



European Society for Ceramic Implantology

Scientific survey ESCI „Clinical approach of ceramic dental implants“

-Evaluation-

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**Prof. André Chen
Prof. Michael Gahlert
Prof. Mutlu Özcan
PD Dr. Stefan Röhling**

**Prof. Jérôme Chevalier
Prof. Ralf Kohal
Prof. Michael Payer
Dr. Jens Tartsch**

**Prof. Jens Fischer
Dr. Frank Maier, MSc
Prof. Corrado Piconi
Prof. Werner Zechner**

ESCI Survey Ceramic Implants - Evaluation

Introduction

Ceramic implants establish in modern dental implantology as a supplement to the treatment spectrum with titanium implants. An increasing interest can be observed not only on the part of health-conscious patients, but also in the dental profession due to the biological advantages. Promising short- and medium-term data on the successful use of ceramic implants are already available. Nevertheless, the topic of "ceramic implants" is still controversial in part due to the lack of long-term data. Systematic reviews refer to specific experiences with individual systems. Comprehensive findings from the general practical use of ceramic implants and experience from daily dental practice are still lacking.

The European Society for Ceramic Implantology (ESCI) would like to contribute with this survey in order to find answers to the most important questions and to provide a deeper insight into the general daily handling of ceramic implants. This survey provides valuable information for the further development of these implants and makes an important contribution to the reliable use of ceramic implants - ultimately for safe use in our patients.

Method

The questionnaire was designed by the ESCI Scientific Advisory Board in German / English and was addressed to users of ceramic implants as well as users of titanium implants and dental technicians. The results of the survey were evaluated by the ESCI. To ensure a clear presentation, a relevant selection of the questions has been presented below. A detailed overview of all questions and results can be requested from ESCI. The survey was not conducted for commercial purposes, and no financial resources were provided by partners or other third parties.

This questionnaire was implemented in the survey tool "Survey Monkey" and sent as an online link via email, among others to the members of the ESCI, published on the homepage of the ESCI, published via print media of the trade press, as well as distributed via various other channels of the survey partners from April to November 2021. This included social media activities and newsletters from collaborating professional societies and ESCI Company Partners.

At this point, the ESCI would like to thank all supporters for their commitment: these were the Austrian Society of Implantology (ÖGI), European Association of Dental Implantologists (BDIZ/EDI), PEERS, the German Society for Environmental Dentistry (DEGUZ), the "Zahngipfel", as well as the companies Straumann AG, Camlog Biotechnologies AG, Nobel Biocare AG, Dentalpoint AG, Z-Systems AG, COHO Biomedical Technology, Ceramtec AG, Zircon Medical and the Dental Campus Association, as well as the publishers Quintessence Publishing, PIP Verlag, Dentale Implantologie DI Spitta Verlag, ZZ Schweiz, Oemus Media and others.

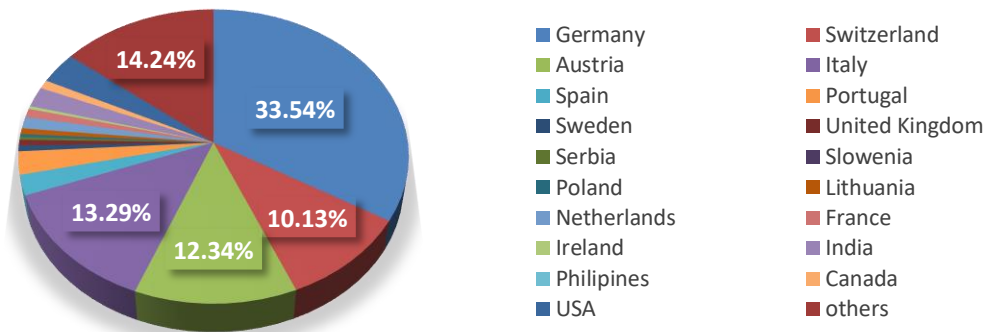
The common approach in cooperation with all partners ultimately led to a high response among the survey participants. At the same time, the activities of the individual partners and their intensity varied. Reach and response therefore varied depending on the measures taken by the individual partners. This "preselection" has to be taken into account for the evaluation in a different weighting of the responses, especially for the different implant systems. Thus, an implant concept with a high dissemination activity is more strongly represented in the responses than a system with a lower dissemination activity. Accordingly, the answers reflect a scientific tendency but no scientific data.

Part A Demographic evaluation

Although the questionnaire for an online survey was very extensive with a total of 40 questions and an average processing time of 9 minutes, the response rate was 66%. This represents a good value for online surveys and shows a very high degree of motivation of the participants to express themselves on this topic. The number of 316 responses received allows significant and relevant conclusions to be drawn.

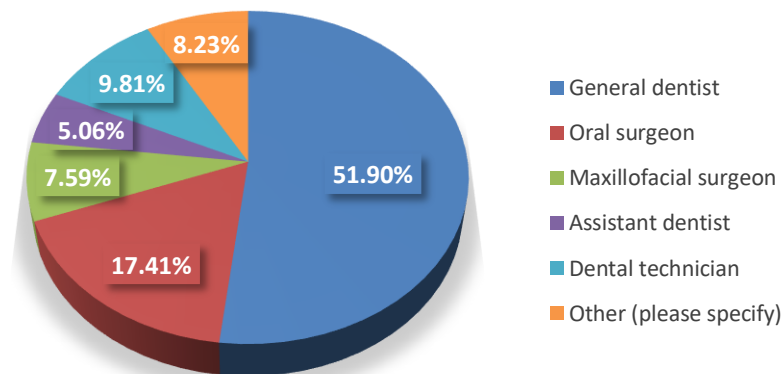
Q 1. In which country do you work?

Participants from 45 countries expressed the international relevance of the topic "ceramic implants", with the majority of responses (56%) coming from the German-speaking countries D, A, CH and Italy (13.3%). In particular, countries in which ceramic implants have not yet been approved were also represented.



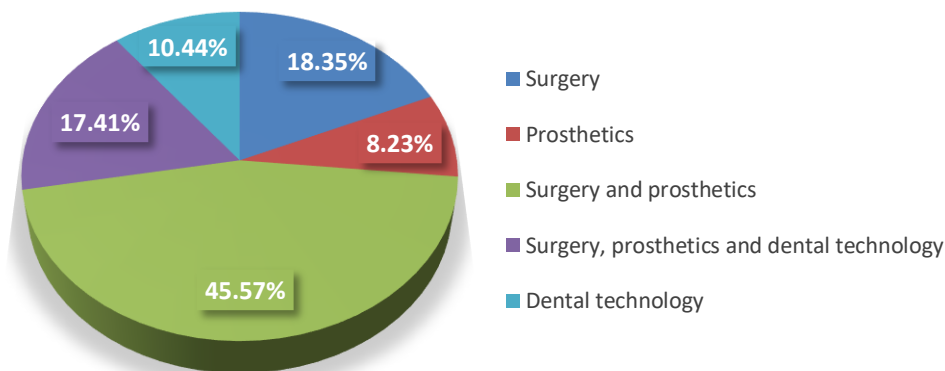
Q 2. My field of work

More than half of the responses came from general dentists (51.9%), 58% of whom place ceramic implants themselves. 10.7% refer patients to specialists, but do the prosthetic work themselves. 31.3 % of general dentists do not use ceramic implants. Of the maxillofacial and oral surgeons (25%), 65.3% place ceramic implants themselves and only 2.7% refer patients for this purpose. 32.0 % of maxillofacial or oral surgeons do not place ceramic implants.



Q 4. Please specify your implantology field of activity

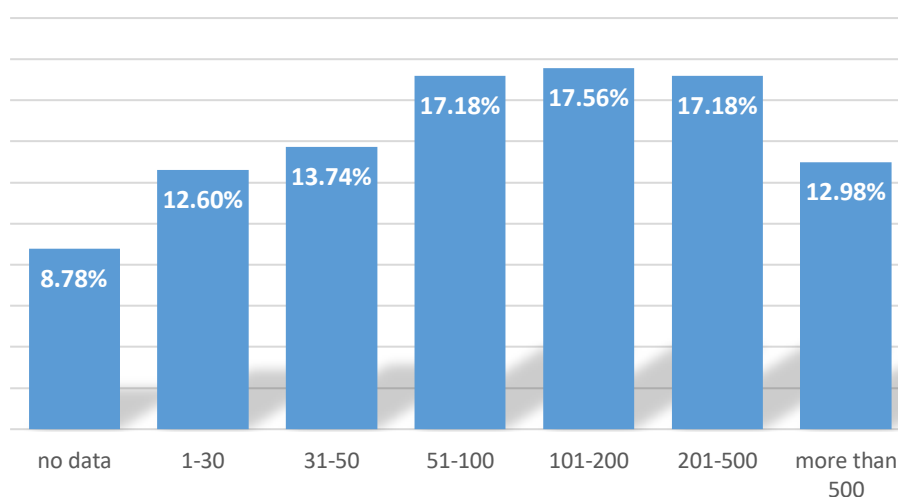
At 63%, significantly more than half of the participants deal with surgery and prosthetics, of which 17.4% additionally deal with dental technology. This indicates a focus on the overall care of the patient by the respective practitioners.



Q 5. Please indicate the total number of implants (titanium and/or ceramic) you have placed annually.

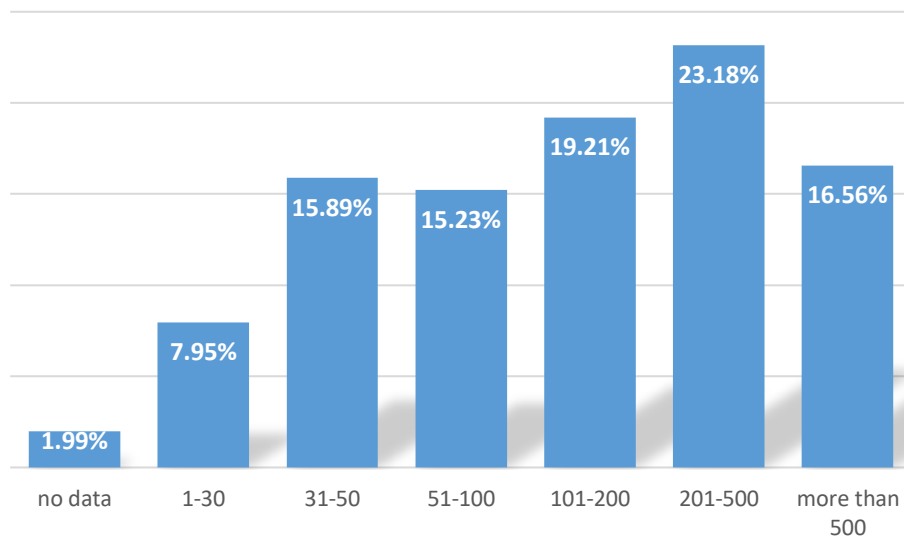
The majority of the survey responses were provided by users experienced in implantology, as 47.7% of users place more than 100 implants and 64.9% of users place more than 50 implants per year.

Q 5a. Please indicate the total number of implants placed by you annually (titanium and/or ceramic)



A similar statement can be made for the users of ceramic implants. 59% of the users place more than 100 and with 74.2% almost two thirds of the participants place more than 50 ceramic implants per year. From the data it can be seen that 112 participants in the survey place more than 50 implants per year, of these 25 colleagues place more than 500 implants per year.

Q 5b. Please indicate the total number of implants placed by you annually (titanium and/or ceramic) Only select users Ceramic implants



Q 8. Are ceramic implants already part of your implantology treatment spectrum?

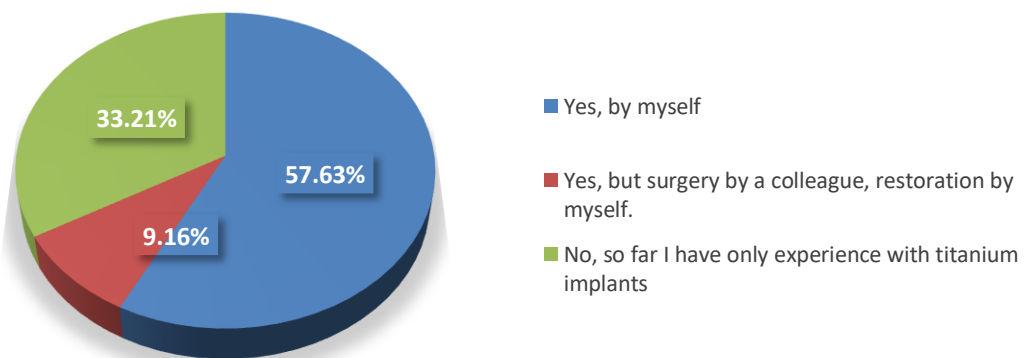
In addition to the general demographic information (Part A), the question catalog was divided into three sections (Parts B, C and D). Each of the target groups was directed to a part of the overall catalog with questions specific to that target group. (in parentheses: number of respondents):

Part B: Dentists, oral surgeons, maxillofacial surgeons with experience in ceramic implantology (n=175).

Part C: Dentists, oral surgeons, maxillofacial surgeons without experience in ceramic implantology (n=87).

Part D: Dental technicians (n=31)

In addition, other occupations ("other") such as researcher, business developer, periodontist, implantologist, prosthodontist were indicated (n=26). Minor duplicate entries can be neglected in the evaluation.

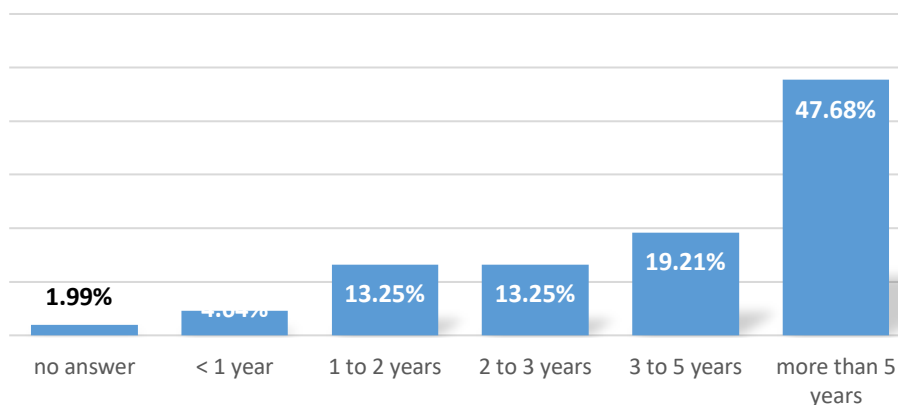


Part B - Questions for dentists, oral/ maxillofacial surgeons with experience in ceramic implantology.

Of 316 participants, 175 had experience with ceramic implants, of which 151 were implanting themselves and 24 were having implants placed but were restoring the prosthetics themselves. The questions from Part B were answered by 151 participants. The answers reflect the actual experience in the use of ceramic implants.

Q9. How long have you been placing/providing ceramic implants?

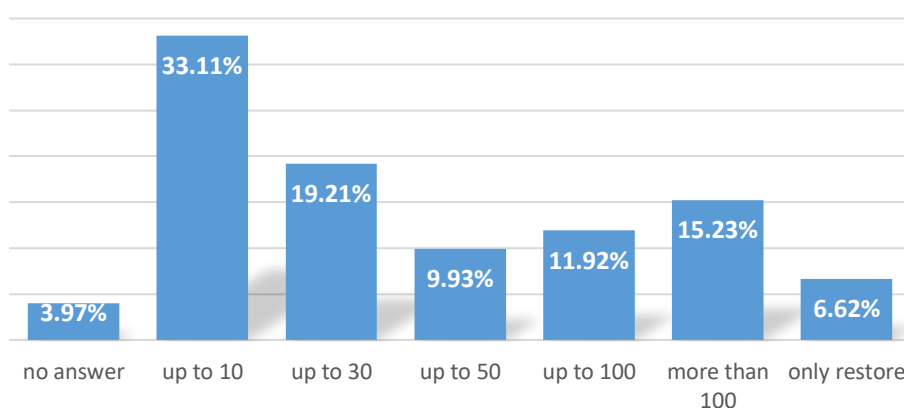
Ceramic implantology is still a rather young field of general implantology, but here, too, many years of experience underpin the relevance of the answers. It should therefore be emphasized that with 47.7% of ceramic users, almost half of the participants have more than 5 years of experience with ceramic implants. From the lower number of responses with less long-term experience does not indicate a decreased interest in ceramic implants, but merely that this survey reached more of an experienced target group



Q 10. How many ceramic implants do you place per year?

37.1% of ceramic users place more than 50 ceramic implants per year. If this value is compared with the value of 74.2% from Q5 regarding ceramic users, it can be concluded that in most practices ceramic implants are used as a supplement to titanium implants.

It should be noted, however, that a similar number of users (33.1%) place only 10 or fewer ceramic implants per year. Since experience in handling the material and the special features of the systems plays a major role in the successful long-term use of ceramic implants in particular, this can be seen as a starting point for optimizing the long-term results.



Q 12: What are your main arguments for a ceramic implant?

One of the most discussed questions regarding ceramic implants is the question: "Why use ceramic implants at all?"

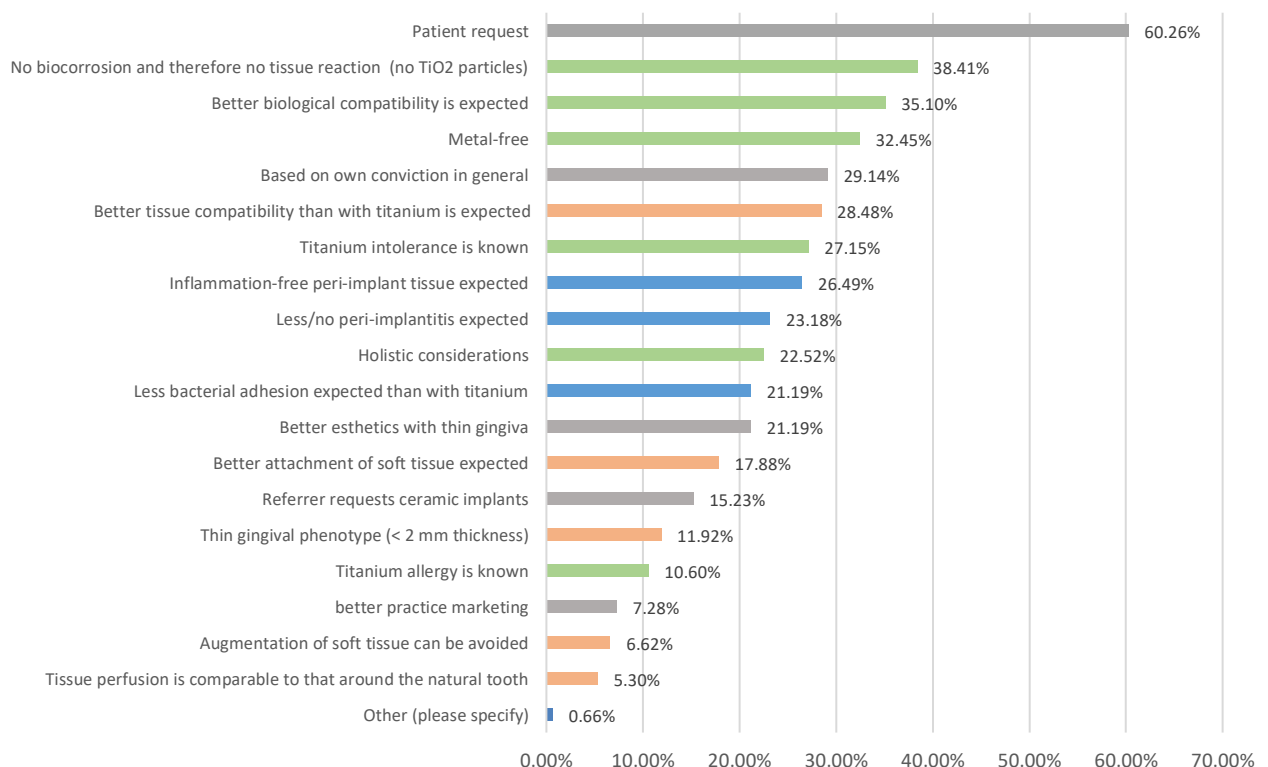
To answer this question, the participants were able to select 5 of the arguments that were most obvious to them. Due to the accumulation that took place, the data do not provide a "statistically correct ranking", but the evaluation allows trends to be derived and merely provides orders of magnitude for assessment in direct comparison. For the evaluation, questions were grouped into different topics:

The wish of the patient seems to be still in the foreground in the argumentation, since with 60.26% over half of the asked ones selected this argument. On the other hand, "own conviction" only accounts for 29.1%.

The largest proportion is represented by the "holistic biological" aspects, which are more concerned with freedom from metal and corrosion (Ø 31.2%). Thus, according to patient preference, the more holistic arguments "no biocorrosion" (38.41%) "better biological compatibility" (35.10%) and "metal-free" (32.45%) represented the most important arguments for ceramic implants. Since titanium allergy is physiologically absolutely rare, this aspect was not taken into account in the mean value determination, although it still accounted for 10.6% of the responses.

The clinical biological aspects combined a total of Ø 18.63 % . This value results from the combination of the aspects soft tissue (Ø 14.0%) and peri-implantitis (Ø 23.6%).

In the overall view, it can be seen that the arguments of holistic dentistry, which were almost exclusively cited in the past, are still dominant in the decision-making process and thus determine the target group of users. Market pressure from health-oriented patients also seems to be opening the doors to general implantology. More and more, however, the existing clinical, biological advantages with regard to soft tissue and peri-implantitis seem to be recognized and also come to the fore in general implantology practice. However, there is a need for further research and education in this regard. The arguments often used in advertising for ceramic implants, namely esthetics (21.19%) and improved practice marketing (7.28%), play only a minor role.



Q 13. Which ceramic implant concept do you use?

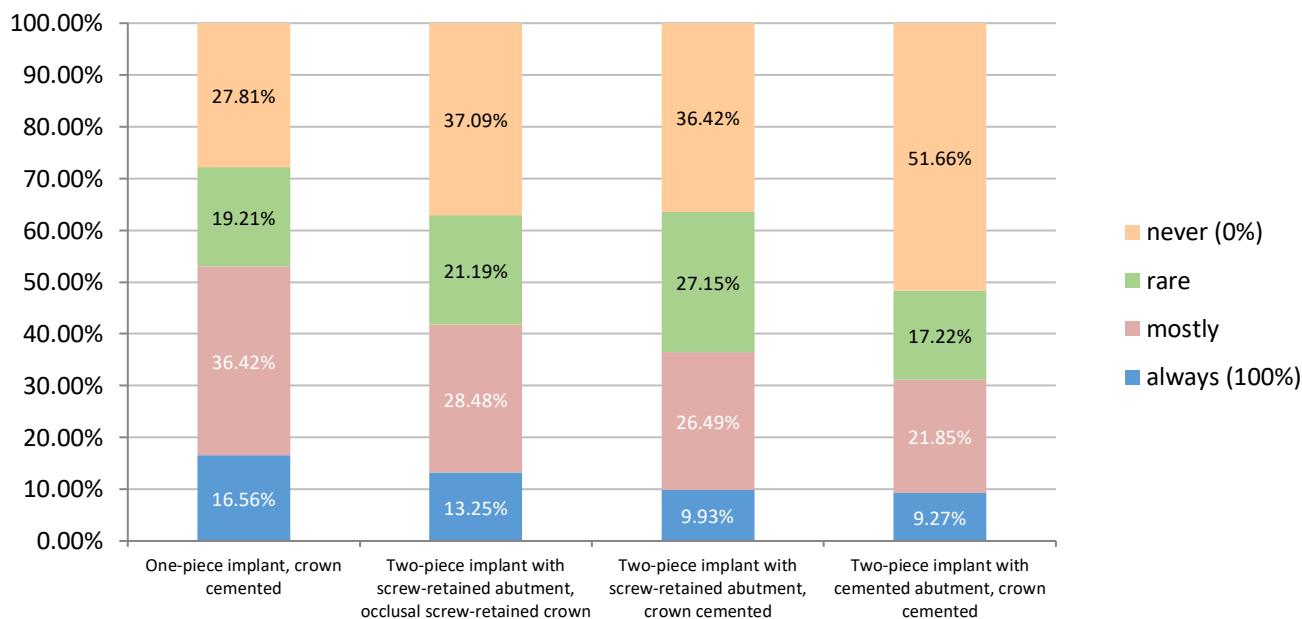
For the analysis of this question, it is important to know which systems were used to reach the greatest number of participants. If this was done increasingly by providers of two-piece systems only, an increased value for two-piece systems is to be expected. Conversely, the same applies to providers of one-piece systems or systems with cemented abutments.

For the following evaluation, however, only the evaluations actually received were included. For this reason, however, it does not represent a representative market situation, but it does show a clear trend based on the number of responses.

One-piece systems have the longest scientific evidence and are widely accepted due to the good data available. Consequently, 16.6% of participants report using one-piece systems exclusively and 36.4% frequently, for a total of 52%. This contrasts with the data for exclusive use of two-piece screw-retained systems with 13.2% (crown occlusal screw-retained) and 9.9% (crown cemented to screw-retained abutment). If the cementation of the restoration is neglected, an exclusive utilization rate of 23.2% is obtained for two-part systems and, taking frequent use into account, a mean value of 39.1% for screw-retained systems.

This indicates an almost equal percentage of use of one-piece and two-piece screw-retained systems.

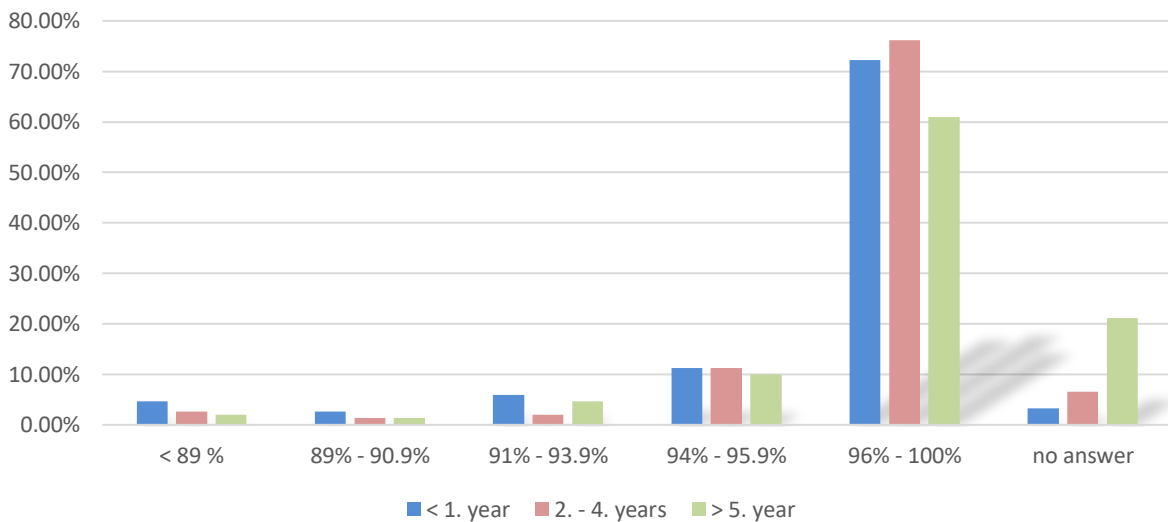
51.7% of the users do not use systems with cemented abutments, which indicates the declining trend of this type of restoration.



Q 15. How do you estimate the survival rates (implant is still in situ) of ceramic implants after placement in your practice?

Participants were asked about their assessment of survival rates in their practice. The data are not based on any practice-specific data analysis.

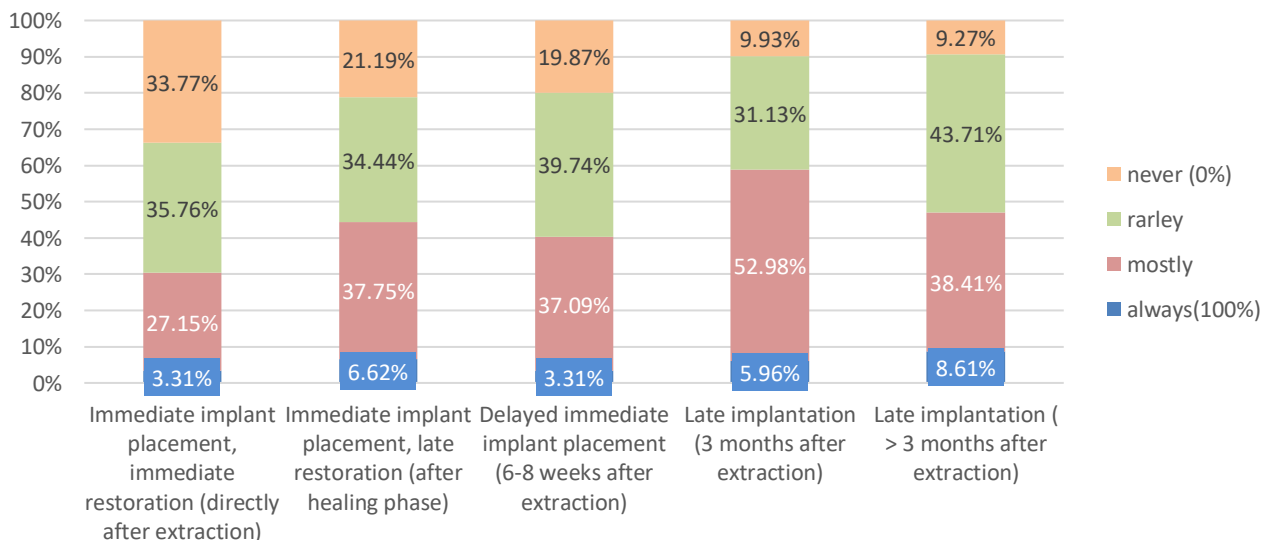
The good survival rate of 100 - 96% beyond 5 years is striking. These values are comparable to titanium implants. Survival rates below 93.9% were reported by less than 10% of the participants. This indicates the successful use of ceramic implants in private practice.



Q 16. What is the distribution of the frequency of implantation timing for ceramic implants in your practice?

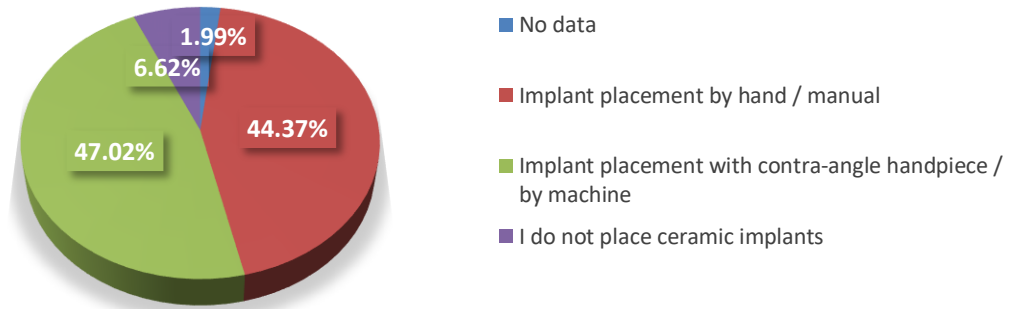
Immediate implant placement with immediate loading is rarely performed with ceramic implants. Only users of systems specifically designed for this purpose state that they always perform this procedure (3.3%). At 27.1%, the frequency with which this procedure is performed is also lower than that of the other procedures.

However, the frequently used immediate implantation with late loading (37.7%) is of similar importance to delayed implantation (37.1%), which, together with late implantation, is considered to be the actual main indication for ceramic implants and also received the most responses here (52% frequently 3 months after extraction).



Q 17. How is implant placed after preparation of the implant socket?

Zirconia has a lower thermal conductivity than titanium as a metal. This can lead to an overheating of the bone while inserting ceramic implants. Therefore, it is recommended to place ceramic slowly and without pressure. 44.4% of the questioned insert ceramic implants by hand

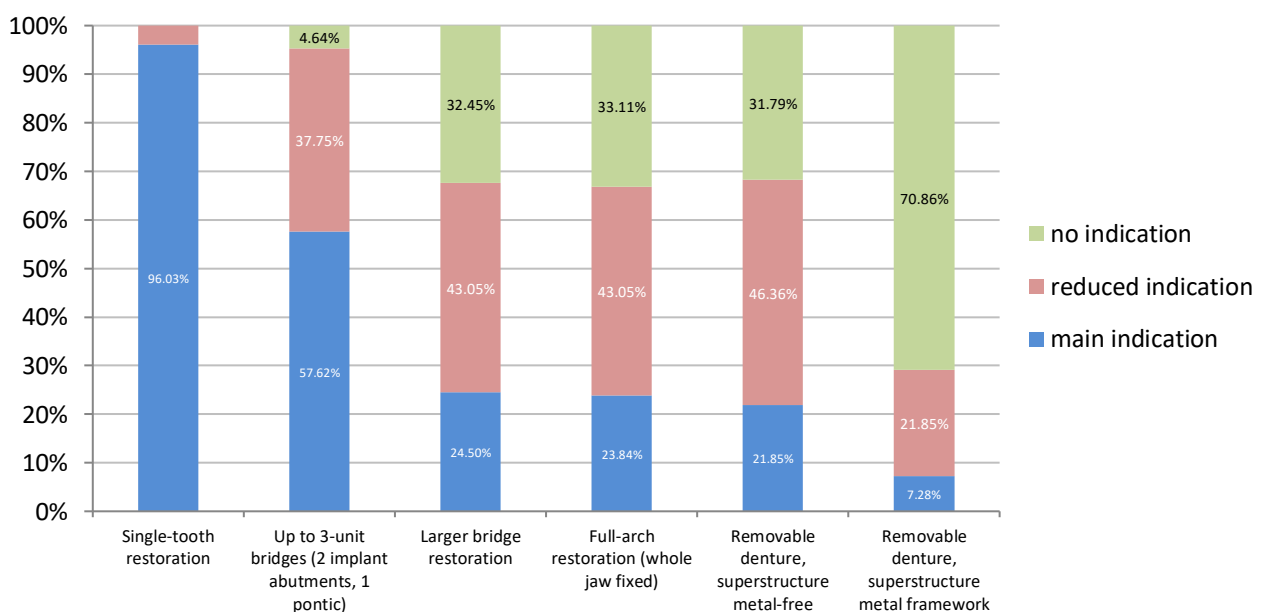


Q 18. What indication do you see for ceramic implants?

The survey confirmed for ceramic implants the indication "single tooth restoration" and "up to 3 unit bridges".

A majority rated other indications "larger bridge restoration" (43.1%), "full-arch restoration (whole jaw fixed)" (43.05%), "removable denture (superstructure metal-free)" (46.4%) as "reduced indication". Interestingly, these indications were also stated as "main indications" with 24.5%, 23.8% and 21.8% by others. This suggests that these more extensive restorations are also successfully implemented by these users.

Only "Removable dentures (superstructure metal framework)" was assigned "no indication" by the majority (70.8%).



Q 21. Classify the properties of the implant material!

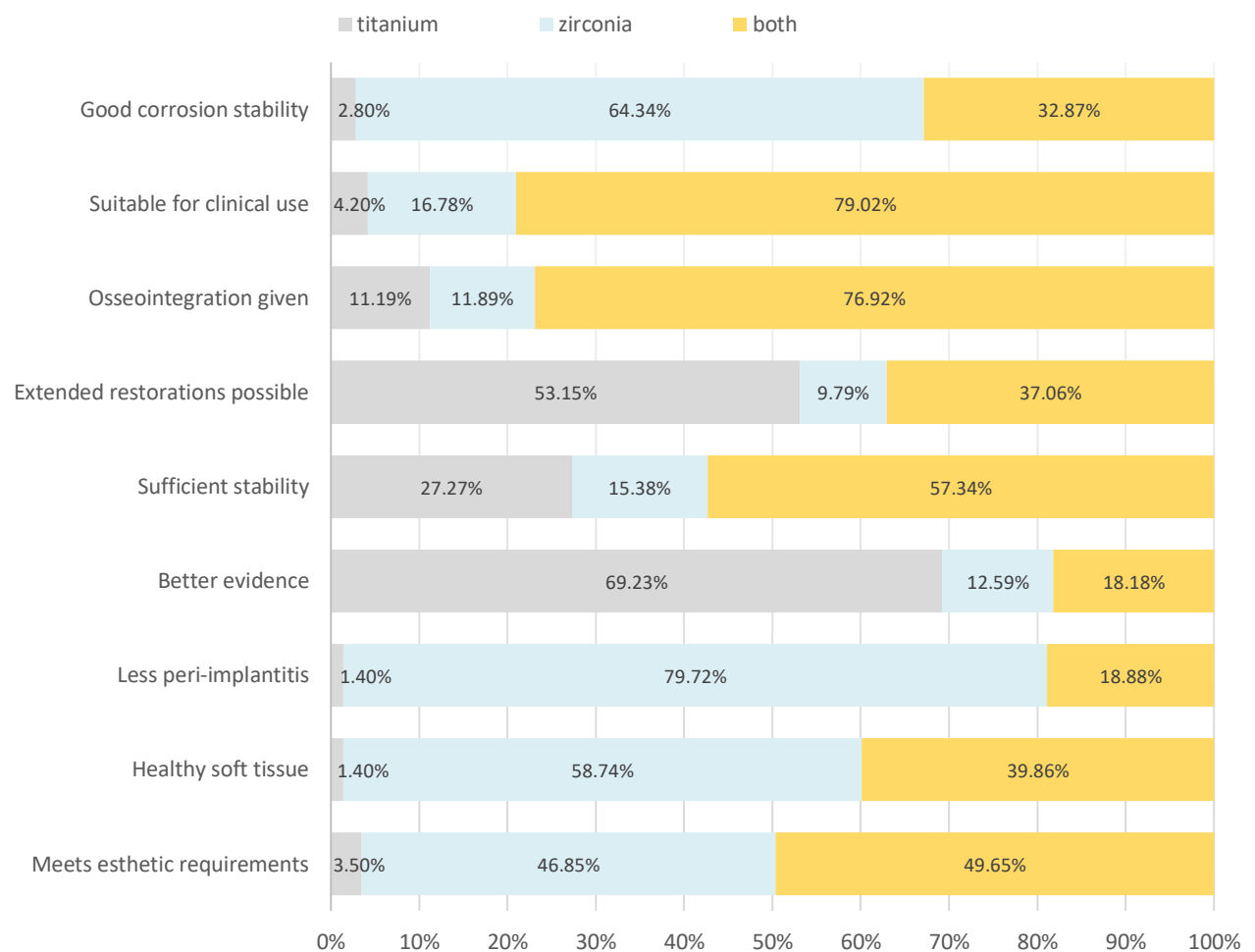
This question shows the users' view on the different materials. There were no "winners and losers: most properties were attributed to both materials.

However, clear tendencies could also be derived here. For example, the biological factors such as corrosion stability, healthy soft tissue and less peri-implantitis were attributed more to ceramic implants.

Ceramic implants also seem to have an advantage in esthetics: 46.8% of the participants attribute an advantage to ceramics and only 3.5% to titanium. However, 49.6% of the participants also attest good results to both materials.

Titanium implants have a significantly better evidence base and, according to the users, more extensive restorations can be implemented. Consequently, titanium implants have a slight advantage in terms of stability. However, this factor is also attributed to both materials in the majority of cases.

With regard to osseointegration, both materials were rated almost equally and considered equally suitable for clinical use.



Q 22. In your experience, with which implant material do the difficulties or complications listed below occur more frequently?

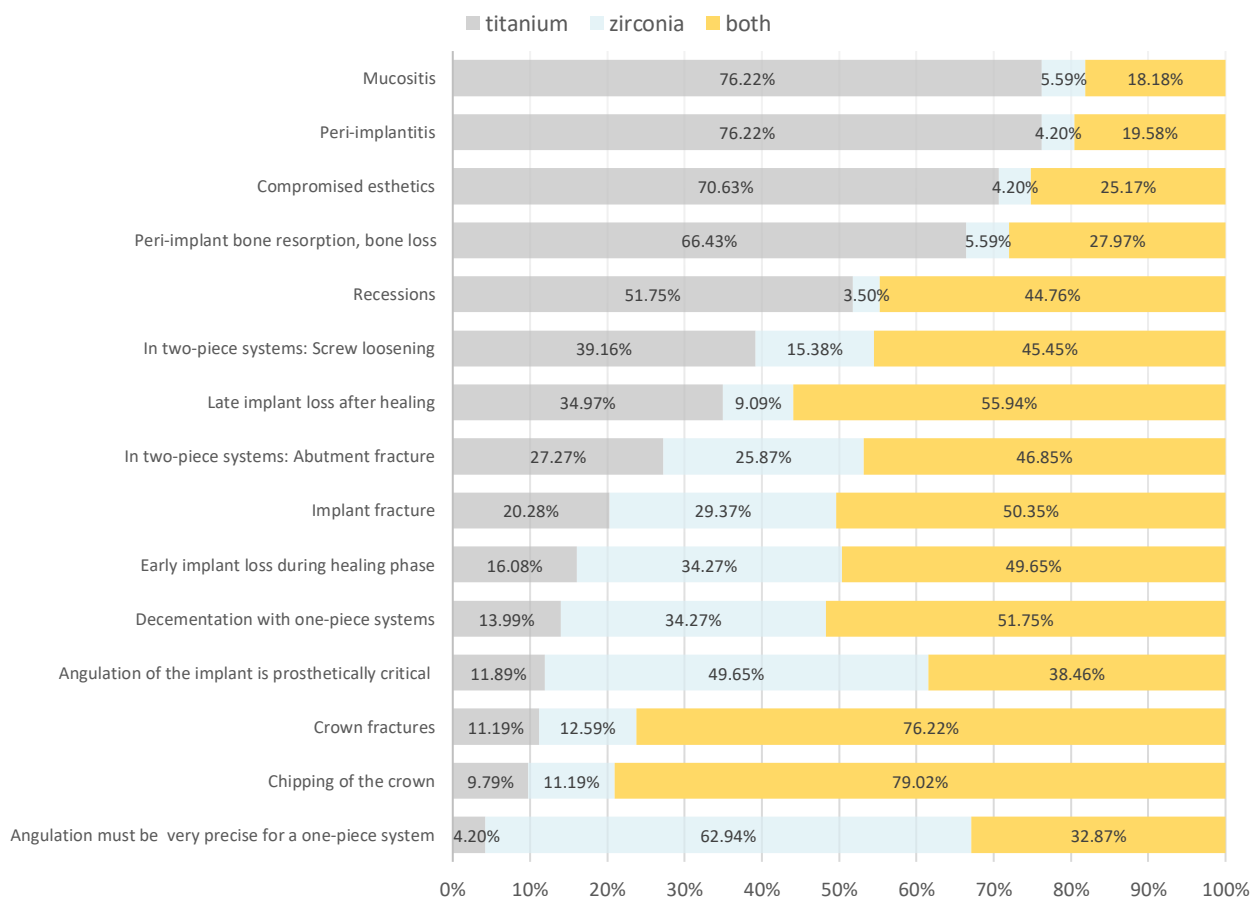
The occurrence and management of complications represent a decisive factor for long-term success. Accordingly, the weighting of the complications encountered in the context of this survey is groundbreaking.

Significantly more complications related to inflammatory events such as mucositis or peri-implantitis as well as the associated problems such as hard and soft tissue resorption or compromised esthetics were attributed to titanium implants.

Although the screw connection in particular is the focus of discussion for two-piece ceramic implants, loosening of the connection screw is attributed twice as frequently to titanium implants. This is in contrast to the more frequent de-cementing of restorations with ceramic implants. Similarly, fracture of both abutment and implant appears to be equally distributed between the two materials.

However, the observations made on the subject of implant loss are striking. For titanium implants, late implant loss after the healing phase is reported significantly more often, whereas for ceramic implants, loss during the healing phase is reported more often. In particular, this may be due to overloading/misloading during the healing phase in the case of one-piece systems (see Q 23)

The most serious factor for complications with ceramic implants seems to be the need for correct implant positioning, or angulation. However, this factor can be compensated for by two-piece systems. The implant material does not seem to have any influence on prosthetic complications such as chipping or crown fracture: the data for this are homogeneously distributed.

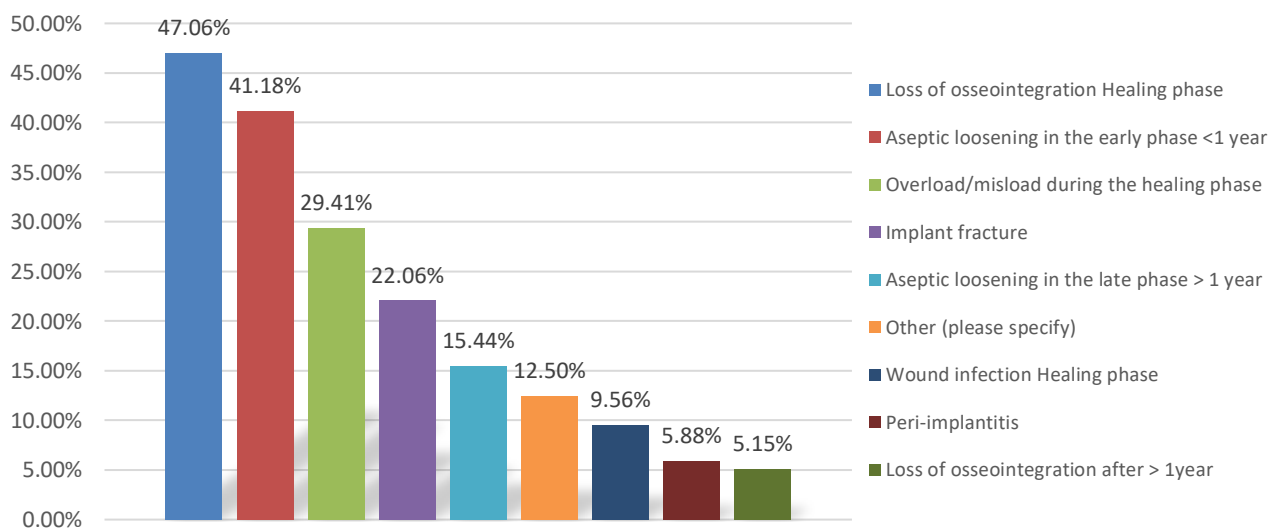


Q 23. Observed reasons for ceramic implant losses in their practice. possible

Complications are also accompanied by implant losses. This question was therefore intended to elicit the actually observed reasons for losses for ceramic implants. The data does not refer to the number of losses but to the frequency distribution among the different reasons.

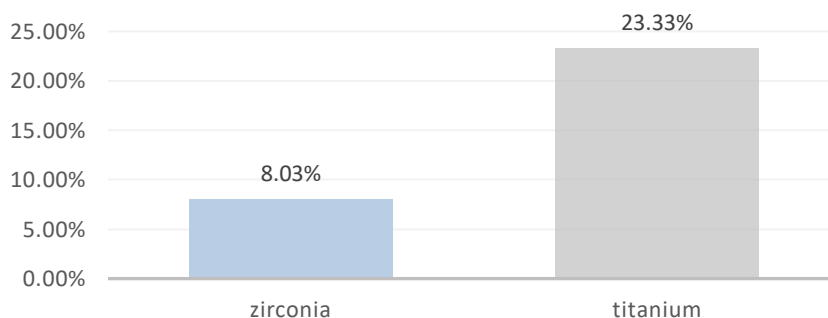
Almost half of the reasons for loss relate to a lack of osseointegration during the healing phase. One of the reasons for this can be incorrect loading during the healing phase, which was still given with one third of the responses. A serious factor is implant fracture, which still affects one fifth of the responses. A loss of osseointegration in the late phase, indicated with 5.1%, seems to occur only rarely. This confirms the information of question 22, from which it can be deduced that osseointegrated ceramic implants maintain their bone bond in the long term. Likewise, loss due to peri-implantitis with 5.88% hardly seems to play a role.

A special differentiation is required for the item "Other", which still accounts for 12.5%, i.e. 17 responses. 9 of these participants stated that they had not yet experienced any losses with ceramic implants.



Q 24/ Q25. Proportion of clinically observed peri-implantitis in all ceramic/titanium implants placed by you, approx. in %. Please set % value with slider

The issue related to peri-implantitis in ceramic implants is currently still controversial due to the lack of evidence-based data. This question at least provides an insight into clinical reality. No absolute data were collected via a simple slider, but only assessments from experience were requested. However, the answers show that the issue of peri-implantitis plays a significantly smaller role with ceramic implants than with titanium implants.



Part C - Questions for dentists, oral/ maxillofacial surgeons without experience in ceramic implantology

With 5 specific questions, this set of questions was aimed exclusively at users without experience with ceramic implants. The answers are therefore not based on actual practical experience, but provide valuable insights into the assessment and thus the "reputation" of ceramic implants.

Of 316 participants, 87 had no experience with ceramic implants. Of these, 70 participants answered this set of questions.

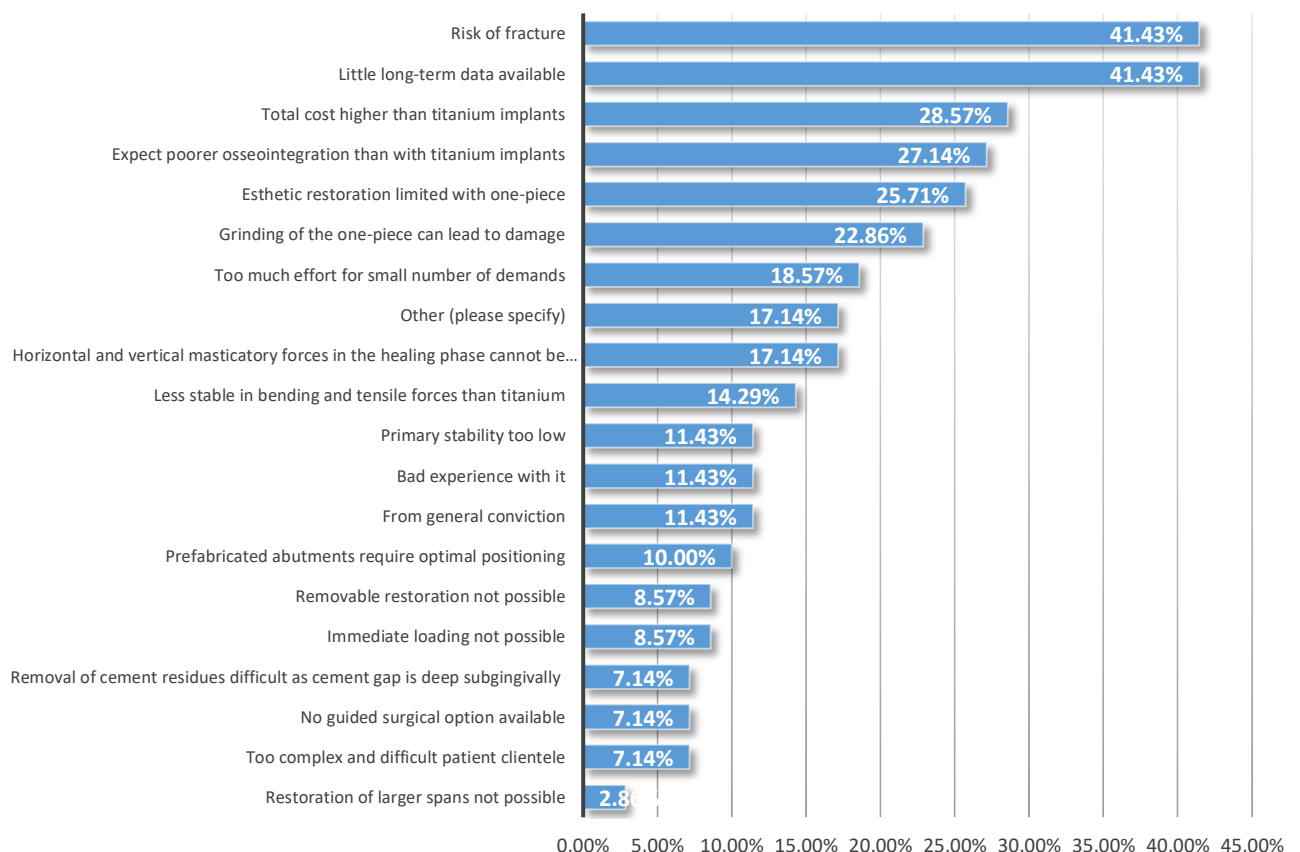
Q 30. Please state the reasons why you do not place ceramic implants. Please max. 5 answers

Ceramic implants are still widely considered a "niche product" in implant dentistry. Question 30 answers reasons for this circumstance.

The main argument against ceramic implants is the still limited long-term data. The fear of fractures plays an equally important role. However, this fear could be refuted by the corresponding data from Part B. The same applies to the fears expressed by non-users. The same applies to the poorer osseointegration expected by non-users. This factor may apply in the initial phase of healing, but no longer in the late phase, in which they are at least on a par with titanium implants.

In addition to the expected higher costs, the problems specific to one-piece systems also play a role: the more difficult restoration in the anterior region and the need to grind the implant body.

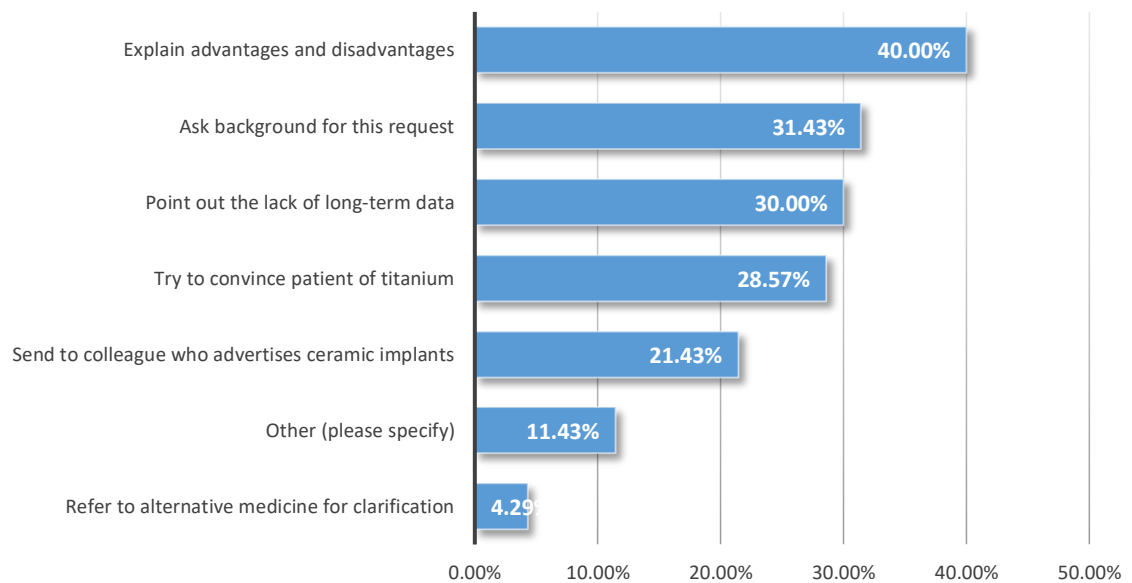
Poor experience and own conviction are only in the lower middle range. Also in this range are other static concerns such as lack of primary stability, risk of overloading, as well as prosthetic restoration options and more difficult removal of cement residue. A lack of or too difficult patient clientele is also at the lower end of the scale, which leads to the conclusion that a corresponding clientele would certainly be available.



Q 31. What is your procedure when a patient requests a ceramic implant? Multiple answers possible

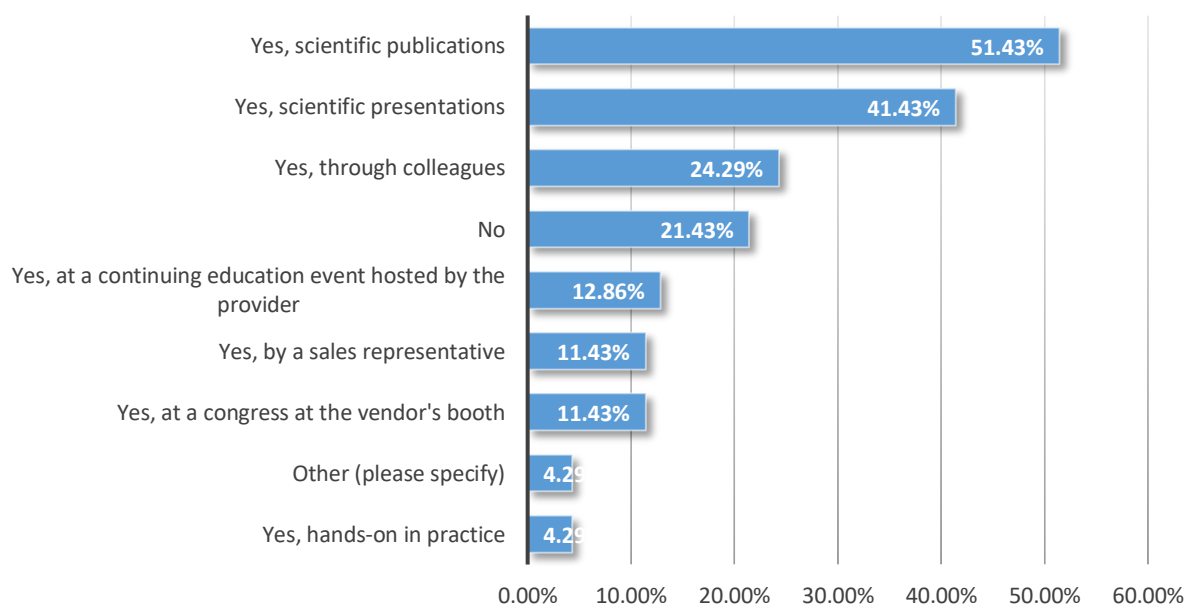
Even if no ceramic implants are offered in the respective practice, the patient's wish is handled carefully. The first priority is to inform and educate the patient, in particular by pointing out the lack of long-term data.

Referral to a colleague with experience in this area is rare. Rather, a titanium implant is placed in response to the request. Holistic clarifications play almost no role. Two-thirds of the statements under "Other" refer to a lack of demand on the part of the patient.



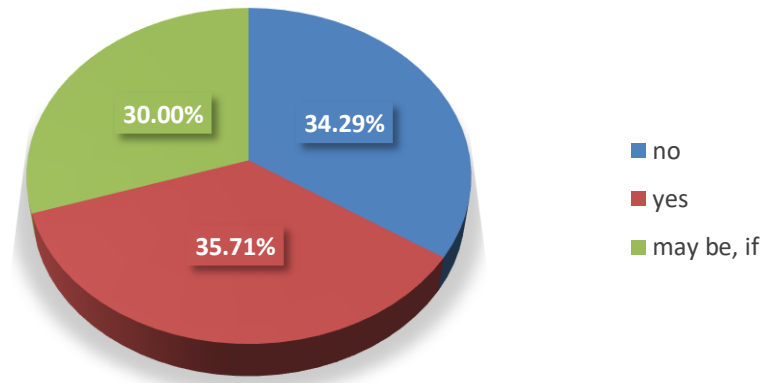
Q 32. Have you already informed yourself in more detail about zirconia implants? Multiple answers possible

Only 15 of the 70 participants in this section of the questionnaire stated that they had not yet obtained information about ceramic implants. 55 participants and thus the clear majority already had information, mostly from scientific publications and lectures.



Q 33. Are you planning to include ceramic implants in your treatment spectrum?

One third of the participants will continue to use non-ceramic implants in the future. On the other hand, one third also plan to include ceramic implants in their practice and another third would also consider doing so, provided certain conditions are met. Among other things, the majority here called for improved long-term data.

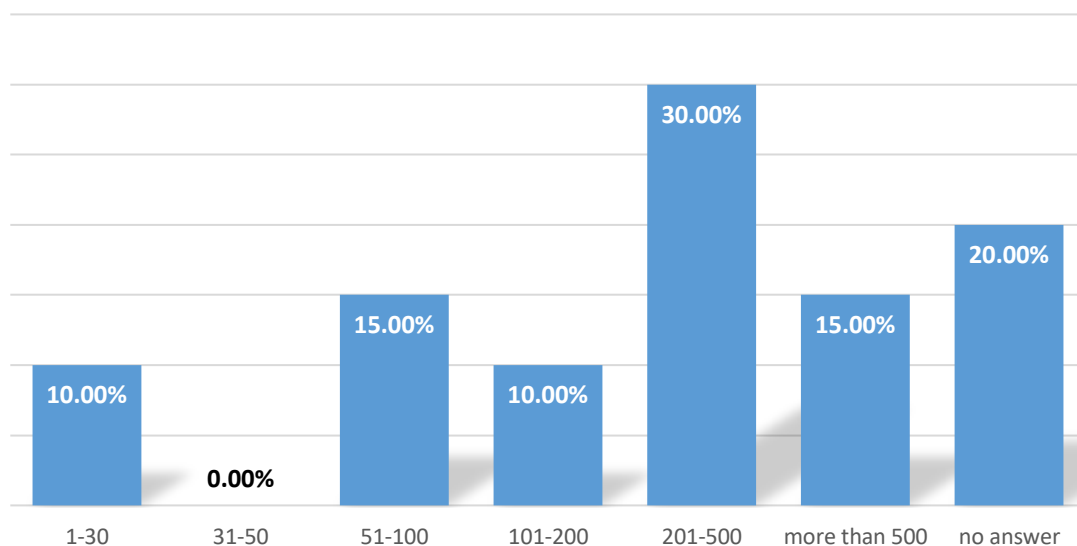


Part D - Questions for dental technicians about ceramic implants

The 5 questions in Part D were specifically addressed to dental technicians, who ultimately also make an important contribution to the provision of ceramic implants to patients. 20 participants answered this set of questions. The results cannot therefore be regarded as representative, but they do show tendencies in the handling of ceramic implants in the dental laboratory.

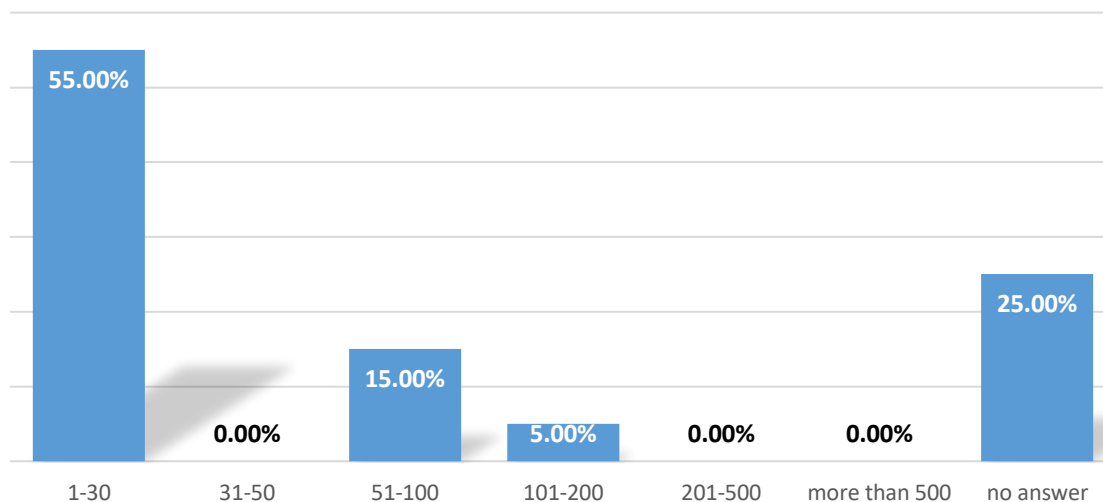
Q 36. Please indicate the total number of implants (titanium and ceramics) you have restored annually

In general, the participating dental technicians are quite experienced in implantology. 55% stated that they restore more than 100 units per year. The answers can therefore be regarded as "experience-based".



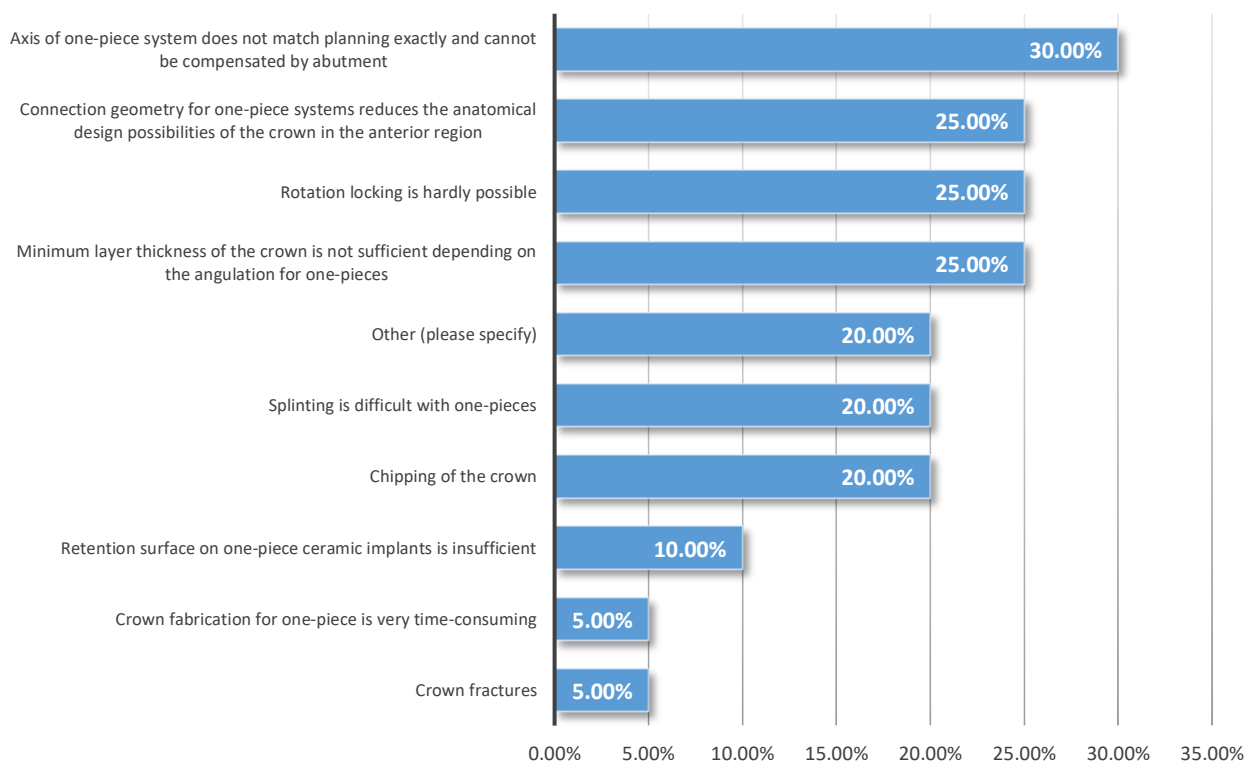
Q 37. Please indicate the number of ceramic implants you have treated each year.

However, the proportion of ceramic implants restored was significantly lower. 55% of the participants restored only 1-30 implants and only 20% 51-200 implants per year.



Q 38. Which problems occur with the prosthetic restoration on zirconia implants? Multiple answers possible

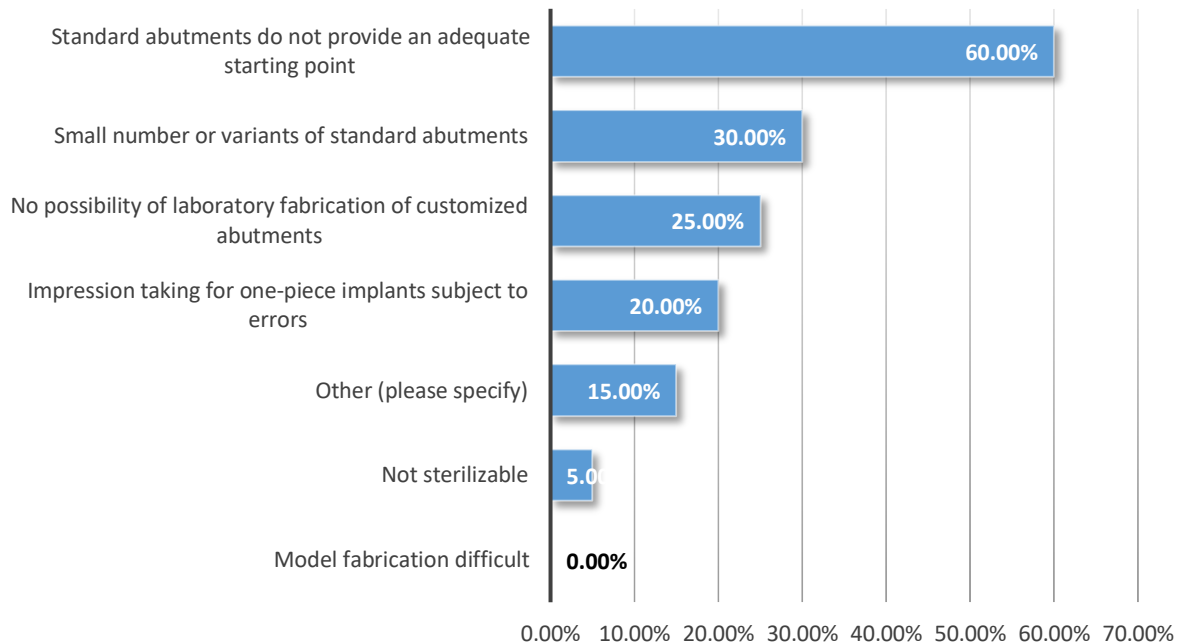
Essentially, the information relates to problems with the axis and abutment inclination, particularly with one-piece systems. The need to secure the restoration against rotation is also likely to play a widespread role. Similar information was also noted under the item "Other". Two-piece systems offer possible solutions here.



Q 39. Problems encountered in dental technology. Multiple answers possible

The data suggest that standardized abutments are only used to a reduced extent as a starting point for the fabrication of restorations on ceramic implants. The trend is towards a wider choice of abutments and the possibility of individual abutment designs. However, impression taking and model fabrication are less challenging.

A more suitable implant positioning by the implantologist seems to be desired, as this is difficult to correct in the laboratory



Part E - Questions for all participants

The requirements made by users and their assessment of the future of ceramic implantology are of great importance for the further development and establishment of ceramic implants. These questions were therefore posed to all three groups of participants (users, non-users, dental technicians) in the respective question sets and are evaluated and contrasted in Part E.

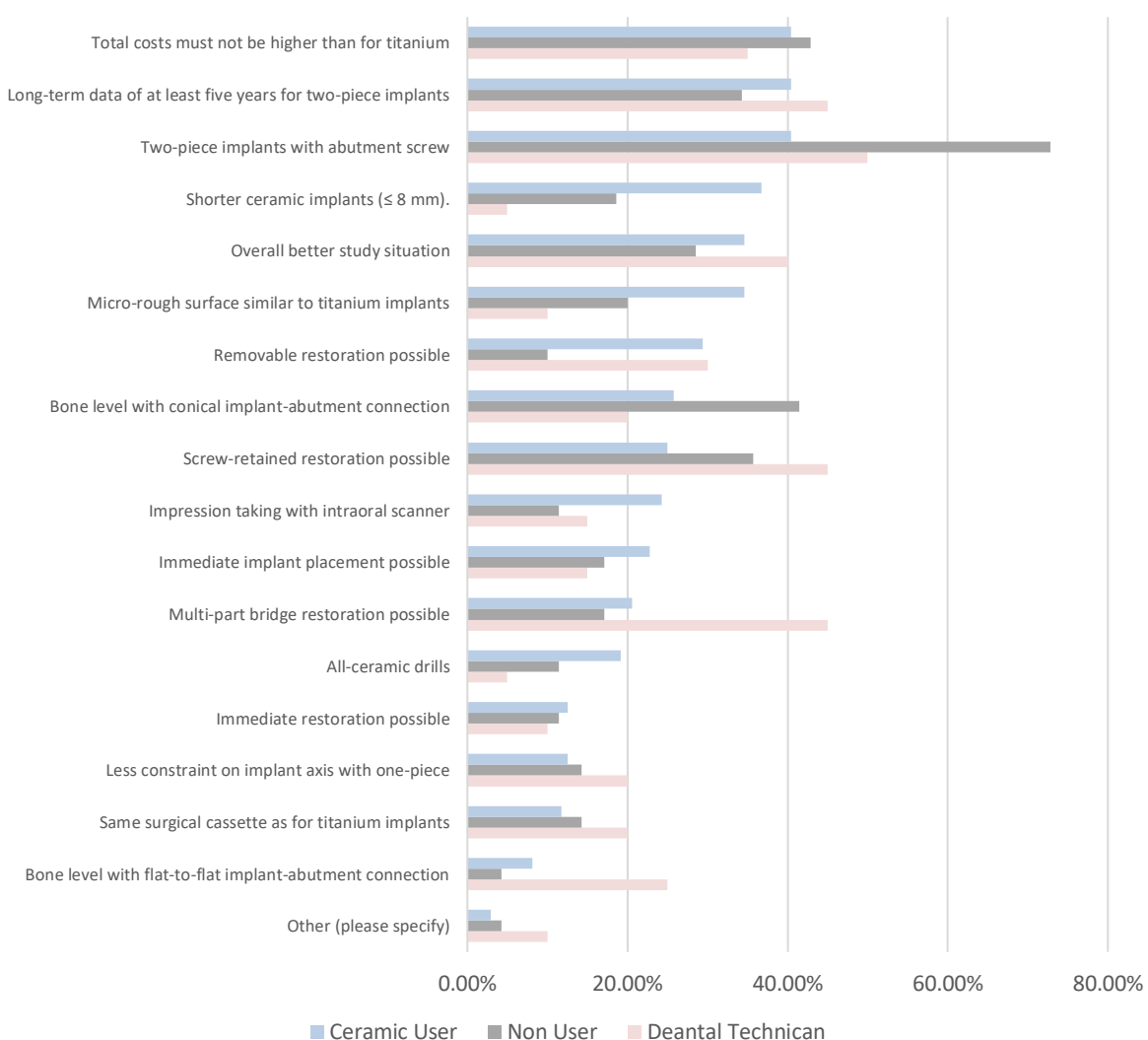
Q 26/34/40. Which requirements should be met in the further development of ceramic implants? Please max. 5 answers

All three groups agree: the total costs for ceramic implants must not be higher than for titanium implants and the data situation must be improved.

Equally clear is the call by all participants for two-piece systems, which titanium implant users in particular emphasize. This is obvious because the same treatment protocols as with the usual titanium implants are desired. This is also reflected in the increased desire of this user group for tapered and screw-retained connections.

However, dental technicians in particular are focusing on the technical aspects of restoration and broader prosthetic options such as removable dentures or multi-unit bridges.

Immediate implant placement and immediate restoration play a rather subordinate role for all groups in the survey, as does the question of instrumentation.

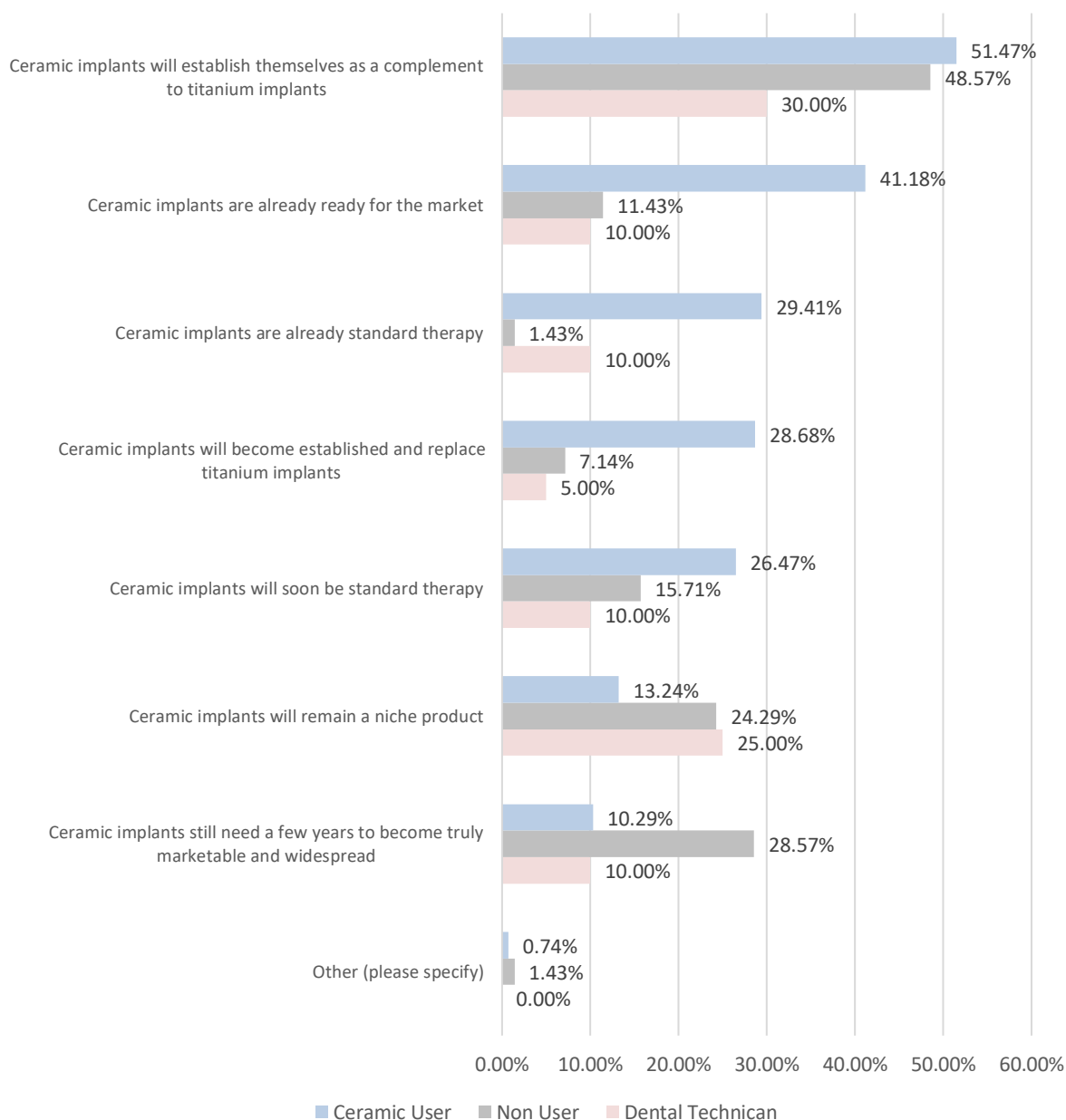


Q 29/35/41. How do you assess the future of ceramic implants? Multiple answers possible

Finally, the question of the future of ceramic implantology is likely to be of particular interest.

After all, 50% of the participants assume that ceramic implants will become established as a supplement to titanium implants. This statement shows that today one can actually no longer speak of a niche product and that ceramic implants will increase in relevance in the future.

The market maturity and application as a standard therapy is essentially attested by the users, while non-users see things differently. A similar picture emerges when it comes to the question whether zirconia implants will displace titanium implants from the market, although significantly fewer users are convinced of this. Consequently, non-users also see ceramic implants more as a niche product that still needs some time to reach market maturity.



Conclusion

The large number of participants in an extensive survey alone shows the interest in the topic of ceramic implants in dentistry and oral surgery.

The comparison of the answers given by practical experienced participants to those who acquired theoretical knowledge of the subject is quite interesting. The assessments coincide in some areas but drift apart in others.

The possible advantages of the material zirconia dioxide in terms of biocompatibility and low tendency to inflammation were confirmed and are in line with our view. In particular, a significantly lower tendency to peri-implantitis seems to be observed in free practice, which should be confirmed by the initialization of corresponding clinical studies. The fear of the past regarding stability could at least be relativized for the newer systems since fractures are not in the foreground in the data on the reasons for loss.

The potential for osseointegration was rated equally for both materials.

In particular, the proportionally most frequently mentioned “early loss” during the healing phase gives cause for further evaluation. Since various factors such as overloading, incorrect loading, surface design, bone degeneration due to overheating can play a role, further differentiation should be made here in order to reduce failures.

All responses indicate a clear tendency towards two-part systems, which allow a broader range of indications and offer more flexibility. Solutions are requested which simplify the application compared to titanium implants.

The clearest requirement, however, runs like a red thread through the survey: users of ceramic implants should convey their experiences and make them accessible to all interested parties. There should be broad, scientifically sound and objective information on the subject. The data on ceramic implants must be improved and long-term evidence-based studies initiated, then ceramic implants will increasingly establish themselves for a broad user group in the interest of our patients.

Implementing this requirement is a clear call from the survey to all manufacturers and research institutes - and a core topic of the European Society for Ceramic Implantology ESCI

Contact

ESCI - European Society for Ceramic Implantology

Dr. Jens Tartsch
Kreuzstrasse 2
CH-8802 Kilchberg
Switzerland
+41 (0) 44-715 48 77
www.esci-online.com
info@esci-online.com