The Implant Protection Plan (I.P.P.)

Innovative implant and periodontal maintenance protocol

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Introduction

The last 30 years of world dentistry have undoubtedly been characterised by the exponential growth of implantology, which has gone from being a discipline in the hands of a few experts "to being a field of treatment at many dental practices. There are several reasons for this increase: firstly, surgical and prosthetic techniques have been simplified over the years, repeatable protocols being certified by decades of literature, reducing costs for the patient and limiting invasiveness and post-operative discomfort. In addition, many patients want an aesthetic and functional restoration by means of fixed implant prostheses as their first choice, rather than resorting to solutions such as removable prostheses or fixed prostheses on natural teeth involving the prosthetic preparation of healthy teeth. Ultimately, it should not be under-estimated that implantology has also increased because it represents a source of income for the economic balance sheet of many healthcare facilities that have decided to specialise in this field. However, the implementation of an oral implant rehabilitation, be it a single tooth or a complex solution, cannot and must not today represent the end point either for the patient or for the dentist and his or her team. Nowadays, thanks to our knowledge, we have no difficulty in achieving implant-based rehabilitation even in cases of severe bone atrophy using regenerative techniques.

> "... modern implantology is trying to address the possibility of guaranteeing a clinical result that endures over time ..."

The critical point that modern implantology is trying to address, not always successfully, is the possibility of guaranteeing a clinical result that endures over time. To achieve this ambitious goal, it is crucial to design an effective and feasible implant and periodontal maintenance protocol. We know that home maintenance around implants can be more difficult than around natural teeth because the techniques and instruments to be used, in many clinical cases, are inevitably different from those used for natural teeth. In addition, we may be confronted with the typical pathologies of implants, represented by mucositis and peri-implantitis, subtle pathologies that are difficult to control and whose differences from gingivitis and periodontitis we have learnt about.[1] According to studies on the prevalence of peri-implant disease,[2] 45% of patients show, after an average of nine years, signs of mild peri-implantitis and 14.5% medium to severe. In recent times, we have gained knowledge about oral biofilm, discovering that the biofilm changes in its characteristics when a pathology is established and that some pathologies, such as mucositis and peri-implantitis, are characterised by a repetitiveness in the type of pathogenic microorganisms present.[3] Implant maintenance protocols, however, have not evolved alongside knowledge, sometimes only introducing new instruments or technologies, such as laser therapy or phototherapy, and some new antiseptic principles.

The concepts of periodontal and peri-implant eubiosis and dysbiosis

One of the key points for the long-term success of a patient rehabilitated with implants, which is no different from that of a patient treated for periodontal disease, is to establish a correct programme of supportive therapy and periodic follow-up that includes differentiated recalls based on an analysis of risk factors and consequent classification into risk categories. The literature and our decades of clinical experience have shown that patients with treated periodontal disease are at risk of having setbacks and developing a new disease process.[4] Thus, the implant patient or the periodontal therapy patient should not and must not be considered a patient who after treatment, however successful, can return to being normal and be low risk. Based on this scientific and clinical evidence, we can begin to plan the future of our therapies, starting with the biological basis of the problem and the new assump-

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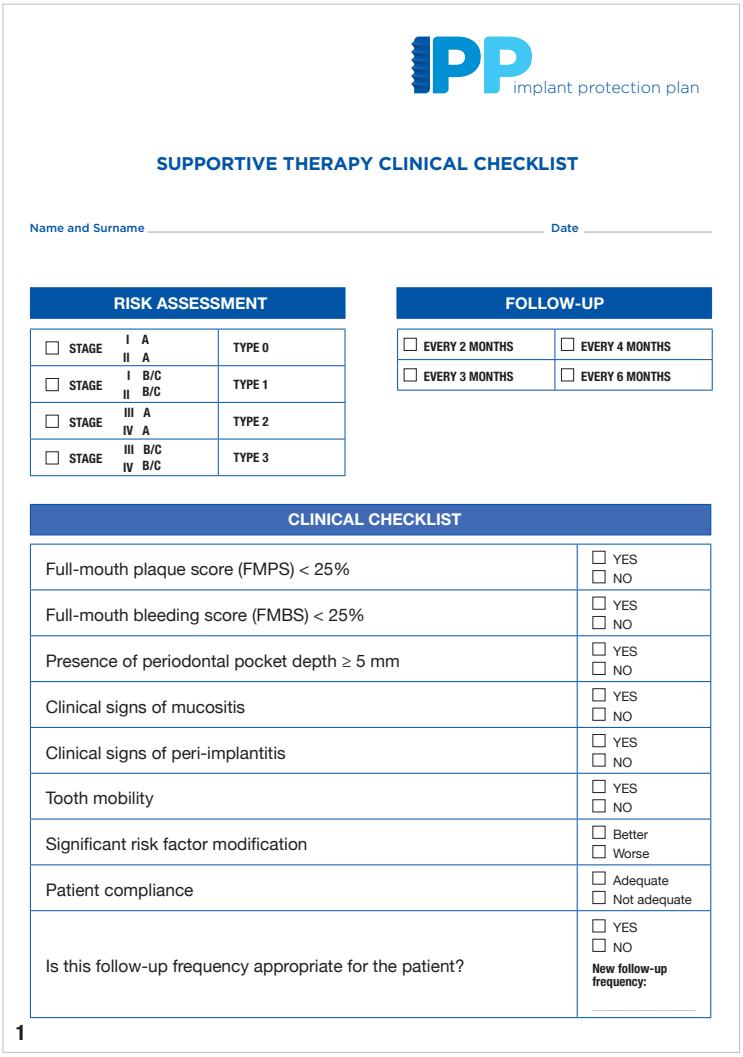


IPP implant protection plan

SUPPORTIVE THERAPY CLINICAL CHECKLIST

Name and Surname _____ Date _____

RISK ASSESSMENT	
☐ STAGE I A, II A	TYPE 0
☐ STAGE I B/C, II B/C	TYPE 1
☐ STAGE III A, IV A	TYPE 2
☐ STAGE III B/C, IV B/C	TYPE 3

FOLLOW-UP	
☐ EVERY 2 MONTHS	☐ EVERY 4 MONTHS
☐ EVERY 3 MONTHS	☐ EVERY 6 MONTHS

CLINICAL CHECKLIST	
Full-mouth plaque score (FMPS) < 25%	☐ YES ☐ NO
Full-mouth bleeding score (FMBS) < 25%	☐ YES ☐ NO
Presence of periodontal pocket depth ≥ 5 mm	☐ YES ☐ NO
Clinical signs of mucositis	☐ YES ☐ NO
Clinical signs of peri-implantitis	☐ YES ☐ NO
Tooth mobility	☐ YES ☐ NO
Significant risk factor modification	☐ Better ☐ Worse
Patient compliance	☐ Adequate ☐ Not adequate
Is this follow-up frequency appropriate for the patient?	☐ YES ☐ NO New follow-up frequency: _____

1

Fig. 1: Operational checklist for maintenance sessions.

tions linked to a more accurate knowledge of the oral microbiota.

The oral microbiota is the set of microorganisms that live and coexist in the oral cavity. It should be distinguished from the concept of oral microbiome, which is the collective genomes of the microorganisms present. The microbiota is made up of more than 700 different bacterial species, as well as numerous other microorganisms, and in a healthy state it is in perfect balance with the host, causing no harm and providing numerous benefits through the predigestion of food, antibacterial action, and the secretion of enzymes. This state of equilibrium is called "eubiosis". It is important to emphasise that a eubiotic microbiota may also contain species that are considered pathogenic but which as part of a balanced biofilm are not capable of inducing pathology. Thus, the mere presence of periodontopathogenic species or implant pathogens is no longer considered a sign of pathology, as it was in the past; they can at most be considered risk factors to which more attention should be paid.

However, when a pathological process of either periodontitis or peri-implantitis occurs, the oral biofilm changes and a picture of dysbiosis[5] of the oral microbiota emerges, there being a change in the relationships between the present species and that can trigger an immune and inflammatory response. It is precisely the inflammation created by the bacterial trigger that feeds and often maintains the dysbiosis itself, leading to chronicity of the condition. This alteration in the balance leading to the onset of disease is affected by many variables or risk factors which can affect the patient's clinical situation at several levels.[6] There is a solid body of literature on the most important risk factors for periodontal disease, drawn from many clinical trials and a smaller number of longitudinal studies.[7,8] This has made it possible to identify some of these factors as being strongly correlated with periodontal disease and, at least regarding the current state of research, to suggest for others a correlation whose nature has yet to be validated in detail.[9–14]

Risk factors include some that are modifiable and others that are not. Among the most important modifiable factors are smoking, stress and diabetes, which we know cannot yet be eliminated but is treatable and therefore modifiable. Among the non-modifiable factors is genetic predisposition, a generic and imprecise term that refers to a host's ability to modulate the quality of the immune and inflammatory response differently and thus favour the onset of disease. Other risk indicators whose correlation with implant and periodontal disease has yet to be fully clarified include obesity, metabolic syndrome, hypertension, cardiovascular disease, and osteopenia/osteoporosis.

A cooperative patient–professional plan

Once the biological bases currently considered valid for a more scientific and modern understanding of peri-implant pathologies have been clarified, other much more practical and organisational aspects of maintenance need to be investigated. First of all, not all patients are the same: the selection of a good candidate for periodontal treatment or implant therapy should always be made *a priori*, excluding those patients in whom the risk factors described, or even who display an unsuitable propensity and attitude regarding adhering to the practitioner's requests and prescriptions (patients defined as having a low degree of cooperation or compliance), are not considered satisfactory. Sometimes it is not possible to select only ideal candidates, and even these, in the course of their lives, may suffer a disease setback if not properly motivated and followed up. Although a number of periodontal and peri-implant risk assessment tools have existed for years to assist clinicians in setting up the most suitable maintenance programme possible,[15,16] there is no uniformity even among the most experienced

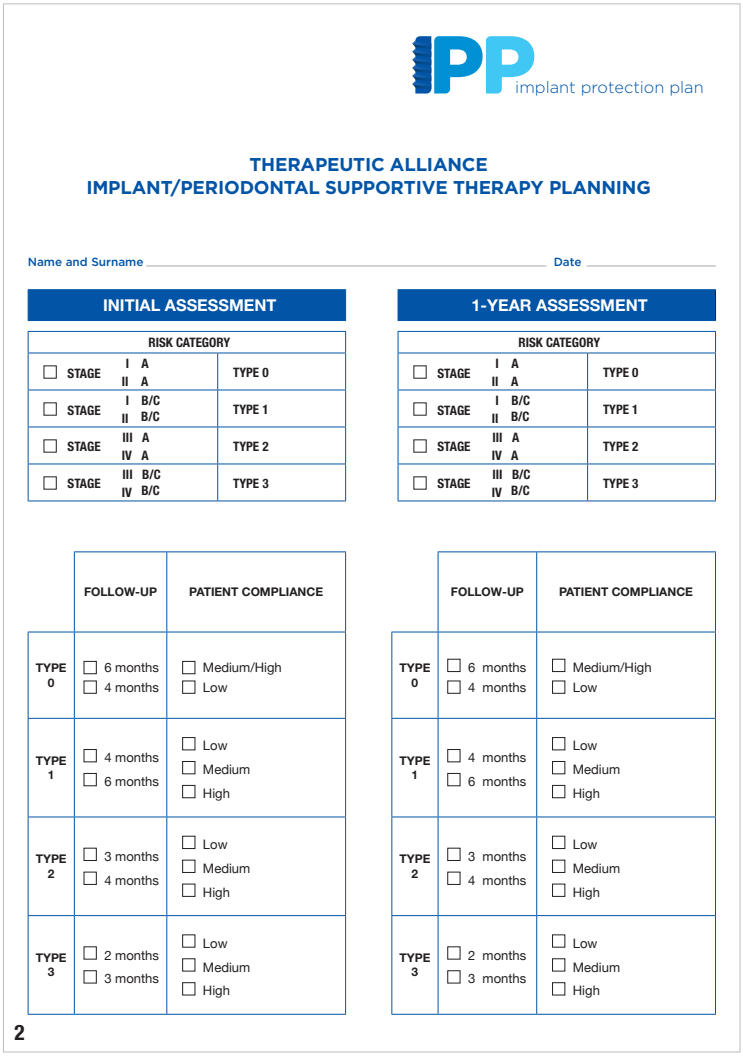
professionals.[17] Furthermore, the patient undergoing implant and periodontal rehabilitation often requires a guarantee of duration of treatment, a need which goes far beyond what medicine can offer but to which, nowadays, we cannot fail to provide a satisfactory answer.

The aim of this scientific contribution is to suggest a protocol, the implant protection plan (IPP), that establishes a therapeutic alliance between the treating dentist, the dental hygienist and the patient at the end of the active phase of periodontal or implant therapy. The IPP protocol provides for a shared maintenance pathway which starts with the initial assessment of the patient and periodic re-evaluations, which are not an end in themselves or a mere collection of clinical data, but determine actions and changes in the dental professional's attitude or that of the patient in order to optimise the periodontal and implant prognosis. The patient himself or herself should feel involved in the IPP, share its purpose and not play a passive role (Figs. 1 & 2).

The protocol also includes an operational checklist with all the factors that the hygienist has to check during the session. This tool is designed to monitor the clinical situation and alert the dental practitioner to any worsening of the patient's clinical condition compared with the baseline and to make consequent adjustments to the current supportive therapy (e.g. shortening recall times; Fig. 3).

The true innovation is to ensure that the patient does not have to give up compliance because, in return for a personalised maintenance programme set out in a contract signed by both parties, he or she will be guaranteed specific treatments or interventions, such as prosthetic replacement treatments, without any financial cost should any biological problems occur, but only if he or she has complied with the maintenance sessions agreed with him or her beforehand.

The first step in implementing the protocol is to assign a periodontal or peri-implant risk profile. The dentist determines a specific risk class on the basis of systemic and local risk factors, the presence or absence of implants (patient with only natural teeth, patient with natural teeth and implants, or patient with only implants) in order to plan the frequency and manner of individualised maintenance therapy. The assessment of the risk profile is therefore divided into a periodontal profile, if the patient still has natural teeth, and a periodontal framework in order to combine the two classifications into a single patient risk class assignment. Assigning a prognostic risk for a patient who has a partial natural dentition is a process that requires cross-referencing anamnestic information and elements from the objective examination and interpreting this data through prognostic assessment. It is necessary to include in the


IPP implant protection plan

THERAPEUTIC ALLIANCE
IMPLANT/PERIODONTAL SUPPORTIVE THERAPY PLANNING

Name and Surname _____ Date _____

INITIAL ASSESSMENT

RISK CATEGORY	
☐ STAGE I A / II A	TYPE 0
☐ STAGE I B/C / II B/C	TYPE 1
☐ STAGE III A / IV A	TYPE 2
☐ STAGE III B/C / IV B/C	TYPE 3

	FOLLOW-UP	PATIENT COMPLIANCE
TYPE 0	☐ 6 months ☐ 4 months	☐ Medium/High ☐ Low
TYPE 1	☐ 4 months ☐ 6 months	☐ Low ☐ Medium ☐ High
TYPE 2	☐ 3 months ☐ 4 months	☐ Low ☐ Medium ☐ High
TYPE 3	☐ 2 months ☐ 3 months	☐ Low ☐ Medium ☐ High

1-YEAR ASSESSMENT

RISK CATEGORY	
☐ STAGE I A / II A	TYPE 0
☐ STAGE I B/C / II B/C	TYPE 1
☐ STAGE III A / IV A	TYPE 2
☐ STAGE III B/C / IV B/C	TYPE 3

	FOLLOW-UP	PATIENT COMPLIANCE
TYPE 0	☐ 6 months ☐ 4 months	☐ Medium/High ☐ Low
TYPE 1	☐ 4 months ☐ 6 months	☐ Low ☐ Medium ☐ High
TYPE 2	☐ 3 months ☐ 4 months	☐ Low ☐ Medium ☐ High
TYPE 3	☐ 2 months ☐ 3 months	☐ Low ☐ Medium ☐ High

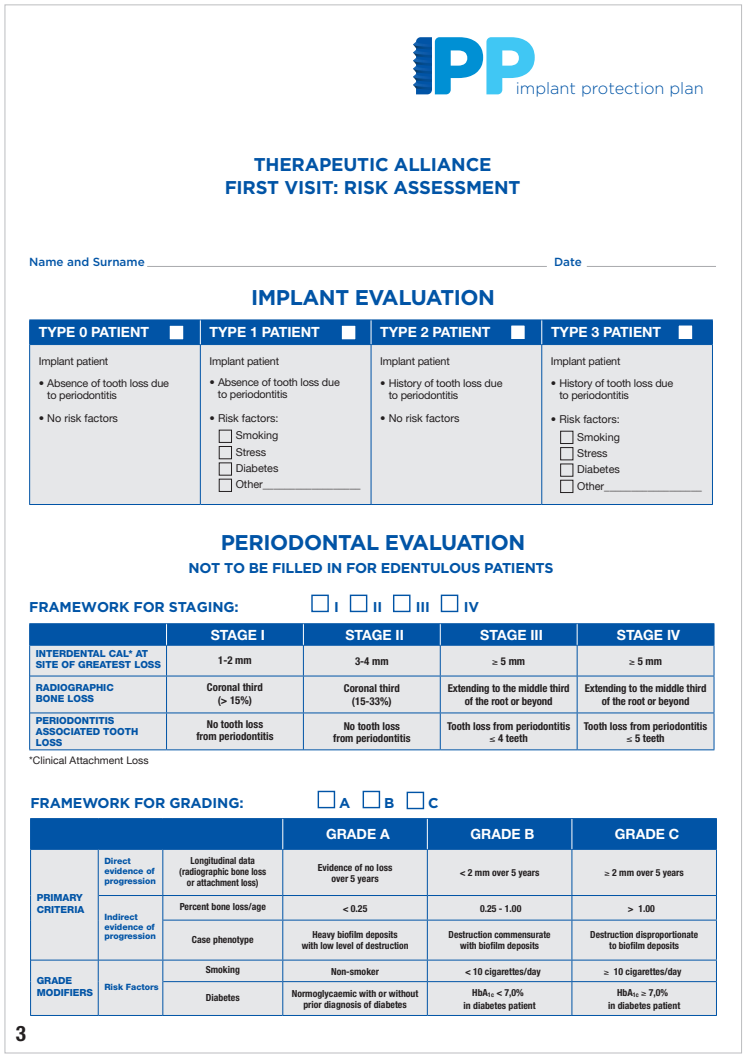
2

Fig. 2: Programming of periodontal and implant maintenance sessions.

analysis the patient's medical and dental history, oral and extra-oral radiographs and the main periodontal variables (plaque index, bleeding on probing, probing depth, recessions, furcation involvement, pathological tooth mobility, bone profile) and to give the patient the correct periodontal disease diagnosis (in terms of stage and grade).[18]

Today, there are several tools and algorithms that help us to plan the correct timing of maintenance sessions and, indirectly, to predict the patient's prognosis. It should also be pointed out that some of these collected variables, besides having a greater relative weight (odds ratio) than others in influencing prognosis, offer more information as indicators of disease progression. The most important of these are smoking, diabetes and a history of periodontitis.

In a recent review of the scientific evidence supporting periodontal maintenance planning, the following was emphasised:[19]



implant protection plan

THERAPEUTIC ALLIANCE
FIRST VISIT: RISK ASSESSMENT

Name and Surname _____ Date _____

IMPLANT EVALUATION

TYPE 0 PATIENT ☐	TYPE 1 PATIENT ☐	TYPE 2 PATIENT ☐	TYPE 3 PATIENT ☐
Implant patient • Absence of tooth loss due to periodontitis • No risk factors	Implant patient • Absence of tooth loss due to periodontitis • Risk factors: ☐ Smoking ☐ Stress ☐ Diabetes ☐ Other_____	Implant patient • History of tooth loss due to periodontitis • No risk factors	Implant patient • History of tooth loss due to periodontitis • Risk factors: ☐ Smoking ☐ Stress ☐ Diabetes ☐ Other_____

PERIODONTAL EVALUATION
NOT TO BE FILLED IN FOR EDENTULOUS PATIENTS

FRAMEWORK FOR STAGING: ☐ I ☐ II ☐ III ☐ IV

	STAGE I	STAGE II	STAGE III	STAGE IV
INTERDENTAL CAL* AT SITE OF GREATEST LOSS	1-2 mm	3-4 mm	≥ 5 mm	≥ 5 mm
RADIOGRAPHIC BONE LOSS	Coronal third (> 15%)	Coronal third (15-33%)	Extending to the middle third of the root or beyond	Extending to the middle third of the root or beyond
PERIODONTITIS ASSOCIATED TOOTH LOSS	No tooth loss from periodontitis	No tooth loss from periodontitis	Tooth loss from periodontitis ≤ 4 teeth	Tooth loss from periodontitis ≤ 5 teeth

*Clinical Attachment Loss

FRAMEWORK FOR GRADING: ☐ A ☐ B ☐ C

			GRADE A	GRADE B	GRADE C
PRIMARY CRITERIA	Direct evidence of progression	Longitudinal data (radiographic bone loss or attachment loss)	Evidence of no loss over 5 years	< 2 mm over 5 years	≥ 2 mm over 5 years
	Indirect evidence of progression	Percent bone loss/age	< 0.25	0.25 - 1.00	> 1.00
		Case phenotype	Heavy biofilm deposits with low level of destruction	Destruction commensurate with biofilm deposits	Destruction disproportionate to biofilm deposits
GRADE MODIFIERS	Risk Factors	Smoking	Non-smoker	< 10 cigarettes/day	≥ 10 cigarettes/day
		Diabetes	Normoglycaemic with or without prior diagnosis of diabetes	HbA_{1c} < 7,0% in diabetes patient	HbA_{1c} ≥ 7,0% in diabetes patient

3

Fig. 3: Assignment of risk class.

1) In healthy patients or those with mild forms of periodontal disease, stable clinical conditions can be maintained with six-monthly recalls. In patients with medium and severe forms of periodontal disease, the scientific evidence suggests a maintenance protocol with a greater frequency, varying in the literature from two to four months.

2) Data from retrospective studies shows that the proportion of residual affected sites (residual periodontal pockets with bleeding on probing) is an important variable in planning the frequency of visits. The efforts of health professionals should aim precisely at reducing these sites with disease both during the active phase of therapy and during supportive therapy.

Less prolific in the literature are systematic reviews and longitudinal studies on implant patient retention and prevention of peri-implantitis. However, as peri-implantitis shares many risk factors with periodontal disease, it is intuitive that implant patient maintenance planning will also have many common variables to consider.[20–22] However, the key to the prevention of peri-implantitis lies in the prevention of peri-implant mucositis. As reported by Jepsen et al., control of modifiable risk factors—smoking and bleeding on probing of residual dentition—is crucial in controlling mucositis.[23] Monje et al. in a meta-analysis on the impact of maintenance in the prevention of peri-implantitis emphasise the critical role of a history of periodontal disease as modifying the incidence of mucositis and peri-implantitis.[24] Numerous works identify plaque control, bleeding on probing, smoking and diabetes as the most important biological variables to consider.[25,26]

Having to classify, not a random sample of patients, but a subcategory (patients with previous periodontal disease and patients with implant restorations) with a higher intrinsic risk,[4] we decided to maximise the importance of the above-mentioned variables, set very strict cut-off values and establish rather tight recall intervals. Patients are thus divided into four classes of increasing risk, which are re-evaluated by the treatment team on a yearly basis with total transparency and in dialogue with the patient.

It is much more effective to plan this phase for the duration of one year (12 months from the date of initial planning), as achieving good compliance and correct use of home oral hygiene instruments often requires several months and several professional recall sessions, during which time positive reinforcement by the hygienist and dentist will contribute to progressive improvement. The patient himself or herself is actively involved in this decision-making phase, promptly informed of his or her risk status and encouraged to excel in protecting the investment he or she has made during the active phase of therapy.

The patient is motivated to scrupulously follow the instructions of the hygienist, who has the authority to suggest to the dentist after an observation period of one year a different maintenance protocol according to the degree of compliance demonstrated by the patient and the clinical results obtained. This patient–hygienist synergy has a twofold objective: it raises the status of the hygienist, who, in the eyes of the patient, becomes a professional figure empowered to propose a different treatment plan to the dentist; and it motivates the patient to follow the hygienist's therapeutic indications, which, if put into practice, will save the patient both time, because by spacing out the recalls the patient will come to the practice fewer times, and economic resources, since reducing the maintenance sessions will reduce the costs. The tangible saving of time and money is an important motivating factor for most, if not all, patients and is far more motivating than a generic invitation to follow clinical indications, which are often under-estimated and experienced by the patient as an imposition.

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Finally, the IPP protocol is an important instrument of patient loyalty and involvement, similar to other contracts that patients sign every time they buy tangible goods and want to protect an investment. In this specific case, the patient protects his or her own oral health, which, as we know, also has repercussions for systemic health,[27,28] an aspect that is increasingly clear from the literature and becomes a motivational lever for patients to take care of their restorations. As mentioned, patients increasingly demand a form of guarantee for the professional service in which they have invested time and financial resources. It is universally accepted, including by legislation, that in many areas of medicine we cannot offer absolute guarantees similar to the purchase of material goods. The IPP protocol represents, in our opinion and experience, a realistic and professional response to patients' demands for a guarantee that does not increase the risk of free prosthetic remakes because, by reviewing patients according to a tight and individually modulated recall schedule, mucositis can be intercepted and treated effectively before it becomes peri-implantitis.

> "The therapeutic alliance involving the dentist, the dental hygienist and the patient is the cornerstone of long-term success ..."

The protocol also allows the practitioner to have a powerful communication weapon should a clinical problem occur in patients who have refused the IPP. In this regard, it is advisable to write down any refusal in the medical record and have it countersigned by the patient. Clinical experience over the past 40 years has shown us that patients usually lose track of time and think that they have been out of treatment for a few years when in reality many more years have passed and the patient has never shown up for his or her scheduled appointments. Having recorded even the non-acceptance of the PPI protocol allows the practitioner to demonstrate his or her diligence and protects him or her from possible medicolegal proceedings that patient appear increasingly willing to bring in the event of failure. We are convinced that, by protecting the patient from biological problems that may occur, we are fulfilling our professional duty in an ethical manner and protecting ourselves by demonstrating our competence and diligence.

Conclusion

The aim of establishing the IPP protocol is to help the dental team to assign a future risk profile designed specifically for the periodontal and implant therapy, not neglecting the many variables that contribute to the prognostic assessment but giving maximum emphasis to those that evidence suggests are the most relevant. The therapeutic alliance involving the dentist, the dental hygienist and the patient is the cornerstone of long-term success, there being a continuous flow of communication between the parties and periodic feedback to recalibrate the most appropriate times and methods for continuing to maintain health.

In its essence, the IPP protocol represents a modern and innovative approach to the patient that is aimed at: (1) effectively motivating the patient, who perceives real and tangible benefits; (2) building patient loyalty, because the practitioner offers protection that many other practitioners do not offer, thinking it too risky for the practice; (3) raising the professional profile of the hygienist, who becomes a key player in maintaining the results achieved by the dentist through treatment; and (4) protecting the dental practitioner from possible medicolegal proceedings, especially in those patients with inconsistent compliance.

Author details

Literature

about the author

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