Establishment of a supportive hygiene protocol to prevent mucosal and peri-implant lesions

Hugo Roberto Lewgoy*
Maurício Rufaiel Matson**
Marcel M Matsushita***
Suzelei Izzo Forger****
Pedro Tortamano*****
Julio Cesar Joly******

* PhD in Dentistry, University of São Paulo (Fousp); Professor, Master's in Biomaterials – Anhanguera Uniban
** PhD in Clinical Odontology – Fousp; Specialist in Implantodontics – APCD
***Specialist in Implantodontics – Uninove
**** PhD in Implantodontics – University of Göttingen; Professor of Implantodontics – Abeno
***** PhD in Prostheses – Fousp; Professor of the Department of Prostheses – Fousp
****** PhD in Periodontics – Unicamp; Scientific head – ImplantePerio.

Abstract
Due to the technological advances and improvements on surgical techniques, the implant-supported oral rehabilitation has become the first treatment choice in many cases. However, the increased incidence of mucositis and peri-implantitis could compromise its long-term function. Unfortunately, the level of awareness on implant supportive therapy has not reached the same level. If one wants to preserve the osseointegration process in a long-term basis, the main point is the establishment of an efficient and atraumatic implant prophylaxis protocol in accordance with different rehabilitation modalities.
Key Words – Dental implants; Mucositis; Peri-implantitis; Implant supportive protocol.

Introduction
As a result of the excellent mechanical and biological performance of osseointegrated implants, and due also to the improvement of operative techniques, the success rate of these treatments is steadily increasing[1-3]. Oral restoration with the use of implant-supported prostheses is not simply one more option, it is a choice which may be considered as the standard in resolving a considerable number of cases. However, this does not mean that cleaning of implants is unnecessary, since the oral biofilm can cause peri-implant diseases known as mucositis and peri-implantitis. Often, these diseases are asymptomatic and develop slowly, but their late resolution is usually fairly complex and the prognosis is uncertain[4]. In addition, as peri-implant diseases are chronic in their development, they may mask precarious oral health and consequently compromise patients' general health[5].
In order for implant-supported treatments to be really successful, it is essential to have healthy gingival tissue around the implants. Not only to guarantee the aesthetic quality, but to ensure true conditions of oral and general health. Mechanical disorganisation of the oral biofilm is the best way to achieve this objective, with the establishment of a clinical protocol of supportive hygiene being essential for the various possibilities of implant-supported restoration. As a result, treatments will be longer-lasting and patients' health will be improved, which is the true objective of odontology.

Case Report
Four different possibilities are proposed for the institution of an oral hygiene routine in areas where there are implants. One option for the postoperative phase and three options for the maintenance phase, depending on the situation or the type of implant-supported prosthesis installed. Six patients were selected whose situations coincided with the

proposed possibilities, so as to illustrate the supportive hygiene protocol with the most appropriate accessories in each case.

Postoperative phase

Maintenance of implant-supported prostheses should begin immediately after surgery. The use of a 0.12% chlorhexidine solution twice a day with a mild mouthwash for one minute is recommended. Chlorhexidine eliminates gram-positive and gram-negative bacteria. It is released over a 12-hour period, and is the antiseptic of choice for such cases. From the second to the fourth week, a post-surgery brush with "megasoft" type bristles measuring only 60 µm in diameter may be used together with the chlorhexidine. Postoperative cleaning should be undertaken with caution. The great danger is that the patient will knock the brush against the implants at a very critical point of the osseointegration process. Prior training and preparation of the patient in these cases is fundamental in guaranteeing hygiene without compromising the success of the treatment (Figure 1 a and b).

Figure 1 a and b - Postoperative cleaning must be undertaken with caution.

Maintenance phase

Situation 1 – unitary implants

In order to provide supportive hygiene for unitary implant-supported prostheses, it is necessary to use accessories which permit effective disorganisation of the oral biofilm without causing damage in the peri-implant site. The use of a conventional toothbrush, dental floss and interdental brushes is essential.

The use of ultra-soft brushes with over five thousand bristles of no more than 100 µm diameter permits efficient disorganisation of the oral biofilm (Figure 2a and 2b).

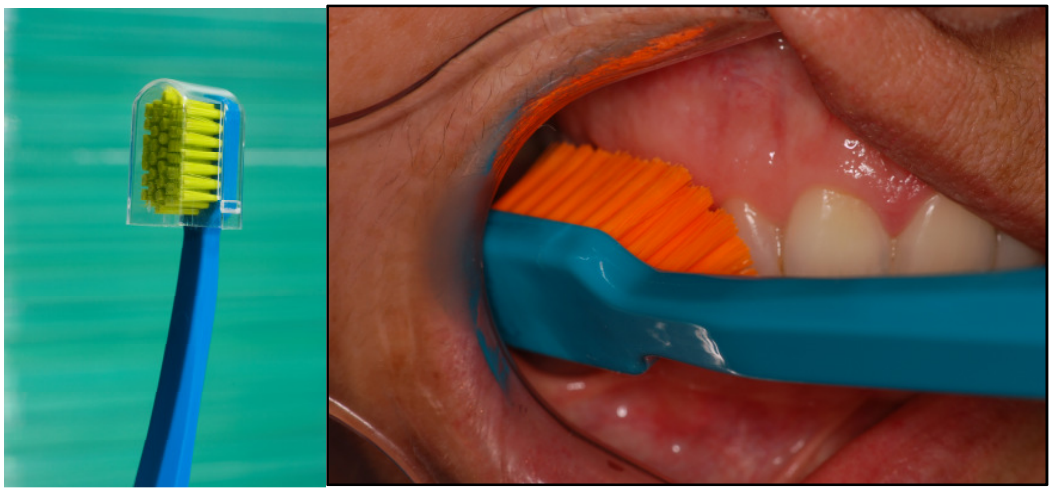

Figure 2 a and b - Conventional ultrasoft brush with over five thousand bristles.

The most important part of the cleaning of implants is the use of interdental brushes. These make it possible to clean the proximal region efficiently without injuring the tissues at the peri-implant site and the components of the implants, and their use is essential to prevent mucositis and peri-implantitis. "Prime" type interdental brushes have different diameters of access and effectiveness and provide accurate calibration of the interproximal space with a measuring probe. This facilitates their effective and completely atraumatic use (Figure 3).

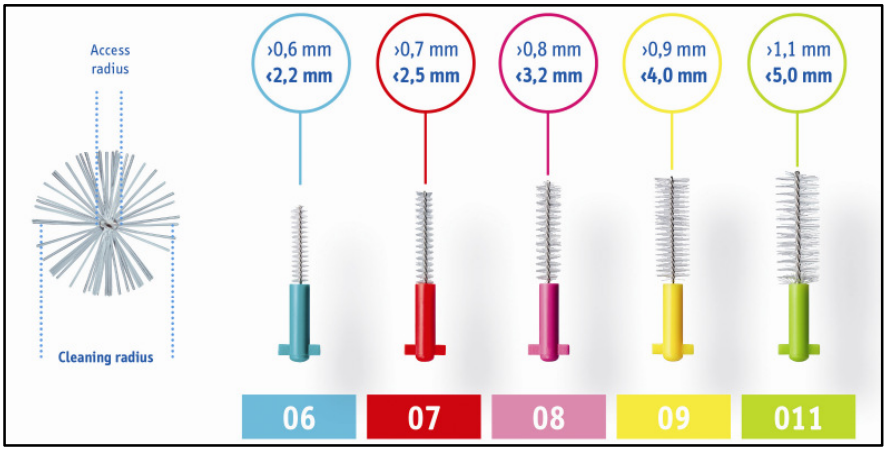

Figure 3 - Different diameters of "prime" type interdental brushes.

In Figure 4a and 4b the calibrating probe can be seen in action; this makes it possible to select the correct interdental brush.

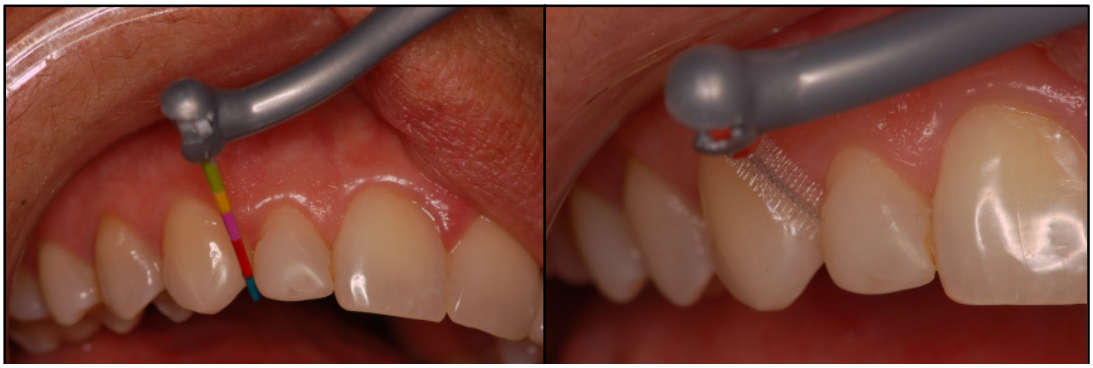

Figure 4 a and b - The calibrated probe prevents gingival retraction and black space.

Situation 2 – multiple implants with conventional or protocol-type fixed prosthesis.
The recommendations of *Situation* 1 apply to both conventional implant-supported fixed prostheses and those with a protocol-type gingival extension, with the use of "soft implant" interdental brushes (longer and thicker) and also unituft brushes (Figure 6).
In Figure 5 a, b and c we can see the clinical application of the interdental brush in a protocol-type prosthesis over a gingival extension in acrylic resin.

Figure 5 a, b and c - Cleaning of the peri-implant site with an interdental brush.

In Figure 6 a and b we can see the use of the unituft brush with lingual and vestibular access. This brush has slightly firmer bristles and prevents the formation of dental calculus at the junction between the implants and the prosthetic pillars.

Figure 6 a and b - Cleaning with a *Unitufo Solo* unituft brush.

Any type of prosthesis should allow for the possibility of using mechanical hygiene accessories. All professionals involved in restoration work with a protocol-type prosthesis should be aware that it is impossible to construct large overextensions which obstruct access to the end of implants. Figure 7 a and b shows a layout which is aesthetically pleasing and also allows interdental brushes to access the peri-implant areas.

Figure 7 a and b - There should be a balance between cosmetic appearance and ease of cleaning.

Situation 3 - implants with removable prosthesis (bar-clip or ball).
For cleaning of removable implant-supported prostheses, the recommendations for *Situations 1* and *2* apply, together with the use of brushes used exclusively for cleaning acrylic prostheses.
Oral restoration by removable implant-supported prosthesis facilitates cleaning because it is possible to remove the device, but cleaning should not be neglected. In Figures 8 to 10 we can see a cleaning sequence for a removable implant-supported prosthesis.

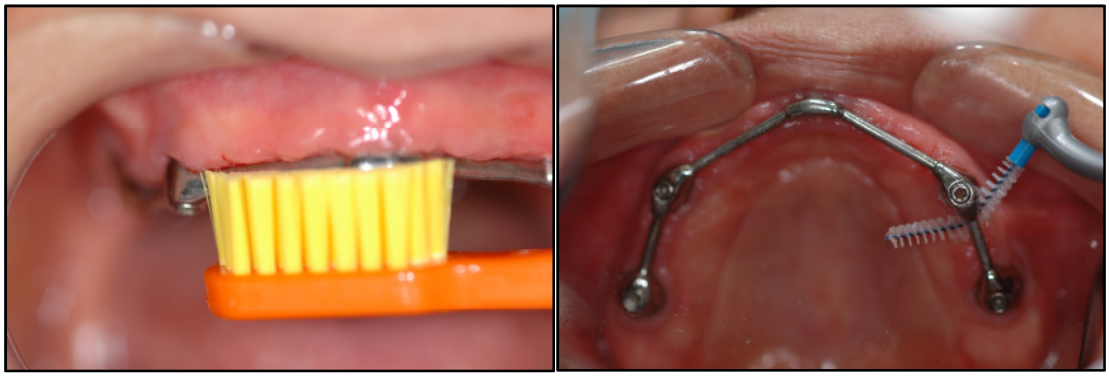

Figure 8 a and b - Brushing of the bar and use of an interdental brush on the retainers.

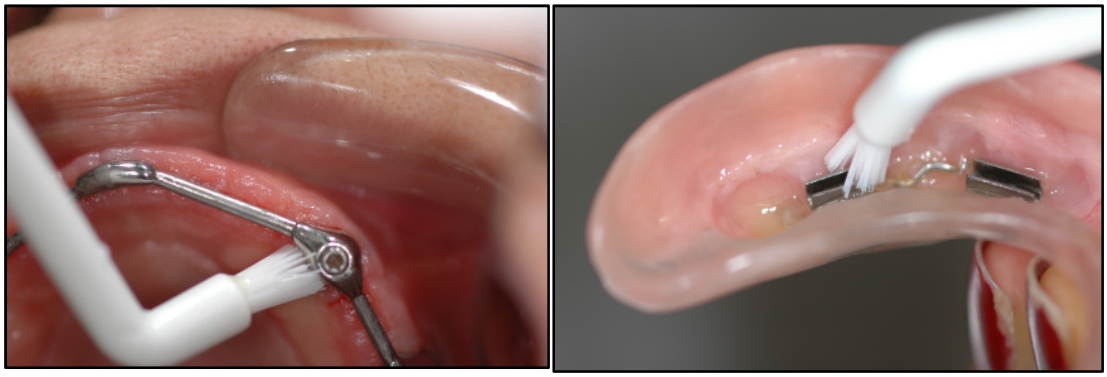

Figure 9 a and b - Unituft brush cleaning the clip of the removable prosthesis.

Figure 10 a, b and c - Use of a special brush to clean the removable prosthesis.

When access to the prosthetic space is greatly reduced, the use of conventional dental floss or floss tape is also appropriate (Figure 11).

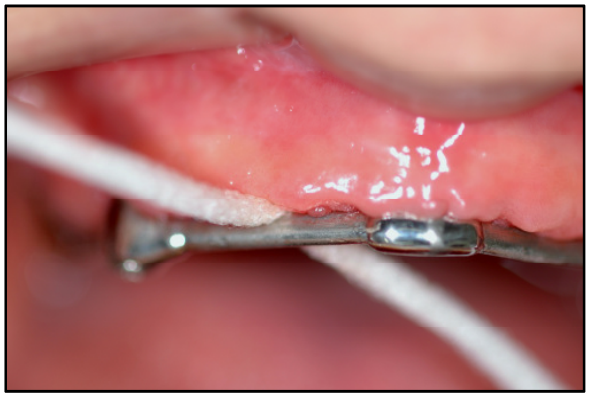

Figure 11 - Some areas can only be accessed by dental floss.

Discussion

In Brazil, it is estimated that over 50 million people are totally or partially edentulous. In this context, osseointegrated implants are becoming common clinical practice for a large number of patients. Thus it can be predicted that within a short time millions of implants will have been installed and, if we do not immediately turn our attention to a protocol of supportive hygiene for implants, a large number of peri-implant diseases will develop, compromising not only oral health, but the general health of the population.

A fact that can never be forgotten is that longevity of implants is essential in maintaining patients' general health and quality of life. A simple inflammation in the mouth may be related to a series of illnesses and systemic problems, such as, for example, cardiovascular diseases, cerebrovascular accident, gastrointestinal disorders, respiratory problems, diabetes, oral cancer and premature birth, among others[6-8]. It is clear that these problems are primarily multifactorial, that is, they are caused by a combination of factors, but oral hygiene plays a major role in the prevention of these diseases.

Implants may be affected by mechanical and/or biological problems. Problems which are mechanical in origin are related to the technical part of the implants and their prosthetic components. Biological problems, however, are related to the oral biofilm,

affect the soft and/or hard tissues which surround the implants and may occur immediately or some time after their installation[9]. Peri-implant mucositis is a reversible inflammatory process which occurs in the soft tissues surrounding the functioning implant[10-11]. Peri-implantitis, however, is a more serious inflammatory process characterised by the presence of a leukocyte infiltrate in the supporting peri-implant bone and additional bone loss unrelated to the physiological process of remodellation[12-13].

Because of the phenomenon of osseointegration, which results in large-scale bone anchorage, mucositis and peri-implantitis may for some time pass unnoticed. However, as the disease becomes worse, especially in the case of peri-implantitis, it may in the end require complex treatments and be difficult to resolve. Several authors[14-16] report in their studies an incidence of around 50% of cases of mucositis and 43% of peri-implantitis. Other studies[17-19] have not shown such alarming data, but all assert that the application of a supportive hygiene protocol for implants is essential for the success of treatments and the prevention of these diseases. It is important to emphasise that the formation of the oral biofilm on implants is no different from the biofilm formed on the surfaces of the teeth. This formation may be affected by the smoothness of the surface of the implants, but there is no evidence that this difference can prevent the appearance of peri-implant diseases of biological origin.

It is incorrect to imagine that implants are more resistant than teeth. In reality, the tissue in the peri-implant area does not have the characteristics of a protective capsule, has a smaller number of collagen fibres and contains fewer blood vessels. Consequently, it is less resistant to exogenous threats than the periodontal tissues of natural teeth. Furthermore, a high level of oral biofilm and a history of previous dental loss due to periodontal disease increase the chance of peri-implant disease more than tenfold[20 -21]. Thus it is easy to imagine a large number of problems in the medium term, since it is precisely those patients affected by periodontal disease who are the principal candidates for implants. It is indisputable that the maintenance phase of prosthetic restoration over implants is as important as the surgical phase and is directly related to the treatment success rate[22].

On the basis of these studies, the establishment of a supportive implant hygiene protocol for the various clinical possibilities of implant-supported oral restoration is essential for the prevention of peri-implant diseases because, in the same way as the natural teeth were lost, the same may happen to the endosseous implants.

Conclusion

The specific guidelines existing in this area of knowledge are extremely vague and not very objective. The establishment of a clinical supportive hygiene protocol based on scientific evidence and professional experience may guarantee oral biofilm control, thus preventing mucositis and peri-implantitis.

Note of clarification

We, the authors of this study, have received no financial support for the research from organisations which might obtain profit or suffer loss with the publication of the study. Neither we nor our family members have received any consultation fees or been paid as assessors by organisations which might obtain profit or suffer loss with the publication of this study, nor do we own shares or investments in organisations which might also obtain profit or suffer loss with the publication of the study. We have received no fees for presentations from profit-making organisations which might obtain profit or suffer loss with the publication of this study, we are not employed by any commercial organisation which sponsored the study, we do not own any patents or receive any royalties and we do not work as expert witnesses or undertake activities on behalf of any organisation with a financial interest in this area.

Address for correspondence:

Hugo Roberto Lewgoy
Rua Goiás, 46 – Higienópolis
01244-010 – São Paulo – SP
Tel.: (11) 3661-7846
hugorl@usp.br

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