Coefficient of friction and preload in implant abutment screw connections

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The clamping force needed to keep implant parts tightly together is called preload. Preload is generated by a screw when a torquing force is applied to the screw. The ratio of preload is predominantly affected by the applied torque and coefficient of friction between the screw thread and implant internal thread and screw head and abutment. The coefficient of friction has to be known for the calculation of preload. The application of optimal preload is the most important aspect to prevent screw loosening.

The aim of this in vitro study was to develop an experimental approach to determine the torque-tension relationship for a typically used implant abutment complex.

Objectives

Mean preload value for dry components: 224 ± 3.2 N at first tightening (Fig. 3, left red box), and 191 ± 14.5 N at second tightening (Fig. 3, left green box). Thread friction component: 5.8 ± 0.8 Ncm at first tightening (Fig. 4, left red box), and 6.2 ± 1.3 Ncm at second tightening (Fig. 4, left green box).

Mean preload value for lubricated components: 185 ± 12.6 N at first tightening (Fig. 3, right red box), and 169 ± 17.7 N at second tightening (Fig. 3, right green box). Thread friction component: 6.7 ± 0.3 Ncm at first (Fig. 4, right red box), and 6.8 ± 0.3 Ncm at second tightening (Fig. 4, right green box).

Calculated coefficient of friction is 0.54 at first tightening of the dry components (Fig. 5).

The experimental approach seems to be adequate to measure preload and the thread friction component. Lower preload was achieved through repeated use of titanium screws. The results suggest that the application of a used screw (e.g. from the try-in appointment) may be unfavorable for obtaining optimal preload.

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Conclusions

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