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CLINICAL FEATURES OF DENTAL RECONSTRUCTION WITH SEVERE JAW ATROPHIES IN PARTIAL AND COMPLETE ADENTIUM

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Currently, dental implantation is widely used in practical dentistry to restore defects in dental arches with fixed orthopedic structures. At the same time, complex anatomical and topographic conditions of the bone tissue of the alveolar process of the upper and lower jaws cause a number of clinical difficulties that require bone grafting before installing dental implants, which requires an individual approach. In case of severe atrophy of the alveolar process of the jaws in the frontal and lateral sections, the choice of surgical correction method is bone augmentation by distraction osteogenesis, splitting of the alveolar ridge, grafting of autogenous, allogeneic and xenogeneic bone blocks, as well as the method of tissue regeneration. In general, restoration of dental arch defects and the function of the dental system requires the necessary placement of dental implants in the most correct position for their subsequent osseointegration and fixation of fixed orthopedic structures, which ensures the achievement of the expected clinical result with full restoration of the patients' aesthetic requirements and an improvement in the patient's quality of life.

Keywords: atrophy of the alveolar process, anatomical and topographic features, maxillofacial region, dental implantation, bone grafting, sinus lifting, splitting and reconstruction of the alveolar process, restoration of dentition, fixed orthopedic structures, medical and social rehabilitation.

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Introduction. Nowadays, dental implantation is actively used in practical dentistry, which allows expanding the scientific, theoretical and practical aspects of the restoration of dentition defects with fixed orthopedic structures [7, 8, 12, 16, 17, 32, 34]. A fixed prosthesis on artificial supports has a number of advantages associated with solving physiological problems of functioning and biomechanics of the dentoalveolar system, aesthetic requirements of patients with improvement of their psychological, professional and social status [3, 4, 8, 13, 15, 35]. In this regard, there are studies solving the main problems of dental implantation in the restoration of dental defects with pronounced uneven atrophies of the alveolar process, which is an urgent general medical problem.

There is the research evidence that the predominant part (71.4%) are people of working age 25-40 years old, where women consult 2 times more than men [4, 16, 18, 21, 24, 50] in the structure of patients who require orthopedic rehabilitation, with the use of intraosseous artificial supports. At the same time, recently there has been an increase in a negative trend, where persons with complete adentia are found not only among the elderly and senile age, but also among younger patients. Meanwhile, the clinical possibilities of dental implantation cover a wide range, including the restoration of single defects, as well as the complete restoration of dentitions on toothless jaws [1, 4, 5, 6, 8, 14, 20, 24, 26, 35, 41, 46, 51]. In our opinion, this trend in the North is especially acute, since the high prevalence of dental diseases in the population determines the frequency of detection of dental defects and the need of residents for dental implantation.

The section of basic dental implantation mainly provides for the installation of implants under standard anatomical conditions, where the sufficient height and thickness of the alveolar process are determined, which in 30% of cases due to pronounced uneven atrophies of the alveolar process can be used only with certain modified methods [7, 8, 9, 10]. In such cases, the use of rod-type implants of optimal length and diameter becomes difficult, which require additional osteoplastic surgical measures to prepare the alveolar crest [4, 24, 38]. Meanwhile, with uneven vertical and horizontal atrophic processes leading to a pronounced decrease in the size of the alveolar processes, the installation of intraosseous structures in the jaws must be carried out with preliminary reconstructive surgery [11, 16, 18, 19, 23]. Nevertheless, the development of modern medical science leads to minimally invasive interventions through the use of digital technologies and the features of micro- and macro-design of implantation systems.

It should be emphasized that the above determines the presence of complex anatomical and topographic conditions of the bone tissue of the alveolar process of the upper and lower jaws, where dental implantation acquires the use of different variations that require an individual approach [1, 4, 11, 16, 18, 24, 31]. The variability of the tactical management of the patient with pronounced atrophy of the alveolar process includes the optimal choice of dental implants, taking into account the micro- and macrodesign of the intraosseous parts of the implants, depending on the specific clinical and anatomical proposal, intended for use in case of a lack of height and width of bone tissue with additional bone augmentation in order to reconstruct and create optimal

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conditions, if necessary, the use of lateral subperiosteal implants [18, 24, 31]. As practice shows, the use of micro- and macrodesign of various types of implants allows expanding the range of indications for their use, which in some clinical cases allows avoiding volumetric reconstructive interventions.

It should be noted that there are air cavities on the upper jaw, as well as low bone density with the presence of gravity phenomena on orthopedic structures, which have a negative effect on longer osteointegrative processes, which can reach 6 or more months. In this case, the percentage of complications and unsatisfactory results of dental implantation can reach up to 24% [10, 18]. In addition, with severe atrophy of the bone tissue of the alveolar process, the possibility of using intraosseous implantation of standard sizes is reduced due to the likely perforation of the bottom of the maxillary sinus with the subsequent development of acute and exacerbation of chronic sinusitis [1, 11, 21, 25, 27, 43, 47, 49]. Meanwhile, there is a problem even after reconstructive surgical interventions in the alveolar process, where the installation of full-size implants can be difficult and complications associated with rupture or perforation of the Schneider membrane, maxillary sinusitis, focal acute osteomyelitis of the jaw and augmentate rejection can occur [21, 25, 27, 43]. Meanwhile, augmented bone tissue does not have sufficient density, which leads to the formation of low primary stabilization of a standard titanium implant in the newly formed "young" bone tissue of the jaws in reconstructive surgery [2, 11, 16, 37]. At the same time, multi-stage treatment creates the prerequisites for the rehabilitation increase in case of upper and lower jaws dentition defects, where orthopedic rehabilitation can last up to one and a half years. Moreover, it is associated with the presence of physical and psychological trauma, as well as the high cost of medical manipulations, where in some cases there may be a need for inpatient treatment of patients, which ultimately reduces the availability of medical care [4, 5, 6, 7, 8]. Studies have established alternative implantation options of the alveolar process reconstruction of the upper jaw depending on the clinical situation, aimed at bypassing the lower borders of the maxillary sinus and nasal cavity, which are associated with the installation of implants in the tubercles, in the palatine process, as well as in the zygomatic process [11, 16, 21]. The listed surgical interventions are technically complex, with more serious complications, both during and after the operation [25, 26, 36]. In clinical practice, there is a reconstruction technique by basal implantation which is used in cases of bone deficiency of the alveolar process, where there is a possibility of developing a significant number of complications associated with injury to soft and bone tissue during implantation, osteolysis during aseptic rejection of the established intraosseous part of the structure [38, 40]. Practical experience, as well as the development of additive technologies in dentistry, suggest that the installation of implants can be made bypassing the subantral space using the anatomical features of the canine buttress and the wing-jaw space of the upper jaw.

It is important to note that today there is a way to prepare the conditions for the dental implant on the lower jaw, which is associated with lateralization of the mandibular nerve, where such a complication as persistent paraesthesia in the innervation zone may increase, which determines the limitation of its use in clinical practice [3, 11, 16, 19, 23]. In the last period, the preferred methods for pronounced atrophic processes of the alveolar process of the jaws are directed regeneration of bone tissue using resorbable and non-resorbable membranes, as well as bone materials, autotransplantation of bone blocks, distraction osteogenesis, splitting of the narrow alveolar crest, bone plastic using individual titanium scaffolds, subperiosteal and endo-subperiosteal implants [2, 3, 4, 11, 13, 22]. The disadvantage of subperiosteal reconstruction implantation is two invasive surgical interventions, which are associated with large skeletonization of jaw bone tissue.

It should be noted that in modern surgical dentistry, the method of distraction osteogenesis is mainly used to restore a sufficient volume of bone tissue. However, according to a number of researchers, the method has certain disadvantages that are associated with invasiveness, possible formation of fistula passages in the distractor area, accompanied by the inflammatory process of the surrounding soft tissues, which, accordingly, causes certain discomfort and aesthetic shortcomings in the patient, a longer course of treatment, as well as the probable risk of mandibular fracture during retraction [3, 11, 19]. Moreover, in some clinical cases, a significant part of specialists prefer to carry out the reconstruction of a significantly atrophied alveolar process of the jaws using autogenic bone, which has a number of contraindications and is determined by the occurrence of complications [2, 3, 4, 16, 23, 27, 30, 39]. Currently, the method of directed bone regeneration is widely applied using bone implants of xenogenic and allogeneic origin with resorbable and non-resorbable membranes, the use of which significantly increases the treatment period, where optimal osteointegration of the implanted material is not achieved in all cases. Moreover, the use of materials of non-autogenic origin in reconstructive interventions is associated with a higher risk of augmentate infection, and some patients may also develop intolerance to "foreign" material [2, 6, 25, 42, 45]. According to a number of scientists, the most optimal method of dental implantation for patients with severe atrophy of the alveolar process, is the use of short implants without bone expansion, where a change in the ratio of crown length to implant length is a risk factor for the development of areas of overvoltage in bone tissue that contribute to the formation of a recession of bone tissue around the implant [4, 11, 16, 21, 26, 31, 40, 43]. In our opinion, although there is a wide range of materials and methods of augmentation using bone substitutes and barrier membranes, the most predictable is bone augmentation using autogenic tissues.

In general, despite the extensive study of the main problems of dental implantation in the restoration of dental defects with pronounced uneven atrophies of the alveolar process, they remain completely unresolved, which requires additional study of effective methods that will focus on improving the quality of dental care and rehabilitation measures, as well as improving the quality of life of patients [5, 6, 7, 12, 31]. There are various approaches to reconstructive surgery that are used when there is insufficient bone volume in the area of the alveolar process of the jaws. These techniques include the use of bone grafts, which allows to restore the missing volume of bone tissue and create adequate conditions for the installation of implants, which require additional operational preparation for dental implantation [1, 2, 3, 4, 8, 11, 34]. As our dental implantation experience shows, the problems of improving the reconstruction of the alveolar process of the upper and lower jaws with secondary partial and complete adentia have not been fully resolved, which characterizes its significance and relevance in clinical dentistry and requires further research.

It should be noted that certain difficulties in clinical practice cause the elimination of pronounced defects in the alveolar processes of the jaws [1, 2, 4, 8, 11, 19, 23, 27]. At the same time, special attention is paid to preserving the volume of

bone tissue of the alveolar process after tooth removal, which prevents further atrophy of the well. For this purpose, in practical dentistry, the method of condoning the socket of a removed tooth and bone plastic material is used. Studies have established a significant decrease in the amount of bone plastic to increase the volume of bone tissue of the alveolar process after tooth removal, there are a number of methods preserving the volume of the surrounding bone and soft tissues, where the key aspect is to minimize bone loss and prevent resorption that may occur as a result of tooth removal [1, 5, 8, 20]. These atrophic processes require a more comprehensive approach, which may include the use of bioresorbable membranes in combination with bone grafts and various tissue regeneration technologies [28, 29, 30]. In general, bioresorbable membranes are typically made of materials that are able to integrate with patient tissues and resorb over time without having to remove them surgically, making them particularly relevant in dental practice before installing dental implants, augmentation of the upper and lower jaws is mandatory.

It should be noted that the standard surgical protocol for reconstruction involves the installation of a dental implant with a diameter of 3.5-4.0 mm into bone tissue with a width of at least 6-7 mm [31, 34]. Moreover, according to the generally accepted clinical standard for successful implantation in conditions of bone deficiency of the alveolar process, bone augmentation is up to 5-7 mm wide and up to 8-10 mm high [11, 24, 40]. In this regard, preparatory surgical reconstructive interventions before the dental implants installation should be carried out according to the results of clinical and radiological studies, which are important in a favorable outcome of treatment [20, 24, 45]. The frequency of patients who required bone plastics before implantation was 87%, which determines the prevalence of categories of patients with significant atrophies of the jaw bones [2, 3, 4, 8, 11, 20, 24]. According to some researchers, when performing reconstructive sinus lifting from both sides simultaneously with the installation of a dental implant, it is preferable to use xenogenic and autogenic bone-plastic material [2, 3, 11, 19, 21, 22, 23, 24, 47]. Sinus lifting surgery requires specialists to maintain the integrity of the Schneider membrane of the maxillary sinus, where perforations are likely to occur during its detachment [2, 21, 27]. Our practical experience confirms that anatomical and topographic features detected on the upper jaw, as a rule, require reconstructive augmentation many times more compared to the lower jaw.

In case of vertical atrophy of the alveolar part of the lower jaw, the sandwich plastic method is used, as a result of which a predictable result of treatment can be obtained [3, 11, 19]. When using the directed bone regeneration method to close a bone defect using an insulating membrane, the regeneration of connective tissue strands is achieved, which ensures the creation of optimal conditions for the migration and differentiation of osteogenesis stem cells [1, 2, 3]. Moreover, a prerequisite for this method is the presence of autogenic viable bone cells in the area of augmentation, which are the main source of bone formation and development [3, 39, 44]. An important point for reconstructive surgical interventions of the alveolar process of the upper and lower jaws is not only the type and characteristics of the drug used that play an important role in the recovery process, but also the individual characteristics of the patient's body. These include age, the presence of concomitant diseases, as well as the volume and location of the bone defect in the implantation area. All these factors can significantly affect the result of treatment and the effectiveness of implantation, including possible postoperative complications [6, 8, 11]. Thus, the pathogenetic mechanisms of the inflammatory response of the tissue bed and the regenerative processes of the surrounding tissues are widely studied when using various bone-plastic materials, where the optimal choice of bone-plastic types is of great practical importance for the successful implementation of reconstructive-plastic interventions on the upper and lower jaws [2, 11, 22]. Optimal augmentation by the splitting method is achieved with a deficiency of the bone tissue of the alveolar process in the horizontal direction, where cuts of the cortical plate in the sagittal plane are carried out without significant violation of the integrity of the bone fragment [19, 23]. The main purpose of bone augmentation by splitting when installing dental implants is the practical application of the ability to regenerate periosteum and alveolar bone tissue. The essence of the technique consists in intercortical osteotomy, where in its space, due to the preservation of the spongy substance, favorable conditions are created for feeding the surrounding tissues and the process of osteogenesis, which in turn allows installing dental implants in the correct position for the subsequent manufacture of orthopedic structures, where a high level of 10-year "survival" of implants is determined with achievement of clinical effectiveness up to 95.7% [31, 39]. According to our data, the 10-year "survival" of implants reaches values from 94 to 97%.

It is important to note that when preparing bone before dental implantation, the use of avascular bone autografts is considered the most optimal option for performing reconstructive bone grafting on the jaws [3, 19, 23, 27]. The positive clinical properties of these grafts are their osteoplastic, osteoconductive and osteoinductive properties, which significantly improve the conditions for bone regeneration and remodeling. The peculiarities of bone block sampling include the exclusion of bone tissue overheating to reduce its injury and preserve viable cells, which is of great practical importance that determines the successful outcome of the operation [3, 23, 27, 38]. In addition, it is necessary to pay special attention to the condition of the recipient bed, where correct incisions, delamination of the mucoperiosteal flap of the correct shape, as well as rigid immobilization of bone blocks to the receiving area and hermetic suturing of the surgical wound make it possible to significantly reduce the percentage of complications [11, 23, 27]. Depending on different anatomical zones, as well as the extent and severity of the atrophic process of the alveolar process of the upper and lower jaws, various bone autografts can be used [3, 23, 27]. So, when restoring deformities of bone tissue of alveolar process within 4 teeth, bone blocks are taken in the area of external oblique line, mental symphysis, anterior edge of mandibular branch, as well as maxillary tubercle and coronary process. In case of extensive defects, autogenic grafts from extrauterine zones can be used, including areas of the bone of the cranial vault and the anterior surface of the tibia in the form of bone chips, bone blocks, or a combination thereof [23, 27, 43]. When obtaining autobody in the area of the external oblique line for reconstruction, it gives the clinician the opportunity to obtain a larger volume of bone compared to other areas of the oral cavity. However, when taking a large block, there are risks of a number of complications, such as damage to the mandibular nerve when the lower border of the transplant is close to its canal, as well as a fracture of the lower jaw [3, 6, 24, 38]. When working with the donor zone in the area of the tubercle of the upper jaw, there is a possibility of perforation of the bottom of the maxillary sinus with the appearance of oral-antral communication. Sampling of autogenous bone tissue from intraoral anatomical for-

mations is characterized by the possible development of complications, including cicatricial changes in the vestibule of the oral cavity, the formation of keloid scars in the retromolar region and insufficient volume of autografts for augmentation [3, 27]. According to research resources, extrauterine donor zones make it possible to obtain a bone autogenic graft of a larger volume, the hallmark of which is the presence of several operational zones, which at the postoperative stage cause the appearance of great discomfort [23, 27, 38]. Taking into account the above, the authors developed a soft tissue protector-retractor device for a surgical angular tip for taking an autogenous bone block from the external oblique line, which allows for minimally invasive interventions that increase the quality of dental care and the quality of life of patients (utility model patent No. 233201 dated 11.04.2025. Published by 11.04.2025 Buhl. № 11).

Today, there are various methods of surgical restorative operations that solve the important clinical problem of soft tissue deficiency of the keratinized gum and vestibule depth in the area planned for the restoration of dental defects by various orthopedic structures during dental implantation. This tactic ensures minimization of postoperative complications, which determine the success of the treatment measures [2, 3, 11, 19]. Technically, the operation to enlarge the attached keratinized gingiva is closely related to the use of a free-gingival autograft from the donor zone. In this regard, this method at the present stage of surgical dentistry is the "gold standard" of mucogingival surgery. At the same time, the area of the mucous membrane of the hard palate remains preferable in choosing the donor zone, since the area of the hard palate has a multilayer morphological structure, including adipose and glandular tissues, a connective tissue base, as well as its own epithelium [24, 26, 30, 31, 37]. Meanwhile, in the postoperative period, an extensive area requiring soft tissue correction appears after bone plastic, which in turn is limited by the mucous membrane of the hard palate, which creates certain difficulties for the recipient area to be completely covered with an autograft [6, 8, 11, 48]. Meanwhile, there are some disadvantages in mucogingival surgery, associated with large autografts, which are likely to develop necrosis in the flap due to thermal ischemia and existing reperfusion injuries that can develop when the microvasculature in the surgical area normalizes [22, 25, 30, 33]. This surgical approach to dental implantation does not completely solve the problem of lack of soft tissues at the site of their installation [30, 36].

Thus, clinical dentitions reconstructions with pronounced uneven atrophies of the alveolar process of the upper and lower jaws with secondary partial and complete adentia have their own differences associated with individual anatomical and topographic features. Such a tactic requires the installation of the intraosseous part of the implant in an optimal orthopedic position for the subsequent fixation of non-removable structures on them, which ensures the achievement of the clinical expected result with a full restoration of the aesthetic requirements of patients and an increase in the quality of life of the patient.

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