

A CLINICAL STUDY ON THE INCIDENCE AND MANAGEMENT OF BIOLOGICAL COMPLICATIONS IN IMPLANT THERAPY

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Abstract

The scope of the study was to evidence the methods recommended for avoiding, managing and implementing an efficient treatment capable of reducing the biological complications accompanying implant therapies.

Materials and method. The study evaluates the patients with prosthesis charged implants - or during their osseointegration period - inserted in the Clinic of The Emergency Military Hospital of Sibiu, over a 5 year period (2009-2014). Retrospective investigation was based on the evaluation of the treatment files and on the imagistic and clinical analyses of the 125 patients to whom 385 implants had been inserted.

Results and discussion. The study demonstrates that, when implants are the support of an overdenture, surrounded by either limited keratinized gingiva or mobile tissues, the presence of the bacterial plaque is considerable, the peri-implant pocket exceeds 5 mm, and sensitivity and bleeding are produced on contact with the probe. In susceptible patients, or in those with pathological periodontal antecedents, the re-infection potential has been always higher. The clinical study confirms that, invariably, peri-implantitis is associated with the existence of the bacterial plaque and also with the presence of a peri-implant pocket exceeding 4 mm (8.9%), with partial exposure of the covering screw (4.5%) and fixed restorations without self-cleaning spaces (2%).

Conclusions. Out of the post-surgery biological complications, peri-implantitis is the most frequent one, causing a - sometimes total - loss of the alveolar bone around the osseointegrated implant.

Keywords: *biological complications, peri-implant infections, implant therapy*

1. INTRODUCTION

The therapy on implants represents an option of prosthetic restoration with increased predictability and high rate of success, resulting either from post-extraction insertion or from implant insertion in previously edentulous zones.

Avoidance and management of complications are part of the clinical practice, whereas the

implant-prosthetic medical team should be capable of recognizing the possible risk factors, in view of a successful treatment. Identification and limitation of biological complications are mainly aimed at minimizing risks and at reducing morbidity in patients.

Several studies showed that the implant-prosthetic therapy is always facing biological, technical and aesthetic complications, many of them directly related with the patient, such as:

- the healing capacity of each person in part,
- the ability of understanding the importance of the treatment and of its monitoring,
- the necessity of an individual oral care.

Many complications have an iatrogenic component, for example those occurring in planning or execution of the surgical stage. Consequently, the requirements of implant surgery in the aesthetic region assume a rich surgical experience in various domains, such as bone or soft tissue augmentation, prosthetic and occlusological knowledge, as well as experience in periodontal treatments and treatment of implant mucositis and peri-implantitis. As an inflammatory process, periodontitis may affect dental implants - by peri-implantitis, and, as an untreated periodontitis finally leads to the loss of the natural teeth, it may also cause the loss of dental implants [1].

The etiology of peri-implantitis may be established as early as the selection of patients for implant treatments. 86% of the patients suffering from peri-implantitis have an unsatisfactory oral hygiene or are responsible for an incorrect application of the maintenance techniques of the prosthetic devices, thus favouring the development of bacterial plaque.

The biofilms formed on either teeth or implants, or the bacterial plaque are formed of complex microbial colonies, included in a matrix of polymers derived from bacteria and saliva.

Plaque bacteria are the main etiological factors in the development of peri-implantitis, while the biofilms from the implant surfaces are described as the chief source of the pathogenic phenomena developed around the implants – actually, one of the major causes of their loss.

In cases of prosthetic dies on implants, the marginal depths should be of 0.5 mm lingually, 1 mm mesially and distally and 1.5 mm vestibularly, respectively, as these spaces will assure both masking of the junction between the dies and restoration, and an adequate access for cement cleaning. [2]

Several clinical studies stated that the absence of keratinized gingiva is associated with a statistically significant increase of either bone loss or attachment, comparatively with the keratinized gingiva zones [3].

The scope of the study was to evidence the methods for avoiding, managing and implementing an efficient treatment capable of reducing the biological complications accompanying implant therapies, for granting the oral health, comfort, functionality and aesthetics of patients.

2. MATERIALS AND METHOD

The study evaluated the patients with prosthesis charged implants or during their osseointegration period, inserted in the Clinic of The Emergency Military Hospital of Sibiu, over a 5 year period (2009-2014). Also included in the study were patients with implants inserted in other dental offices, suffering from peri-implant biological complications, to whom therapies and protocols of peri-implant maintenance had been applied.

The retrospective investigation was based on the evaluation of the treatment files and on the imagistic and clinical analyses of the 125 patients to whom 385 implants had been inserted.

The files of the patients affected by peri-implant problems recorded the protocol of the inflammation indices of soft tissues, the

therapeutic protocol for combating possible complications and the objectives of the procedures for maintaining the health condition of the peri-implant tissues. The cases of peri-implantitis under treatment were between 3 and 7 years.

3. RESULTS AND DISCUSSION

Selection of the aggregation solution of prosthetic restoration may influence the health condition of the peri-implant tissues; 12% of the causes of soft tissue inflammation were related to the presence of residual cement.

The possibility to remove the cement retained after the final aggregation of restoration is a serious argument against the application of cemented crowns on dies. Hermanides [4] recommends a subgingival placement of crowns, not farther than 1.5 mm under the gingival margin.

In cases of prosthetic dies on implants, the marginal depths should be of 0.5 mm lingual, 1 mm mesial and distal and 1.5 mm vestibular, respectively, as these spaces will assure both masking of the junction between the dies and restoration, and an adequate access for cement cleaning. [2]

As most of the restorations analyzed in the present study are stabilized through cementation, a main concern of ours was to identify the presence of the retained cement in the peri-implant ditch, 24 cases in which this presence caused peri-implant inflammation being evidenced.

A prosthesis cemented on implants should meet the following criteria:

- the matured and keratinized peri-implant gingiva should be at a minimum distance of 2 mm from the peri-implant sac,
- placing of dies plate at a maximum distance of 2 mm from the final free gingival margin,
- utilization of semi-soluble cements
- the emergence profile of the curved-shaped dies and the complete removal of the cement.

In some situations (9 cases), the cemented worked had to be removed and replaced, the cause being a difficult peri-implant approach, which prevented stopping of peri-implant

phenomena. As a matter of fact, the necessity of recovering a prosthesis cemented on the implant may be caused by a loosened screw, by an incorrect adaptation of the margin of the crown to the margin of the die, fractured ceramics, peri-implant bone resorption, impossibility of cement removal, or peri-implantitis impossibility to be healed.

The biofilms formed on teeth, implants or bacterial plaque are complex microbial colonies included in a matrix of polymers derived from bacteria and saliva.

For now, the mechanism through which oral bacteria adhere to the solid surfaces is not fully elucidated, however, in the oral cavity, a pellicle formed through absorption of the salivary components gets attached to the surface of the trans-gingival dies. The mechanism continues through the interface of oral bacteria with these biological adhesions by their fixation onto the dental or implanting surfaces [5].

Periodontal or peri-implant infections are a component of the sub-clinical oral-facial infections, which proves that the immune response controlled the bacterial attack, no clinical signs of infection: erythema, tumefaction, being present. If the inflammatory process is not treated, tissue destruction occurs, a situation considered as a disease [6].

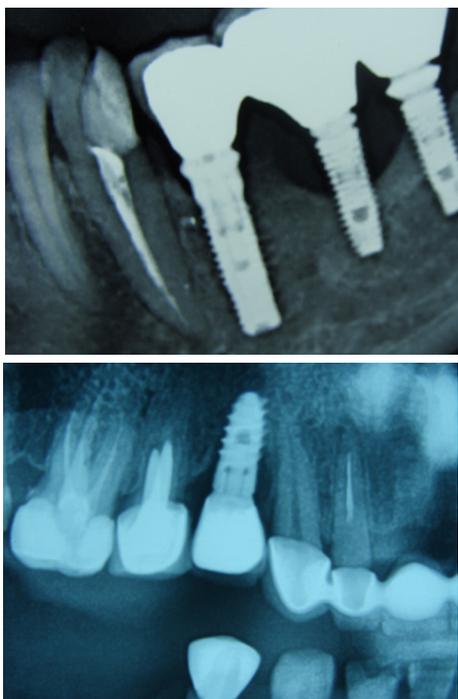


Fig. 1. Advanced bone resorption

The present study confirms that peri-implantitis is an affection with a symptomatology similar to that of chronic diseases, more precisely it is not associated with the general signs or symptoms of infection or of bacteriemia.

Only two cases of acute infection were identified - a peri-implant abscess and peri-implant cellulitis with sinus invasion, that may be characterized as being of polymicrobial nature, with a strong immune response, oedema, pain and functional disorders.

Oral infections have a polybacterial nature, 5% of them are caused by aerobic germs, 35% are anaerobic, and 60% are associated.

Aerobic bacteria are dominated by gram positive cocci (streptococci and staphylococci), whereas the anaerobic bacteria are anaerobic cocci (peptostreptococci) and gram negative anaerobic bacilli [6].

In view of standardization, measurements of inflammation involved evaluation of the bleeding index, of the index of bacterial plaque, depth of the peri-implant pocket and width of the keratinized gingiva surrounding the implants.

The keratinized gingiva plays an important role in implant sealing with fibrous and epithelial tissue, as most of the implants affected with peri-implantitis had a mobile gingiva, pseudo-attached onto implants. In this respect, absence of the keratinized tissue (< 2 mm) was registered, and several researchers reported a statistically significant increase of the inflammation degree, comparatively with the areas of keratinized gingival tissue, exceeding 2 mm [3].

The study demonstrates that, if the implants are the support of an overdenture, and a narrow keratinized gingiva occurs around them, or if the implants are surrounded by mobile tissues, the bacterial plaque is considerable, the peri-implant pocket exceeds 5 mm, and sensitivity and bleeding appear on probe touching.

Mucous irritation and accumulation of bacterial plaque is visible in senior patients with a scarce oral hygiene. Most of the failures were caused by the infections produced around implants with ball systems for maintaining the detachable prostheses, when occlusal stress is added to the mucosal infections generated by their movements.



Fig. 2. Clinical aspect of peri-implantitis

The two factors of osseointegration loss, namely peri-implantation and biomechanical stress, are difficult to evaluate separately. If the peri-implant infection may appear prior to prosthetic charges, in implants which support prosthetic structures, the biomechanical component appears as one of the causes of the implant therapy failure. The implants supporting detachable prostheses are more liable to failure, comparatively with single tooth dental implants, in which the biomechanical factor is more reduced; if neither inflammation nor stress induces significant bone losses when acting individually, association of the two factors represents a disastrous combination [7].

Comparatively with the other specialty studies of the field, the low ratio (16%) of mucosal peri-implantitis (mucositis) evidences the reduced interest of the patient for a periodical medical program and application of the techniques of individual oral care. A high frequency of inflammation around the implants was also observed in patients with mixed implant-prosthetic prostheses, when the natural teeth were affected by rebellious periodontal disease or when biomechanical overcharge occurs. Another local risk factor identified for peri-implantitis was the height of the alveolar ridge, unequal at the level of the implant site, accompanied by a premature

uncovering of the deficient slope or the absence of graft integration, when this had been applied for correcting the defect.

Peri-implant inflammation is more frequently occurring where the implant had not been covered by the flap, an incorrect irrigation of the flap and of the adjacent bone being observed when the too thin vestibular wall was resorbed, leaving the surface of the implant in contact only with the fibro-mucous structure. Loss of the vestibular bone and deepening of the peri-implant pocket was more frequent in positions in which the implants with a large diameter (4.5 mm) were placed in alveolar ridges with inadequate width (below 6 mm).

In susceptible patients or in those with periodontal pathological antecedents, the re-infection potential was always higher. The presence of some periodontal pockets on the natural teeth, even on those subjected to mechanical debridement for the elimination of the periodontal pathogenic risk, does not maintain, nor does it prevent progression of the disease, which may be easily transferred towards the peri-implant sulcus.

The multi-factorial etiology has a preponderantly local component (bacterial plaque and occlusal oversteering), as well as a series of general (smoking, decompensated diabetes, osteoporosis) or local (periodontal disease, oral hygiene, mucosal hyperplasia) favouring factors [8].

Patients suffering from peri-implantitis were subjected to a program of peri-implant soft tissue care and it were only those who did not observe the medical indications (usually coming from other dental offices) that lost their implants, while the re-infection potential is always present in susceptible patients. In such cases, techniques of peri-implant maintenance and prevention have been applied, along with multimodal therapeutic procedures, including utilization of saline solutions, solutions with soluble antibiotics, chlorhexidine (solution and gel - 0.12%) local antibiotics (spherical monocyclines with slow release - Arestin) with direct antibacterial and anti-inflammatory local effect, insertion of dexamethasone in the peri-implant pocket, decontamination of

implant surface with gel of citric acid, chlorhexidine cones with slow release. The surgical interventions involved local debridement and application of reconstructive and regenerative techniques of bone resection, with apical repositioning of the flap, bevel of the alveolar bone, addition of xenogeneic bone graft (Bio-Oss) with no mixture of autogenous bone, post-surgery monitoring, systemic antibiotherapy (600 mg clindamycin each 12 h, or 2g amoxicillin/day and metronidazol), irrigations with chlorhexidine 2 times a day for 2-3 weeks and updating of the oral hygiene instructions.

Clinical studies confirm that, invariably, peri-implantitis is associated with the occurrence of the bacterial plaque, and also with the presence of a peri-implant pocket larger than 4 mm (8.9%), partial exposure of the covering screw (4.5%) and fixed restorations without self-cleaning spaces (2%).

Implant exposure through dehiscence is a consequence of some errors made in the final surgical stage, such as: incomplete implant insertion, flap tension or oedema and prolonged sub-mucosal hematoma [9].

In susceptible patients – which suffer from a severe periodontal disease – a periodical and careful evaluation is recommended, at well-determined time intervals, for an early recognition of a peri-implant infection, and for the establishment of a rigorous therapeutic protocol and the most suitable measures to be taken.

4. CONCLUSIONS

Out of the post-surgery biological complications, peri-implantitis is the most frequent one, causing loss – sometimes total – of the alveolar bone around the osseointegrated implant.

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