CONICAL IMPLANT-ABUTMENT CONNECTIONS: A MICROBIOLOGICAL AND 3D MICRO-CT ANALYSIS

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BACKGROUND: Implant connections have undergone various design modifications over time to increase their resistance to micromovement and prevent bacterial penetration. In this context, conical connections have been developed, based on the 'cone within a cone' concept developed by Stephen Morse in 1864. Several studies have shown that cone screw connections perform better than other connection types in preventing bacterial contamination. However, there are no studies comparing different types of cone screw implants, relating any bacterial contamination to the geometric characteristics of the different types of implants.

PURPOSE: The aim of the present study is to assess, using an in vitro model, the microbial penetration and leaving by strains of *Streptococcus Mutans* (SM) and *Pseudomonas Aeruginosa* (PA), and to evaluate, by 3-dimensional microtomography (Micro-CT), the implant-abutment contact surface, angle and microgap at the implant-abutment junction (IAJ) in six different commercially available types of cone screw connection implants (3P, Nobel, Neodent. Winsix, Mech & Human and Ankylos).

METHODS: Eighteen implants (three for each manufacturer) were embedded in autoclavable resin and sterilised. Microbiological testing assessed bacterial passage from the inside to the outside and from the outside to the inside of the implant internal chamber. Micro-CT analysis assessed the volume of the implant-abutment microgap and provided geometric information, including contact surface area and taper angle of the conical connection.

RESULTS: The microbiological results showed varying degrees of contamination with SM and PA among the tested implant systems. Only Nobel and Neodent implants were sterile in all tests. The microgap volume within the IAJ was negligible for all implants. Geometric analysis revealed differences in contact area and degree of taper between the implant systems. A correlation between contamination and connection angle was observed in the in-out tests, with contamination decreasing as the angle increased, except for sample 2. Contamination with an extremely large or extremely small contact area showed a lower microbial sealing capacity than those with an intermediate contact area. except for sample 2. No significant relationship was found between contamination and angle or surface area in the out-in tests.

CONCLUSION: The study demonstrated superior microbial sealing performance in Nobel and Neodent implants compared to other implants analysed. Significant relationships were observed, suggesting that connections with higher angles and intermediate contact surfaces may improve microbial sealing. These findings provide a basis for future research aimed at optimising the microbial sealing capacity of implant connections.