

Level of knowledge of dentists about the diagnosis and treatment of peri-implantitis

Abstract / Introduction: Peri-implantitis is defined as an inflammatory process that affects the bone tissue around osseointegrated implants and may therefore be a cause of dental implant failure.

Objective: The objective of this study was to evaluate dentists' knowledge of the diagnosis and treatment of peri-implantitis using a questionnaire applied to dentists from the towns of Cascavel and Maringá, State of Paraná, Brazil. **Methods:** The sample consisted of specialists in Implantology. The same researcher explained and applied the questionnaire. With respect to the clinical characteristics of peri-implantitis, 33% of the respondents associated the condition with inflammation, 28% with radiographic bone loss around the implant, 26% with bleeding, 24% with the presence of plaque and calculus, and 5% with implant mobility. Approximately 16% of the respondents were unable to answer the questions related to peri-implantitis. **Results:** In the presence of a diagnosis of peri-implantitis, the most frequently used treatment was maintenance by peri-implant curettage, followed by antibiotic therapy. More than half the dentists suggested surgical treatment of peri-implantitis by guided bone regeneration combined with bone grafting. Eighty percent of the respondents considered the failure rate of osseointegration to be related to the surface, shape and material of the implant. **Conclusion:** We conclude that diagnostic methods and treatment modalities of peri-implantitis should be further clarified by scientific literature, since this study showed a lack of knowledge of dentists regarding specific aspects related to peri-implantitis.

Keywords: Diagnosis. Osseointegration. Bone resorption. Inflammation.

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INTRODUCTION

Osseointegrated implants have been used in Dentistry with high success rates. A key factor for the long-term success of these implants is the maintenance of peri-implant soft tissue health,¹⁻³ given that microbial infection, also known as peri-implantitis, may occur.⁴

Peri-implantitis is defined as an inflammatory process that affects the tissues around osseointegrated implants, resulting in the loss of bone support.⁵⁻⁸ The microorganisms detected in cases of peri-implantitis include *Fusobacterium nucleatum*, *Spirochaeta*, *Actinobacillus actinomycetemcomitans*, *Porphyromonas gingivalis*, *Prevotella intermedia*, *Tannerella forsythia*, and *Campylobacter rectus*. These bacteria have been associated with peri-implant bone loss.^{9,10} The clinical signs of peri-implantitis are similar to those observed in teeth with periodontal disease and include suppuration, bleeding, pain, an increased pocket depth, and radiographic radiolucency indicating bone loss around the implant.^{1,11,12}

Different types of treatment of peri-implantitis have been proposed in an attempt to guarantee survival of the implant. Similar to the treatment used for periodontal disease, peri-implant infection should be treated by eliminating the bacteria present at the site of infection¹³. Thus, antibiotic therapy combined or not with surgical methods of guided tissue regeneration and bone grafting should be used depending on the stage of the disease.^{4,14,15}

In view of the scarcity of studies and lack of data on peri-implantitis, the objective of the present study was to evaluate dentists' level of knowledge about the diagnosis and treatment of peri-implantitis in dental

offices in the cities of Cascavel and Maringá, Brazil, and its correlation with other factors such as implant surface and implant system.

MATERIAL AND METHODS

This study consisted in the application of a systematized questionnaire containing questions about: the dentist's identification, type of implant surface, clinical experience and qualification, as well as data regarding the diagnosis and treatment modalities of peri-implantitis (Fig 1).

For the interview, implant specialists living in the cities of Cascavel and Maringá, registered at the Regional Council of Dentistry of Paraná, were selected. The project was approved by the Human Research Ethics Committee of the State University of Western Paraná (Permit N°. 253/2011-CEP, 26/05/2011).

The dentists were contacted by telephone and a visit was scheduled for the individual interview. At the beginning of the interview, a single researcher explained the objective of the study and the questionnaire, and an informed consent form was given to the professional.

The interviews were conducted in Maringá and Cascavel and involved a sample of 50 dentists, twenty-five from each city. The sample consisted of postgraduate students, teachers of higher education institutions, as well as private dentists.

The data collected with the questionnaires were entered into Excel spreadsheets (Windows XP), printed and compared to the original data on paper for the correction of possible typing errors. After tabulation, the data were analyzed using the statistical analyses for Windows program, describing the distribution and frequency of the different variables.

Project: Level of knowledge of dentists about the diagnosis and treatment of peri-implantitis.

Questionnaire
Identification and formal education

1. Sex:
a. ☐ M
b. ☐ F

2. Main place of work:
City: _____
State: _____

3. Degree in Dentistry:
a. Institution: _____
b. Year of conclusion: _____

4. Degree in Dentistry:
a. Institution: _____
b. Year of conclusion: _____

5. Specialization in Implantodontics
a. Institution: _____
b. Year of conclusion: _____

6. Have you received other specialization degree registered by the Federal Council of Dentistry?
a. ☐ Yes b. ☐ No
If so, provide the following information:
c. Institution: _____
d. Year of conclusion: _____

7. Have you been involved with private and/or public clinical practice in the last 12 months?
a. ☐ Yes b. ☐ No

8. What is your field of work?
More than one answer may be chosen.
a. ☐ General practice dentist
b. ☐ Specialist
c. ☐ Professor
d. ☐ Researcher

9. In your clinical practice, do you perform any kind of implant treatment?
a. ☐ Yes b. ☐ No

If not, you may cease answering this questionnaire.

Questions related to implant surface:

10. A) Do you use treated-surface implants?
a. ☐ Yes b. ☐ No

B) What led you to the use of treated-surface implants?

11. What implant system do you use and why?
a. ☐ Nobel Biocare AB (Brånemark).
b. ☐ Astra Tech AB (Astra titanium oxide blasting).
c. ☐ Friedrichsfeld AG (IMG-TPS plasma titanium spray).
d. ☐ Institut Strauman AG (ITI-SLA).
e. ☐ Steri-Oss.
f. ☐ Southern Implants Irene.
g. ☐ Other. Specify: _____
Why?: _____

12. Do you have treated cases with more than 5 years of follow-up?
a. ☐ Yes b. ☐ No

13. Do you use:
a. ☐ Treated-surface implants?
b. ☐ Smooth-surface implants?

Considering your experience and clinical observation of the use of treated surface-implants:

14. Are there any clinical advantages with regard to the use of treated-surface implants?
a. ☐ Yes b. ☐ No

15. Based on your experience, is peri-implantitis-induced bone loss greater in rough-surface implants?
a. ☐ Yes b. ☐ No

16. In comparison to rough-surface implants, are smooth-surface implants less prone to bone loss due to the higher frequency of chronic infection?
a. ☐ Yes b. ☐ No

17. Do treated-surface implants have a higher long-term success rate in comparison to smooth-surface implants?
a. ☐ Yes b. ☐ No

18. Does periapical radiograph reveal greater peri-implant bone loss around rough-surface implants?
a. ☐ Yes b. ☐ No

19. The failure rate of treated-surface implants is higher:
a. ☐ Before prosthesis placement.
b. ☐ After prosthesis placement.

20. Does the failure rate of peri-implant osseointegration vary according to the surface, shape and material of the implant?
a. ☐ Yes b. ☐ No

21. The definitive prosthesis is installed:

- In the mandible:
a. ☐ 4 to 8 months after rough-surface implant placement.
b. ☐ Less than 4 months after rough-surface implant placement.
c. ☐ More than 8 months after rough-surface implant placement.

- In the maxilla:
a. ☐ 7 to 10 months after rough-surface implant placement.
b. ☐ Less than 7 months after rough-surface implant placement.
c. ☐ More than 10 months after rough-surface implant placement.

22. In your opinion, what are the clinical characteristics of peri-implantitis? How do you diagnose peri-implantitis?
a. ☐ Bleeding.
b. ☐ Inflammation.
c. ☐ Presence of plaque and calculus.
d. ☐ Suppuration.
e. ☐ Implant mobility.
f. ☐ Probing depth > 5 mm.
g. ☐ Radiographic bone loss around the implant.

23. What treatment modality do you employ in the presence of peri-implantitis?
a. ☐ Implant maintenance by curettage.
b. ☐ Surgical procedure.
c. ☐ Antibiotic therapy.

24. Regarding maintenance by curettage, which instruments do you commonly use?
a. ☐ Carbon fiber or plastic curettes.
b. ☐ Jet spray of bicarbonate.
c. ☐ Periodontal curettes.
d. ☐ None of the above.

25. Do you use 0.2% chlorhexidine?
a. ☐ Yes b. ☐ No

26. Which surgical procedure technique do you use?
a. ☐ Bone grafting combined with a membrane.
b. ☐ Bone grafting, only.
c. ☐ Membrane, only.
d. ☐ Osteotomy around the implant.

27. Which antibiotic therapy medication do you use?
a. ☐ Metronidazole - Flagyl 350 mg (three times a day).
b. ☐ Ornidazole - Tiberall 500 mg (twice a day).
c. ☐ Amoxicillin 500 mg (three times a day).
d. ☐ None of the above.

Figure 1. Questionnaire answered by the dentists selected for this study.

RESULTS

In the opinion of the respondents, the clinical characteristics that can be used to establish the diagnosis of peri-implantitis are, in decreasing order: inflammation, radiographic bone loss around the implant, bleeding, presence of plaque and calculus, suppuration, a probing depth > 5 mm, and implant mobility (Fig 2).

The treatment modality most commonly used by the respondents in the presence of peri-implantitis was implant maintenance by curettage, followed by antibiotic therapy and surgical procedures. Regarding maintenance by curettage, the instruments most commonly used were

carbon fiber or plastic curettes, followed by a jet spray of bicarbonate and periodontal curettes. With respect to antibiotic therapy, amoxicillin (500 mg) administered twice a day and metronidazole (Flagil, 350 mg) administered three times a day were the antibiotics most frequently selected by the dentists. Chlorhexidine (0.2%) was used for the treatment of peri-implantitis by 82% of the respondents. As for the surgical procedure, 69% of the dentists reported to perform bone grafting combined with a membrane, only 5% perform bone grafting, 4% use only a membrane, while 4% perform osteotomy around the implant, and 16% did not respond.

The sample consisted mainly of male dentists who obtained their graduate degree at private universities and have a private practice. Most respondents had received no specialty degree other than Implantology, even though Periodontics was cited by some of them.

With respect to Implantology, 94% of the respondents claimed to use osseointegrated implants in their clinical practice (Table 1); of which 42% had cases with more than 5 years of follow-up.

The use of national implant systems (Neodent and Conexão) was reported by 39% of the dentists, whereas 24% also used imported systems (Nobel Biocare AB, Astra Tech AB and Steri-Oss), and 20% did not respond to this question.

When questioned about the implant surface, 82% of the respondents claimed to use treated-surface implants while 18% did not. The reasons for the use of treated-surface implants were: better osseointegration, the benefits reported in

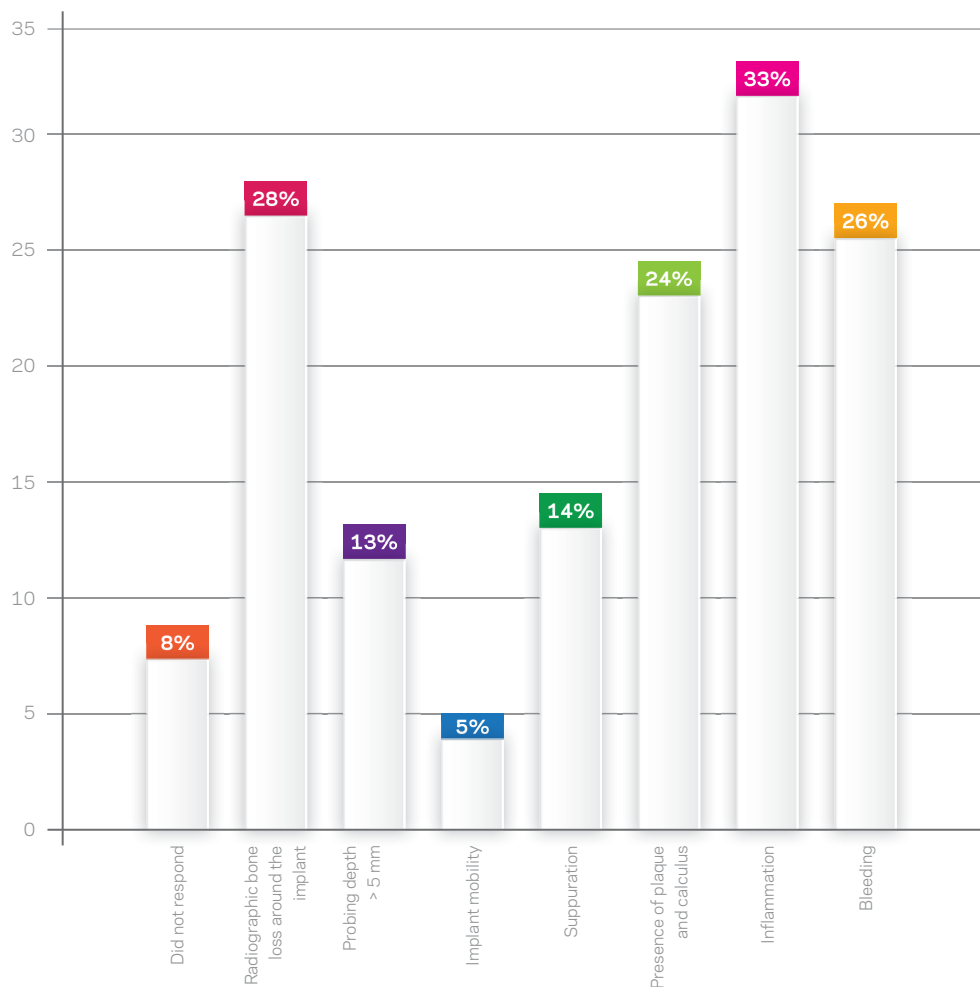


Figure 2. Percentage of responses according to the clinical characteristics of peri-implantitis..

Table 1. Respondents' profile.

Question	Answer / Sample		Percentage (%)
Sex	Male	38	76
	Female	12	24
City	Cascavel	25	50
	Maringá	25	50
University	Public	32	64
	Private	18	36
Institution of Specialization in Implantodentics	AMO	18	36
	UNIOESTE	9	18
	Did not respond	15	30
	Other	8	16
Other specialty	Yes	18	36
	No	31	62
	Did not respond	1	2
Clinical practice in the last 12 months	Yes	45	90
	No	5	10
Field of work	General practice dentist	26	23
	Specialist	34	61
	Professor	6	13
	Researcher	3	3
Involved with Implantodentics	Yes	47	94
	No	3	6

research studies and recommendation of the specialization course, as well as greater efficacy, evolution of the implants, and random acquisition (Fig 3). This question is also related to the experience and clinical observation of the use of treated surface-implants. In this respect, 66% of

the respondents reported clinical advantages of the use of implants with treated surfaces, 14% reported the lack of advantages, and 20% did not respond.

More than half of the respondents did not observe greater peri-implantitis-induced bone loss in

rough-surface implants, whereas 26% reported greater bone loss and 22% did not respond. Also regarding peri-implant bone loss around rough-surface implants revealed by periapical radiographs, 44% of the respondents did not believe that bone loss is greater in cases of rough-surface implants, whereas 36% did and 20% did not respond to this question.

When asked about implants with relatively smooth surfaces, 56% of the dentists responded that smooth-surface implants are less prone to bone loss due to the higher frequency of chronic infection in the case of rough-surface implants, whereas 24% did not agree with this statement and 20% did not respond to this question.

Eighteen percent of the respondents believe that treated-surface implants have a higher long-term success rate in comparison to smooth-surface implants; 64% did not

agree with this statement and 18% did not respond to this question. In contrast, 80% of the dentists responded that the failure rate of peri-implant osseointegration varies according to the surface, shape and material of the implant and only 2% responded that it does not. Eighteen percent of the dentists did not respond to this question.

With respect to the definitive prosthesis, 38% of the respondents believe that the failure rate is higher for treated-surface implants after installation of the prosthesis, 28% reported before installation of the prosthesis, and 34% did not respond to this question. A difference in the interval between placement of rough-surface implants and definitive prosthesis installation was observed: in the mandible, 46% of the respondents reported to install the prosthesis within 4 to 8 months, 32% within less than 4 months, and 22% did

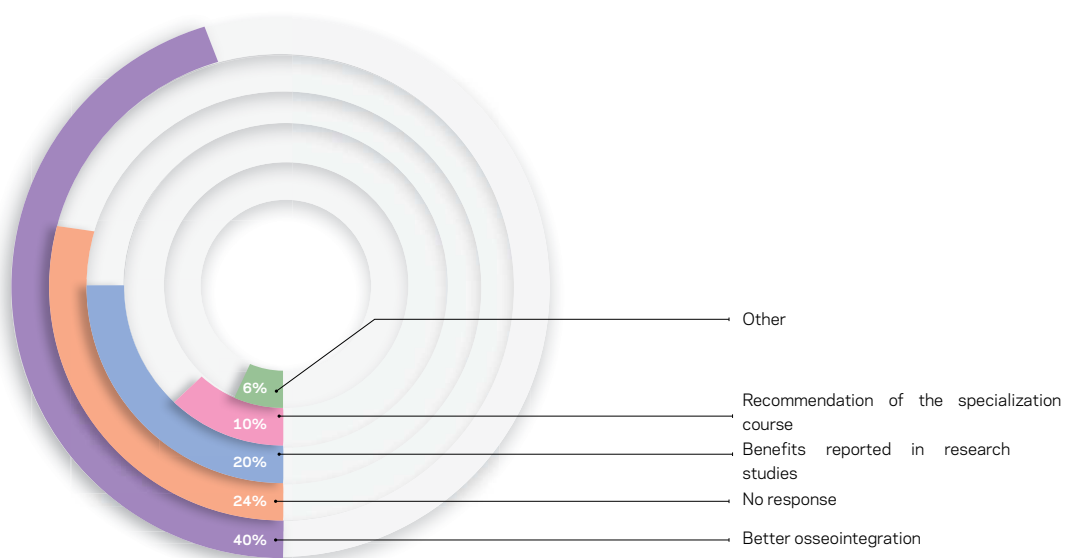


Figure 3. Percentage of the reasons for using treated-surface implants.

not respond; in the maxilla, 34% reported to install the prosthesis within 7 to 10 months, 30% within less than 7 months, 2% after 10 months, and 34% did not respond to this question.

DISCUSSION

The key parameter for the diagnosis of peri-implant mucositis is bleeding on probing under a pressure of less than 0.25 N. Peri-implantitis is characterized by changes in the level of the bone crest and bleeding on probing in the presence or absence of an increased probing depth and in the presence of purulent exudation. In addition, the onset and/or maintenance of peri-implantitis can be induced by iatrogenic factors such as excess cement, inadequate prosthesis-intermediate prosthesis adaption, overcontouring of restorations, malpositioned implants, and technical complications. Surgical trauma during implant placement and mechanical overload of the prosthesis on the host bone that exceeds its adaptive capacity can lead to the induction and persistence of bone loss.¹⁶

In general, osseointegration is preserved in the apical portion of the implant and peri-implant bone resorption occurs in the absence of signs of implant mobility. Implant mobility is an indicator of the lack of osseointegration, characterizing implant loss. In peri-implantitis, inflammation and bleeding on probing of soft tissues are observed in addition to bone loss around the implant and suppuration from the peri-implant pocket may occur. Bleeding on probing can be used as a predictor of bone loss. Swelling and redness of marginal tissue may not be prominent and there is generally no pain associated with peri-implantitis.¹ These were the characteristics most frequently cited by the study participants.

The characteristics of peri-implantitis are the result of the formation of a biofilm on the surface of the implant, with implant surface features influencing the amount and composition of biofilm formation. There is no sufficient evidence to draw definitive conclusions regarding the association between implant surface rugosity and biofilm formation in clinical practice,¹⁶ although mucositis and peri-implantitis have been well defined by Lindhe and Meyle.¹⁷

One of the least cited clinical parameters for the diagnosis of peri-implantitis was a probing depth greater than 5 mm. A peri-implant probe does not seem to be routinely used by dentists, as demonstrated in a study on periodontal diagnosis in private dental practices in which the frequency of use of a periodontal probe by the participants was 19.3%.¹⁸

On the other hand, radiographic bone loss around the implant was the second most frequently cited characteristic for the diagnosis of peri-implantitis, probably because most implantologists consider bone quality to be an important parameter to evaluate implant treatment outcomes.¹⁹

Despite the lack of scientific studies on the diagnosis and treatment of peri-implantitis, the identification of clinical and radiographic characteristics of this disease by the dentist is important, as it allows an early diagnosis and, as a consequence, prevents implant loss, since clinically detectable mobility indicates total implant loss. In this respect, clinical analysis of probing depth, bleeding on probing, suppuration and biofilm control, as well as regular radiographic monitoring of the level of bone support, are recommended for the early diagnosis of peri-implantitis.

The approach most commonly used by the respondents in the presence of a

diagnosis of peri-implantitis was implant maintenance by curettage. According to Cerbasi,¹⁵ mechanical treatment combined with physical means has some advantages, such as not causing damage to the implant surface since abrasive streams can reduce the biocompatibility of the surface. In addition, chemical control of bacterial plaque by irrigation with chlorhexidine digluconate solution is used for the inhibition of bacterial plaque, decontamination and elimination of local pathogens.²⁰

Treatment of peri-implantitis mainly consists of decontaminating the implant surface and stabilizing bone loss around the implant. Guided bone regeneration is used in some cases.^{21,22} The indications of treatment vary according to the type and extent of bone loss, implant surface coating, and the need to cover the implant.¹⁵

Although there is scientific evidence of the superiority of imported implants, these implants were not the most frequently cited by the respondents. Since many national systems exist in Brazil that are less expensive than imported implants, they were used by the respondents to meet the social and economic needs of the population attended.

In the study by Esposito et al,²³ rough-surface implants were more affected by peri-implantitis, whereas a risk reduction of 20% was observed for smoother machine-treated implants over a period of 3 years. Similarly to what is reported in the literature, 26% of the respondents observed greater bone loss, whereas 52% reported no increased peri-implantitis-induced bone loss in rough-surface implants.

Moreover, it is believed that the clinical advantages of rough-surface implants are the result of the development of new implant surfaces and the large financial investment

of companies in the technological development of implant systems in an attempt to accelerate the process of osseointegration and installation of the prosthesis,²⁴⁻²⁶ which was a major reason for the use of treated-surface implants by the respondents.

Despite the small number of respondents, we observed that the dentists have little knowledge of the diagnosis and treatment of peri-implantitis. Although specialists in Implantology, many of the participants did not respond to the questions. Regarding questions directly related to the diagnosis and treatment of peri-implantitis, there was contradiction and lack of knowledge of specific aspects. However, these results should be interpreted with caution, since the participants of this study represent only a small proportion of implantologists.

Considering the increasing use of dental implants, the conduct of dentists and the definitive approach to osseointegrated implants need to be reevaluated in view of the emergence of cases of peri-implantitis.

CONCLUSION

It can be concluded that the dentists interviewed have little knowledge of the diagnosis and treatment of peri-implantitis. Therefore, further studies are needed to gain more insight into the pathogenesis, etiology and treatment of peri-implantitis.

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