements: Glassionomer (Ketac Cem), Zinc-oxide-phosphate (Harvard-Cement), provisional cements (TempBond-NE, Implantlink), self-adhesive cement (RelyX - Unicem). Statistics: Means, standard-deviation (Tab. 1), ANOVA.

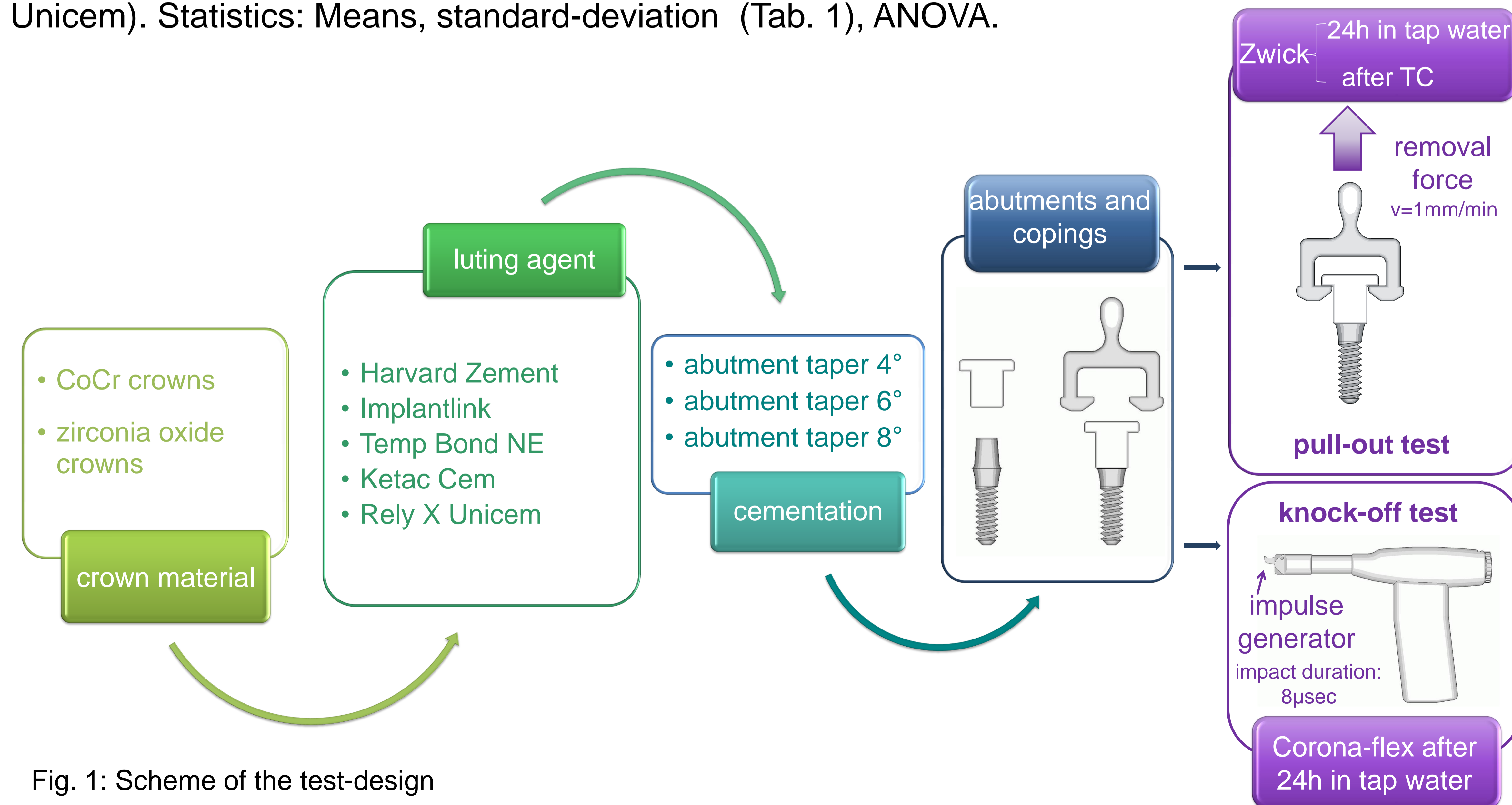


Fig. 1: Scheme of the test-design

Results:

The higher the taper-degree of the abutments the lower was the impact of the type of luting agent on the pull-off-resistance. Luting agents with delayed setting reaction e.g. zinc-oxide-phosphate, showed after TC higher amounts of pull-out resistance when CoCr copings were luted.

	Taper	Luting Agent					
		Ketac Cem	Harvard Cement	Temp Bond NE	Implantlink	RelyX Unicem	
24h	mean number of beats to knock-off copings	CoCr 4°	16	10	1	1	8
		CoCr 6°	5	4	1	1	5
		CoCr 8°	2	2	1	1	6
	Zir	4°	18	14	1	1	5
		6°	6	5	1	1	3
		8°	2	3	1	1	3
pull-out-test means tensile force [N]	CoCr	4°	184	230	121	125	284
		6°	140	208	86	98	227
		8°	107	158	95	95	253
	Zir	4°	136	322	115	111	223
		6°	214	414	79	99	261
		8°	124	225	61	62	283
TC	CoCr	4°	345	475	31	0	315
		6°	274	351	28	0	240
		8°	178	292	38	0	219
	Zir	4°	231	396	22	0	280
		6°	228	399	14	0	285
		8°	114	262	13	0	232

Tab. 1: Results

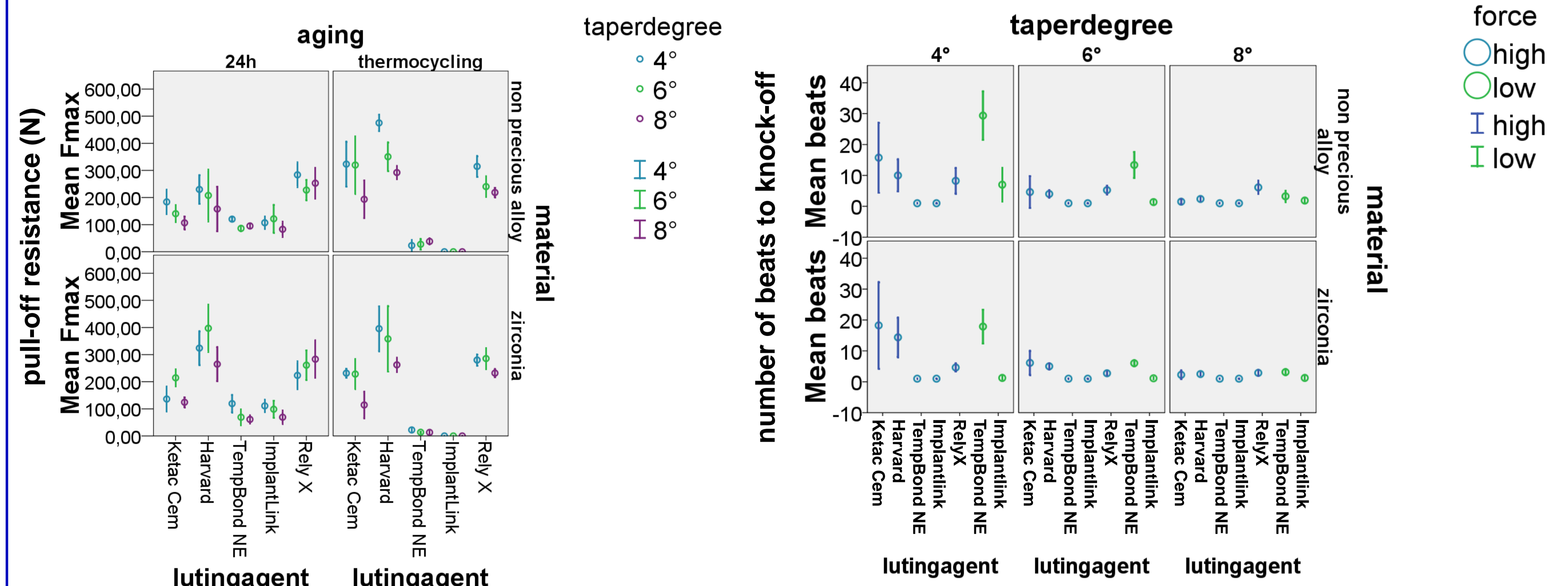


Fig. 2: Results - pull-out test (Zwick)

Fig. 3: Results - knock-off test (Corona-flex)

Conclusion:

The higher the taper-degree is, the less is the impact of the luting agent on the pull-out or knock-off resistance of zirconia or CoCr copings on titanium-abutments. Fast or slow acting move-off forces showed contrary results with same luting agent. Aging influenced the pull-out resistance of zirconia and especially of CoCr copings on abutments (post-curing reaction).