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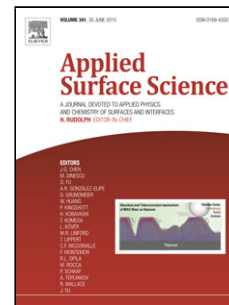
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R&D on Dental Implants Breakage

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R&D on Dental Implants Breakage - Highlights

- A brief review of mastication force and inserting torque values is presented in order to set maximal values for simulations.
- FEM simulations concluded that any of the two steps dental implant components may be broken, either because great forces (shocks) or fatigue.
- A new set of instruments for broken dental implant restoration was designed, manufactured and presented.

Abstract: Most used dental implants for human dental prostheses are of two steps type: first step means implantation and, after several months healing and osseointegration, second step is prosthesis fixture. For sure, dental implants and prostheses are meant to last for a lifetime. Still, there are unfortunate cases when dental implants break. This paper studies two steps dental implants breakage and proposes a set of instruments for replacement and restoration of the broken implant. First part of the paper sets the input data of the study: structure of the studied two steps dental implants based on two Romanian patents and values of the loading forces found in practice and specialty papers. In the second part of the paper, using DEFORM 2D™ FEM simulation software, worst case scenarios of loading dental implants are studied in order to determine which zones and components of the dental implant set are affected (broken). Last part of the paper is dedicated to design and presentation of a set for extracting and cutting tools used to restore the broken implant set.

Keywords: dental implant, breakage, FEM simulation, new instruments, implant restoration

1. Introduction

Dental implants are used in oral implantology as support for dental prostheses, which are designated for oral rehabilitation in cases that cannot be solved by means of classic methods. Dental prostheses fixed onto dental implants have superior static and dynamic stability compared to mobile dental prostheses.

Depending on the used prosthetic rehabilitation method onto dental implants they are being inserted in one or two steps and they may have smooth or threaded external surface. In case the patient has a narrow dental alveolar ridge or in case of temporary prostheses mini-implants are used; in all these cases dental implants are inserted in one step.

Very rarely dental implants break, because of the materials they are made of: titanium or zirconia and because of the real load, shock or periodical. In practice each case of dental implant breakage is different, specific to the patient and restored by the dentist in his own way: by extracting the broken component of the dental implant using custom made tools for the specific case or by completing the dental implant using other methods [1].

Because cases of dental implant breakage are so very rare, a research on this subject could be expensive. Authors did not find any references to a set of instruments used to restore many cases of broken dental implants. This paper studies breakage of two steps cylindrical dental implant. This type of implant is the most used in real practice. Finally, it proposes a set of instruments for replacement and restoration of the broken implant based on real cases.

2. Methods

2.1. Two steps dental implant set presentation

Two steps dental implants are defined by two moments in time:

- insertion followed by a healing period of several months,
- dental prosthesis fixture.

	Two steps dental implant [1,2,3] has special upper surfaces meant to fix abutment and ensure its anti-rotational movement. The abutment is the link between the artificial dental root represented by the screw implant and the
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