http://dx.doi.org/10.35630/2199-885X/2021/11/3/17

COMPARATIVE CLINICAL AND RADIOLOGICAL ASSESSMENT OF ACUTE AND CHRONIC PERI-IMPLANT MUCOSITIS

Received 25 April 2021;
Received in revised form 26 May 2021;
Accepted 29 May 2021

Vladimir Tlustenko ✉, ***Valentina Tlustenko***, ***Elena Golovina***, ***Nikolay Popov***, ***Vladimir Koshelev***, ***Sergey Komlev***

Samara State Medical University, Samara, Russia

✉ *vlastt@yandex.ru*

ABSTRACT — Dental implants used as artificial additional support for orthopedic structures have allowed solving more than a few issues faced by dentistry. However, complications are not always avoidable, with inflammation in peri-implant tissues (as respective literature holds it) being the most common one observed.

This paper offers a view at comparative assessment of the clinical and radiological data concerning acute and chronic peri-implant mucositis. The study included 218 patients (678 implants) who had their peri-implant tissues examined, with around 166 (24.55%) found to have soft tissue inflammation of varying severity.

Finding new effective methods of treating such complications will take a deeper differentiation of inflammatory and destructive issues affecting the soft tissues at the peri-implant area. The clinical and radiological research methods carried out through the study allowed identifying the differential signs, which serve the basis for detecting the nature of the acute and chronic course of peri-implant mucositis. During that, a low level of oral hygiene plays a negative role in this inflammation etiology.

KEYWORDS — implantation, peri-implant mucositis, oral hygiene indices, periodontal indices.

INTRODUCTION

Dental implantation is one of the most promising areas in dentistry, where, along with its positive results, there are complications to be observed. Despite the variety of advanced types of implants, as well as their installation and integration methods, inflammatory complications still remain quite relevant an issue [1, 4, 7–12]. Most often, both in the early and in the late post-implantation period, peri-implant soft tissue inflammation (mucositis) occurs; should that be the case, patients suffering from the issue need rehabilitation [2], whereas the subsequent peri-implantitis may lead to complete implant disintegration [7].

The causal relationships of peri-implant diseases still remain poorly understood, the main etiological factors including dental plaque-induced bacterial infection [3]. Experience shows that the process often turns lengthy and chronic, yet in some cases it features an acute onset. While studying the currently available literature, we failed to find a description of specific features pertaining to either chronic or acute course of peri-implant mucositis. Proper and reasonable treatment will take advanced differential diagnosis of these pathologies [5], since peri-implant mucositis is an inflammatory process affecting soft tissues [6], which is of reversible nature, and this, in turn, may help avoid further implant disintegration.

Aim of study: to study the clinical and radiological features demonstrated by patients with chronic and acute course of peri-implant mucositis, thus aiming to identify the future tactics for their treatment.

MATERIALS AND METHODS

To arrive at the aims set for the study, the data obtained through monitoring the peri-implant tissues status in the area of 678 implants (218 patients) was analyzed. The observation lasted carried out for 10 years — from 2009 to 2019. Clinical analysis of long-term outcomes revealed inflammation of varying severity in the area of 166 implants (24.5%).

The outpatient control included a clinical index evaluation of periodontal and peri-implant tissues: the Green-Vermillion index (OHJ-S); the gingival Loe-Silness index; the Muhlemann index, as well as the periodontal Russel index; the dental and implant mobility Miller-Fleszar index; the integral implant functioning factor (by M. Z. Mirgazizov). The statistical data processing was done using the SPSS 25 software package, with the values of the arithmetic mean (M) and standard deviation (SD) of quantitative features and percentage for nominal values calculated. The groups were compared through the Student, Mann-Whitney, and Pearson chi-square (χ^2) criteria with the Yates correction. The results were considered different at the statistically significant level of $p<0.05$.

RESULTS AND DISCUSSION

A detailed analysis of clinical images showing peri-implant mucositis revealed different levels of inflammation. There was a wide clinical variability of the

signs, which suggested a more detailed investigation. It helped find out that 104 cases of mucositis affecting the sites at 83 implants (79.8%) (Group I), had an inflammation of the chronic type. The patients complained of a burning sensation, slight pain in the gums when touched, bleeding gums around the implant, and some minor swelling. There was also congestive hyperemia observed, while no peri-implant pockets or discharge from the peri-implant cuff were detected. Part of the patients had never suspected the pathology and learned about it only at an outpatient checkup. The clinical image matched the nature of chronic inflammation in the soft tissues. At 21 implants (20.2%) (Group II), the degree of inflammation affecting the peri-implant zone was more severe: significant edema of the peri-implant gum, bleeding at light touch, significant hyperemia, serous or purulent discharge from the peri-implant cuff during palpation, while there was often a false peri-implant pocket developing due to the respective peri-implant soft tissue edema. There was no implant mobility observed, while the clinical presentation reflected acute inflammation in the soft tissues. Table 1 shows clinical and radiological symptoms of Groups I and II.

In order to identify distinctive clinical signs for differential diagnostics, the study implied comparative assessment of acute and chronic peri-implant mucositis clinical symptoms. Given acute mucositis, the pain in 81% of cases is significant ($p<0.001$), while chronic mucositis offered no sharp pain in 69% of cases, with a third of patients never complaining of pain. Gum bleeding, though, proved an inevitable symptom in both groups ($p=0.877$).

Gum palpation in Group II was different meaning that in 90.5% of the cases it was sharply painful ($p<0.001$), which confirmed acute inflammation, while the majority of the patients in Group I (80%) reported moderate pain, another 6% reporting none of it. The type of the discharge from the peri-implant cuff differed, too. The shares of serous discharge in the groups in question were comparable and accounted for around a third of the cases (33.7% in Group I and 28.5% — in Group II, $p=0.849$). The remaining cases, however, differed radically. In Group II, 71.4% of the cases were found to have some purulent discharge, which is a significant factor pointing at purulent inflammation. As for Group I, 66.6% of the patients had no discharge ($p<0.001$).

Given that oral hygiene is one of the major factors ensuring stable functioning of implants, we studied a number of indices pertaining to the chronic and acute course of peri-implant mucositis. Table 2 below shows the results obtained.

In case of chronic peri-implant mucositis, oral hygiene, following the Green-Vermillion and Muhlemann indices, was not good, yet only reflecting a satisfactory level; the Loe-Silness index reflected a degree of inflammation that could be described as mild, while in case of acute course, the oral hygiene was significantly worse, matching a poor level, whereas the degree of inflammation, based on the Loe-Silness index, featured a medium degree of severity. There were significant differences identified in the hygiene and periodontal status indices. For all the three indices, higher values were typical for patients with acute peri-implant mucositis ($p<0.001$).

Table 3 contains data on the periodontal status indices.

Patients with acute peri-implant mucositis featured a periodontal Russel index value that exceeded significantly that in patients with chronic mucositis ($p<0.001$). The tooth and implant mobility, though, differed neither statistically nor clinically (stable in all patients, $p=1$), while the integral implant functioning factor (by Mirgazizov) fell within norm in both groups.

An X-ray examination of peri-implant tissues revealed no bone resorption, which confirmed inflammatory issues only in soft tissues.

The obtained results suggest that poor oral hygiene is a real factor leading to inflammation. This fact points at the effect that the microbial factor has on the degree of inflammation developing at teeth and implants, as well as potential cross-infection from teeth to implants.

In view of the above, it is advisable to follow the oral hygiene status dynamics as well as the status of peri-implant tissues, both at the stage of implantation and implant-based prosthetics.

A comparative assessment of the clinical image presented by peri-implant mucositis in Groups I and II revealed distinctive features that can be considered as differential symptoms, whereas the entire issue requires further research.

CONCLUSION

Clinically and radiologically, peri-implant mucositis of a chronic course can be identified based on the combination of the following features: bleeding peri-implant gum; slight soreness and swelling of the peri-implant gum; lack of implant mobility; lack of peri-implant pocket; lack of peri-implant bone tissue destruction; a direct relationship between the hygiene index indicators and mucositis; lack of issues in the patient's overall condition.

Acute peri-implant mucositis was clinically diagnosed subject to a combination of the following signs: significant pain in the peri-implant gum; sharp

Table 1. *Comparative assessment of clinical and radiological signs of peri-implant mucositis (Group I and II)*

Symptom	Peri-implant mucositis; n=104			
	Chronic course (Group 1; n=83)		Acute course (Group 2; n=21)	
	abs	%	abs	%
Pain: significant	0	0	17	80.95
insignificant	57	68.67	4	19.05
none	26	31.33	0	0
Bleeding gums: seldom	0	0	0	0
often	3	3.61	0	0
always	80	96.39	21	100
Gum palpation: mildly painful	66	79.52	2	9.52
painless	5	6.02	0	0
sharpy painful	12	14.46	19	90.48
Hyperemia: insignificant	10	12.05	0	0
significant	68	81.93	3	14.29
sharp	5	6.02	18	85.71
Discharge from the peri-implant cuff: serous	28	33.7	6	28.57
purulent	0	0	15	71.43
none	55	66.3	0	0
Implant mobility: immobile	83	100	21	100
Osteoporosis: present	0	0	0	0
none	83	100	21	100
Peri-implant bone destruction: present	0	0	0	0

Table 2. *Index evaluation of oral hygiene, periodontal and peri-implant tissue status in patients with peri-implant mucositis, Groups I and II*

Peri-implant mucositis	Green-Vermillion index (OHI-S)		Loe- Silness gum index		Muhlemann index	
	Abs.	Assessment	Abs.	Assessment	Abs.	Assessment
Chronic course (Group 1; n=83)	2.5±0.21	satisf.	1.3±0.11	Mild degree	1.8±0.17	Medium inflammation
Acute course (Group 2; n=21)	3.3±0.26	poor	2.4±0.19	Medium inflammation	2.2±0.30	Severe inflammation

Table 3. *Index assessments of periodontal and peri-implant area tissues in patients with peri-implant mucositis, Groups I and II*

Peri-implant mucositis	Russel periodontal index		Tooth and implant mobility Miller-Fleszar		Integral implant functioning factor (by Mirgazizov)	
	Abs.	Assessment	Abs.	Assessment	Abs.	Assessment
Chronic course (Group 1; n=83)	1.2±0.08	Mild degree	0	Stable	1.0	Norm
Acute course (Group 2; n=21)	1.6±0.11	Medium degree	0	Stable	1.0	Norm

soreness, hyperemia and swelling of the peri-implant cuff; serous and purulent discharge; peri-implant *false pocket*; constant and significant bleeding of the peri-implant gum; a direct relationship between the hygiene index and mucositis, as well as lack of destruction in the peri-implant bone tissue.

A combination of these factors is the issue behind a fairly frequent inflammation in the soft peri-implant tissues, which, in turn, can result in a disintegrated implant.

REFERENCES

1. **Olesova, V.N.** The incidence of inflammatory complications in peri-implant tissues according to long-term clinical analysis / D.A. Bronstein, A.F. Stepanov, A.N. Kalinin, I.S. Lyashko // Dentist. Minsk. – 2017 (1). – P. 58–62.
2. **Bronstein, D.A.** Results of orthopedic rehabilitation of patients with complete absence of teeth depending on the design of prostheses on dental implants / D.A. Bronstein, E.E. Olesov, R.S. Zaslavsky, N.A. Uzunyan, K.V. Shmatov, S.A. Lobanov // Russian Bulletin of Dental Implantology. – 2017. – No 2 (36). – P. 45–49.
3. **Ivanov, S.A.** Dynamics of hygienic and periodontal indices at the stages of implant treatment. Ivanov, Z.U. Sakaeva, D.I. Morozov, D.V. Martynov, M. Ya. Salimov, E.E. Olesov, E.A. Olesova // Russian dental journal. - 2020.Vol. 24 (4). – P. 225–228.
4. **Yaremenko, A.I.** Analysis of complications of dental implantation / A.I. Yaremenko, M.V. Kotenko, S.N. Meisner, V.V. Razdorsky // Institute of Dentistry. – 2015. – №. 2 (67). – P. 46–49.
5. **Carcuac, O**/ Adjunctive systemic and local antimicrobial Therapy in the Surgical treatment of peri-implantitis: A Randomized Controlled clinical Trial / O. Carcuac [et al.] // J Dent. Res. – 2016. Vol. 95 (1). – P. 50–57. DOI: 10.1177/0022034515601961
6. **Mombelli, A.** The epidemiology of peri-implantitis/ A. Mombelli, N. Muller, N. Cionca // Clin.Oral. Implant Res. – 2012. – 3 (Suppl 6). – P. 67–76. https://doi.org/10.1111/j.1600-0501.2012.02541.x
7. **Khachikyan, N.A.** Comparative pathogenetic assessment of the factors of post-implantation complications and their correction using modern methods of prevention of oral diseases. Khoachikyan, O. V. Leontiev, A.V. Dergunov, Yu. A. Parfenov // Fundamental research. - 2015. – No 1–7. – P. 1462–1465. URL: http://fundamental-research.ru/ru/article/view?id=37992 (date of the application: 25.04.2021).
8. **Kupryakhin S.V., Lepilin A.V., Kupryakhin V.A.** Optimization of dental implantation combined with closed sinus lift in patients with low maxillary sinus floor // Archiv EuroMedica. 2019. Vol. 9; 2: 117–121. https://doi.org/10.35630/2199-885X/2019/9/2/117
9. **Kupryakhin S.V., Lepilin A.V., Kupryakhin V.A., Postnikov M.A.** Potential introduction of cell technologies to improve dental implant surface preparing // Archiv EuroMedica. 2019. Vol. 9; 2: 122–129. https://doi.org/10.35630/2199-885X/2019/9/2/122
10. **Karpyuk V.B., Perova M.D., Gilevich I.V., Sevostyanov I.A.** Cell-potentiated regenerative technologies for restoring jaw bone tissues in case of odontogenic inflammatory & destructive process // Archiv EuroMedica. 2019. Vol. 9. No 2. P. 140–146. https://doi.org/10.35630/2199-885X/2019/9/2/140
11. **Karpyuk V.B., Perova M.D.** Innovation-based approach in reconstruction of reduced jaw alveolar ridge bone using cell regeneration technologies // Archiv EuroMedica. 2019. Vol. 9. No 2. P. 147–155. https://doi.org/10.35630/2199-885X/2019/9/2/147
12. **Bairikov I.M., Gaivoronskaya T.V., Dedikov D., Stolyarenko P.Yu.** Reconstruction of mandibular defects using individual vascularized autografts combined with macroporous titanium fiber material // Archiv EuroMedica. 2021. Vol. 11. No 1. P. 147–159. https://doi.org/10.35630/2199-885X/2021/11/1.32