


Communication

# A Proposed Protocol for Ordinary and Extraordinary Hygienic Maintenance in Different Implant Prosthetic Scenarios

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**Citation:** Felice, P.; Bertacci, A.; Bonifazi, L.; Karaban, M.; Canullo, L.; Pistilli, R.; Sammartino, P.; Gasparro, R.; Barausse, C. A Proposed Protocol for Ordinary and Extraordinary Hygienic Maintenance in Different Implant Prosthetic Scenarios. *Appl. Sci.* **2021**, *11*, 2957. <https://doi.org/10.3390/app11072957>

Academic Editors: Luca Testarelli, Gilberto Sammartino and Hom-Lay Wang

Received: 10 March 2021  
Accepted: 24 March 2021  
Published: 25 March 2021

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**Abstract:** Prevention of peri-implantitis involves the early diagnosis of peri-implant mucositis. This article presents a protocol of hygienic maintenance in different implant prosthetic scenarios: single crown, fixed partial prosthesis, fixed full-arch, and overdentures. Others clinical conditions have to be taken into consideration: patient compliance; history of periodontitis; implants placed in augmented bone; short, zygomatic, pterygoid, and tilted implants; and complex prosthesis with false gingiva. Two levels of implant maintenance are described: ordinary, performed by dental hygienist, and extraordinary, carried out by both dentist and hygienist. Extraordinary maintenance also involves the removal and decontamination of the prosthetic structure. To obtain an effective prevention of peri-implantitis, one must plan ordinary and extraordinary hygiene in relation to the type of rehabilitation and clinical parameters.

**Keywords:** hygienic maintenance; innovative rehabilitative techniques; prosthetic therapy

## 1. Introduction

Dental implant placement has become a routine procedure in oral rehabilitation of fully and partially edentulous patients, involving a great variation of implant prostheses due to the development of innovative surgical and prosthetic techniques [1–5].

Inflammatory biological complications compromise the long-term results of implant therapy [6,7]. Moreover, the number of patients affected by peri-implant disease is increasing [1,8–12]. Peri-implantitis has been defined as a plaque associated pathologic condition characterized by inflammation in the peri-implant mucosa and subsequent progressive loss of supportive bone [6]. Peri-implantitis is clinically preceded by peri-implant mucositis, which is characterized by bleeding on probing and clinical signs of inflammation that can be reversed with measures aimed at eliminating the plaque [13,14].

In absence of predictable treatment for peri-implantitis, primary prevention should involve the early diagnosis of peri-implant mucositis, avoiding its progression into peri-implantitis [1]. Although biological complications in implant therapy cannot be completely avoided, it has been shown that proper maintenance of peri-implant tissues positively

influences long-term success rates, while the lack of patient motivation is associated with a higher risk of peri-implantitis and implant loss [1,15,16].

The purpose of this article is to propose a hygienic maintenance protocol for patients with different implant prosthesis scenarios and clinical situations.

## 2. Materials and Methods

A supportive therapy to prevent peri-implantitis should be calibrated on each single patient [17]. In clinical practice, these interventions consist of monitoring of peri-implant conditions, patient education and motivation for home oral hygiene, professional oral hygiene, and control of risk factors (e.g., history of periodontal disease).

According to the authors' clinical experience, two levels of implant maintenance can be considered: ordinary, performed by dental hygienist, and extraordinary, carried out by the dentist together with the hygienist.

The ordinary hygiene session includes soft tissue evaluation, plaque index, probing depth, bleeding on probing, presence of pus, mobility, plaque and calculus removal, and individual instructions for oral hygiene (emphasizing the use of interdental cleaning devices). Full-mouth plaque score (FMPS), full-mouth bleeding score (FMBS), periodontal probing depth (PPD), and bleeding on probing (BOP) are assessed at 6 sites using a periodontal probe [18]. Excellent motivation and compliance from patient are associated to values of FMPS < 20% and of FMBS < 20% [19]. Clinically, peri-implant health is characterized by the absence of signs of inflammation (such as edema and redness) and bleeding on probing, stability of probing depth in measurements taken at different times and absence of further bone loss compared to post-bone remodeling surgical [13,14].

The scaling and root planing procedures include the use of specific instruments, such as modified curettes and piezoelectric or ultrasonic tips (in plastic material) for the removal of submucosal microbial deposits on implants and polishing with rubber cup or air polishing [20,21]. The patient should also receive personalized instructions for home oral hygiene. It is necessary to properly instruct the patient in order to respect the delicate peri-implant attachment apparatus. Given the cross-sectional differences between teeth and dental implants, using interdental brushes and other tools, such as subgingival irrigators, for interdental cleaning around dental implants allow for better plaque removal than flossing alone [22].

Extraordinary maintenance involves the removal of the prosthetic structure, operated by the dentist, to better evaluate the probing depth and the bleeding on probing, the mobility of the implants, and the state of the soft tissues, as well as to more accurately clean the implants by removing, in presence of plaque and signs of inflammation, implant abutment [23]. The same specific instruments described for the ordinary hygiene are used. Furthermore, every time the prosthesis is removed, it is decontaminated eliminating plaque and dental calculus while respecting the prosthetic surfaces. This particular machine the authors use works by gentle cleaning of the prosthesis with soft stainless-steel brushes. It helps clean and preserve dental prostheses without affecting the precision of the original design of the components. Its principle is based on soft brushes turned by powerful magnets fitted round a container which has the effect of cleaning and polishing objects (Figure 1).

To decide on an adequate maintenance choice, one must calibrate cadence and type (ordinary and extra-ordinary) in relation to the different prostheses and clinical situations.

The types of prosthetic rehabilitations have been divided into (1) single crown, (2) fixed partial prosthesis, (3) fixed full-arch, and (4) overdentures (OVD).

However, these implant prosthetic scenarios can be associated with different clinical situations, which also have to be taken into consideration: patient compliance; history of periodontitis; implants placed in augmented bone; short [24–27], zygomatic [28,29], pterygoid, and tilted implants; and complex prosthesis with false gingiva.

The results of numerous longitudinal and cross-sectional studies have provided evidence that a history of previous periodontitis (e.g., patients with previously treated pe-

riodontitis and in supportive therapy) represents a risk factor for the development of peri-implantitis [30–32]. However, patients with a history of successfully treated periodontitis who adhere to a periodontal maintenance program are not necessarily at increased risk of developing peri-implantitis [21].



**Figure 1.** Example of prosthesis removed and decontaminated eliminating plaque and dental calculus while respecting the prosthetic surfaces (GD Cleaner, Global D, Brignais, France).

### 3. Results and Discussion

The present article combines authors' personal experience and literature to suggest an adequate ordinary and extraordinary hygienic maintenance protocol for different implant prosthesis scenarios and clinical conditions.

#### 3.1. Single Crowns

In cases of single crowns [33–35], normally the patient can properly clean these rehabilitations. For this reason, in our opinion, ordinary hygiene should be performed every 6 months. In cases of unfavorable clinical conditions, our advice is to recall patients every 4 months. Extraordinary hygiene should be performed only in case of clinical signs of inflammation (Figure 2).

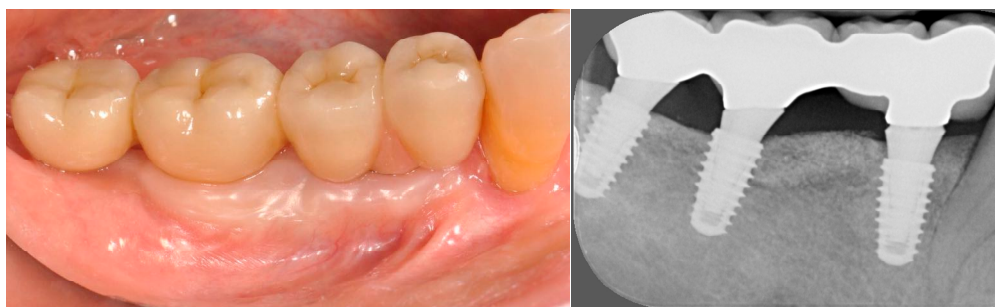


**Figure 2.** Single crown rehabilitation without any unfavorable clinical condition: ordinary hygiene every 6 months and extraordinary only in case of BOP+ (bleeding on probing).

#### 3.2. Fixed Partial Prostheses

Fixed partial prostheses involve more than one implant, and for this reason prosthetic rehabilitations are more difficult to be cleaned by the patient. As a consequence, ordinary hygiene should be performed every 3 or 4 months on the basis of patient compliance and

individual risk factors. Extraordinary maintenance should be repeated once a year or in cases of inflammation (Figure 3).

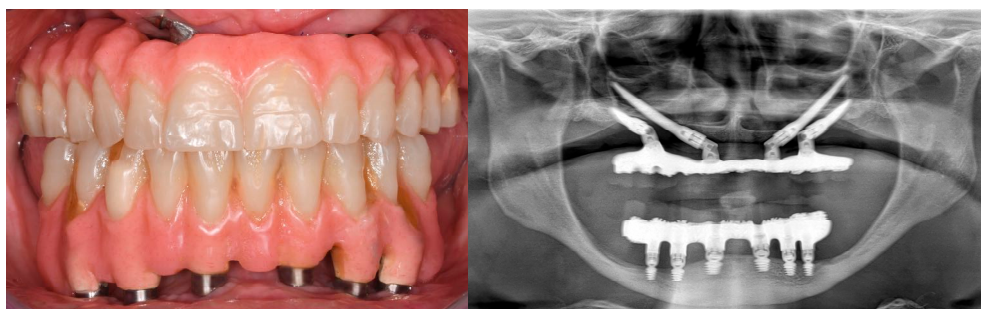


**Figure 3.** Fixed partial prosthesis on implants in regenerated bone: ordinary hygiene every 3 months and extraordinary every 12 months or in case of BOP+.

### 3.3. Fixed Full-Arch Prostheses

Implant-prosthetic rehabilitation type is a relevant factor, as it has been shown that, in the presence of sites difficult to access for oral hygiene maneuvers, the incidence of peri-implantitis increases [36]. In the presence of complex prosthetic rehabilitations, such as full-arch, plaque control can be challenging for the patient, even if properly trained, and an accumulation of plaque on prostheses and abutments is a frequent finding [37,38]. Moreover, in the presence of prostheses on several implants, the mobility of the single element can be masked, which is why it is necessary to remove the prosthesis, as well as to evaluate gingival health and hygiene conditions [39].

For these reasons, ordinary hygiene should be performed every 3 or 4 months on the basis of patient compliance and individual risk factors, while extraordinary maintenance should be repeated every 6 months (Figure 4).



**Figure 4.** Fixed full-arch prosthesis on short and zygomatic implants: ordinary hygiene every 3 months and extraordinary every 6 months or in case of BOP+.

### 3.4. Overdentures (OVD)

Patients can clean at home overdenture prostheses more easily than a fixed full-arch; however, the presence of fixed prosthetic components can harbor plaque and calculus. Hence, hygiene should be performed every 3 or 4 months on the basis of the evaluation of clinical parameters and patient compliance. Extraordinary maintenance should be performed only in presence of clinical signs of inflammation (Figure 5).

Other important and specific clinical factors have to be taken into consideration. For instance, the prevalence of peri-implantitis in patients with implants in augmented sites is more variable and less predictable compared with the prevalence in patients with implants in pristine sites [40–44]. There are differences in bone loss during the spontaneous progression period between pristine and augmented: the size and vertical dimension of the peri-implantitis lesion were larger at augmented than at pristine sites and the findings

seemed to be confirmed by clinical data, which showed a faster and worsening progression of peri-implantitis in augmented bone [45].



**Figure 5.** Overdenture (OVD) prosthesis on short implants: ordinary hygiene every 3 months and extraordinary only in case of BOP+.

In patients with severely atrophic maxillae, zygomatic implants represent an alternative to conventional bone augmentation with the advantage of a fast functional rehabilitation [27,28]. However, according to the literature, this kind of prosthetic rehabilitation is associated with an increased risk of mucositis [28]. The presence of false prosthetic gingiva, often related to zygomatic, tilted, and pterygoid implants, can favor plaque accumulation and retention.

Nowadays short implants (defined as  $\leq 6$  mm long) are used as an alternative to reconstructive bone surgeries due to their up-to-date reliable results [26,27,46–48]. Despite of stable peri-implant marginal bone levels, short implants require a special attention in order to avoid marginal bone loss.

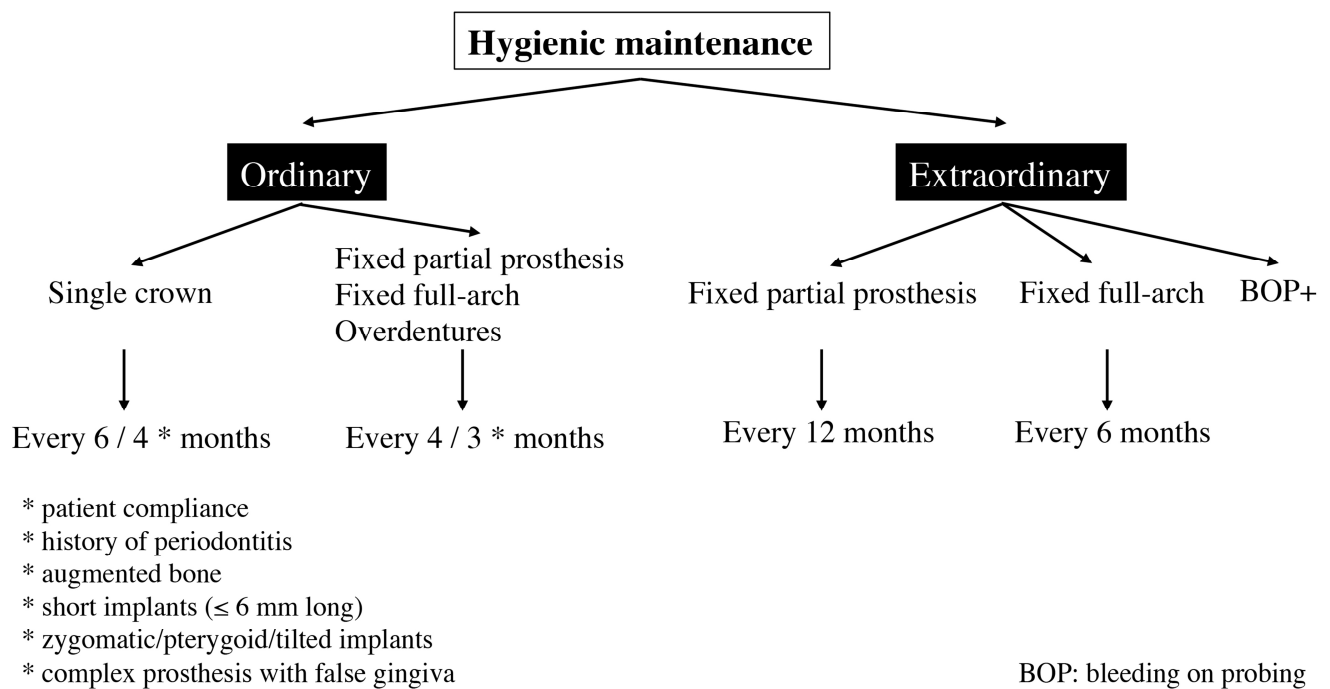
For all of these patients with unfavorable clinical conditions, ordinary hygiene should be performed every 4 months for single crowns and every 3 months in all the other rehabilitations (Table 1, Figure 6). Especially in these kinds of rehabilitations, special attention should be given to the extraordinary hygiene removing the prosthesis and using the extra-oral magnetic cleaner.

**Table 1.** Ordinary and extraordinary hygienic maintenance in different implant prosthetic scenarios.

Types of Implant Prosthetic Rehabilitations	ORDINARY Hygiene (Months)	EXTRAORDINARY Hygiene (Months)
Single crown	6/4 *	BOP+
Fixed partial prosthesis	4/3 *	12/BOP+
Fixed full-arch	4/3 *	6/BOP+
Overdentures	4/3 *	BOP+

\* Patient compliance \* history of periodontitis \* augmented bone \* short implants ( $\leq 6$  mm long) \* zygomatic/pterygoid/tilted implants \* complex prosthesis with false gingiva. BOP: bleeding on probing.

However, all the limitations of a communication should be taken into consideration: the lack of a control group and of a sample size calculation, and the absence of a statistical analysis and of a rigorous study design. For this reason, we strongly suggest for future research studies to confirm these results.



**Figure 6.** Ordinary and extraordinary hygienic maintenance in different implant prosthetic scenarios.

#### 4. Conclusions

Within all the limitations of an article mainly based on clinical experience, we have proposed a proper maintenance hygienic protocol in order to prevent peri-implantitis. Ordinary hygiene sessions should be performed by a dental hygienist every 6 months in cases of single crowns and every 4 months in all the other prosthetic rehabilitations. In cases of unfavorable clinical conditions (reduced patient compliance; history of periodontitis; implants placed in augmented bone; short, zygomatic, pterygoid, and tilted implants; complex prosthesis with false gingiva), ordinary hygiene should be performed more frequently (every 4 months for the single crowns and every 3 months in all other cases). Regarding extraordinary hygiene, performed by both dentist and hygienist, it should be done by removing prosthesis in any case of inflammation, and every 6 and 12 months for fixed full-arch and partial prostheses, respectively. However, randomized controlled clinical trials (RCTs) should be performed to better confirm these clinical opinions.

**Author Contributions:** Conceptualization, P.F. and C.B.; methodology, L.C.; validation, R.G.; writing—original draft preparation, A.B., L.B., and M.K.; writing—review and editing, R.G. and P.S.; visualization, P.S.; supervision, R.P. All authors have read and agreed to the published version of the manuscript.

**Funding:** This research received no external funding.

**Institutional Review Board Statement:** Not applicable since it is a communication reporting authors' clinical experience on routine hygienic protocols. No research clinical treatments on these protocols were delivered.

**Informed Consent Statement:** Patient's figures were completely anonymized so a formal consent to show images was not elaborated.

**Data Availability Statement:** Not applicable.

**Conflicts of Interest:** Prof. Felice receives research grants from Global D.

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