The use of narrow platform implants (<3.5mm) to support single tooth restorations has brought about significant challenges in clinical practice. This is due to the need for increased load in narrow implants compared to non-narrow ones. As a result, these implants are more prone to mechanical failures such as abutment movement, angular deformation, residual tightening torque and wear of implant abutment connections (IACs).

The purpose of this study is to investigate the vertical settling, angular deformation, residual tightening torque and wear of IACs in narrow and extra narrow platform implants. This study compares different types of IACs for ENPIs with statistical significance.

**Materials and Methods**

Control Group:
- Neoss ProActive Narrow Platform Straight (3.25mm x 13mm)
- Straumann Bone Level Tapered Small Platform Straight (3.2mm x 12mm)
- Astra OsseoSpeed EV (3.0mm x 13mm)
- Nobel Active 3.0 (3.0mm x 13mm)

Test Groups for Extra Narrow Platform Implants:
- Straumann Bone Level Tapered Small CrossFit Roxolid (2.9mm x 12mm)
- Astra OsseoSpeed EV (2.9mm x 13mm)
- Nobel Active 3.0 (2.5mm x 13mm)

Fatigue testing was performed in accordance with ISO 14801 in air at room temperature, at 15 Hz for 1 million cycles under load. (Fig. 1)

- SEM imaging was used to record implants and abutments at tensile and compressive surfaces prior to assembly and cyclic loading. (Fig. 8)
- After the assembly of the IACs, the abutment screw was tightened to 20Ncm to simulate the maximum torque in current prosthetic designs. It was then reverse torqued. (Fig. 5)
- After cyclic loading, SEM imaging was completed. (Fig. 9) and then samples were reassembled and loaded to failure with an Instron testing device. (Figs. 6, 7)

- Statistical analysis was completed using Kruskal-Wallis and Dunn’s Pairwise Comparison testing.

**Results**

**Null Hypothesis**

- Vertical Movement in System Between 5Ncm and Maximum Torque (Fig. 2)
- Residual Tightening Torque (Fig. 5)
- IAC Angular Displacement (Fig. 3)
- Load displacement (Fig. 6)

**Conclusions**

- Narrow Platform Implants: Neoss showed less vertical movement, a lower load displacement and less angular displacement than all conical systems with statistical significance (p<0.05). Mesia showed higher residual tightening torque than Astra and Nobel with statistical significance (p<0.05), but no statistical significance was seen compared to Straumann Roxolid.
- Extra Narrow Platform Implants: Straumann Roxolid showed higher residual tightening torque than Astra and Nobel with statistical significance (p<0.05). Vertical settling was noted for all systems, but with no statistical significance. No statistical significance was seen among systems for load displacement or angular displacement.

**References**