Fluid leakage from the implant-abutment interface: a comparison between KAT implants and the traditional external hex implants

Final report by

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Purpose: to compare the potential for fluid leakage from the implant-abutment interface of two implant systems, KAT and Branemark design.

Methods: A total of 30 KAT 5.0x12mm and 18 Branemark external hex (BRK) 5.0x12 implants were used for this study. Implant abutments were connect to KAT implants with 25Ncm (n=12) and 30Ncm (n=12) torque, respectively. Implant abutments were connected to BRK with 30Ncm torque (n=12) and served as controls.

2ul of crystal violet was then added to the abutment chamber for each implant, and the occlusal openings of the implants were sealed with sticky wax plus plastic films to ensure water tightness.

The implant assemblies were then placed in 2ml of distilled water with implant-abutment interface fully immersed. The absorbance of the water at 580nm was measured at 0, 24, 72, 120 and 168 hours with the Tecan 200 Pro spectrophotometer to assess the leakage of the crystal violet from the implant-abutment interface.

An additional 6 each of the KAT and BRK implant assemblies without crystal violet were also immersed in distilled water and the absorbance of the water was measured at the same time points to serve as blank controls.

The standard curve was made with the concentrations of crystal violet at concentrations of 0, 3, 6, 9, 12 and 15ul/ml.

Statistical analysis: ANOVA and the *post hoc* Tukey test was used to compare crystal violet concentrations in the distilled water immersing the 3 groups of implants (KAT 25Ncm, KAT 30Ncm, BRK 30Ncm) at different time points of observation. Paired T-tests were used to compare crystal violet concentrations between different time points and baseline within each group.

Results:

The standard curve shows approximately linear increase in absorbance with increasing concentrations of crystal violet (Figure 1):

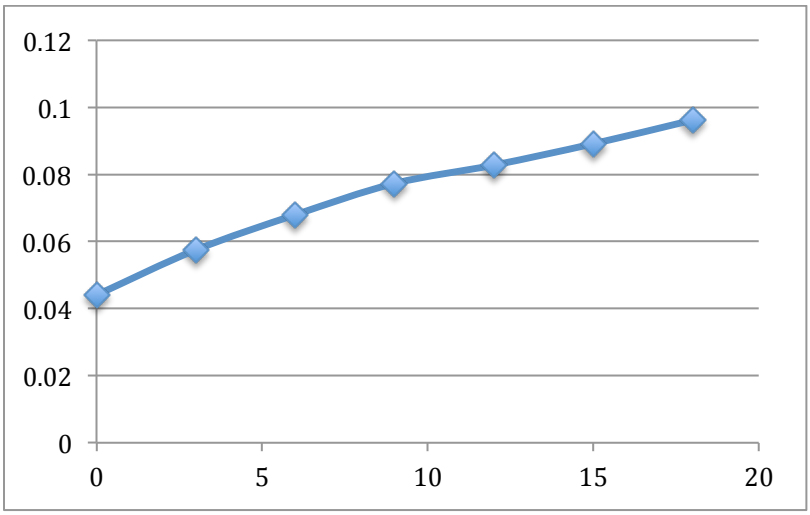

Figure 1. Standard curve

Leakage of crystal violet from KAT implant-abutment interfaces (Figure 2):

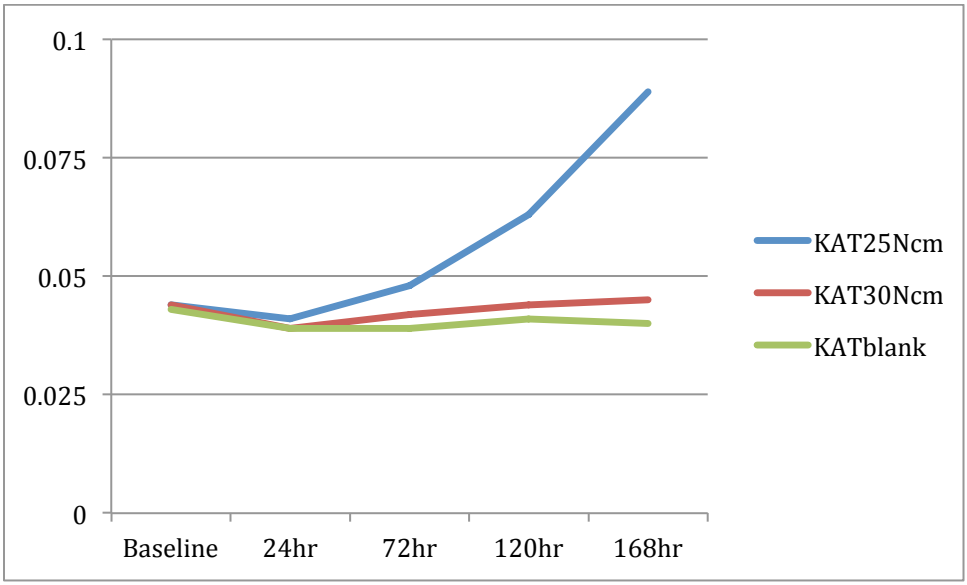

Figure 2: Mean leakage of KAT implants at 25Ncm and 30Ncm as compared to the blank control.

AT 25Ncm, elevation in mean concentrations of crystal violet was found at 72hr after immersion, followed by significant increase at 120 and 168 hours.

At 30Ncm, no statistically significant increase in crystal violet leakage was found at any time points as compared to baseline.

There are statistical differences in crystal violet concentrations between KAT 25Ncm and KAT 30Ncm at 72, 120 and 168 hours ($p<0.05$).

Leakage of crystal violet from BRK implant-abutment interfaces (Figure 3):

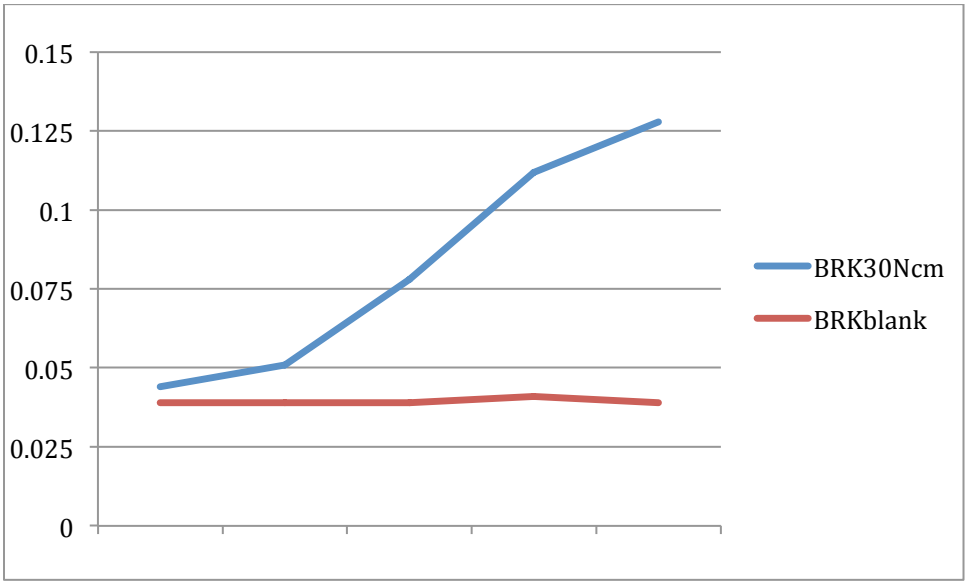

Figure 3: Mean leakage of BRK implants at 30Ncm as compared to the blank control.

AT 30Ncm, elevation in mean concentrations of crystal violet was found at 24hr after immersion, followed by significant increase at 72, 120 and 168 hours.

Statistically significant increases in crystal violet leakage were found at 24, 72, 120 and 168 hours as compared to baseline ($p<0.05$).

Comparisons of implant-abutment interface leakage between KAT and BRK implants (Figure 4):

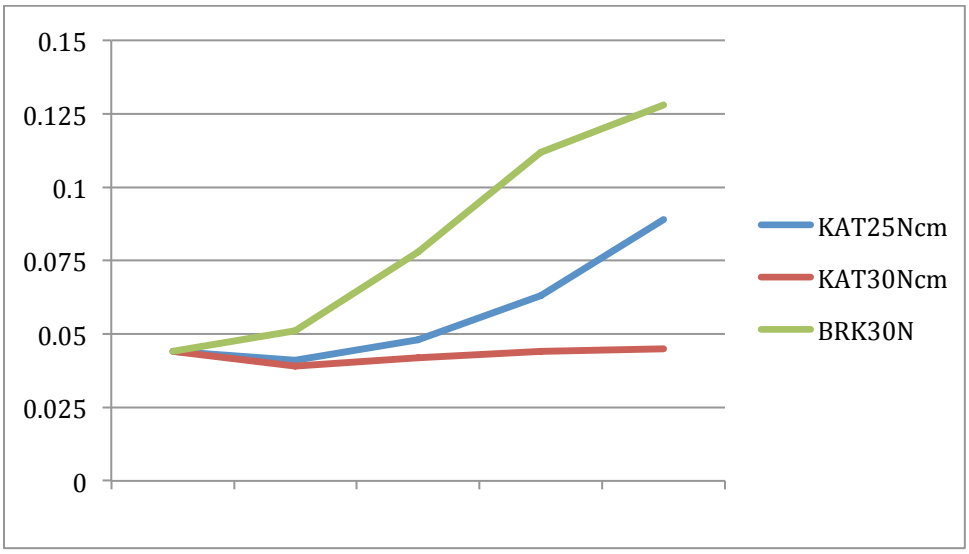

Figure 4: Comparisons between KAT and BRK implants

BRK 30Ncm showed significantly more leakage than KAT 30Ncm and 25Ncm at 24, 72, 120 and 168 hours ($p<0.05$). KAT 25Ncm showed significantly more leakage than KAT 30Ncm at 72, 120 and 168 hours ($p<0.05$).

Conclusions: Within the limit of the current study design, fluid leakage from the implant-abutment interface of KAT implants can be prevented when 30 Ncm torque is used to connect the abutment to the implant.