Effects of two fretting damage modes on dental implant-abutment interface and the generation of metal wear debris: an in vitro study

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Abstract

The fretting damage and wear debris on the dental implant-abutment interface (IAI) are unclear. In this study, fatigue cycle loading (FT) and chewing cycle loading (CW) test were applied to two implant systems, the fretting damage morphology and wear debris generation on the IAI were observed by a scanning electron microscope. The torque value of the central screw was measured by electronic torque tester. The fretting damage on the IAI was relatively slight and mainly plastic deformation in the FT group, which was more serious and mainly furrow wear in the CW group. Various forms of wear debris were generated. The removal torques were lower than its pre-tightening value in both groups, the decline and loss rate of the CW group was significantly higher. This study confirmed the critical roles of fretting damages and metal wear debris on the IAI in the implant-supported prosthesis.

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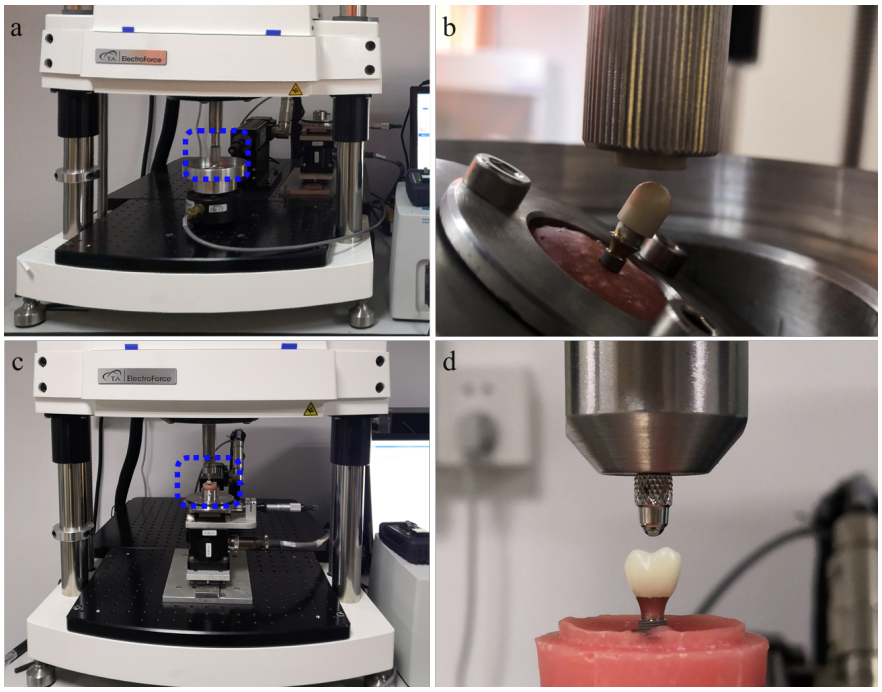

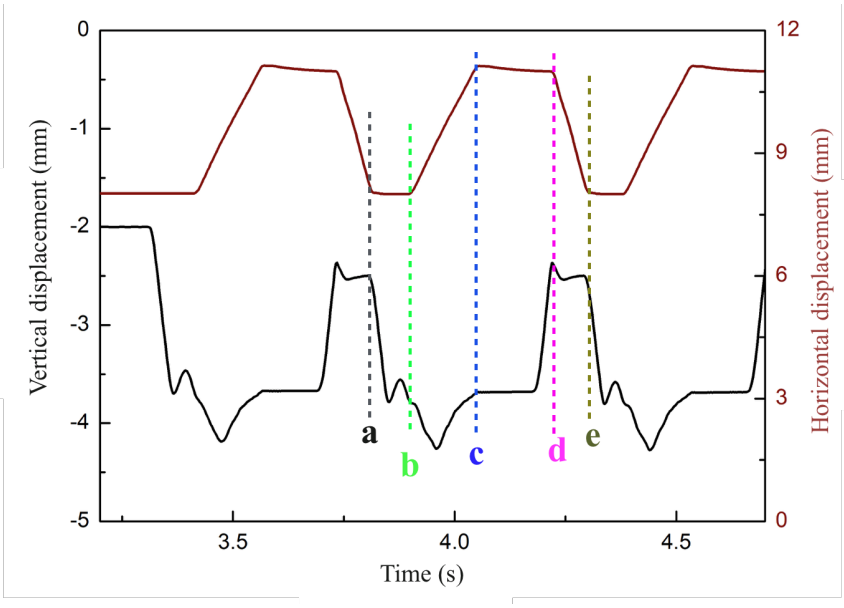

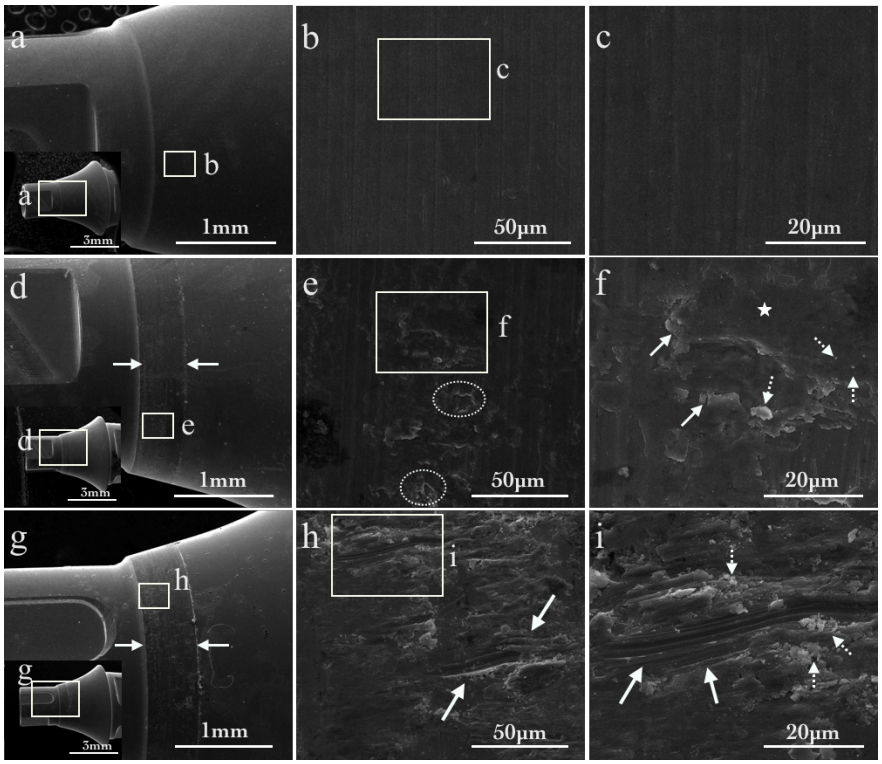

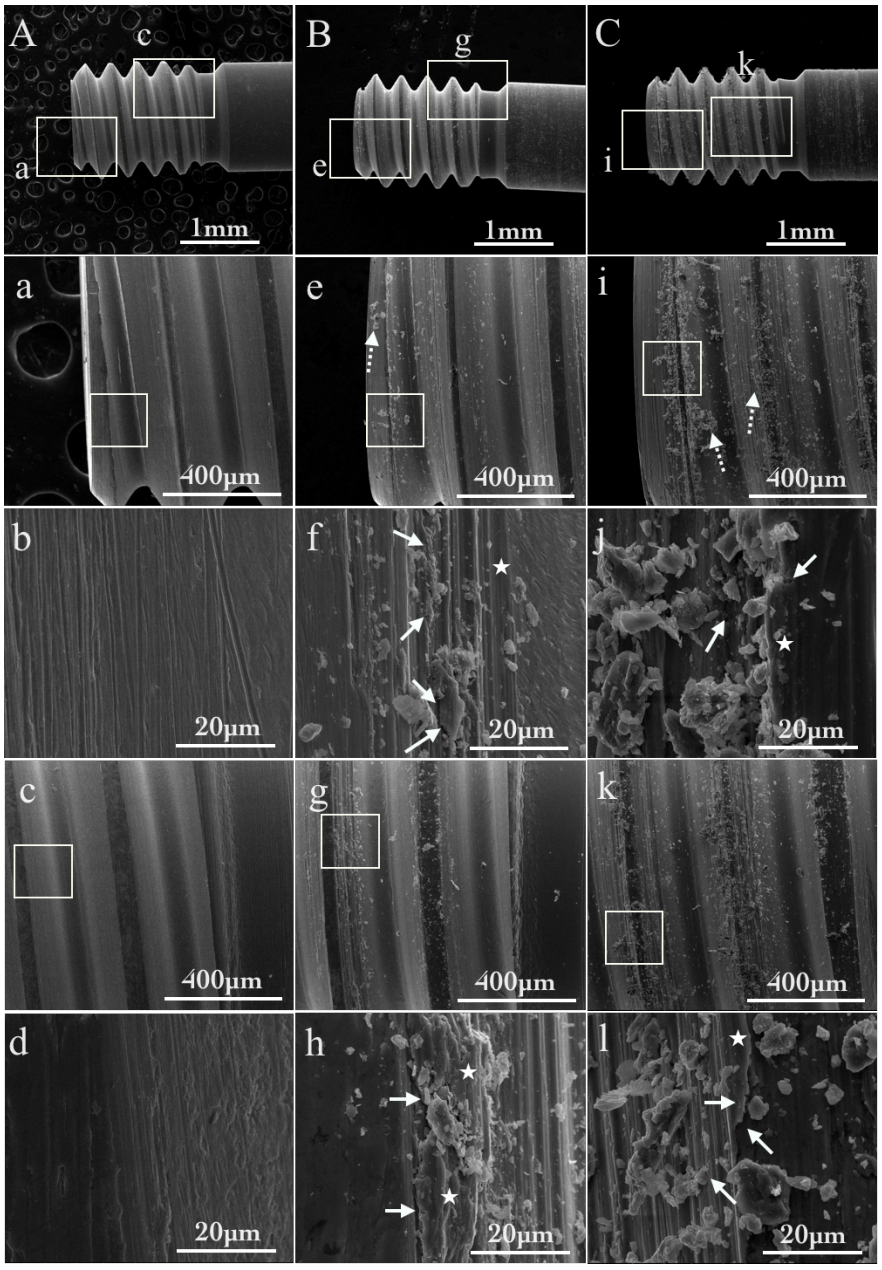

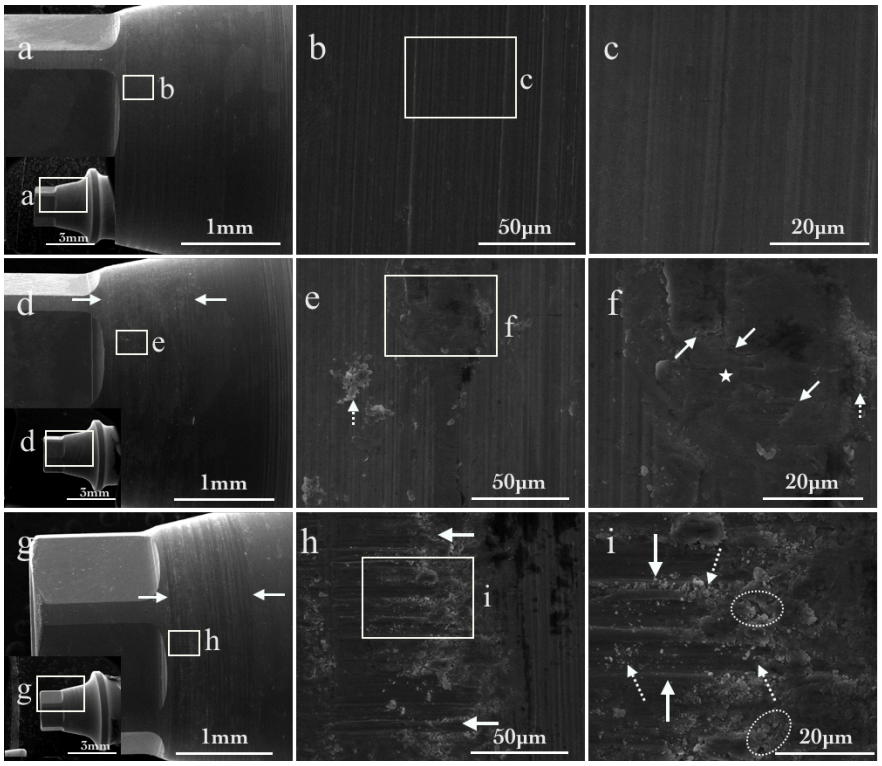

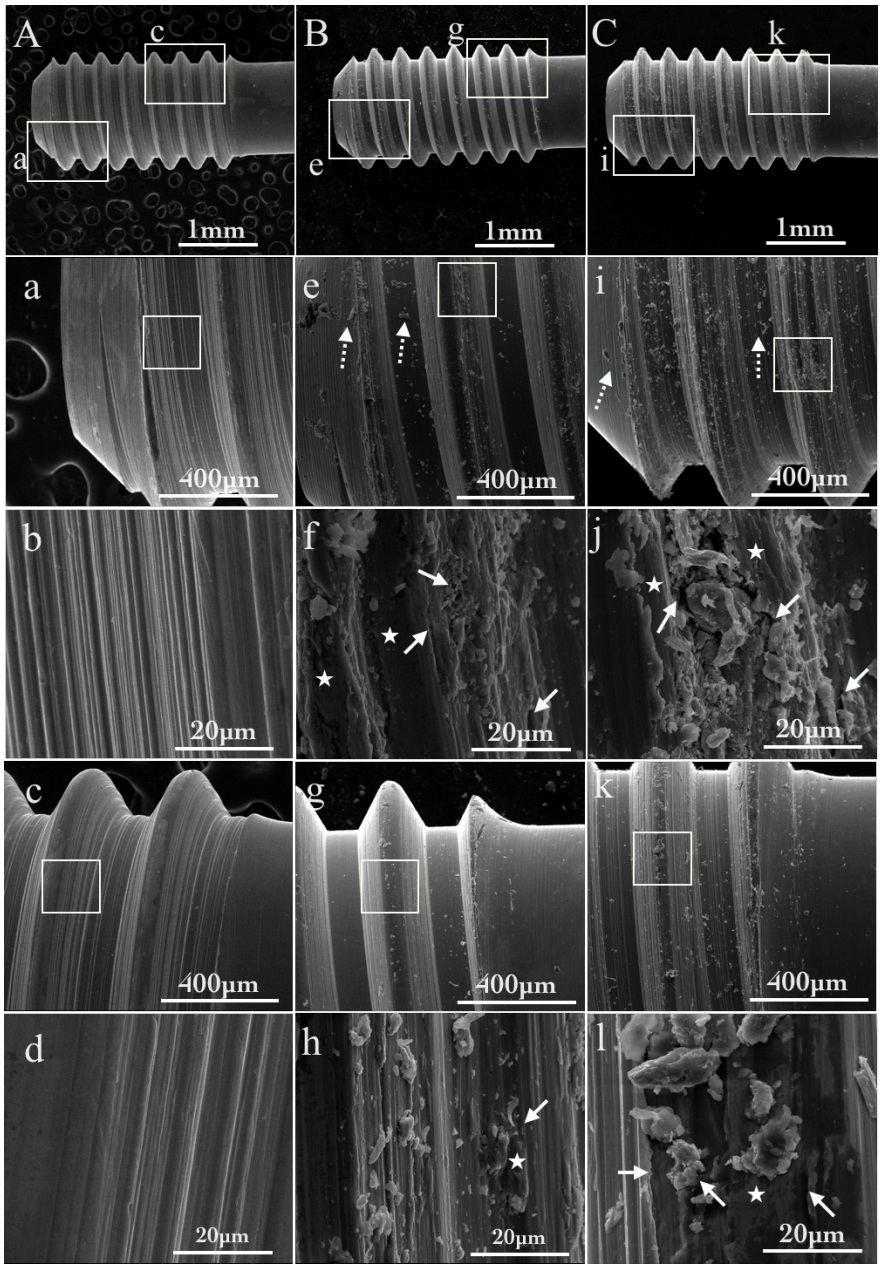

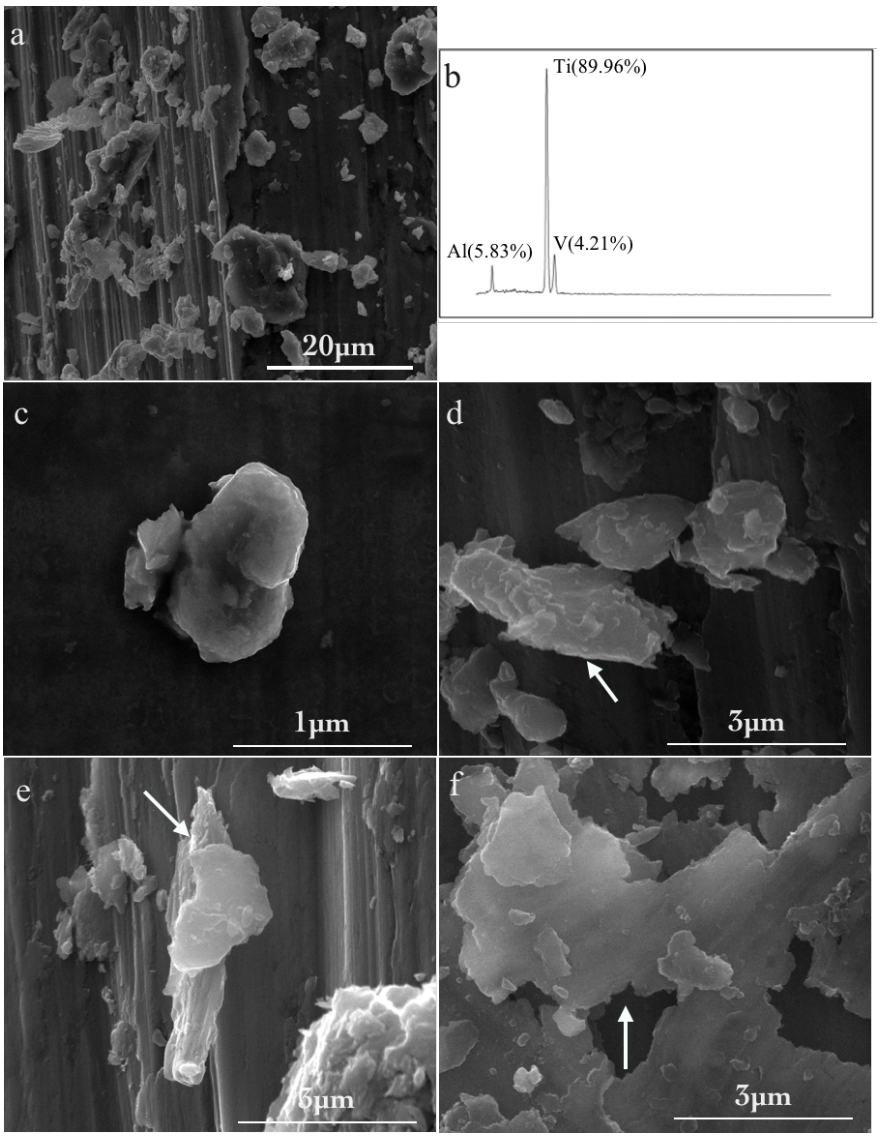

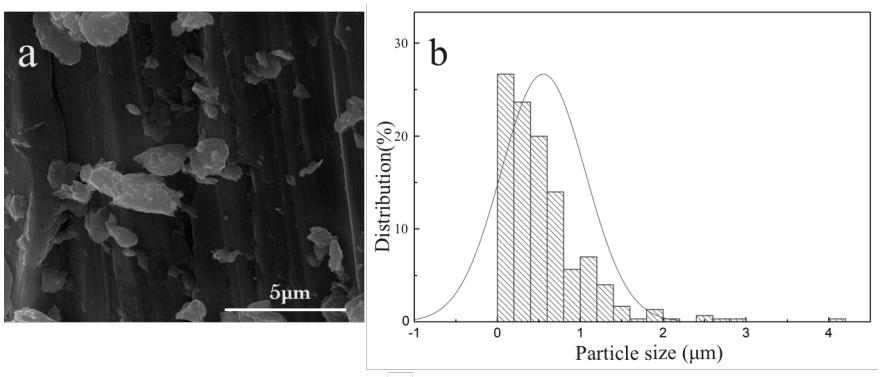

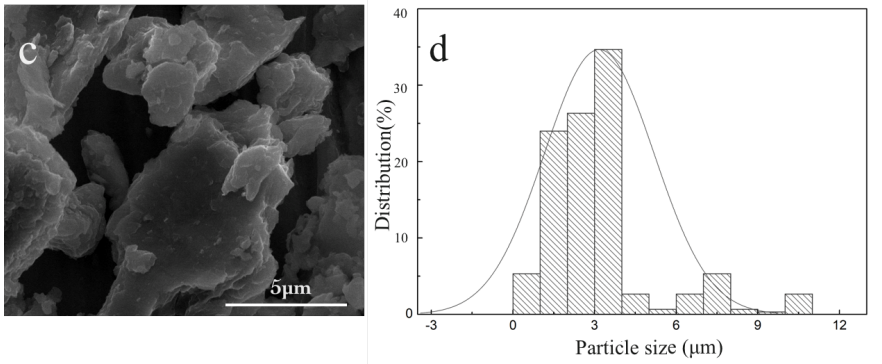

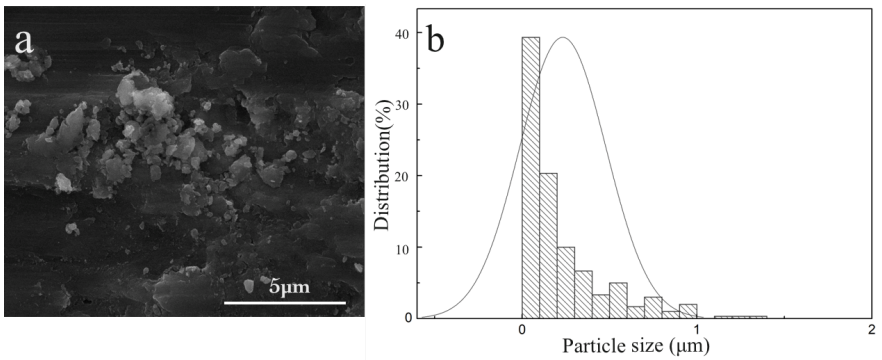

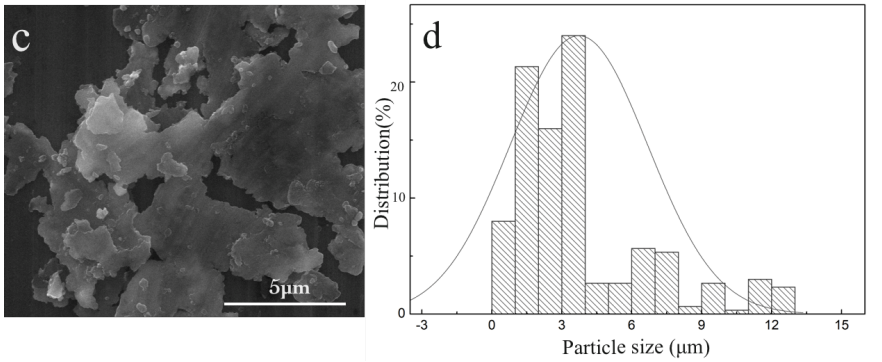

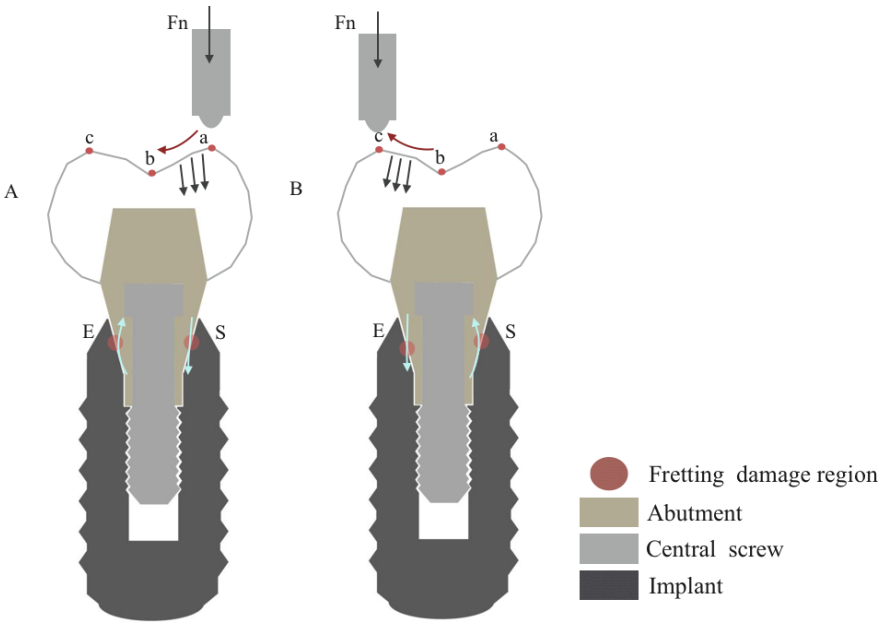

Groups	FT		CW	
	M1	M2	M1	M2
D_{mix}	0.058	0.011	0.594	0.172
D_{max}	4.158	1.323	10.826	12.048
D_{50}	0.433	0.128	2.915	3.143
$\bar{D}$	0.553	0.232	3.142	3.675

Groups	FT		CW	
	M1	M2	M1	M2
T_n	31.88±0.21	28.83±0.62	31.57±0.30	29.12±0.66
T_s-T_n	3.12 [a]	6.17 [b]	3.43 [a]	5.88 [b]
T_m	24.31±0.65	21.15±0.76	21.54±0.42	20.68±0.47
T_s-T_m	10.69 [+]	13.85 [*]	13.46 [++]	14.32 [*]

Groups	FT		CW	
	M1	M2	M1	M2
δ_n	8.91±0.6 [a]	17.63±1.77 [b]	9.80±0.85 [a]	16.80±1.89 [b]
δ_m	30.54±1.86 [+]	39.57±2.17 [*]	38.46±1.20 [++]	40.91±1.34 [*]