MECHANICAL AND CLINICAL COMPLICATIONS OF FIXED PROSTHETIC RESTORATIONS ON TWO-STAGE OSSEOINTEGRATED SCREW IMPLANTS: ANALYSIS AND PREVENTIVE STRATEGIES

K.M.Tashpulatova [1]
A.E.Lisitsyna [2]
[1] Assistant of the Department of Hospital Orthopedic Dentistry,
[2] Resident of the Department of Hospital Orthopedic Dentistry,
Tashkent State Medical University, Tashkent
https://doi.org/10.5281/zenodo.18810456

ARTICLE INFO

Qabul qilindi: 20- fevral 2026 yil
Ma'qullandi: 25- fevral 2026 yil
Nashr qilindi: 28- fevral 2026 yil

KEY WORDS

implant, prosthetics, complications, screw loosening, prevention, fixed constructions.

ABSTRACT

This study presents a comprehensive analysis of a ten-year clinical experience in prosthetic rehabilitation using fixed constructions supported by two-stage osseointegrated screw implants. The primary objective was to evaluate the long-term clinical performance of such implant-supported restorations, identify the types and frequency of biological and mechanical complications, determine the underlying etiological factors contributing to their development, and formulate effective strategies for their management and prevention.

The research was based on clinical observations, radiographic assessments, and retrospective analysis of 25 implants placed in patients who underwent prosthetic treatment with fixed implant-supported restorations. Special attention was paid to peri-implant tissue condition, implant stability, prosthetic component integrity, and occlusal load distribution. Over the observation period, the overall complication rate was 8.15%. The most frequently encountered complications were mechanical in nature, predominantly screw loosening and fractures at the abutment–implant connection. These complications were associated with factors such as inadequate preload, micro-movements under functional loading, occlusal overload, and inaccuracies in prosthetic fit.

Biological complications were minimal and did not significantly affect implant survival; however, their potential impact on long-term outcomes was considered in the comprehensive evaluation. The findings emphasize the critical importance of precise prosthetic

planning, correct torque application, passive fit of the superstructure, and regular maintenance protocols. Based on the identified causes, a set of corrective and preventive measures was developed, including optimization of occlusal schemes, reinforcement of abutment connections, strict adherence to torque control protocols, and systematic follow-up examinations. Implementation of these strategies significantly reduced the recurrence of mechanical failures and contributed to improved long-term stability and predictability of implant-supported fixed prosthetic restorations..

Relevance. In recent years, there has been a steady and significant increase in the number of patients undergoing dental rehabilitation with osseointegrated two-stage screw implants. Advances in implant surface technology, surgical protocols, diagnostic imaging, and prosthetic materials have substantially expanded the indications for implant therapy. As a result, implant-supported fixed restorations have become one of the most widely used and predictable treatment options for the replacement of partial and complete tooth loss. Consequently, the overall number of fixed prosthetic constructions supported by two-stage osseointegrated screw implants has grown proportionally to the increase in implant placement procedures [1].

Despite the high survival rates traditionally reported for implant systems, the growing volume of long-term clinical observations has revealed an increasing incidence of complications associated with the prolonged functioning of fixed orthopedic structures supported by osseointegrated screw implants [2,3]. These complications may be mechanical (such as screw loosening, fracture of prosthetic components, or chipping of veneering materials) or biological (including peri-implant mucositis and peri-implantitis). With extended service life and exposure to continuous functional loading, even minor inaccuracies in prosthetic design, occlusal scheme, or component connection can lead to cumulative stress, micro-movements at the implant–abutment interface, and subsequent technical failures.

The rise in complication frequency highlights the need for detailed clinical analysis of long-term outcomes, identification of risk factors contributing to mechanical and biological failures, and development of evidence-based preventive strategies. Therefore, studying the patterns, causes, and management approaches for complications in fixed implant-supported prosthetic constructions is of considerable scientific and practical importance for improving treatment predictability, durability, and overall patient satisfaction [4].

Goal and Objectives. The primary aim of this study was to improve the quality and long-term effectiveness of orthopedic (prosthetic) care provided to patients who had previously undergone dental implantation using a two-stage surgical protocol with osseointegrated cylindrical implants. Particular emphasis was placed on enhancing the reliability, functional stability, and clinical longevity of fixed implant-supported prosthetic constructions.

To achieve this objective, the following tasks were defined:

1. Based on accumulated clinical experience, to determine the nature, structure, and frequency of complications arising during prosthetic treatment with fixed orthopedic constructions supported by intraosseous two-stage cylindrical osseointegrated implants.

2. To analyze the time intervals between prosthetic loading and the onset of complications, identifying early and late failures and their potential etiological factors.

3. To develop effective clinical approaches for the management and elimination of identified complications.

4. To formulate practical, evidence-based recommendations aimed at preventing mechanical and biological complications in long-term implant-supported prosthetic rehabilitation.

Materials and Clinical Observations. During the period from 2018 to 2022, fixed (non-removable) orthopedic constructions were fabricated and delivered on 25 osseointegrated two-stage cylindrical implants. These restorations were placed following standard surgical and prosthetic protocols, with attention to osseointegration, prosthetic fit, occlusal balance, and torque control of prosthetic components.

Within the same observation period, 11 patients presented with orthopedic complications related to implant-supported fixed prosthetic structures. These patients had a total of 22 implants supporting permanent prosthetic constructions. Complications were identified in orthopedic structures associated with 9 implants. The observed complications were predominantly mechanical in nature and included screw loosening, instability of the abutment–implant connection, and structural component damage.

The calculated overall rate of orthopedic complications amounted to 8.15% of the total number of installed implants supporting permanent fixed prosthetic constructions. This indicator reflects the proportion of implants affected by prosthetic complications relative to the total number of implants restored with definitive fixed structures.

The analysis of these clinical cases enabled identification of the main contributing factors, assessment of complication timing in relation to prosthetic loading, and development of targeted corrective and preventive measures aimed at improving long-term treatment outcomes.

Management of Complications. Mobility of the fixed orthopedic structure associated with loosening of the fixing screw connecting the implant and the abutment was observed in eight cases [6,7]. In these situations, the complication was eliminated by sectioning (sawing) the prosthetic construction, removing it, unscrewing and replacing the fixation screws, and subsequently fabricating a new orthopedic structure according to generally accepted prosthetic protocols. Screw replacement was considered necessary due to the possibility of deformation or curvature resulting from pronounced mobility of the entire construction under functional load.

In four additional cases, where mobility of the prosthetic structure was minimal, removal was performed without compromising the integrity of the construction using a specialized removal device (Kop apparatus). Since the crowns had been cement-retained, this method allowed atraumatic access and preservation of the prosthesis whenever possible [5,8].

One of the most severe mechanical complications encountered was fracture of the screw connecting the abutment to the implant. In both observed cases of screw fracture, it was not

possible to retrieve the remaining fragment by conventional methods. Therefore, the residual screw portions were carefully drilled out, after which custom post-and-core (stump) inlays were fabricated using a combined clinical–laboratory technique. This was followed by the production of new fixed orthopedic structures to restore function and structural integrity [9].

In cases of complete unscrewing of the abutment fixation screw (7 cases), two different management approaches were applied depending on clinical circumstances. In some instances, access to the screw was achieved by creating a perforation channel through the crown, allowing retightening of the screw with a screwdriver. The access opening was subsequently sealed with polymer restorative materials or amalgam. In other similar cases, the crown was removed by sectioning, the defective screw was replaced, and a new crown was fabricated according to standard prosthetic procedures.

In situations involving decementation of crowns from the abutment, analysis revealed an irrational angle of abutment inclination contributing to inadequate retention. The abutment was replaced with one of appropriate angulation, followed by fabrication of a new prosthetic construction to ensure improved biomechanical stability.

Preventive Recommendations. Based on the clinical findings, the following practical recommendations are proposed to reduce the incidence of complications during prosthetic rehabilitation with fixed structures supported by two-stage cylindrical osseointegrated implants:

• Patients should be instructed to seek professional evaluation promptly upon detecting any mobility, discomfort, or functional disturbance in the prosthetic structure.

• When clinically feasible, fixed structures should be designed with screw-retained (preferably lateral screw-retained) fixation, which enables retrieval of the prosthesis without damaging its integrity and provides direct access to the implant–abutment connection.

• Occlusal surfaces must be adjusted with particular precision to prevent functional overload and excessive stress concentration on implant components.

Adherence to these recommendations, combined with continuous improvement of prosthetic design and implant component technology, can significantly reduce the frequency of mechanical complications and enhance the long-term clinical success of fixed orthopedic structures supported by two-stage osseointegrated cylindrical implants.

List of References:

1. Safarov, M. T., Akhmadzhonov, M., & Ruzimbetov, A. (2022). Study of the microbiological status in patients with peri-implantitis in the area of bridge prostheses. Conferences, (138). Retrieved from https://journals.scinnovations.uz/index.php/aposo/article/view/111

2. Safarov, M. T., Ro'zimbetov, X. B., Tashpulatova, K. M., & Safarova, N. T. (2023). Biomechanics of full-arch prostheses on dental implants. Conferences, 35–36. Retrieved from https://journals.scinnovations.uz/index.php/aposo/article/view/1030

3. 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 dentition defects. Education Science and Innovative Ideas in the World, 34(4), 42–48. Retrieved from https://www.newjournal.org/index.php/01/article/view/9797

4. Tashpulatova, K., Safarov, M., Ruzimbetov, H., & Lisitsyna, A. (2020). Technique for eliminating traumatic occlusion in patients using implant-supported bridges. European Journal of Molecular & Clinical Medicine, 7(2), 6189–6193.

5. Misch C.E. Contemporary Implant Dentistry. – 3rd ed. – St. Louis: Mosby, 2008.
6. Goodacre C.J., Bernal G., Rungcharassaeng K., Kan J.Y. Clinical complications with implants and implant prostheses. J Prosthet Dent. 2003.
7. Sailer I., Mühlemann S., Zwahlen M., Hämmerle C.H.F., Schneider D. Cemented and screw-retained implant reconstructions: systematic review. Clin Oral Implants Res. 2012.
8. Wittneben J.G., Millen C., Brägger U. Clinical performance of screw- versus cement-retained fixed implant-supported reconstructions. Int J Oral Maxillofac Implants. 2014.
9. Schwarz M.S. Mechanical complications of dental implants. Clin Oral Implants Res. 2000.