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Is there a **key** to the successful osseointegration of zirconia implants?

Summary of all currently published clinical studies of zirconia implants.

Dr. Jochen Mellinghoff
Private practice, Pfauengasse 14, Ulm/ Donau, Germany

Topic: Implant and guided surgery

Abstract

The currently only five clinical studies on dental zirconia implants [1,2,3,4,5] are screened for relevant factors regarding successful osseointegration using a questionnaire. Data was collected solely from failures to identify the most common risk factors. The analysis showed that all major risks for a successful osseointegration either reduce the primary stability or compromise the implant protection during the healing period of the implant. When choosing a one-piece implant system, it is recommended to thoroughly check in advance whether it will be possible to provide an effective implant protection. If not, it is recommended to use a two-piece system. The most common risk factors are mentioned.

Background and Aim

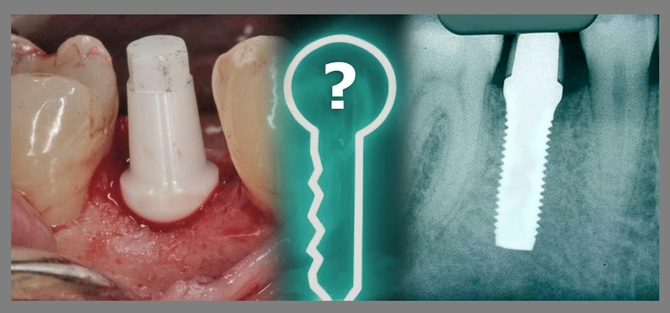
In recent years, dental implants made of zirconia have enjoyed increasing popularity. Since there are no long-term clinical studies yet, the five previously published clinical studies are of particular importance. The aim of this study is to determine the parameters from existing studies that played a key role with regard to a successful osseointegration.

Methods and Materials

The results from the following five studies were incorporated into the study:

	Mellinghoff *2006*	Oliva *2007*	Stoll *2008*	Lambrich *2008*	Wiltfang *2008*
Total	189	100	22	139	24
Mean time in situ [month]	8,2	16-18	19,4	18,1	12
Failures	9	2	0	11	3
Failure rate	4,8	2	0	7,9	12,5
Success rate	95,2	98	100	92,1	87,5

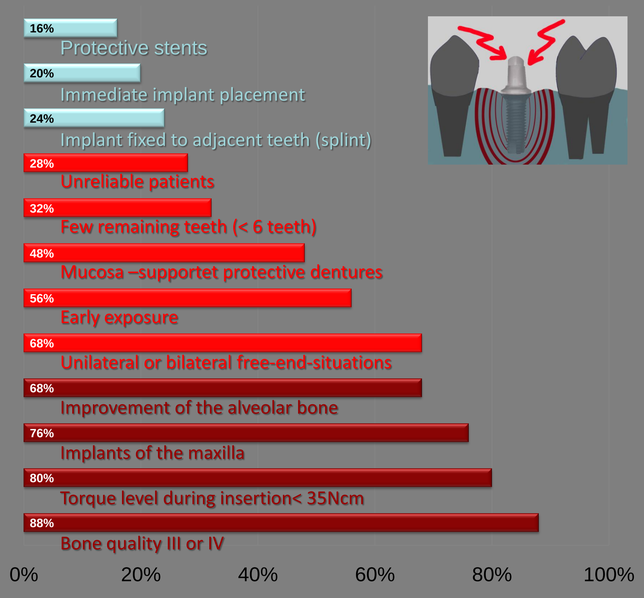
For a better comparability of data from different publications, a uniform assessment form was sent out to all authors in order to collect data. Only implant cases were queried, which did not lead to satisfactory osseointegration, to identify the implantation parameters that jeopardize a successful osseointegration. In addition to questions about the surgical procedure, the conditions of transgingival healing received special consideration in the data collection.



Results

Among the 474 placed implants, 25 failures were documented. Excluded from the survey was the study by Stoll, because, according to their information, no failures had occurred. In general, a lack of osseointegration during the healing phase was the cause of explantation. The mean time in situ of the failures was 3.8 months (minimum 1 month/maximum 16.8 months). The following list shows all parameters that were recorded in connection with one of the 25 failures, in order of frequency.

Frequency of risk factors



In 88% of the cases, a combination of these findings was apparent.
Two major categories of risk factors could be identified:

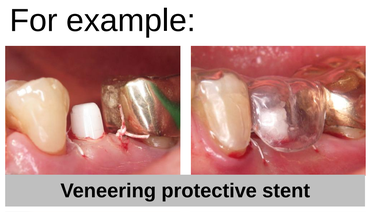
1. On one hand, these are parameters that characterize the quality and quantity of the bone implant site and determine, as such, essentially the primary stability of the implant (**brown**).
2. The second group of parameters, on the other hand, characterizes the protective arrangements for the healing of the implant after surgery (**rot**).
   - "Free-end-situations" → Only one-sided dental support of the protective measure is possible
   - "Few remaining teeth" → Limited possibilities of the dental retention and support for protective measures
   - "Unreliable patient" → Implant protection not reliably given
   - "type of implant protection"

Discussion

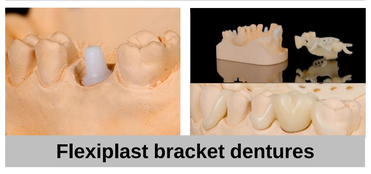
The results suggest that the failure of an osseointegration of implants is not due to material-specific causes of zirconia, but is likely explained by the risks of transgingival healing, especially in an inferior bone implant bed. This statement also supports all previously performed histological studies in animals on osseointegration, in which no difference could be found between titanium and zirconia, if the surface roughness was comparable.

Conclusion

Is there a key to the successful osseointegration of zirconia implants? Within the limitations of this study, we would say Yes! It lies in the proper risk analysis for a planned implantation. In addition to the anatomical and prosthetic preliminary considerations for zirconia implants, the single-piece design of the implant must be taken more into account. It is critical for success to clarify and prepare the safest method for an atraumatic healing of the implant in every individual case. Various techniques and materials are available. For example:


Veneering protective stent

Flexiplast dentures


Flexiplast bracket dentures


Adhesive bridges

If it is likely - especially with poor bone quality and quantity – that an atraumatic, transgingival healing of the implant cannot be ensured, the following is recommended: Either the bone bed should be optimized in a preliminary operation to increase the primary stability, or it is advisable to resort to a two-piece implant system. This applies to all single-piece implant systems, regardless of whether we are dealing with ZrO2 or TiO2. Conversely, recent clinical results also show, that when good protection during the healing period of the implant is ensured, zirconia implants can lead to an equally good prognosis that is comparable to that of Titanium.

References

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