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STUDY OF INTRAOSTEAL AND SUBPERIOSTEAL IMPLANTATION EFFECTIVENESS IN THE FRONTAL PART OF UPPER JAW AT PATIENTS WITH SINGLY SAVED TOOTH AND ATROPHY OF THE ALVEOLAR PROCESS

Summary

For 24 patients with multiple teeth loss the study of effectiveness of sub periosteal and intraosteal implants and subsequent prosthetics at the atrophy of the alveolar ridge in the area of singly saved tooth in the frontal part of upper jaw was carried out. For the period from 5 to 15 years the results of clinical studies indicate that in the frontal part of upper jaw at the III type alveoli atrophy by Schroeder it is inappropriate to introduce intraosteal implants and carry out additional osteoplastic surgery. Keeping a single tooth in the upper jaw is required for the prevention of progression of atrophy of the alveolar ridge in the frontal part and is functional element in ensuring the stability of the denture on the subperiosteal implant.

Keywords: intraosteal implant, subperiosteal implant, frontal part, atrophy of the alveolar ridge, upper jaw, singly saved tooth.

Recent data indicate an increase in the number of patients with multiple teeth loss. In this connection aspects of prosthetics of the patients with atrophy of the alveolar ridge and singly saved tooth in the upper jaw (UJ) are poorly examined. Traditional set of the maximum number of screw intraosteal implants (SII) in the frontal part of jaw supposes making the non-removable denture with its continuation beyond the area of entered implants by one artificial tooth of console type. However, this approach is controversial because at the closing of dentition 70% of the charge is put on the lateral parts and only 30% on the parts of the front row with installed supports [1,2,3].

Along with this, number and quality of SII installation on UJ is limited due to the shortage of bone volume, which is identified at more than 36% of dental patients. At the same time modern methods of bone volume osteoplastic correction are the most developed in the lateral parts and have efficiency from 65% to 70%, extend deadlines of orthopedic treatment to 12-18 months. Possibilities of alveolar ridge increase and growth in the frontal part of the upper jaw are problematic, and for the subsequent application of SII up to 15% of failures are found, due to the conditions insufficient for osseointegration of implants installed, the structural features of UJ bone. Therefore, with significant atrophy of the alveolar process of UJ aspects of additional supports with help of subperiosteal implants (SPI) are actual [4,5,6].

In this context, **the aim of this study** was to analyze the clinical efficacy of intraosteal and subperiosteal implants in the frontal part in terms of atrophy of the alveolar process of the upper jaw with single saved tooth.

Materials and methods. On the clinical basis of the surgical dentistry department, maxillofacial surgery and dentistry Kharkiv Medical Academy of Postgraduate Education were observed 24 patients aged from 45 to 60 years, with multiple loss of teeth for various reasons over the last 10-12 years at the moment of treatment. A single standing canine or one of the premolars were found at all patients in the frontal part of UJ. Local status of the atrophy types of alveolar processes of the upper jaw was examined clinically by Schroeder classification [7]. All operations were carried out taking into account the generally accepted indications

and contraindications for dental implantation. Intraosteal and subperiosteal implantations were performed according to the traditional two-step procedure. All operations were performed under local anesthesia and pre medication. To identify possible hidden defects the produced SPI were put under radiological control and electrochemical surface treatment.

The patients were divided into two groups according to the process of implantation in the frontal part of the upper jaw. **The first (control) group** was composed of 12 people with enough bone for addition to the single saved tooth installing the maximum quantity of screw titanium implants with 3,6mm diameter and length not less than 10mm. **The second group** also was composed of 12 patients with deficiency of bone volume and installed SPI in the frontal part of the jaw. In the postoperative period patients received broad-spectrum antibiotics, analgesics and antiseptic gargle. Orthopedic correction of occlusion was performed 3-4 weeks after the removal of sutures. All patients underwent the denture of non-removable construction in the frontal part of the jaw on the singly saved tooth and installed implants. Denture on implant superstructures was mounted using cement or fixing screws. Manufactured non-removable denture in the frontal part served as a support for mounting the removable denture during the replacement of missing teeth in lateral parts. Examination of the implants functioning was performed every year.

The study used the methodology of interest to compare results; methods of variation statistics for the Student - Fisher with the bound of the confidence level $p < 0.01$. Statistical data processing performed with the use of application package STATISTICA 6.0.

Results and discussion. In total there were examined 24 patients 19 (79,2)% of them of women and 5 (20,8)% of men, whose average age was 52,5 years, leading an active lifestyle, with a predominance in average to 76% of patients, working in an urban environment. The results of clinical and laboratory testing of blood and urine, the results of electrocardiography in all patients before implantation were within normal limits. Systemic comorbidities were not revealed. During examination configuration disturbance due

to the different degree of the middle third of the face shortening were found at all patients. Nasolabial folds were strongly expressed. Among examined patients on UJ there was identified one tooth saved: fang at 15 (62,5)% of the patients, the first premolar at 7 (29,1)% of the patients and at 2 (8,3)% of the patients the second premolar.

The I type of the alveolar process atrophy was found at the examined 9 (75,0)% of patients in the first control group, at which there was radiographically diagnosed bone volume in average 12-13mm to pyriform aperture, 14mm in buttresses parts and 8-9mm before the maxillary sinuses with wide alveolar process of 5mm of the frontal part. 3 (25,0)% of the patients were diagnosed with atrophy type II, in which the alveolar ridge rises from 2 to 4 mm above the arch of the jaw, representing in the frontal part the narrow formation with a width of alveolar process of frontal part in average till 3 mm. Radiologically there was diagnosed bone volume in average of 10mm to pyriform aperture, 12mm in buttresses parts and in average of 4mm till the maxillary sinuses. With this type of atrophy favorable prognosis of SII functioning was problematic because of the risk of vector traumatic charge when eating: because of shorter length of intraosteal part compared with the size of intraoral superstructure. Therefore, the introduction of the SII needed additional use of osteoplastic materials and membranes, and for 2 (16,6)% of patients the stage of denture completion was delayed by 9 months, and in for 1 (8,3)% of patients at 10 months for osseointegration of implants.

In the second group 10 (83,3)% of patients were diagnosed with type II atrophy and for 2 (16,6)% of the patients in the oral cavity the height of the alveolar process was practically absent, flat palate was identified, flattening of hillocks and transitional fold, corresponding to atrophy type III. Thus radiographically was determined insignificant bone amount till the maxillary sinus (in average till 3 mm) on the side of the saved premolars. On the opposite side of the jaw of these patients the amount of bone till the above mentioned cavity averaged 1mm. In the pyriform aperture the presence of bone was identified in average till 3mm. Frenulum of the upper lip was attached near the top of the alveolar ridge and had width in average 3 mm, which created difficulties for removable denture.

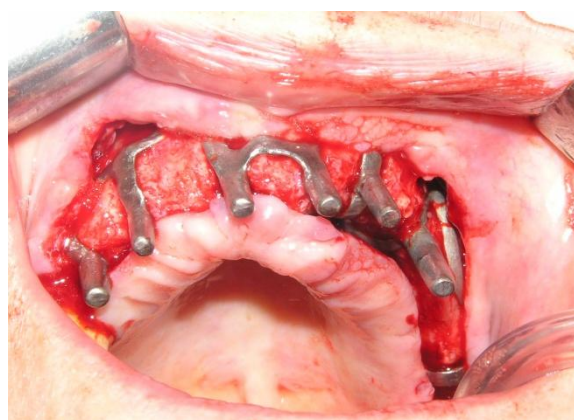
After the introduction of the SII there were difficulties in making non-removable part of the denture, which are associated with an increase of implant superstructures tilt angle due to unfavorable ratio sizes of UJ atrophied bone towards the lower one. As a result, the non-removable denture made on a limited number of additional supports and shallow entered SII at occlusion supercharged periodontium. 3 years later 5 (41,7)% of patients from the first group were diagnosed with mobility of non-removable part in the frontal part of UJ of first degree. After the conducted treatment and replacement denture in the removable constructions with telescopic view of fixation eating function was restored for 3 (25,0)% of the patients. As a result of delays in seeking care 2 (16,6)% of patients 3 and 4 years later, respectively, were diagnosed with enhancement of denture mobility, formation of pathological bone pockets up to 5mm around SII, impossibility of full force when biting off pieces of food. Prolonged use of such prostheses led to the development of inflammatory reactions, bone resorption around the implant and subsequent SII removal at all 6 and cranky canine. This patient, after making temporary removable denture 10 months after removal of the

SII in the frontal part, underwent subperiosteal implantation, because atrophy of the alveolar process after SII removal increased and corresponded to type III by Schroeder. With help of SPI there were received 5 additional supports for the new non-removable denture in the frontal region of UJ. Due to the precise correspondence to bone bed SPI was securely fixed on the bone surface, and "snapped" on it by the type of clasp and skeleton covered a large area of the alveoli, providing regular distribution of functional charge (Pic. 1).



Pic. 1 On the refractory model in the frontal part of the upper jaw subperiosteal implant is modeled with appropriate tilt and height of supporting elements, relative to opposing teeth on the lower jaw. The construction of the implant occupies a large area of the alveolar process, providing reliable primary fixation on its surface.

Clinical experience shows that application of SPI is reasonable even at the considerable looseness and thinness of alveolar ridge of the frontal part. It allowed to design denture that can fully carry out the charge without negative consequences. The number of supports may be adjusted to 5-6, whereas in the first group under the same clinical conditions 3-4 intraosteal screw constructions could be barely entered (Pic. 2).



Pic. 2 The subperiosteal construction with 6 support elements is mounted on the atrophied alveolar ridge of the frontal part of the upper jaw.

In the second group of patients at SPI application, non-removable part of the denture in the frontal part appeared to be more extensive and bordered region of the second premolar (Pic. 3).

Preparation of 6 supporting elements of SPI affected the duration and effectiveness of the denture compared with prosthetic of upper jaw on SPI. For all 12 of patients in the second group during 7 years of observation, non-removable denture on a singly saved tooth and SPI were



Pic. 3 The subperiosteal implant with 6 supports is installed in the frontal part of the upper jaw. Making non-removable part of the denture may extend to the second premolars.

more resistant, provided secure fixation and stabilization of the removable denture. To obtain the most aesthetic result removable construction of lateral parts was supplied with locking fasteners (Pic. 4).



Pic. 4. In the frontal part of the jaw non-removable structure with locks is fixed on sub periosteal implant and singly saved tooth for mounting removable denture during the replacement of missing teeth in the lateral parts.

The results of clinical observations of patients in the groups studied showed that the removable denture in the lateral parts of UJ, fixed to the non-removable part on SPI, fully restored chewing efficiency, minimally overlapped hard palate by their basis. It prevented the gag reflex and significantly shortened the term of the patient's adaptation to the

removable structure. Furthermore, we preferred locking fastening of transom type, because unlike the matrix attachments and various telescopic systems, they prevent the occurrence of adverse charges when removing denture with force (Pic. 5-6).



Pic. 5 Removable denture in the upper jaw with a locking mount of transom type.



Pic.6 Non-removable structure in the frontal part of the jaw and removable denture during the replacement of missing teeth of lateral parts, equipped with locking fasteners contribute to the achievement of high aesthetic treatment result.

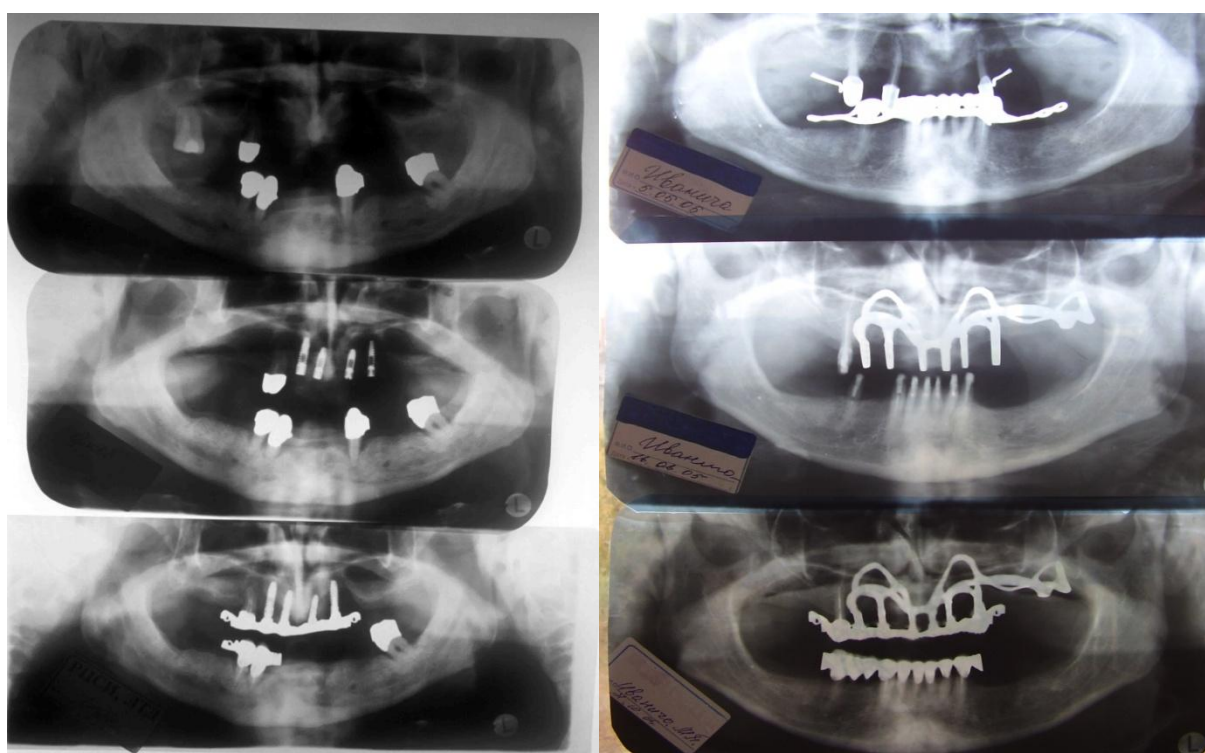
For comparison Pic. 7 shows the variant of the dental implantation and prosthetic of patients of the first and second clinical groups with similar clinical situations: the length of the defect and type II of atrophy by Schroeder. Patient from the first group, in order to improve the osseointegration of SII, needed introduction of osteotropic substances and the use of membrane technology. For the patient of the second group due to the use of the SPI was

achieved shortening of prosthetics terms for 9 months and financial expenses of the patient approximately in 1.5 - 2 times.

Thus, data from clinical studies indicate limited access to additional supporting elements in a short term of SII at the second type of the alveolar ridge atrophy by Schroeder: up to 42% of risk of long-term complications as inflammatory reactions, bone resorption and implant loosening. In clini-

cal groups singly saved tooth in the frontal part of UJ restrained the progression of atrophic processes and only in 17% was detected impossible for SII third type of atrophy of the alveolar process by Schroeder. In addition, at such atrophy conducting of additional osteoplastic operations in the frontal part of UJ is practically feasible. Therefore, to prevent amplification of atrophy of the alveolar process in the frontal part of UJ it is reasonable to keep the singly saved tooth and use it in conjunction to the supporting elements of SPI as part of the denture. Application of SPI in terms of atrophy allowed to increase the amount of additional supporting elements to 6 against 3-4 when installing screw SII. In this group of patients making of locking fasteners of transom type on the removable denture part contributed to reducing the period of adaptation to orthopedic constructions and prevention of traumatic force when removing the denture. Removable denture of lateral parts, as well as non-

removable part on SPI and on a singly saved tooth in a whole provides a complete restoration of the dentition of the jaw with a stable fixation. Complications occurred on SII as a result of the development of functional overload of saved tooth and periodontal central part of the jaw due to the insufficient number of poles, the deficit of bone and a short intraosteal part of implants. While the stability of fixation and duration of denture on the SPI operation provided more additional received supports and even charge distribution over a large area of bone alveoli. Observing the patients with SPI it is necessary to note that in most cases functioning of many of them is 10-15 years or more, and during this time they "survived" several replacements and alterations of orthopedic jobs that fail, and the implants continue to serve showing a high degree of reliability and durability. The positive results of sub periosteal implants functioning after 10 years are received: 90-92%, after 15 years: 84-86%.



Pic.7 Comparative possibility of rehabilitation of dental patients with similar clinical situation in the upper jaw, with the help of intraosteal implants (R-c. left) and subperiosteal implant (R-c. right).

Based on this study it is possible to make the following **conclusions:**

1. The use of subperiosteal implantation in patients with significant atrophy of the alveolar process and singly saved tooth in the frontal part of the upper jaw provides long-term, predictable and functional stabilization of the implant and denture.

2. Analysis of clinical conditions indicated the identification of the adverse atrophy of alveoli of type III by Schroeder for introduction of intraosteal implants and objective difficulties in the feasibility of additional osteoplastic interventions in the frontal part of upper jaw.

3. Keeping a single tooth in the frontal part of the upper jaw is required to prevent the progression of the alveolar process atrophy and is the element of functional stability of the denture on the subperiosteal implant.

4. Application of subperiosteal implants in multiple teeth loss, accompanied by significant atrophy of the alveolar ridge in the frontal part of upper jaw allows not only to improve the efficiency and reduce the time of orthopedic rehabilitation of dental patients, but also to improve the quality of life for demanded stratum of society, leading active career.

References:

1. Вовк В.Е., Шакаралиев А.А., Чуйков В.В., Тыштыбаев Т. Восстановительная хирургия по устранению дефектов альвеолярного отростка верхней челюсти костными аутотрансплантатами // Материалы III Украинского международного конгресса, Киев. – 2008. – С.159–165.
 2. Лабунец В.А. Анализ осложнений, возникающих при протезировании несъемными конструкциями зубных

протезов, фиксированных на двухэтапных остеointегрированных винтовых имплантатах, их устранение и профилактика / В.А. Лабунец, Е.И. Семенов, О.Н. Сенников // Вісник стоматології. – Одесса. – 2009, №3. – С. 82–84.

3. Готь І.М., Варес Я.Е., Угрин М.М., Штука О.М., Солонько М.Ю. Основи передпротезної хірургічної підготовки порожнини рота // Методична розробка, Львів. – 2008. – 52 с.

4. Linkow L., Wagner I., Chanavaz M. Tripodial mandibular subperiosteal implant / G. Oral Implantology. – 1996. – P. 17–36.

5. Суров О. Современная практика субпериостальной имплантации // Новое в стоматологии. – 2009, № 4. – С. 1–26.

6. Тимофеев А.А. Хирургические методы дентальной имплантации // Киев: ООО «Червона Рута-Турс». – 2007. – 128 с.: ил.

7. Трезубов В.Н., Щербаков А.С., Мишнёв Л.М., Фадеев Р.А. Ортопедическая стоматология (факультетский курс): Учебник для медицинских вузов // Под ред. проф. В. Н. Трезубова. – 8 изд–е, перераб. и доп. – С-Пб: ООО «Фолиант», – 2010. – 656 с.

Түйіндеме

ЖЕКЕ САҚТАЛҒАН ТІСПЕН ЖӘНЕ АЛЬВЕОЛЯРЛЫ ӨСКІННІҢ АТРОФИЯСЫМЕН НАУҚАСТАРДАҒЫ ҮСТІҢГІ ЖАҚТЫҢ ФРОНТАЛДЫ БӨЛІГІНДЕГІ ТІСШІЛІК ЖӘНЕ СУБПЕРИОСТАЛДЫ ИМПЛАНТАЦИЯНЫҢ ТИІМДІЛІГІНЕ ТАЛДАУ

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Украинаның денсаулық сақтау Министрлігі

Көптеген тістердің болмауымен 24 пациентте үстіңгі жақтың фронталды бөлігіндегі жеке сақталған тістің ауданындағы альвеолярлы айдардың атрофиясы кезіндегі субпериосталды және тісшілік имплантаттарды қолданудың тиімділігіне талдау өткізілді. 5 жылдан 15 жылға дейінгі мерзімде клиникалық зерттеулер нәтижелері Шредер бойынша альвеолардың атрофиясының 3 түрі жағдайында үстіңгі жақтың фронталды бөлігіне тісшілік имплантаттарды енгізу және қосымша остеопластикалық араласуларды өткізу жөнсіздігін көрсетеді. Үстіңгі жақтың фронталды бөлігіндегі жеке тісті сақтау фронталды бөлігіндегі альвеолярлы өскіннің атрофиясының үдеуінің алдын алу және субпериосталды имплантаттағы тысқаптамасының функционалды тұрақтылығын қамтамасыз етуші элементі үшін міндетті болып табылады.

Негізгі сөздер: тісшілік имплантат, субпериосталды имплантат, фронталды бөлігі, альвеолярлы айдардың атрофиясы, үстіңгі жақ, жеке сақталған тіс.

Резюме

АНАЛИЗ ЭФФЕКТИВНОСТИ ВНУТРИКОСТНОЙ И СУБПЕРИОСТАЛЬНОЙ ИМПЛАНТАЦИИ ВО ФРОНТАЛЬНОМ ОТДЕЛЕ ВЕРХНЕЙ ЧЕЛЮСТИ У БОЛЬНЫХ С ОДИНОЧНО СОХРАНИВШИМСЯ ЗУБОМ И АТРОФИЕЙ АЛЬВЕОЛЯРНОГО ОТРОСТКА

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У 24 пациентов, с множественной потерей зубов, проведен анализ эффективности применения субпериостальных и внутрикостных имплантатов и последующего протезирования при атрофии альвеолярного гребня в области одиночно сохраненного зуба во фронтальном отделе верхней челюсти. За период от 5 до 15 лет результаты клинического исследования указывают, что во фронтальном отделе верхней челюсти в условиях 3 типа атрофии альвеолы по Шредеру нецелесообразно введение внутрикостных имплантатов и проведение дополнительных остеопластических вмешательств. Сохранение одиночного зуба на верхней челюсти является обязательным для профилактики прогрессирования атрофии альвеолярного отростка во фронтальном отделе и элементом обеспечения функциональной стабильности протеза на субпериостальном имплантате.

Ключевые слова: внутрикостный имплантат, субпериостальный имплантат, фронтальный отдел, атрофия альвеолярного гребня, верхняя челюсть, одиночно сохраненный зуб.