THE IMPORTANCE OF THE IMPLANT-ABUTMENT CONNECTION AND ITS TIGHTNESS FOR SUCCESSFUL ORTHOPEDIC TREATMENT.

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Abstract

Objectives: One of the main reasons for the occurrence of peri-implantitis and the lack of successful osseointegration around the installed dental implant is the contamination of inflammation-causing bacteria in the microspace at the implant-abutment junction. Therefore, the design of the implant-abutment connection is of great importance for the long life of the prosthetic restoration supported by a dental implant.

Materials and methods: 18 "Implant.Uz" two-stage dental implants were randomly selected for 3 series of laboratory studies for contamination with St.aureus, Str.pyogenes and a suspension of these microbes St.aureus and Str.pyogenes. The abutments were connected to the implants under sterile conditions with an approximate torque of 25 N/cm.

Results: The components of the design of the dental implant "Implant.Uz" after contamination with St.aureus, Str.pyogenes and a suspension of these microbes St.aureus and Str.pyogenes turned out to be sterile, which indicates the tightness of the implant design

Conclusion: the dental implant "Implant.Uz" developed in Uzbekistan and the design of the connection between it and its abutment after a series of exogenous infection in vitro remains hermetic, therefore, can be recommended for further successful orthopedic prosthetics.

Keywords: Dental implant, implant-abutment connection, structural tightness, bacterial contamination.

DOI Number: 10.48047/nq.2022.20.19.NQ99187 **NeuroQuantology2022;20(19): 2227-2232**

Introduction

To date, fixed orthopedic constructions based on dental implants are a worthy alternative to removable prosthetics. At the same time, it is important to emphasize that dental implantation is considered completely successful only when the implants are functionally loaded and there is no bone resorption around them.

Therefore, one of the urgent problems of dental implantology is the loss of marginal bone around the installed implants at the level of the alveolar ridge, which is observed by clinicians immediately after the

installation and opening of the implant for further prosthetics [5, 7].

Research in the field suggests that this bone loss occurs during the first year of exercise. Thus, numerous attempts are being made to minimize or eliminate such bone loss. However, the timing and cause of this bone loss is not always clear. One of the hypotheses of bone loss around these implants was associated with the presence of bacteria at the interface between the implant and the abutment (implant - abutment connection (IAC)) [1, 2].

Microscopic gaps formed due to insufficient fit of the abutment to the implant increase the leakage of saliva and oral bacteria into these gaps, which in turn leads to the accumulation of various microorganisms at the junction of the implant with the abutment. This leads to loss of marginal bone [7, 14, 15].

Bacteria found at the level IACs are often both anaerobic and facultative anaerobic, depending on the characteristics of the microenvironment. The design of the IAC can influence the amount of microbial leakage at the interface between the implant and the abutment. In addition, the success of implant rehabilitation is related to mechanical properties such as correct loading. Excessive occlusal loading after prosthetic rehabilitation can lead to increased loading on both the implant and the implant-to- abutment connection, as well as the surrounding bone. The design and fit of the IAC influence the loading of the implant- abutment system during physiological jaw movements. If this load is too high, the implant system may fail due to screw failure and loss, implant fracture, or damage to the prosthesis. To avoid breakage of the implant system, the implant must be placed correctly and the design of the prosthesis must minimize the leverage length. In addition, the occlusion must be designed so that loads are transmitted along the axis of the implant to prevent excessive stress concentration in the IAC [19, 20].

Moreover, micro-movements of the abutment under the action of chewing pressure during operation cause the appearance of micro-gaps in the connection of the implant with the abutment. Microorganisms colonize this area and enter the interior of the implant during loading, leading to an inflammatory response and ultimately implant rejection [15, 23].

The design features of the connection between the implant and the abutment are one of the factors of microbial leakage into this connection [3].

To date, there are many alternative implant systems with various types of connections, the main requirement of which is the prevention of inflammation of the tissues around the implant. According to some studies, internal connections provide an accurate fit of the implant-abutment connection and are more stable than external ones [3,10,12,24].

There are various types of implant-abutment connection including butt-butt, with platform switching and without

interface (at the tissue level or in a single design) [4].

Therefore, the study of the connection between the implant and the abutment, as well as its tightness, is of great importance for maintaining the volume of bone tissue in the marginal area.

Materials and methods

Our study was conducted in a research laboratory at the Tashkent Medical Academy. In this study, the tightness of the "Implant.Uz" abutment-implant connection developed in Uzbekistan was studied [8, 9, 11, 13, 22]. In this design, the abutment is connected to the implant with an internal hex end-to-end [17.18, 21]. 3 series of studies were carried out with 6 implants for each study (in each of 3 tubes with microorganisms St.aureus, Str.pyogenes, mixed suspension of St.aureus and Str.pyogenes, 2 implants connected to the abutments were placed). The components of the Implant.Uz dental implant and accessories for its assembly were sterilized by autoclaving at a temperature of 1500C for 30 minutes. The assembly of the implant parts was carried out in a sterile box. To prevent microleakage from the abutment screw hole, this area was completely sealed by gutta-percha (Pumadent, Pumadent Co. Ltd., China) and cyanoacrylate adhesive (Razi chemical Co., Tehran, Iran).

The assembled implant was placed in 3 tubes with a nutrient medium: 1 tube - with St.aureus, 2 tube - Str.pyogenes, 3 tube - a suspension of microbes St.aureus and Str.pyogenesa. After a 3-day incubation in a thermostat at 37°C, the broth implant was placed for 45 minutes in a 6% hydrogen peroxide solution for decontamination, then washed with saline. After washing, the disassembled implant was lowered into a sterile broth and incubated in a thermostat at 370C for 48 hours. At the end of the incubation period, inoculation was carried out from sugar broth on blood agar. The plates were incubated at 370C for 72 hours. At the end of the incubation period, the growth of microorganisms was recorded. Conducted on 3 series of studies.

Results: The components of the design of the dental implant "Implant.Uz" after contamination with St.aureus, Str.pyogenes and a suspension of these microbes St.aureus and Str.pyogenes turned out to be sterile. Therefore, the absence of growth of test strains of microorganisms St.aureus, Str.pyogenes and a suspension of these microorganisms indicates the tightness of the dental implant "Implant.Uz".

The results of testing the tightness of the design of the dental implant «Implant.Uz » with exogenous infection in vitro.

Series of studies	Impact factors (exposure time 48 hours)				
	St.aureus	Str.pyogenes	Suspension microbes	6% hydrogen peroxide	Bouillon culture
№1	 No growth				 No growth
№2		 No growth			 No growth
№3			 No growth		 No growth

Conclusion: The developed design of the connection between the "Implant.Uz" dental implant and its abutment is airtight, therefore, it can be recommended for further successful orthopedic prosthetics.

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