Determining the Biological Sealing Quality of the Implant-abutment Interface Using *Streptococcus mutans* in Both, Conical and Internal Hex Connections

A comparative study

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Implants have been around for many years already, having a lot of advantages and high success rates, by some authors even higher than 90%. Nevertheless, throughout the years, problems and failures have occurred in practice which led to bone loss around the implants and even, in some cases, to losing the implant itself. The phenomenon behind this pathological process -peri-implantitis - is believed to be the microleakage which occurs at the implant-abutment interface. This happens due to the existence of a gap present between the implant and the prosthetic abutment. Moreover, the microleakage is amplified because of the, so-called, pumo effect. The pump effect occurs when the crown-abutment complex is subjected to occlusal, vertical and oblique, forces. During these micro-movements of the abutment, the microleakage intensifies and the bacteria can easily enter inside the implant, where is impossible to reach and remove through oral hygiene, thus, creating the perfect conditions for peri-implantitis. There are two major types of implant-abutment connections widely used nowadays - internal hex and conical - which are believed to influence the phenomenon and, so, the outcome. In the present study, both types of connections are tested, using *Streptococcus Mutans*, a common bacteria found in the oral cavity.

Keywords: Implants, Peri-implantitis, Microleakage, *Streptococcus mutans*, Biocompatibility

Experimental part

Materials and methods

For this experiment, two different connection types were chosen - the standard internal hex connection and the conical connection. Two implants, together with their own abutments, of each type were selected.

The first step of the experiment was to inoculate all the implants with the chosen bacteria - *Streptococcus mutans* ATCC® 35668™ (Microbiologics®) reference strain was cultured on Columbia agar supplemented with 5% blood (Sanimed, Romania) and incubated for 24 h in microaerophilic conditions (Genbagmicroaer, BioMerieux, France). From the fresh culture, a suspension was made in physiological saline with a final density of 0.5 McFarland, corresponding to a bacterial concentration of 108 germs/mL. From this suspension, about 1 µL was taken and inoculated into the dental implants.

The implants were then introduced into 2 mL of nutrient broth (Sanimed, Romania) and incubated in microaerophilic conditions at 37°C for 48 h. The tubes were also
numbered to be able to distinguish between the two connection types later on.

Results and discussions

The presence of bacteria in the tubes containing the dental implants with an internal hex connection was suggested by the macroscopic appearance of the broth, which became cloudy; while in the other 2 tubes, containing the implants with the conical connection, the broth remained clear.

For confirmation, the broth of all 4 tubes was cultured on Columbia agar supplemented with 5% blood, incubated in microaerophilic conditions at 37°C. Cultures examination was performed after 24 h; bacterial growth being present only in case of the samples containing the internal hex type of implants.

Compared to other studies in literature, the results are somehow similar, showing a better fit and sealing capacity of the conic implant-abutment interface [10,11].

However, in a similar study, Joao Paulo da Silva-Neto [10], inoculated the inner part of the implants with a bacterial suspension before tightening the abutments [10], inoculated the inner part of the implants with a bacterial suspension before tightening the abutments [10], inoculated the inner part of the implants with a bacterial suspension before tightening the abutments [10], inoculated the inner part of the implants with a bacterial suspension before tightening the abutments [10], inoculated the inner part of the implants with a bacterial suspension before tightening the abutments [10].

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Compared to other studies in literature, the results are somewhat similar, showing a better fit and sealing capacity of the conic implant-abutment interface [10,11].

So, it’s very hard to say if the morse-tapered implants, indeed, have no microleakage, but it’s certain that they provide a way more stable conection, mechanically and biochemically.

Conclusions

The conical connection is, according to most authors, the best and the most reliable connection available. Both the present study and the literature review have pointed out a higher stability, lower micro-movements and lower to no microleakage.

Analyzing it, from a clinical perspective, it is safe to assume that, due to all these characteristics combined,

the morse tapered connection can lead to an improved outcome.

The lack of microleakage translates into much less chances for the oral bacteria to colonize the hidden spaces inside the implant, or at the implant-abutment interface. With other words, the chances of peri-implantitis and peri-mucositis are much lower.

Even though all in vitro studies point out its advantages, only time will tell if the conical connection is, indeed, superior to the internal hex one, clinically.

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