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ORIGINAL ARTICLE

DIGITAL PROTOCOL OF DENTAL IMPLANTATION WITH THE USE OF AN INDIVIDUAL BONE GRAFT AND THE CREATION OF A SOFT-TISSUE BARRIER

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Abstract

The article presents a method of rehabilitation of a patient with partial secondary adentia in segment 3, complicated by atrophy of the alveolar process. During the treatment, bone augmentation was performed using an individual bone graft with simultaneous installation of dental implants, conditions were created for the formation of a soft-tissue barrier, permanent orthopedic structures were made based on installed implants. Common types of bone grafting according to Kuri and Urban are described.

A clinical case is presented: the initial situation, anamnesis, X-ray, CT scan. The logic of decision-making when choosing treatment in a given clinical case is described, taking into account the individual characteristics of the patient.

The essence and features of the type of surgical intervention based on navigation implantation using the alveolar bone reconstruction method are demonstrated. The advantages of using a single digital space are described. At the preparatory stage, the patient's oral cavity is scanned, and a jaw model is obtained from the CBCT in STL format. At the digital planning stage, bone block modeling, navigation pattern modeling and combining of these simulations take place.

The programs "Diagnocat", "RealGuide", "PlastyCad" are described. At the surgical stage, dental implants are installed according to a digital surgical template in a strictly planned position, simultaneously with the fixation of an individual bone graft. At the second surgical stage, the installation of gum shapers with simultaneous soft tissue plasty is carried out. The method of soft tissue plasty according to Kazanjan is described. The results of using this method of treatment are presented and its effectiveness is demonstrated using such indicators as the height of new bone tissue in the position of the installed implants, the height of the keratinized gum starting from the implant platform and stabilization of dental implants using the ISQ MegaGen device 4 months after the operation.

The conclusion describes the impact of digital technologies on dental practice and the benefits of the treatment protocol described in the article in the long term.

Keywords: *dental implantation; bone graft; soft tissue barrier; bone grafting; digital protocol.*

Introduction

Currently, dental implantation is widespread in surgical dentistry and is one of the mostoptimal ways to restore the chewing function of the patient.[1] The effectiveness of this treatment method is ensured by the osseointegration of the implant and the creation of a soft-tissue barrier in the area of its suprastructure.[2] The main criterion for the success of implantological treatment is the absence of resorption of the marginal bone and, in some cases, even an increase in the volumeof bone tissue in the area of the dental implant platform, after the start of its functioning.[3] However, if a simultaneous implant placement has not occurred, then the volume of bone tissue decreases over the years and may become insufficient for dental implantation. In this case, it is necessary to simulate the lost bone textures due to bone grafting. There are several ways to restore bone volume.

The most common bone grafts are Kuri and Urban. For example,the "sausage technique" proposed by I. Urban serves to increase the horizontal volume of bone tissue when using osteocompensating material and a resorbable membrane. The resulting conglomerate is immobilized by pins and sutured.[4] Vertical and horizontal augmentation of bone tissue is possible using the technique described by F. Kuri, which consists in increasing the volume of bone tissue with the help of osteocompensating material.[5]

The framework for it is an autogenous material from the area of the lower jaw branch. This technique is suitable for horizontal and vertical bone volume increase. Despite the effectiveness of the method, there is a disadvantage, which is that the material intake causes additional injury to the patient.

The purpose of this article is to demonstrate a new method of dental implantation performed simultaneously with vertical and horizontal bone augmentation and the creation of a soft-tissue barrier in the transplanted area using a digital protocol. Digital planning allows you to simulate in detail an individual template and bone grafting for each clinical case simultaneously, which maximizes the success of dental implantation, reduces the time and invasiveness of surgery and ensures the optimal orthopedic position of the supporting structure.

Material and methods

Patient M. (48 years old) in May 2022 applied to the Samara Dental Center "DAS Clinic" complaining of discomfort in the lower jaw on the left in the area of previously installed dental implants, which occurs when chewing food. The patient was found to have no general somatic pathology affecting bone regeneration, mental illness or diseases of the central nervous system. Exclusion criteria: allergic reactions to the drugs used; anemia (hemoglobin <105 g/l for womenand <115 g/l for men); pregnancy; oncological

diseases. Contraindications to implantological treatment have not been identified. Anamnesis of the disease: 5 years ago, in another clinic, the patient had implants in the position of missing 35, 36 teeth. At the time of contacting DAS Clinic (Figure 1), signs of disintegration were detected in the area of these implants. The X-ray showed a decrease in bone tissue of the order of 4-5 mm in the area of the dental implant platform installed in the position of the missing 35 tooth and 3-4 mm in the area of the dental implant platform installed in the position of the missing 36 tooth (Figure 2).

Figure 1. *The initial situation. Vestibular projection.Implants 3.5, 3.6 were prosthetics 4 years ago*

Figure 2. *The initial situation. X-ray of dentalimplants in positions 3.5, 3.6*

A clinical examination revealed the absence of a keratinized gum attachment zone in the periimplant area of the third segment, which, according to the literature and our own observations, is a significant risk factor for the development of peri-implantitis.[6-9]

In the area of these implants, bone resorption was accompanied by gum recession with visualization of the surface of their cervical part covered with plaque. At the first moment, when palpation of soft tissues in the area of implants, soreness was determined and serous discharge appeared. It was decided to remove zirconium restorations, remove dental implants and preserve holes to restore bone tissue. After 6 months, a second CT scan was performed.

When analyzing the CBCT, a lack of bone volume was found for the installation of dental implants (Figure 3). The exit site of the inferior lunular nerve significantly hampered the positioning of implants and the performance of surgical manipulations aimed at augmentation of bone tissue. The lack of bone support led to the formation of a pronounced soft tissue defect of the alveolar process, which was accompanied by the absence of an attached keratinized gum (Figures 4, 5).

Figure 3. *The initial situation of the CBCT*

Figure 4. *Soft tissue defect of the alveolar process. The absence of an attached keratinized gum*

Figure 5. *Soft tissue defect of the alveolar process. The absence of an attached keratinized gum*

In this regard, manipulations to create an attached gum zone were included in the treatment plan, since it isknown that one of the conditions for the formation of a protective soft tissue barrier is the presence of a strip of attached gum in the periimplant area with a width of about 4 mm[10].

Taking into account the complexity of the clinical task of achieving a highly aesthetic and functional

result, the principles of applying a low-traumatic approach to treatment, it was decided to perform surgical intervention according to the protocol specified in the patent based on navigation implantation using the alveolar bone reconstruction method.[11]

The essence of the method is as follows: modeled in a single digital space together with a navigation template, an individual bone graft is manufactured before surgery. Next, a bed for a dental implant is formed. Then the bone block is fixed with dental implants to the alveolar process, while pin fixation is not required and, therefore, additional fixing elements are not injured either during surgery or after healing, since their removal is not required. Bone augmentation occurs simultaneously with dental implantation, which reduces the number of surgical interventions.

All planning stages are performed in a single coordinate system in digital space, which allows to achieve minimal errors when comparing all elements: a navigation template, a bone graft, dental implants and an alveolar process, as well as to recreate surgery taking into account the individual characteristics of the patient, therefore, not to injure anatomically important formations. The graft serves as a support, as if a framework, for bone augmentation, forming its additional volume.

The navigation template eliminates errors in the preparation of the bed for dental implants. The use of this approach makes it possible to achieve a successful treatment result in one surgical intervention and is an excellent alternative to multi-stage protocols for increasing bone volume.

A treatment plan has been agreed with the patient, consisting of the following stages: planning, preparatory, surgical, orthopedic.

The planning stages

- Oral cavity Scan (STL) (Figure 6);
- Obtaining a model of the mandible from the CBCT (STL) (Figure 7);
- Bone block modeling (STL) (Figure 8, 9);
- Modeling of the navigation template (Dicom+STL) (Figure 10,11);
- Modeling of the template and bone block in the "plastycad" program (Figure 12). The surgical stage;
- Installation of two dental implants according to a digital surgical template in a strictly;
- Planned position, simultaneously with the fixation of an individual bone graft (Figures 15, 21);
- Installation of gum shapers, soft tissue plastics to increase the volume of the attached gum(Figures 24-27);
- Orthopedic stage;
- Manufacture of ZrO_2 designs.

The preparatory stage

In order to create a virtual model of the patient, files obtained during oral cavity scanning (STL format) (Figure 6) and files obtained during CBCT (DICOM format) (Figure 7) were combined. A three-dimensional model of the mandible (STL format) was obtained using the "Diagnocat" program and a bone graft was simulated (Figures 8, 9). Using the "RealGuide" program, three-dimensional positioning of implants and bone block was performed (Figures 10, 11). At the next stage,a surgical template was modeled and technological holes were made in the bone graft for dental implants in the "PlastyCad" program (Figure 12).

Figure 6. Oral cavity scan (STL)

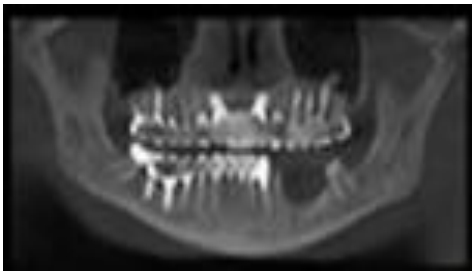

Figure 7. *Obtaining a model of the mandible from the CBCT (STL)*

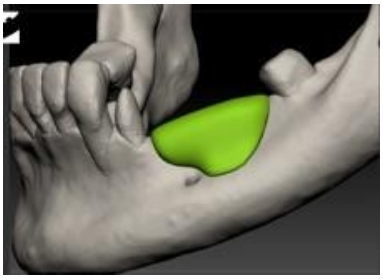

Figure 8. *Bone block modeling (STL)*

Figure 9. *Modeling of the bone block (STL)*

Figure 10. *Navigation template modeling (Dicom +STL)*

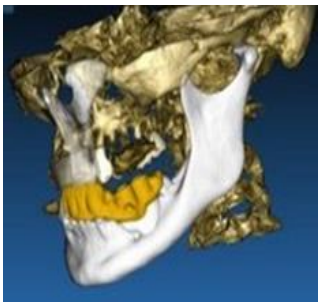

Figure 11. *Navigation template modeling (Dicom+STL)*

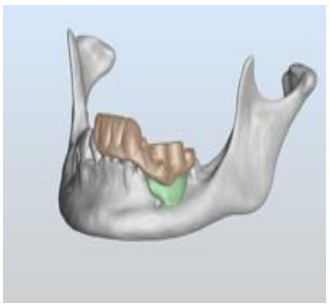

Figure 12. *Modeling of the template and bone block in the PlastyCad program*

Further, an individual bone graft was manufactured in the laboratory using CAD/CAM technology, which is a lyophilized allogeneic bone that undergoes sterilization by gamma radiation. In parallel, the draft surgical guide template was printed using a 3D printer. As a result of the preparatory work, the following materials were obtained: a guiding surgical template and an individual bone graft.

Before the surgical stage, the patient underwent a test procedure. The list included: a general blood test, a general urine test, a biochemical blood test, including reactions to HIV, hepatitis and syphilis.

According to the results of the analyses, there were no contraindications to the operation.

<u>Clinical stages Surgical stage No. 1</u>

Bone augmentation with simultaneous dental implantation

Under local anesthesia, an incision was made in soft tissues and vestibular and lingual mucoperiosteal flaps were formed. The incision is made by a special design with an offset to the vestibular side, to obtain a suture line in the projection of the apex of the alveolar after fixation of the bone graft (Figure 13). The bone defect is quite pronounced, the output of the inferior lunular nerve is visualized (Figure 14).

To prepare the bed, the R 2 Kit surgical kit was used, which includes drills with a wide working part designed to accurately position the implant in space and a locking ring to control the depth of immersion. The navigation template is made with a special design, including a sleeve, respectively, for the wide part of the drill and the locking ring (Figures 15,16). Using a guide template fixed to the teeth of the lower jaw (Figure 15), the preparation of the bed for implants was performed (Figure 16).

Figure 13. *Cut design*

Figure 14. *Visualization of the mandibular nerve*

Figure 15. *Fixation the navigation template to the teeth*

Figure 16. *Creating a bed for dental implants*

Pre-installation of dental implants was performed to eliminate angular divergence (Figure 17). This manipulation serves to prevent possible fractures and cracks in the bone block as a result of emerging internal stresses. Then the implants were removed (Figure 18). The bone graft was positioned on the alveolar process, the cortical plate of the alveolar process was perforated for additional vascularization

and secured with two dental implants followed by fixation of plug screws (Figures 19, 20, 21, 22).

Figure 17. *Pre-installation of dental implants to eliminate angular divergence*

Figure 18. *An example of a crack in a bone block during surgery*

Figure 19. *Positioning of the bone block on the alveolar process*

Figure 20. *Perforation of the cortical plate*

Figure 21. *Installation of dental implants*

Figure 22. *Fixation of the bone block with dental implants*

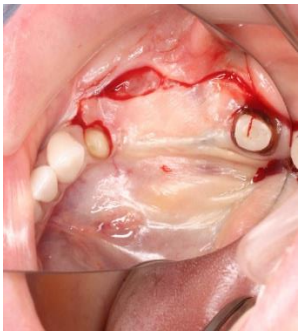

Figure 23. *The initial situation before installing of the gum shaper*

The bone block, having sufficient rigidity and having a spongy structure, contributes to the formation of the necessary volume of bone tissue. A bone graft (Bio-Oss) was inserted into the spaces above the plug screws formed as a result of the installation of dental implants.

The patient was prescribed medication therapy. During the healing process, preventive examinations, X-ray examinations and professional oral hygiene were carried out.

<u>Surgical stage No. 2</u>

Installing the gum shaper with simultaneous soft tissue plasty

Under local anesthesia, an incision was made in soft tissues and a vestibular split and lingual full-layer flaps were formed. The incision is again made with a special design with an offset to the vestibular side (Figure 24). In this case, such an incision is needed to combine the operation of installing gum shapers and soft tissue plasty to increase the area of the attached gum according to Kazanjan.[12] Next, the plug screws were removed (Figure 26). Two star-shaped holes were made in the lingual flap so that the gum shapers passed through them and created the necessary downforce to immobilize the flap. Then the gum shapers were installed in the positions of the implants 3.5 and 3.6 (Figure 27). The free edge of the lingual flap is fixed with sutures to the periosteum from the vestibular side.

It is important to note that at this stage, radiography was performed to exclude pressure on the bone of the gum shapers.

Figure 24. *The design of the incision before installing the gum shaper*

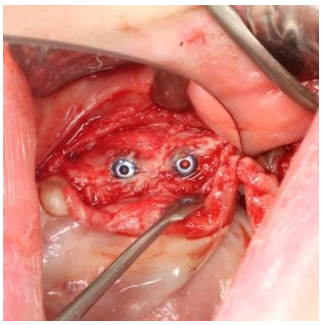

Figure 25. *Dental implant cover screws*

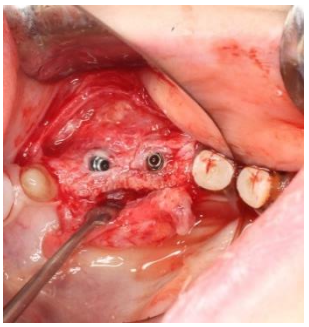

Figure 26. *Removing the cover screws*

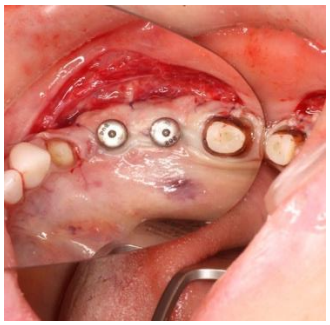

Figure 27. *Installation of gum shapers*

After installing the gum shapers, a permanent zirconium dioxide structure supported by implants was fixed, made individually after scanning the patient's oral cavity (Figures 28, 29). After 10 days, no complaints were found at the control examination.

Figure 28. *Fixation of a permanent structure supported by implants, vestibular projection*

Figure 29. *Fixation of a permanent structure supported by implants, occlusal projection*

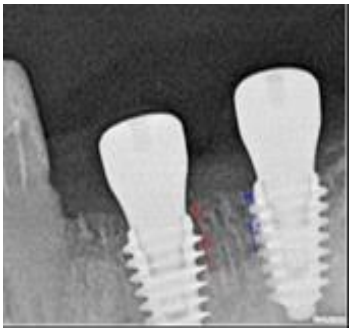

Figure 30. *X-ray after surgery*

Results and discussion

In this clinical case, thanks to digital planning and the production of an individual template, it was possible:

- eliminate traumatization of anatomically important structures during surgery;
- ensure control of the depth of the implantation bed;
- optimize orthopedic treatment on implants with the distribution of chewing loads.

The success of the clinical case is characterized by a stable treatment result, as evidenced by the level of bone tissue in the area of the dental implant platform 4 months after implantation. On the targeted X-ray image, the height of the formed bone tissue in the implant position is 3.5- 3.6 mm, in the implant position 3.6-3.4 mm. (Figure 30).

As a result of soft tissue plastic surgery to increase the area of fixed keratinized gums, simultaneously with the installation of gum shapers, it was possible to create a soft-tissue barrier around the implants, which significantly reduces the likelihood of infection in the re-implant zone and increases the service life of implants in the long-term prognosis. The height of the keratinized gum, starting from the implant platform, is 3.5-3 mm in the implant position, 3.6-3.5 mm in the implant position. (Figures 31, 32)

At the stage of manufacturing orthopedic structures, the stabilization of dental implants was checked using the ISQ MegaGen device, which is designed to determine the area of contactbetween the implant and bone tissue. An indicator above 70 points indicates a successful process of osseointegration (Figures 33, 34)

Figure 31. *Formation of a stable soft tissue buffer zone around the installed implant 3.5*

Figure 32. *Formation of a stable soft tissue buffer zone around the installed implant 3.6*

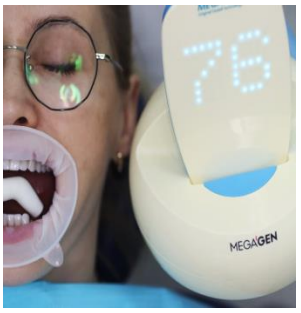

Figure 33. *Stabilization of the implant in position 3.5*

Figure 34. *Stabilization of the implant in position 3.6*

Conclusion

Thanks to the development and introduction of digital technologies into dental practice, practitioners have the opportunity to minimally invasive achieve highly aesthetic and functionally successful treatment results.

Due to careful planning and high accuracy, it is possible to carry out such rehabilitation in difficult clinical conditions, taking into account the anatomical characteristics of the patient. A bone graft made exclusively for this patient has an increased area of contact with the alveolar process, which is key to achieving positive results of implantological treatment in the long term.

In addition, the method of bone grafting in combination with the simultaneous installation of dental implants eliminates the need for multi-stage surgical treatment protocols, which significantly reduces the duration of rehabilitation, the number of complications and the financial burden on the patient. Of course, this has a positive effect on the patient's satisfaction and quality of life.

Declarations

Conflicts of interest and financial disclosures

The author declares that he has no conflict percent and there was no external source of funding for the research in question.

Ethical approval

The study was approved by the University ethics committee and was conducted in accordance with the Declaration of the World Medical Association.

Informed consent

Informed consent was obtained from all individual participants included in the study.

Source of funding

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ԱՏԱՄՆԵՐԻ ԻՄՊԼԱՆՏԱՑԻԱՅԻ ԹՎԱՅԻՆ ԱՐՁԱՆԱԳՐՈՒԹՅՈՒՆ՝ ՕԳՏԱԳՈՐԾԵԼՈՎ ԱՆՀԱՏԱԿԱՆ ՈՍԿՐԱՅԻՆ ՓՈԽՊԱՏՎԱՍՏՈՒՄ և ՍՏԵՂԾԵԼՈՎ ՓԱՓՈՒԿ ՀՅՈՒՍՎԱԾՔՆԵՐԻ ՊԱՏՆԵՇ

Ալեքսանդր Դմիտրիևիչ,[1] Միխայիլ Պոստնիկով,[2] Կրապչատով Վլադիսլավ,[3] Ելենա Բուլիչևա,[4] Իվան Բուտյուգին,[5] Յուլիա Ալպատիևա,[6] Վալերիա Լիսովա,[7] Ելիզավետա Պոստնիկովա[8]

1. Բժշկական գիտությունների թեկնածու, Ռեավիզ բժշկական համալսարանի ստոմատոլոգիայի ամբիոնի դոցենտ, Սամարա, Ռուսաստան
2. Բժշկական գիտությունների դոկտոր, պրոֆեսոր, Ռուսաստանի առողջապահության նախարարության Սամարայի պետական բժշկական համալսարանի թերապևտիկ ստոմատոլոգիայի ամբիոնի վարիչ, Սամարա, Ռուսաստան
3. Ընդհանուր ստոմատոլոգ, վիրաբույժ ստոմատոլոգ, օրթոպեդ ստոմատոլոգ, ստոմատոլոգիական կլինիկա «Դենտալ-Անտիստրես», Սամարա, Ռուսաստան
4. Բժշկական գիտությունների դոկտոր, պրոֆեսոր, օրթոպեդիկ ստոմատոլոգիայի և նյութագիտության ամբիոնի պրոֆեսոր ակադ. I. P. Pavlova Սանկտ Պետերբուրգի առաջին պետական բժշկական համալսարանի մեծահասակների օրթոդոնտիայի դասընթացով, Ռուսաստանի Դաշնության Առողջապահության նախարարության, Սանկտ Պետերբուրգ, Ռուսաստան

5. Բժշկական գիտությունների թեկնածու, դոցենտ, Սանկտ Պետերբուրգի բժշկասոցիալական ինստիտուտի կլինիկական ստոմատոլոգիայի ամբիոնի դոցենտ, Սանկտ Պետերբուրգ, Ռուսաստան,
6. Բժշկական գիտությունների թեկնածու, օրթոպեդիկ ստոմատոլոգիայի և նյութագիտության ամբիոնի ասիստենտ մեծահասակների օրթոդոնտիայի դասընթացով, ակադ. I. P. Pavlova Սանկտ Պետերբուրգի առաջին պետական բժշկական համալսարանի անվ. Ռուսաստանի Դաշնության Առողջապահության նախարարության, Սանկտ Պետերբուրգ, Ռուսաստան
7. Ռուսաստանի Առողջապահության նախարարության Սամարայի պետական բժշկական համալսարանի Ստոմատոլոգիական ֆակուլտետի ուսանող, Սամարա Ռուսաստան
8. Պերմի անվան պետական բժշկական համալսարանի Ստոմատոլոգիական ֆակուլտետի ուսանող, Պերմ, Ռուսաստան

Ամփոփում

Հոդվածում ներկայացված է 3-րդ սեգմենտի մասնակի երկրորդական ադենտիայով հիվանդի վերականգնման մեթոդ՝ բարդացած ալվեոլային պրոցեսի ատրոֆիայով: Բուժման ընթացքում կատարվել է ոսկրային հյուսվածքի մեծացում՝ անհատական ոսկրային փոխպատվաստման միջոցով՝ իմպլանտների միաժամանակյա տեղադրմամբ, պայմաններ են ստեղծվել փափուկ հյուսվածքային պատնեշի ձևավորման համար, տեղադրված իմպլանտների հիման վրա ստեղծվել են մշտական օրթոպեդիկ կառույցներ: Նկարագրված են ոսկրային փոխպատվաստման ընդհանուր տեսակները՝ ըստ Կուրիի և Ուրբանի: Ներկայացված է կլինիկական դեպք՝ նախնական իրավիճակ, անամնեզ, ռադիոգրաֆիա, CBCT: Նկարագրված է տվյալ կլինիկական դեպքում բուժման ընտրության ժամանակ որոշումների կայացման տրամաբանությունը՝ հաշվի առնելով հիվանդի անհատական առանձնահատկությունները: Ցուցադրված են ալվեոլային ոսկրերի վերականգնման մեթոդով նավիգացիոն իմպլանտացիայի վրա հիմնված վիրաբուժական միջամտության տեսակի էությունն ու առանձնահատկությունները: Նկարագրված են մեկ թվային տարածության օգտագործման առավելությունները: Նախապատրաստական փուլում հիվանդի բերանի խոռոչը սկանավորվում է և CBCT-ից ստացվում է ծնոտի մոդել STL ձևաչափով: Թվային պլանավորման փուլը ներառում է ոսկրային բլոկի մոդելավորում, նավիգացիոն կաղապարի մոդելավորում և այդ մոդելավորումների համատեղում: Նկարագրված են «Diagnocat», «RealGuide», «PlastyCad» ծրագրերը: Վիրահատական փուլում ատամնաբուժական իմպլանտները տեղադրվում են թվային վիրաբուժական կաղապարի միջոցով՝ խիստ պլանավորված դիրքում՝ անհատական ոսկրային փոխպատվաստման ֆիքսման հետ միաժամանակ: Երկրորդ վիրաբուժական փուլում լնդերի ձևավորիչները տեղադրվում են փափուկ հյուսվածքների մեկ փուլով պլաստիկ վիրահատությամբ: Նկարագրված է փափուկ հյուսվածքների պլաստիկ վիրաբուժության մեթոդն ըստ Կազանջանի: Բուժման այս մեթոդի կիրառման արդյունքները ներկայացված են և դրա արդյունավետությունը ցուցադրվում են այնպիսի ցուցիչներով, ինչպիսիք են՝ տեղադրված իմպլանտների դիրքում նոր ոսկրային հյուսվածքի բարձրությունը, իմպլանտի հարթակից սկսած կերատինացված լնդի բարձրությունը և ատամնաբուժական իմպլանտների կայունացումը ISQ MegaGen սարքը վիրահատությունից 4 ամիս անց.

Եզրակացություն. Նկարագրվում է թվային տեխնոլոգիաների ազդեցությունը Ստոմատոլոգիական պրակտիկայի վրա և հոդվածում նկարագրված բուժման արձանագրության երկարաժամկետ օգուտները:

ЦИФРОВОЙ ПРОТОКОЛ ДЕНТАЛЬНОЙ ИМПЛАНТАЦИИ С ПРИМЕНЕНИЕМ ИНДИВИДУАЛЬНОГО КОСТНОГО ТРАНСПЛАНТАТА И СОЗДАНИЕМ МЯГКОТКАНОГО БАРЬЕРА

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Резюме

В статье представлен метод реабилитации пациента с частичной вторичной адентией в 3 сегменте, осложненной атрофией альвеолярного отростка. В ходе лечения выполнялась аугментация костной ткани с применением индивидуального костного трансплантата с одномоментной установкой деннтальных имплантатов, создавались условия для формирования мягкотканого барьера, изготавливались постоянные ортопедические конструкции с опорой на установленные имплантаты. Описываются распространенные виды костной пластики по Кури и Урбану.

Представляется клинический случай: исходная ситуация, анамнез, рентгенограмма, КЛКТ. Описывается логика принятия решения при выборе лечения в рамках данного клинического случая с учетом индивидуальных особенностей пациента. Демонстрируются суть и особенности вида хирургического вмешательства на основе навигационной имплантации с применением метода реконструкции альвеолярной кости. Описываются преимущества использования единого цифрового пространства. На подготовительном этапе происходит сканирование полости рта пациента, получение модели челюсти из КЛКТ в формате STL. На этапе цифрового планирования происходит моделирование костного блока, моделирование навигационного шаблона и объединение этих моделировок. Описываются программы «Диагнокат», «RealGuide», «PlastyCad».

На хирургическом этапе осуществляется установка дентальных имплантатов по цифровому хирургическому шаблону в строго запланированном положении, одномоментно с фиксацией индивидуального костного трансплантата. На втором хирургическом этапе осуществляется установка формирователей десны с одномоментной пластикой мягких тканей. Описывается способ пластики мягких тканей по Казанджану. Приводятся результаты использования данного способа лечения и демонстрируется его эффективность с помощью таких показателей как высота новой костной ткани в позиции установленных имплантатов, высота кератинизированной десны начиная от платформы имплантатов и стабилизация дентальных имплантатов с помощью аппарата ISQ MegaGen через 4 месяца с момента операции.

В заключении описывается влияние цифровых технологий на стоматологическую практику и преимущества описанного в статье протокола лечения в долгосрочной перспективе.