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THE RELATIONSHIP BETWEEN THE OCCURRENCE OF LONG-TERM COMPLICATIONS AFTER DENTAL IMPLANTATION WITH THE SHAPE OF THE FACIAL SKELETON

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Annotation. *Hemeroteca and mesoprosopic shape of the facial skeleton and the thickness of the bone plate over the tooth root less than 0.5 mm predispose to MPS. The development of the mandibular postimplantation syndrome is uniquely associated with the DI and the quality of the anatomy of the facial skeleton and the quality of the bone tissue of the alveolar process.*

Key words: *maxillary post-implantation syndrome, facial index.*

One option for the effective replacement of dentition defects or the treatment of full or partial adentia is dental implantation. Intraosseous dental implantation as well as any surgical intervention is accompanied by complications. The least studied it long-term complications after dental implantation [1, 2]. The vast majority of remote dental implantation complications occurs in the region of the upper jaw, due to its more complex anatomy and physiology, especially its topography, bone quality, proximity to the nose and orbit [3, 4].

Variant of remote complications in patients 1-5 years after dental implantation on the upper jaw – maxillary post-implantation syndrome – simultaneous presence of rhinological, ophthalmologic and neuro-stomatologic symptomatology. On the basis of the materials [1-5], it can be assumed that the pathogenesis of the maxillary post-implantation syndrome is to some extent related to the condition and characteristics of the anatomical barrier, represented by the anatomical-topographic relationship of the maxillary sinus, the alveolar process and the roots of the teeth of the upper jaw. In the first place with the geometry of the barrier – the distance from the roots of the tooth of the upper jaw to the bottom of the maxillary sinus.

Little is known of attempts to conceptually adequately perform an objective analysis of an array of data on the problem of distant complications after a trauma of the facial skeleton in dental implantation (DI) to identify interrelated and interdependent pathological processes in bone tissue and organs of the facial skeleton, head and neck.

An analysis of the literature suggests that the impact of improving implant systems and additional practical skills on dental implantation results is rather limited, and the number of adverse outcomes of dental implantation in different researchers does not decrease less than 5-10 % [3, 8].

The purpose of the work is to determine the main anatomical and topographic relationships of the maxillary sinus, the alveolar process and the roots of the maxilla in the system of the human face, leading to the development of the maxillary post-implantation syndrome.

After dental implantation on the upper jaw for partial or complete secondary adentia, the development of chronic postimplantation maxillary sinusitis [9,10,11] or maxillary postimplantation syndrome can be developed in the long term [2,3].

Materials and methods of research. Processed diagnostic computer tomography images of 41 patients (control group) with complete toothpaste on the upper jaw and 132 patients after dental implantation (main group): 72 (34 men and 38 women) - with remote consequences of dental implantation in the form of maxillary post-implantation syndrome, control group 2 - 60 (31 persons and 29 women) - without complaints about dental implantation. The face index (FI) is the ratio of the height of the person (distance from the middle of the base of the mandible to the middle of the frontal nasal septum) to the cervical width (the distance between the arches of the foreskin), expressed as a percentage. There are 3 forms of the skull: FI hameprosopic form: from 78 to 84% (wide and low face); middle, mesoprosopic: FI from 84 % to 88.9 %; leptoprosopic form: face index > 89% (high and narrow face). Face index was determined according to the known method [5]. Measurement of anatomical structures was performed on three-dimensional reconstruction of the skull on tomograms in the software package "Vision" of the DICOM format.

Results of the research and their discussion. In the control group of patients without any complaints about the long-term consequences of dental implantation, hypopneummary upper jaw sinus was detected in 23.3 % of the observations, isopneummary – in 55.0 %, hyperpneummary – in 21.7 %, in patients with maxillary post-implantation syndrome – in 29.2 %, 47.2 %, 23.6 % of observations, respectively.

In the control group, the leptoprosopic form of the facial skeleton was observed in 65.0 % of patients, mesoprosopic – in 26.7 %, hameprosopic - in 8.3% of patients, in patients with maxillary post-implantation syndrome - 20.8%, 29.2%, 50, 0% respectively. Almost hameposopic shape of the facial skeleton is a risk factor for the development of maxillary post-implantation syndrome. Results of identification of the shape of the facial skeleton in patients selected by the type of structure of the maxillary sinus, are presented in Table 1.

In medicine (in orthopedics and traumatology the term bone quality is used very superficially, but there are no classifications), the only application of the quality concept is known, and it is within the framework of dentistry in the treatment of partial / full adentia for satisfying 2 vital needs - there is. This classification of the quality of the bone tissue of the jaws by Mish [8].

Table 1

Dependence type craniofacial area of extent of the upper jaw body pneumatization

Pneumatization	Shape					
	hameprosopic		mesoprozopic		leptoprozopic	
	абс	%	абс	%	абс	%
Control groupe 1 (n= 41)						
hypo -	1	2,3	2	4,6	4	9,3
iso -	3	7,0	7	18,6	11	27,9
hyper -	2	4,6	5	11,6	6	13,9
ALL	6	13,9	14	34,9	21	51,2
control group 2, after dental implantation (n= 67)						
hypo -	0	0,0	2	3,3	12	20,0
iso -	2	3,3	13	18,3	25	33,3
hyper -	3	5,0	5	5,0	5	11,7
ALL	5	8,3	20	26,7	42	65,0
patients with maxillary postimplantation syndrome (n=72)						
hypo -	12	16,7	6	8,3	3	4,7
iso -	16	22,2	10	13,9	8	11,1
hyper -	8	11,1	5	6,9	4	5,5
ALL	36	50,0	21	29,2	15	20,8

Based on the analysis of computer tomograms [12], an alternative classification of the quality of the bone tissue of the jaws from 6 types of architectonics of the bone tissue of the jaws is proposed:

I type - the bone tissue of the jaw is represented almost completely compact layer. This type of architectonics is more often recorded in the frontal part of the lower jaw, less often in the lateral sections and in the frontal part of the upper jaw with varying degrees of atrophy and residual bone volume.

II type - the ratio of compact and spongy layers is 1: 1. The spongy layer is represented by a few but very thick trabeculae; the thickness of a compact layer is 3-5 mm or more.

III type - the ratio of compact and spongy layers is 1: 3. The thickness of the compact layer is 2-3 mm. The spongy layer is represented by a uniform, well-developed network of trabeculae. This type of architectonics is more common in the region of molars of the lower and upper jaws, less often in the frontal region and in the region of the mandibular bumps.

IV type – the ratio of compact and spongy layers is 1: 4 or more. The thickness of the compact layer is 1-2 mm. The spongy layer is represented by a loose network of thin trabeculae. It is observed in the zone of tubercles and alveolar process of the upper jaw in the region of molars and the region of molars of the lower jaw.

V type – the thickness of a compact layer is 2-4 mm. The spongy layer is practically absent. Observed with pronounced atrophy of the jaws and only in the lateral parts (zone of the chewing group of teeth).

VI type – the thickness of a compact layer is not more than 0.5-1.5 mm. The sponge layer is absent. Observed with moderately pronounced atrophy in the lateral parts of the jaws.

In accordance with the quality of bone tissue, the design, size and configuration of the implant system are created to ensure the bi-and intercortical location of the intraosseous elements. The quality of the anatomy of the facial skeleton should be considered. The significant variability in the structure of the maxillary sinuses determines the variety of clinical manifestations of the sinusitis and their course, which makes possible the development of orbital and intracranial complications.

Depending on the degree of pneumatization of the maxillary sinuses, variants of their anatomical structure are distinguished: agenesis, hypogenesis, hypergenesis, normal pneumatization. Taking into account the morphology of the maxillary sinuses and the topographic-anatomical relationships of the maxillary bone with adjacent bone structures, the sinuses are pinched: alveolar, palatine, malar, infraorbital or anterior tear (prelacrimal), sphenoid, palatine bone. The presence of such pockets contributes to the development of the maxillary post-implantation syndrome.

In terms of creating a classification of the quality of the facial skeleton, we note that the maxillary sinus in 15.5 % of patients with acute and chronic sinusitis consists of 2 cells isolated from each other [14]: this anomaly complicates and burdens the treatment of any sinusitis. Anatomical abnormalities of the nasal cavity and osteomeal complex are the main factors in the development of acute maxillary sinusitis and maxillary post-implantation syndrome , as blocking the sinuses of the paranasal sinuses, they lead to a violation of drainage and oxygenation functions.

We note the frequency of elements of anomalous potentially dangerous anatomy in patients with maxillary post-implantation syndrome and patients with a favorable status after dental implantion: nasal septal deformities – 100.0 % and 48.2 %, abnormalities of the hook-shaped process – 39.39 % and 17.86 %, anomalies of the middle nasal shells – 37.88 % and 14.29 %, the anomalies of the latticed bubble – 21.21 % and 12.5%, the nasal tubercle cell – 43.94 % and 19.64 %, the "Haller's cell" – 7.58 % and 3.57%, extramural frontoethmoidal cells – 13.64 % and 5.36%, dehiscence of the medial wall of the orbit – 15.15 % and 3.57 %, hypertrophy of the nasal tubercle cell – 9.09 % and 3.57 %, additional australia hnechelyustnoy sinus – 21.21 % and 7.14 %.

Table 2 shows the thickness of the alveolar sprout from the root of the tooth (or implant) to the maxillary post-implantation syndrome in all groups of the subjects. Measurement of the distance from the incisors to the maxillary sinus was performed diagonally on the specially selected oblique sections of the CT, since the bone plate of the alveolar sprout above the incisors is actually a little thinner and separates the root of the tooth not from the maxillary sinus but from the cavity of the nose. Left and right patients of the same name often have been in an ambiguously identified position.

For example, usually the root of the third tooth enters the bone plate of a considerable thickness over it, but the posterior and posterior-lateral surfaces of its root often borders on the small pre-medial buckling maxillary sinus, because of which the distance from the tooth root to the maxillary sinus is minimal.

Table 2

The distance from the roots of the tooth of the upper jaw to the bottom of the maxillary sinus (in mm)

Teeth upper jaw	Patients without indications for DI	Patients with DI without disturbed complications	Patients with syndrome
8	0,83±0,12	0,74±0,16	0,43±0,13
7	0,78±0,12	0,68±0,14	0,45±0.12
6	0,91±0,10	0,77±0,17	0,47±0,14
5	0,81±0,11	0,67±0,15	0,48±0,12
4	1,18±0,13	1,03±0,18	0,58±0,15
3	2,71±0,14	2,51±0,27	2,44±0,25
3	2,81±0,16	2,48±0,30	2,12±0,21
4	1,38±0,11	1,23±0,22	0,52±0,19
5	0,89±0,12	0,71±0,14	0,54±0,12
6	0,84±0,11	0,71±0,15	0,51±0,14
7	0,85±0,10	0,74±0,16	0,45±0,13
8	0,82±0,11	0,67±0,15	0,48±0,12

The main rethink before the development of the maxillary post-implantation syndrome is topography and anatomy of the bottom of the upper branch of the upper and lower crusts of the upper crusts of the upper crust: the upper root of the tooth is glued to the bottom of the sinus with a mucous membrane or a layer of bone tissue with a thickness of 0.2 to 12 mm [6, 7].

There is no reliable difference in the distances from the root of different teeth to the maxillary sinus on the right or left side is absent. The bone barrier between the countries of the upper jaw teeth has been studied repeatedly in connection with the potential danger of perforation of the bottom of the maxillary sinus in endodontic interventions, for example, in studies [5-7]. One of the main factors contributing to the gradual development of maxillary post-implantation syndrome is the reduction of the layer of the alveolar process between the root of the tooth bone plate above the root of the tooth about 0.5 mm. At lower values of this index, the percentage of the appearance of the maxillary post implantation syndrome after dental implantation is significantly increased. This is due to the anatomical and topographic features of the structure of the upper jaw and the shape of the facial skeleton [5, 7]. Among patients with mesoprosopic and leptoprosopic forms of the facial skull in the control group, sinuses with hypo- and isopneumatisation are found in 60.4 % of the observations, in the control group 2 – 74.9

% of the observations, in patients with maxillary postimplantation syndrome – only 38.0 % of observations. It is quite realistic to form groups of risk by facial index.

Conclusions. The leading anatomical factor in the genesis of a remote complication after dental implantation is an excessively thin bone plate above the root of the tooth. The main prerequisite for the development of the maxillary post-implantation syndrome is the topographic-anatomical ratio of the bottom of the maxillary sinus and the tops of small and large root teeth of the upper jaw. The chameprosopic and mesoprosthetic forms of the facial skeleton and the thickness of the bone plate above the root of the tooth are less than 0.5 mm contribute to the development of the maxillary posterior implantation syndrome.

The development of the mandibular postimplantation syndrome is uniquely associated with the DI and the quality of the anatomy of the facial skeleton and the quality of the bone tissue of the alveolar process. A similar approach based on the concept of quality can be realized with respect to the remote complications of any other operated organs.

References:

1. Asmolova A. A. Dental implants can generate maxillary postimplantation syndrome Sindromul post-implantar maxilar: consecință a implantației dentare. Arta Medica. 2015; 1 (54):28 – 30.

2. Asmolova A.A. Analysis of the taxonomic spectrum of the microbial "landscape" of the mucous membranes of the craniophatic region in patients with the maxillary postimplantation syndrome. Crimea. therapist. Journal. 2012;1:48-52.

3. Asmolova A.A. Maxillary postimplantation syndrome. News of stomatology. 2017;1:62-66

4. Lee K.C., Lee S.J. Clinical Features and Treatments of Odontogenic Sinusitis. Yonsei Med. J. 2010; 51(6): 932-937. http://dx.doi.org/10.3349/ymj.2010.51.6.932

5. Gajvoronsky I.V., Gajvoronsky I.V., Gajvoronsky A.I., Hayvoronskaya MG, Dubovik EI, Kevorkov SA Kranyometrycheskye correlation and dependence zubochelyustnoy system, visochno-nyzhnechelyustnoho joints and facial skull of adult human. Morfolohyya. 2008;2:29.

6. Heyvondyan M.Э. Main factors of development co complications sides facial skeleton during endodontic interventions on the upper mouth of the Bulletin of medical Internet conferences 2012; 11:903-907.

7. Kovalenko Y.P., Mareyev G.A. Computed tomography in measuring anthropometric parameters facial skeleton man. Prospects science. 2012;7(34):21-24.

8. Mish K.E. Orthopedic treatment with support for dental implants: Per. with English. Moscow: Reed Elsiver. 2010; 616:1-24.

9. Pyontkovskaya M.B., Acmolova A.A. Maxillary postymplantatsyonnыy syndrome: Introduction to the issue. Ros. Journal dentalnoy ymplantolohyy. 2013; 2:66-70.

10. Paraskevich V.A. Dental Implantology: The Foundations of Theory and Practice. Minsk: Unipress; 2002:368.

11. Piontkovsky M.B., Drumova A.N. New variant of odontogenic maxillary sinusitis: chronic postimplant sinusitis. Radiation diagnostics, radiation therapy. 2015;3-4:93-98.

12. Piontkovskaya M.B., Drumova A.N. Preventive maintenance and metaphylaxis of chronic postimplantation maxillary sinusitis: control of X-ray density of bone tissue of the upper jaw. Radiation diagnostics, radiotherapy. 2017;2:40-48.

13. Kilic C., Kamburoglu K., Yuksel S.P., Ozen T. An Assessment of the Relationship between the Maxillary Sinus Floor and the Maxillary Posterior Teeth Root Tips Using Dental Cone-beam Computerized Tomography. European Journal of Dentistry. 2010; 4(4): 462-467.

14. Rozenfeld L.G., Rogozhin V.A., Kolotilov N.N. Diagnostic image - an element of the description of the nosological form in otorhinolaryngology. Communication Zhurn. vyshnih, nosovih i throat of a horse. 2002;5:46-50.