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CLINICAL AND FUNCTIONAL CHANGES IN PERI-IMPLANT TISSUES DURING THEIR EARLY FUNCTIONAL LOAD IN FIXED PROSTHETICS.

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Abstract:

This study explores the effects of early functional loading on the clinical and functional status of peri-implant tissues in patients undergoing dental implant rehabilitation. The research aimed to investigate how early masticatory loads influence microcirculation in the tissues surrounding dental implants, using laser Doppler flowmetry (LDF) to measure hemodynamic parameters. The study included 35 patients aged 20–45 years, divided into two groups: one group received delayed loading (Group 1), while the other group received early functional loading (Group 2) immediately after implant placement.

Keywords: Dental Implants, Early Functional Loading, Osseointegration, Hemodynamics, Microcirculation, Laser Doppler Flowmetry (LDF), Peri-implant Tissues, Prosthetic Rehabilitation

The results showed that early functional loading significantly increased capillary blood flow and vasomotor activity in the peri-implant region during the first few months, reflecting an adaptive hyperemic response to the implant. Over time, microcirculation in both groups improved, but Group 2 exhibited more dynamic hemodynamic changes, indicating enhanced tissue perfusion and stabilization of blood flow in the long term. The study concludes that early functional loading promotes favorable adaptations in the microvascular bed, improving the clinical outcomes of implant rehabilitation.The impact of dental prostheses on the tissues of the prosthetic field, as well as on the body as a whole, is multifaceted. It is determined, on the one hand, by the nature, intensity, and duration of exposure to the stimulus (dental prosthesis), on the other hand, by the condition and reaction of the tissues of the prosthetic bed [1,2]

The results of orthopedic treatment of patients using dental implants mainly depend on the functional state and reactive properties of supporting tissues, as well as on the nature of the distribution of masticatory load on supporting structures [1, 3.4,6].

Further study of the mechanisms of osseointegration depending on the timing of functional loading should solve many problems, both theoretically and practically. Considering the importance of early rehabilitation of patients with partial or complete tooth loss when using dental implants, the problem of finding the optimal timing of functional loading on dental implants is currently topical.

THE AIM OF THE STUDY.

Study of the influence of early functional masticatory loads on the clinical and functional status of peri-implant tissues.

RESEARCH MATERIALS AND METHODS.

Hemodynamic studies in patients using implants with early functional load.

In order to study the functional state of peri-implant tissues, we conducted hemodynamic parameters using the laser Doppler flowmetry method using the LAKK-01 capillary blood flow analyzer (Scientific Production Enterprise "Lazma").

For this study, 35 patients aged between 20 and 45 years (of which 18 were women and 17 were men) without somatic pathology were examined. They were divided into 2 groups:

Group 1: 15 patients who, after implant placement, underwent orthopaedic structures according to the well-known delayed procedure.

Group 2: 20 patients who, after implant placement, underwent early functional loading.

The obtained indicators of microcirculation will be compared with known data in individuals with intact dentition. Dynamic observations of the state of microcirculation in gingival tissues were carried out in the area of dentition defects within 2 weeks, 1 month, 3, 6, and 12 months after tooth extraction.

I. Hemodynamic Studies

Analysis of the LDF results in patients from the first group, conducted one month after implantation, revealed a significant improvement in microcirculation indices. However, these indices remained lower than the initial values, indicating that venous congestion in the tissues of the alveolar process mucosa in the

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implantation area persisted. The rhythmic components of tissue blood flow, as observed in the frequency spectrum of LDF-grams, showed a decrease of 41-82% compared to initial levels. This reduction indicates the presence of venous congestion in the microcirculatory bed of the peri-implant tissues. Vasodilation of the microvessels was replaced by vasoconstriction, leading to a 75% increase in the tonic tension of the vascular wall. This change reflexively reduced arterial inflow in the context of venous congestion (Fig. No. 1).

3 months after implantation, congestion in the microcirculatory bed subsided, as evidenced by an increase in the intensity of blood flow and vasomotor activity of the microvessels by 57% and 59%, respectively. Their values exceeded the initial data, which were characterized by increased blood circulation.

The rhythmic components of LDF-grams increased by 6-16%, with the pulse flow showing the most significant rise of 52%. This suggests an enhancement in blood flow within the arteriolar and venular regions of the microvasculature. Concurrently, vasoconstriction weakened, resulting in decreased intravascular resistance, which points to improved microvascular permeability. However, the efficiency of microcirculation decreased by 12%, indicating ongoing tensions in the regulatory mechanisms of tissue blood flow, particularly during the restructuring of bone tissue.

6 months after implantation, the obtained trend of microcirculatory indicators was maintained, which indicated an improvement of microcirculation.

LDF studies conducted on patients in the second group one day after implantation with immediate loading demonstrated a 75% increase in capillary blood flow. This finding indicates enhanced tissue perfusion in the area surrounding the implant. Blood flow activity (σ) rose nearly 2.5 times, while the vasomotor activity of microvessels (Kv) increased by 40%. This suggests the development of hyperemia in the microcirculatory bed as a response to the traumatic intervention in the jaw's bone tissue (see Fig. 3).

After 3 months, the capillary blood flow level (M) in the tissues surrounding the implants decreased by 17%, remaining still quite high relative to the initial value. The microcirculation intensity fell by 31% relative to the initial value. Vasomotor activity (Kv) decreased by 2.5 times compared to the preoperative period, indicating the elimination of the hyperemia phenomenon.

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After 12 months of use, dental implants that were placed immediately into the alveolar bone showed improvements in tissue blood flow (M), its intensity (σ), and the vasomotor activity of microvessels (Kv). These changes indicate a trend towards the normalization of hemomicrocirculation in the tissues surrounding the implants (see Fig. No. 2).

In the frequency spectrum of Dopplerograms, there was a notable change in the ratio of rhythmic components associated with tissue perfusion. This was characterized by a 26% increase in the contribution of vasomotion (ALF/σ) to the rhythmic structure of fluxmotion, indicating heightened active modulation of tissue perfusion. Simultaneously, fluctuations in high frequency (AHF/σ) and pulse (ACF/σ) increased by 25% and 62%, respectively, which suggests the development of hyperemia in the microcirculatory bed. Additionally, vascular tone rose by 29%, and intravascular resistance doubled, indicating impaired blood outflow. As a result of these hemodynamic disturbances, the efficiency of microcirculation function decreased by 14%.

A comparative analysis of hemodynamic parameters in patients from both groups revealed a restoration of the rhythmic components in the LDF-grams, indicating normal blood flow in the microcirculatory system. Additionally, vascular tone decreased by 18%, returning to its initial level. The efficiency of microcirculation was consistent with the initial measurements, suggesting a stabilization of tissue blood flow. After the placement of prosthetics on single implants, a week later, there was a notable increase in capillary blood flow (by 36%) in the gum tissues. Additionally, the intensity of this blood flow increased by 25%, and the vasomotor activity of the microvessels rose by 2.1 times. These changes indicate the development of hyperemia in the microcirculatory bed.

The hemodynamic parameters of peri-implant tissues show a significant adaptive response of the microvascular bed to early functional loading. Based on the hemodynamic measurements from the second group of patients, it can be confidently concluded that the intensity of hemodynamic processes in the tissues surrounding the implants is activated as a result of functional chewing loads.

CONCLUSION

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The findings of this study confirm the effectiveness of early functional loading in improving the clinical and functional status of peri-implant tissues. The hemodynamic responses, as measured by laser Doppler flowmetry, demonstrate significant adaptive changes in the microvascular bed, particularly in terms of increased blood flow intensity and vasomotor activity. These results highlight the beneficial effects of early functional loading on tissue perfusion and the stabilization of blood flow in the peri-implant region.

LITERATURE

1. Tashpulatova K. et al. Technique for eliminating traumatic occlusion in patients using Implant-supported bridges //European Journal of Molecular & Clinical Medicine. – 2020. – T. 7. – No. 2. – pp. 6189-6193.
2. Safarov MT, Ro'zimbetov XB, Tashpulatova KM, Safarova NT (2023). Tish Implantatlarida To'liq Yoyli Protezlarning Biomexanikasi. *Conferences* , 35–36. extracted from https://journals.scinnovations.uz/index.php/aposo/article/view/1030
3. Safarov, M., Akhmadjonov, M., & Ruzimbetov, A. (2022). Study of microbiological status in patients with perimplantitis in the area of bridges. *Conferences* , 138. retrieved from https://journals.scinnovations.uz/index.php/aposo/article/view/111
4. Tashpulatova K. M., Safarov M. T., & Ruzimbetov H. B. (2023). Hemodynamic Changes In The Mucous Membrane Of The Alveolar Ridge Of The Lower Jaw With Partial Defects Of The Dentition. EDUCATION, SCIENCE AND INNOVATION IDEAS IN THE WORLD, 34(4), 42–48. Retrieved from https :// www . newjournal . org / index . php /01/ article / view /9797
5. Safarov M.T., Tashpulatova K.M., & Ruzimbetov Kh.B. (2023). Analysis Of The Effectiveness Of Methods For Fixing Artificial Crowns And Bridges On Dental Implants. EDUCATION, SCIENCE AND INNOVATION IDEAS IN THE WORLD, 34(4), 36–38. Retrieved from https :// newjournal . org / index . php /01/ article / view /9795
6. Tashpulatova K.M., Safarov M.T., Sharipov S.S., Ruzimbetov H.B. (2023). Medium-term Forecast of the Efficiency of Fixed Dentures on Dental Implants. Conferences, 101–103. retrieved from http://journals.scinnovations.uz/index.php/aposo/article/view/1117
7. Safarov M.T., Shirinova Sh., Tashpulatova K.M., Ruzimbetov H.B. (2023). Adaptation of the Chewing Muscles in Patients with Prosthetic Bridges Fixed on Dental Implants. Conferences, 93–95. retrieved from http://journals.scinnovations.uz/index.php/aposo/article/view/1113
8. Ruzimbetov Kh.B., Safarov M.T., Tashpulatova K.M. (2023). Microbiological Studies for Inflammatory Complications in the Peri-Implant Areas. Conferences , 79–82. retrieved from http :// journals . scinnovations . uz / index . php / aposo / article / view /1107
9. Safarov M.T., Tashpulatova K.M., Ruzimbetov H.B., Shakirova D. (2023). Clinical and X-ray Study of Changes in Hard Tissues Around the Implant in Patients with Partial Edentia. *Conferences* , 89–90. retrieved from http :// journals . scinnovations . uz / index . php / aposo / article / view /1111
10. Safarov MT et al. Evaluation of the Compensatory-Adaptive Mechanisms of Bridge Prosthetics at the Terminal Dentition Defects with the Use of Intraosseous Implants by the Method of Electromyography //American Journal of Medicine and Medical Sciences. – 2020. – T. 10. – No. 9. – pp. 657-659.
11. Safarov M. T. et al. Microbiological status of patients using artificial crowns supported by dental implants for peri-implantitis // Conferences. – 2023. – P. 376-379.
12. Safarov M.T., Ruzimbetov Kh.B., Safarova N.T., Kholboev H. (2023). Study of the Functional Efficiency of Bridges Fixed on Dental Implants. *Conferences* , 372–374. retrieved from http://journals.scinnovations.uz/index.php/aposo/article/view/902
13. Safarov, M., & Tashpulatova, K. (2022). Study Of The Microflora Of The Oral Cavity In Patients Using Dental Bridges With Dental Implants For Peri-Implantitis. *Conferences* , 172–173. retrieved from http://journals.scinnovations.uz/index.php/aposo/article/view/78
14. Safarov MT et al. Permanent prosthetics on dental implants //Eurasian Journal of Otorhinolaryngology-Head and Neck Surgery. – 2023. – T. 2. – S. 70-74. https://doi.org/10.57231/j.ejohns.2023.2.3.012
15. Safarov M.T., Akhmadzhonov M., Ruzimbetov A. Study of microbiological status in patients

World Bulletin of Public Health (WBPH)
Available Online at: https://www.scholarexpress.net
Volume-40, November 2024
ISSN: 2749-3644

with perimplantitis in the area of bridges. – Conferences, 2022.
16. Safarov MT, Tashpulatova KM, Ruzimbetov HB To Question About Osteointegration Dental Implants And Ways Her Stimulations //TADQIQOTLAR. – 2023. – T. 27. – No. 3. – pp. 82-89.
17. Safarov MT, Tashpulatova KM, Ruzimbetov HB Modern Representation About Osteointegration Of Dental Implants //TADQIQOTLAR. – 2023. – T. 27. – No. 3. – pp. 98-106.
18. Safarov MT, Tashpulatova KM, Ruzimbetov HB The Problem Of Inflammation In Peri-Implant Tissue And Factors Affecting Its Course //TADQIQOTLAR. – 2023. – T. 27. – No. 3. – pp. 90-97.
19. Musaeva K. A. et al. Biomechanics of fixed full-arch prostheses supported by implants // Conferences . – 2023. – P. 370-372.
20. Musaeva , K. (2023). Prosthodontic treatment of patients with osteoporosis. Current problems of dentistry and maxillofacial surgery 4, 1(02), 103. retrieved from https://inlibrary.uz/index.php/problems-dentistry/article/view/16170
21. Musaeva K. A. On the Issue of Orthopedic Rehabilitation for Osteoporosis //Conferences. – 2022. – P. 90-91.
22. Musaeva, K., Asom, B., & Saliev, S. (2018). Improving the fixation of complete removable plate dentures in conditions of severe atrophy in the area of the maxillary tuberosities. Stomatologiya, 1(2(71), 27–28. retrieved from https://inlibrary.uz/index.php/stomatologiya/article/view/1714
23. Musaeva, K. (2017). Features of the dental status of patients with chronic kidney disease. Stomatologiya 1 (1 (66) , 62–64 . retrieved from https://inlibrary.uz/index.php/stomatologiya/article/view/2364
24. EXPERIENCE IN THE USE OF MATHEMATICAL MODELING TO PREDICT THE LONG-TERM DURABILITY OF PROSTHETICS ON DENTAL IMPLANTS. (APPLICATION OF MATHEMATICAL MODELING IN PROSTHETICS ON IMPLANTS.). (2024). Western European Journal of Modern Experiments and Scientific Methods, 2(3), 14-23.
25. https://westerneuropeanstudies.com/index.php/1/article/view/453
26. Tashpulatovich S. M. et al. DENTAL IMPLANTS AS THE MOST APPROPRIATE METHOD OF ANCHORING FIXED PROSTHESES //INTERNATIONAL JOURNAL OF EUROPEAN RESEARCH OUTPUT. – 2024. – T. 3. – №. 5. – C. 79-85. http://ijero.co.uk/index.php/ijero/index
27. Tashpulatovich S. M. et al. STRUCTURAL CHARACTERISTICS OF PERI-IMPLANT SOFT TISSUE FACTORS INFLUENCING THE DEVELOPMENT OF INFLAMMATION IN THE IMPLANT CAVITY AND PERI-IMPLANT //Ta'lim innovatsiyasi va integratsiyasi. – 2024. – T. 18. – №. 6. – C. 106-111.
28. Tashpulatovich S. M. et al. STRUCTURAL CHARACTERISTICS OF PERI-IMPLANT SOFT TISSUE FACTORS INFLUENCING THE DEVELOPMENT OF INFLAMMATION IN THE IMPLANT CAVITY AND PERI-IMPLANT //Ta'lim innovatsiyasi va integratsiyasi. – 2024. – T. 18. – №. 6. – C. 106-111.
29. Tashpulatovich S. M. et al. RESEARCH TO ASSESS MICROCIRCULATION PARAMETERS AND MORPHOFUNCTION OF GINGIVAL TISSUE DURING PROSTHETICS ON DENTAL IMPLANTS //Ta'lim innovatsiyasi va integratsiyasi. – 2024. – T. 18. – №. 6. – C. 93-96.
30. Сафаров М. Т. и др. СОПОСТАВЛЕНИЕ СПОСОБОВ ЗАКРЕПЛЕНИЯ НЕСЪЕМНЫХ ОРТОПЕДИЧЕСКИХ КОНСТРУКЦИЙ С ИСПОЛЬЗОВАНИЕМ ИМПЛАНТАТОВ //Ta'lim innovatsiyasi va integratsiyasi. – 2024. – T. 18. – №. 6. – C. 97-105.
31. Tashpulatovich S. M. et al. ANALYSIS OF COMPLICATIONS ARISING DURING PROSTHETICS WITH FIXED CONSTRUCTIONS OF DENTAL PROSTHESES FIXED ON TWO-STAGE OSTEOINTEGRATED SCREW IMPLANTS, THEIR ELIMINATION AND PREVENTION //Лучшие интеллектуальные исследования. – 2023. – T. 10. – №. 5. – C. 163-167.
32. Tashpulatovich S. M. et al. FREQUENCY AND STRUCTURE OF CLINICAL COMPLICATIONS DEPENDING ON THE METHOD OF FIXING A FIXED PROSTHETIC CONSTRUCTION ON DENTAL IMPLANTS //Лучшие интеллектуальные исследования. – 2023. – T. 10. – №. 5. – C. 159-162.
33. Tashpulatovich S. M. et al. BIOMECHANICAL PROBLEMS OF CEMENT FIXATION OF ARTIFICIAL CROWNS ON IMPLANTS //Лучшие интеллектуальные исследования. – 2023. – T. 10. – №. 5. – C. 151-158.

World Bulletin of Public Health (WBPH)
Available Online at: https://www.scholarexpress.net
Volume-40, November 2024
ISSN: 2749-3644

34. Tashpulatovich S. M. et al. CLINICAL ASPECTS OF THE APPLICATION OF AN INDIVIDUAL RECONSTRUCTIVE IMPLANT FROM LYOPHILIZED ALLOGENIC MATERIAL IN SEVERE ATROPHY OF JAW BONE TISSUE //TADQIQOTLAR. – 2023. – T. 27. – №. 4. – C. 136-146.
35. Tashpulatovich S. M. et al. SOCIOLOGICAL ASPECTS MODERN DENTAL IMPLANTATIONS WHEN PLANNING FIXED DENTAL PROSTHETICS //TADQIQOTLAR. UZ. – 2023. – T. 27. – №. 4. – C. 127-135.
36. Tashpulatovich S. M. et al. COMPARATIVE MATHEMATICAL MODELING OF STRENGTH AND DEFORMATION PARAMETERS OF METAL-CERAMIC CROWNS WITH SCREW AND CEMENT FIXATION TO IMPLANTS //TADQIQOTLAR. – 2023. – T. 27. – №. 4. – C. 147-152.
37. Tashpulatova K. M. et al. EXPERIENCE IN THE USE OF MATHEMATICAL MODELING TO PREDICT THE LONG-TERM DURABILITY OF PROSTHETICS ON DENTAL IMPLANTS.(APPLICATION OF MATHEMATICAL MODELING IN PROSTHETICS ON IMPLANTS.) //Western European Journal of Modern Experiments and Scientific Methods. – 2024. – T. 2. – №. 3. – C. 14-23.
38. Safarov Murod Tashpulatovich, Musayeva Karima Alisherovna, Tashpulatova Kamilla Maratovna, Buribayeva Madina Gafurjon qizi, Ruzimbetov Hayot Bazorboyevich, & Ahmadjonov Muhammadismoil Anvarjon o'g'li. (2024). APPLICATION OF ULTRASONIC TECHNOLOGIES IN ORTHOPEDIC DENTISTRY. Web of Medicine: Journal of Medicine, Practice and Nursing, 2(10), 127–132. Retrieved from https://webofjournals.com/index.php/5/article/view/1943