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DENTAL IMPLANTATION AFTER RECONSTRUCTION OF TOTAL AND SUBTOTAL DEFECTS OF THE UPPER AND LOWER JAWS

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SUMMARY
Medical and social rehabilitation of patients with total jaw defects is an urgent surgical problem for maxillofacial surgeons. Cicatricial deformities, functional disorders of anatomical structures after resection are a difficult task for reconstructive surgery. It is impossible to achieve positive results without the use of digital technologies, a review of the methods of «digital dentistry» (CAD-CAM modeling and 3D printing) on clinical examples.
***The aim of the study** was to investigate the necessity of using digital technology in prosthetic patients with subtotal and total jawbone defects.*
***Materials and methods.** The review provides examples of complex dental rehabilitation of patients with a detailed description of clinical and laboratory procedures, photographs and X-ray studies.*
***Results.** An illustrative clinical example confirms the high value and significant role of computer simulation in complex clinical cases and situations. The presented technique made it possible to restore the former quality of life of patients, which indicates its high development today.*
***Conclusions.** Clinical examples confirm the effectiveness of the use of digital dental technologies, prosthetics on implants in maxillofacial surgical dentistry. In the future, these methods will be improved through the introduction of new materials, workflow optimization and improved design accuracy using CAD-CAM and 3D modeling technologies.*

***KEYWORDS:** total jaw defects, subtotal jaw defects, resection prosthesis, stereolithographic template, digital dentistry*

***CONFLICT OF INTEREST.** The authors declare no conflict of interest.*

ДЕНТАЛЬНАЯ ИМПЛАНТАЦИЯ ПОСЛЕ РЕКОНСТРУКЦИИ ТОТАЛЬНЫХ И СУБТОТАЛЬНЫХ ДЕФЕКТОВ ВЕРХНЕЙ И НИЖНЕЙ ЧЕЛЮСТЕЙ

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РЕЗЮМЕ
Медико-социальная реабилитация пациентов с тотальными дефектами челюсти является актуальной хирургической проблемой челюстно-лицевых хирургов. Рубцовые деформации, функциональные нарушения анатомических структур после резекции представляют собой сложную задачу для реконструктивной хирургии. Добиться положительных результатов без использования цифровых технологий невозможно, обзор методов «цифровой стоматологии» (CAD-CAM моделирование и 3D-печать) на клинических примерах.
***Цель работы:** изучение необходимости использования цифровых технологий у пациентов с протезированием с субтотальными и тотальными дефектами челюстной кости.*
***Материалы и методы.** В обзоре приведены примеры комплексной стоматологической реабилитации пациентов с подробным описанием клинических и лабораторных манипуляций, фотографиями и рентгенологическими исследованиями.*
***Результаты.** Наглядный клинический пример подтверждает высокую ценность и значимую роль компьютерного моделирования в сложных клинических случаях и ситуациях. Представленная методика позволила восстановить прежнее качество жизни пациентов, что свидетельствует об ее высоком развитии на сегодняшний день.*
***Заключение.** Клинические примеры подтверждают эффективность использования цифровых стоматологических технологий, протезирования на имплантатах в челюстно-лицевой хирургической стоматологии. В будущем эти методы будут усовершенствованы за счет внедрения новых материалов, оптимизации рабочего процесса и повышения точности конструкций с использованием технологий CAD-CAM и 3D-моделирования.*

***КЛЮЧЕВЫЕ СЛОВА:** тотальные дефекты челюсти, субтотальные дефекты челюсти, резекционный протез, стереолитографический шаблон, цифровая стоматология.*

***КОНФЛИКТ ИНТЕРЕСОВ.** Авторы заявляют об отсутствии конфликта интересов.*

Introduction

Reconstruction of the dentition is an inseparable tandem of dentists (orthopedists), dental technicians and maxillofacial surgeons, as well as teams of related specialists using distant revascularizable flaps [1]. The logical conclusion of the successful restoration of the continuity of the jaw bones is the aesthetic and functional prosthetics in the projection of the missing dentition. To achieve the most beneficial result, as is known, according to the data of domestic and foreign authors, a number of conditions are required, in particular, the proper volume of soft tissue structures, osseointegration of dental implants, and other technical nuances required for prosthetics on an implant that is actually installed into the bone tissue [2,3]. The complexity of prosthetics for total and subtotal defects of the jaw bones lies in the difference in the morphological parameters of the connective tissue structures, in the prevailing majority of cases, after a total reconstruction, a number of corrective surgical interventions are required to achieve the goal. In addition, there are certain risks when installing dental implants, due to the type of transplanted bone structures, which corresponds to D 1 according to the Mich classification [4]. In conditions of this type, dental implants with aggressive threads are required to ensure the absence of such phenomena as sliding, rotation and other types of movements [5]. This type of bone tissue requires special attention when installing implants, due to the high risk of its "overheating", creation of compression and subsequent disturbances in blood supply, which is typical for the minimum content of spongy substance [6]. The failure of soft tissue structures is determined in view of the difference in morphology, the skin part, which appears in the oral cavity, does not lose its properties, and in addition to functional limitations, determines the aesthetic imbalance. Despite all the subtleties and existing risks, dental implantation with subsequent prosthetics is the only way to reconstruct total and subtotal postoperative defects of the jaw bones [7].

The aim of the study was to investigate the necessity of using digital technology in prosthetic patients with subtotal and total jawbone defects.

Materials and methods

12 patients after subtotal resection of the lower jaw for bisphosphonate-induced osteonecrosis of the jaw bones underwent a rehabilitation stage using a revascularized fibular autograft, dental implantation and subsequent prosthetics in State Budgetary Health Institution of the Stavropol Territory «Stavropol Regional Clinical Hospital» from 2017 to 2023. Surgical interventions, fixation of personal and other data of patients were carried out after signing an informed voluntary consent to participate in a clinical trial. Patients with no consent to participate in it, somatic pathology in the acute stage were excluded from the study.

The stage of dental implantation was performed no earlier than 4 months after the reconstructive intervention using a fibular autograft. For the most accurate and predictable prosthetics, prototyping of future dentitions was performed using CAD-CAM computer technologies and 3D modeling. According to the virtual modeling protocol, all patients underwent prosthetics on at least 3 dental implants in two stages (immediate loading with a temporary orthopedic structure and "permanent" after 4–6 months). Navigational markings in the positioning of dental implants were used in all cases, which made it possible to set the exact installation angle and position relative to the load of the antagonistic dentoalveolar complex. For the accuracy of the additional visual research method in the volume of CBCT, a preliminary fixation was carried out at the time of the study in the oral cavity, a construction in the form of a wax template with radiopaque marks. Next, using three-dimensional modeling, a surgical stereolithographic template required for positioning dental implants was made.

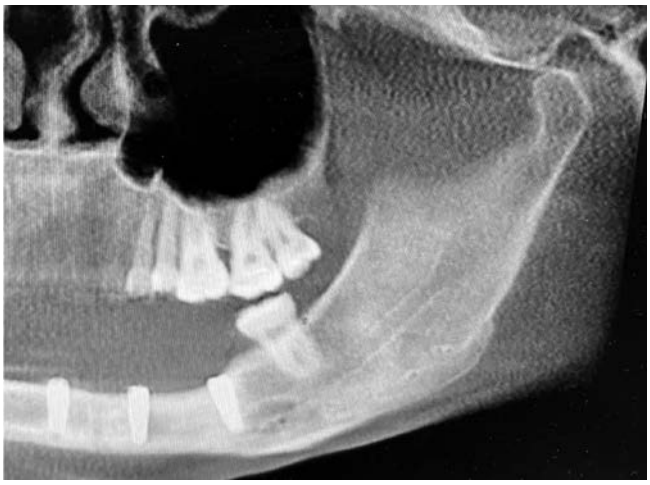

Fig. 1. Patient K., condition after subtotal resection of the lower jaw in the anterior segment with a reconstructive-plastic component in the volume of restoration with an MB-flap and subsequent installation of dental implants for units, condition for 4 months

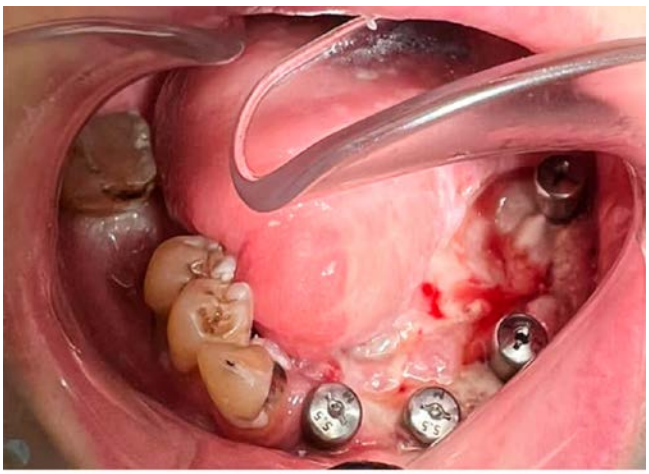

Fig. 2. Patient L., clinical stage of dental implantation in the projection of the autograft with the installation of gum formers

Results and discussion

48 dental implants were installed in 12 patients at the stage of restorative treatment, from 3 to 5 units in each case (*Figure 1*).

The absence of osseointegration was obtained in 2 patients, in one of whom 1 implant was explanted, in the second 2 implants. In both patients, this circumstance correlated with a critical increase in blood pressure in the early postoperative period, which caused increased bleeding and, as a result, suppuration of the postoperative wound with peri-implantitis phenomena that could not be stopped. The installation of gum formers was performed simultaneously with the actual stage of dental implantation in 11 patients (*Figure 2*).

Fig. 3. Patient A., final stage: fixed prosthodontic non-removable constructions

At the same time, the stage of prosthetics was carried out in all patients. Immediate loading with temporary structures allowed both to optimize the biomechanical balance of the dentition and to make the necessary adjustments to the aesthetic component of restoring the continuity of the dentition. At the end of the rehabilitation process, which consisted in restoring the continuity of the dentition with "temporary" structures, by the 6th month, all patients underwent fixation of permanent orthopedic structures (*Figure 3*).

Conclusions

The use of navigation systems in dental implantation, as well as computer modeling in the conditions of reconstructive surgery after subtotal resections of the jaw bones, made it possible to achieve osseointegration in 95 % of cases from the number of implants installed and to achieve the most favorable aesthetic indicators of prosthetics.

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