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# Stress distribution in implants compared to teeth; biomechanical approach

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**Objectives:** The present study investigates how the stress distribution in implants (stress-distribution curve, elastic and linear concepts) is influenced by the shape, length, diameter as compared to a natural human molar tooth. The aim is to determine whether the stress distribution and biomechanical properties are similar between them or if the gap is significant, what consequences can be encounter and what measures needs to be taken.

**Methods:** Finite element analysis studies in stress distribution made within the last years. Stress distribution in the different layers and joints of the teeth and PDL, the biomechanical numbers; modulus of elasticity, density, fracture toughness, density, hardness and comparing these number with the alfa-beta-Ti6Al4V alloy implants and their biomechanical values and corresponding stresses and strain in all subunits before the force reaches the cortical and cancellous bone. The biomechanical differences were then taken into account.

**Results:** The tooth distributes the stress as a graded material, with three stress absorbers; CDJ, CEJ, PDL and graded biomechanical values from enamel to PDL compare to an implant as follow; modulus of elasticity reduction of 90-95%, density reduction of 56%, ultimate strength reduction of 90-94.28%, hardness reduction of 93%, on the contrary the fracture toughness increase from Enamel to dentin in 530%. The tooth experiences an axial mobility of 28 um (10-100 times more than the implant) as a response to the stress. The enamel has the capacity to dissipate 50% of the stress. The joints of the tooth structure helps in stress distribution as follow; DEJ; 40-50%, CDJ; 17.48 and CEJ; 3%: These three joints allow 82% more mobility of the tooth compare to an implant. The molar area has 300% more surface area than an implant and the strains on bone are in the range of 1,000%. On the other hand; the implant is not a graded material, crack formation after occlusal load is in the range of 6,250% bigger than the tooth. The mechanical values on an implant are; 50-2,000% higher than and the strain reaching the bone could reach more than 1,000%. These high results lead to failure in bone (micro crack, resorption, screw loosening, fracture on prosthesis, implants) in the implant system

**Conclusion:** The difference in stress distribution between implant and teeth are in the mechanical proportion of 1:10 more than a 1,000%. To improve the difference the mechanical values the following issues has to be addressed in the implant system; reduction of mechanical values, better surface design, developing of new materials and improve the mobility of the system.

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