Università degli Studi di Modena e Reggio Emilia
Facoltà di Medicina e Chirurgia
Corso di Laurea Specialistico in Odontoiatria e Protesi dentaria
Corso di Laurea in Igiene Dentale

Congresso Nazionale
dei Docenti di Discipline
Odontostomatologiche
e Chirurgia Maxillo Facciale
ROMA
22-24
Aprile 2009

DESIGN SOLUTIONS FOR DENTAL IMPLANTS CONNECTION SCREW: FEM ANALYSIS

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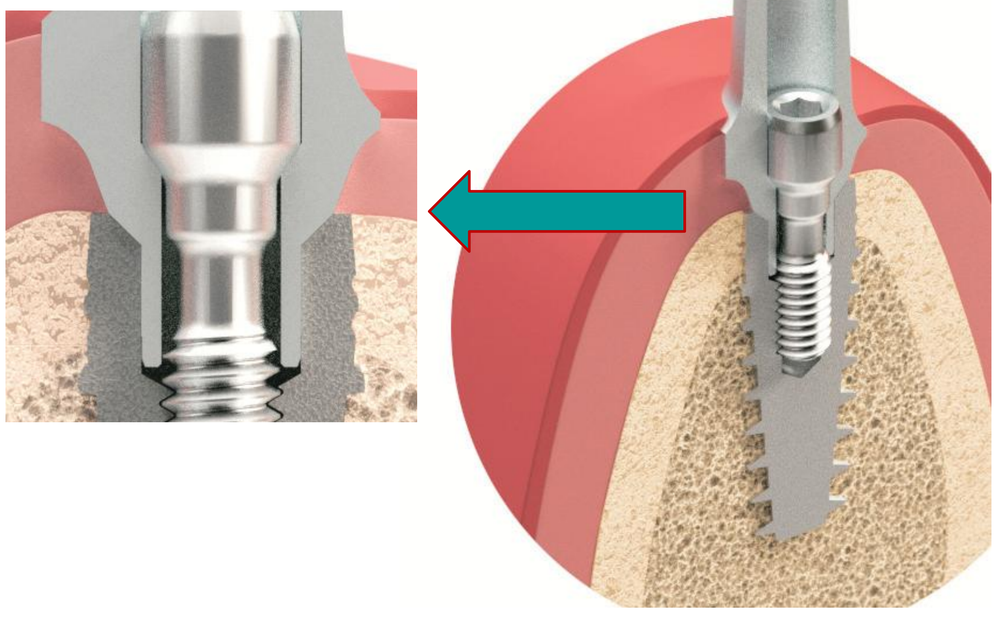
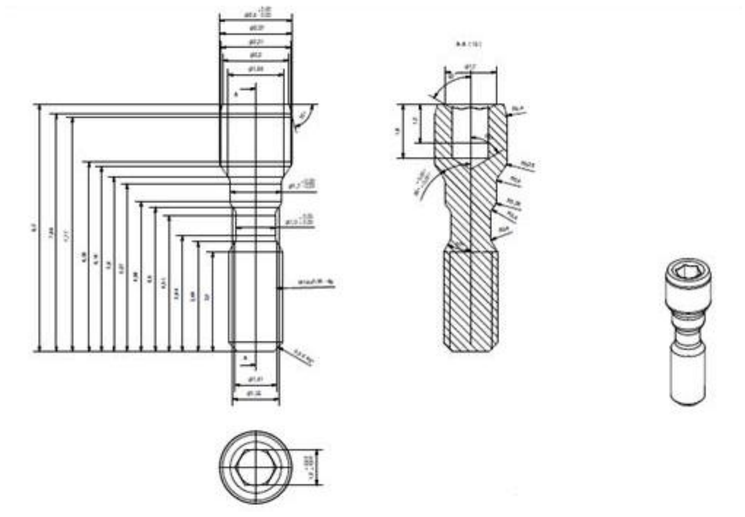
INTRODUCTION: Most of implant systems on the market present a fixture-abutment connection through a passing screw. In respect to conical connections ,this makes the prostehtic procedures performed by dentists and laboratories more simple. However, in the clinical practice, the risk of unscrewing and fracture of the connection screw is detectable.

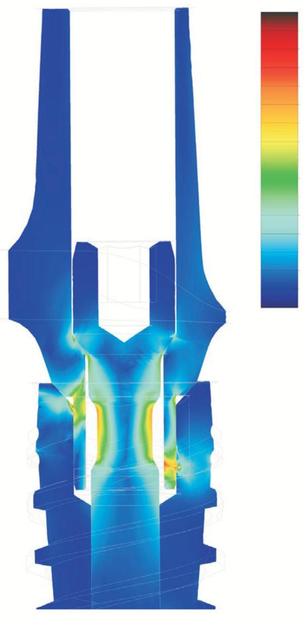


OBJECTIVES: The aim of this work is to evaluate different design solutions of the connection screw in order to reduce the tensional state of the fixture-abutment connection of the new JDEvolution® implant system (JDentalCare srl).

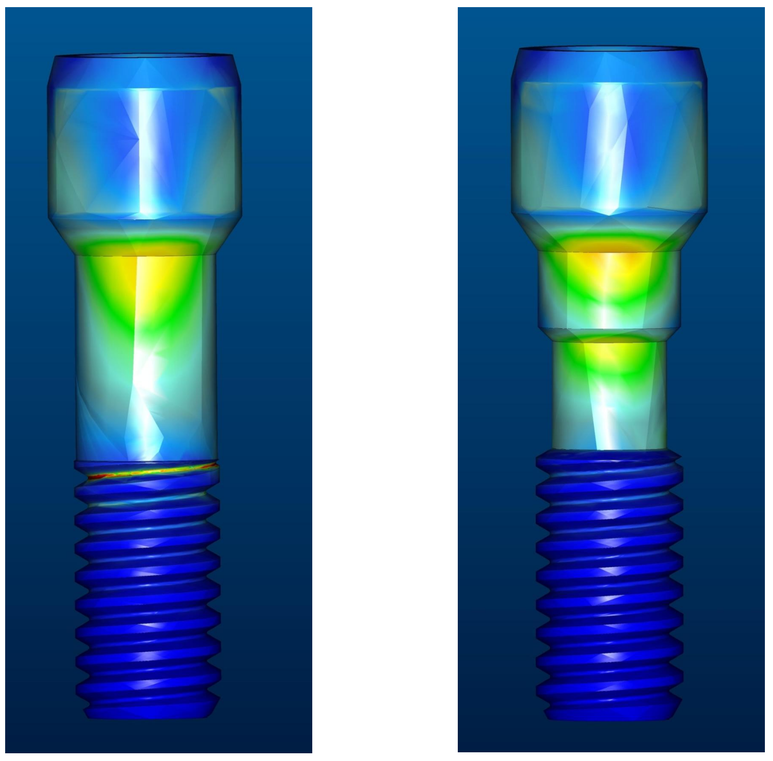
MATERIALS AND METHODS: A FEM analysis was performed on different screw geometries to find the gold standard solution.



Technical drawing of the connection screw of dental implant system JDEvolution®

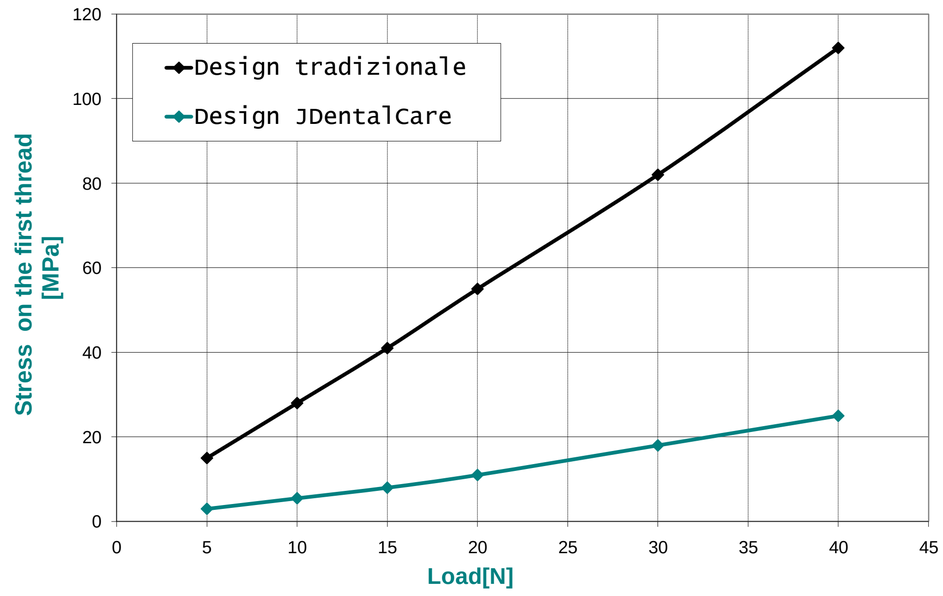


FEM analysis of lateral loading of JDEvolution® implant



Tensional state of the two screws design evaluated: on the left traditional screw design, on the right JDEvolution® design.

RESULTS: The analysis performed highlighted that the maximum stresses of the system are concentrated on the connection screw: this means that it is necessary to optimize the screw design in order to maximize its performance when it undergoes masticatory loads. A calculation was performed to analyze the behaviour of the screw under the action of bending and tightening loads: from this analysis resulted that the mostly stressed region is localized between the stem and the coronal portion of the thread. It was observed that optimizing the profile of the stem of the screw by reducing its diameter close to the beginning of the thread the tensional state of the screw significantly improves with a subsequent reduction of the risk of fracture. It was also introduced an unscrewing system realized with a conical connection between the head of the screw and the abutment.



CONCLUSIONS: It is necessary to optimize the design of the connection screw between the fixture and the abutment, reducing the diameter close to the beginning of the thread , in order to reduce the tensional state of the screw when it undergoes bending and tightening loads and minimizing in that way the risk of unscrewing and fracture.

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