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MODERN ASPECTS OF MORPHOFUNCTIONAL CHANGES IN THE MAXILLOFACIAL AREA IN PARTIAL AND COMPLETE TEETH ABSENCE AT DENTAL IMPLANTATION

Nowadays, there is a high prevalence of major dental diseases among the population, which are associated with carious lesions of teeth and their complications, as well as periodontal diseases leading to tooth loss, which are the main causative factors. The development of secondary deformities of dental rows contributes to the functional activity disorder of the entire dental-mandibular system, where the main etiologic factor is the loss of teeth in various pathological processes. In this case, there is a violation of the functional activity of the dental-mandibular system, which requires timely complex medical and social rehabilitation of patients, which is of great practical importance. One of the restoration types of lost teeth is the installation of dental implants, where in the conditions of pronounced atrophy of the alveolar process of the jaws there are complex clinical situations that are not an easy task for the specialist, as well as for patients. Meanwhile, the restoration of partial secondary and complete adentia with pronounced atrophic changes of the alveolar bone on artificial supports is performed with previous bone grafting, which is a challenging task on the way to improve the quality of life in patients.

In spite of the wide study this problem remains unsolved, which determines its further research aim improving the provision of medical care.

Keywords: complications of dental caries, periodontal diseases, tooth loss, alveolar atrophy, anatomical-topographical features, maxillofacial region, dental implantation, bone grafting, restoration of dental rows, medical and social rehabilitation.

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Introduction. Today, within the framework of the national project “New Technologies for Health Preservation”, special attention is paid to the dental health of the population, which is of great importance in the social-economic development of society. According to the researches A.O. Abdumomunova et al. (2020), V.A. Vakhrusheva (2022), A.A. Britova (2024), the high level of prevalence of the main dental diseases among the population is determined, which are associated with carious lesions of teeth and their complications, as well as periodontal diseases, leading to tooth loss, which are the main causative factors of morphofunctional changes in the alveolar process [1, 2, 3]. In this case, there is a violation of the functional activity of the entire dental alveolar system, which requires timely complex medical and social rehabilitation of patients, which is of great practical importance [4, 5, 6]. One of the types of restoration of lost teeth is the installation of dental implants, where in the conditions of pronounced atrophy of the alveolar process of the jaws there are complex clinical situations that are a difficult task for the specialist as well as for the patients [7, 8, 9].

Restoration of partial secondary and complete adentia with pronounced atrophic changes of the alveolar bone on artificial supports is performed with previous bone grafting, which is a challenging task on the way to improve the quality of life in patients [10, 11, 12]. Meanwhile, despite extensive research, this problem remains unsolved, which determines the need for further studies improving the provision of medical care.

The modern concept of etiological factors and pathogenetic mechanisms of anatomical-topographic changes in the maxillofacial area. The study of the prevalence of partial and complete loss of teeth in the population has an important theoretical and practical significance for the organization and implementation of adequate predictive and preventive measures. According to WHO clinical and epidemiologic data, tooth loss is detected in 75% of the population on a global scale and, accordingly, the restoration of defects in the dental rows and the function of the dental alveolar system is a global problem [13, 14, 15]. In Russia, secondary adentia in the total structure of medical care under state guarantees in therapeutic and preventive dental institutions reaches up to 75%, and in all age groups of the population. There researches say that the frequency of partial tooth loss in young people aged 18-25

years old reaches up to 38.6%, and 70% of the group of people aged 50-60 years old have various prosthetic constructions in the oral cavity, which determines the presence of an urgent medical and social problem of restoring defects of dental rows with the use of artificial supports [16, 17, 18, 19].

Studies by S. Usanova et al. (2021), N. Agbulut (2024), S.K. Akbarjon (2024) established the facts that a person needs at least 20 teeth for biting and chewing food to ensure normal chewing of food and adequate nutrition, as well as the intake of multivitamins, polyminerals and essential nutrients [29, 30, 31]. At the same time, the problems of tooth loss are widely studied, but at the present stage they remain unsolved, which are associated with a high prevalence of major dental diseases that are the main causative factors of secondary partial and complete adentia.

Today, the main causative factors of primary partial adentia have been substantiated and established, which are related to the disruption of embryogenesis of dental tissues, leading to the failure to form the rudiments of permanent teeth [23, 24, 25]. In addition, dysembryogenesis and disturbance of the eruption process often lead to the formation of retained teeth with the formation of primary partial adentia [26, 27, 28].

Dental caries is a common pathology of hard tissues of teeth, which often leads to its complications in the form of pulpitis and periodontitis, causing tooth loss. A wide range of local and general risk factors for the development of dental caries has been substantiated and proved, where qualitative and quantitative changes in the composition and properties of oral fluid and structural resistance of hard tissues of intact teeth can have an impact. In addition, the formation and development of dental caries plays an important role in the presence of general systemic diseases, as well as social-economic and natural-climatic environmental conditions, etc. Dental caries and its complications are chronic foci of infection in the oral cavity, which can cause the development of focal diseases in the body, so the above clinical features are an urgent problem of medicine in general. Changes in the hard tissues of teeth of demineralizing character and its complications cause tooth loss among various population groups, creating varying degrees of severity of disorders of the functions of the dental-alveolar system, gastrointestinal tract, musculoskeletal system, etc. [3, 10, 18].

It is important to emphasize that the severity of the comorbid condition and the number of missing teeth have a direct correlation with age-related aspects. Thus, according to A.A. Vorozhko et al. (2024) the most frequent loss in structure is associated with permanent first molars in the structure of the loss of various groups of teeth, which, as a rule, are most often affected by dental caries during the period of eruption due to a decrease in caries resistance of dental hard tissues [51]. At the same time, extractions of the frontal groups of teeth of the upper and lower jaw are less frequently determined.

It is known that complications of dental caries occur with necrotic processes of dental pulp tissue with subsequent development of granulomas and cystogranulomas in the periapical tissues, and then the formation of cysts, which require therapeutic and preventive measures, including tooth extraction when indicated [32, 33, 34, 35, 36, 37]. At the same time, there are cases of removal of previously treated teeth, which are associated with chipping or splitting of the crown or root of the tooth due to excessive instrumental processing during endodontic treatment, as well as weakened with increased removal of hard tissues of the crown of teeth during their preparation for filling. In addition, traumatic injuries to the teeth, as well as to the bones of the facial skeleton, chemical (acid) necrosis of the hard tissues of the crowns of teeth, and in some cases surgical interventions for inflammatory diseases of the maxillofacial region can lead to tooth loss [38, 39, 40, 41]. In partial secondary adentia, the pathogenetic mechanisms of dental-mandibular system dysfunction are associated with large adaptive and compensatory mechanisms [42, 43, 44].

The prevalence of periodontal diseases among school-age children reaches up to 87%, and in adults this figure is up to 97%. This unfavorable clinical and epidemiological situation has a direct impact on the occurrence of dental defects associated with tooth loss. Thus, by the age of 35 years there are objective facts of losing up to 10 teeth due to complications of inflammatory periodontal diseases [13, 23]. Local and general factors influence the development of inflammatory-destructive processes. Chronic periodontitis is accompanied by a disturbance of microcirculation of periodontal tissues, causing a sharp decrease in the level of oxygen consumption by surrounding tissues, which creates the preconditions for quantitative and qualitative changes in bone density of the alveolar outgrowth of the jaws, which often lead to tooth loss. Such a clinical situation associated with the loss of antagonist teeth from the physiological point of view contributes to a decrease in the functional load of periodontal tissues, leading to deterioration of blood supply and hypoxia with the subsequent development of hemo- and lymphostasis, vascular thrombosis, swelling and destruction of collagen fibers and the formation of osteoporosis and bone tissue resorption [1, 2, 4]. The above determines the need for further research aimed at solving medical and social problems of periodontal diseases.

It is important to note that the presence of various general systemic diseases has an important practical significance in tooth loss. Thus, pronounced changes in metabolic processes in diabetes mellitus have a negative impact on the functional state of the dental-mandibular system, and also contributes to a decrease in immunobiologic reactivity of the organism in patients [8, 16, 21, 29, 30]. At the same time, the main causative factors of tooth loss in patients with diabetes mellitus are the development of microangiopathies, which condition the development of periodontal diseases [4, 5, 46]. In addition, the constant intake of medications, particularly for the treatment of cardiovascular diseases, depressive states, sleep and rest disorders associated with diabetes mellitus, often lead to the appearance of symptoms of xerostomia and other pathological processes of the oral cavity [1, 33, 45]. Meanwhile, in the elderly and seniors, comorbid conditions contribute to an increase in the prevalence of secondary partial and complete adentia, which require restoration of dental defects with various prosthetic structures, including prosthetics supported by dental implants [5, 6, 15, 16, 27, 28, 42].

The analysis of the obtained data showed that there is a high level of prevalence of secondary partial or complete adentia among the population, which determines the timely treatment, prevention and rehabilitation measures, including the restoration of dental defects with prosthetic structures on artificial supports, which necessitates further research aimed at improving dental care for this category of patients.

Etiological factors and pathogenetic mechanisms of morpho-functional changes in the dental alveolar system. Currently, a high prevalence of major dental diseases among the population is determined, where 70% of patients have secondary partial or complete adentia, which are accompanied by significant recession of alveolar bone, which determines the relevance of the problem of complex medical and social rehabili-

tation of patients with marked bone loss [3, 6, 10, 33, 35, 40]. At the same time, pathogenetic mechanisms associated with tooth extraction are known to trigger various interrelated complex restructurings of the dental alveolar system, which are characterized by pronounced anatomical and topographic changes in the tooth rows, as well as in the hard and soft tissues of the upper and lower jaws. Such peculiarities should be taken into account when restoring defects of the dental rows with prosthetic constructions, especially with the support of dental implants [2, 19, 26, 27].

It should be noted that according to A.O. Abdumomunova et al. (2020), G.I. Dzhalilova (2020), Sh. Musaeva (2022) the main anatomical and morphological changes in the alveolar process of the jaws are associated with tooth loss due to complications of dental caries and periodontal diseases, which are common among the population due to clinical and epidemiological features [1, 8, 16]. Thus, during the first year after tooth loss the development of atrophic processes of the external cortical plate is determined up to 25%, and within three years it reaches up to 40%. This clinical situation of the alveolar bone tissue contributes to the displacement of the external compact lamina to the oral side [1, 8, 34, 35, 44]. Studies have shown that pronounced resorption of the bone tissue of the alveolar process, as well as the surrounding soft tissues, is observed within three months after tooth extraction. Thus, six months after tooth extraction there is bone resorption with a decrease in the width of the alveolar ridge by about 4.0 mm, and height - up to 1.5 mm, which is characterized as pronounced anatomical-topographical and morphological changes in the dental arch. Further in 12 months the loss of bone tissue in width reaches up to 50% of the initial volume, and the conducted dynamic control during 2-3 years confirms the loss of bone tissue of the jaw alveolar outgrowth up to 40-60%, which continues in a constant mode from 0.25 to 0.5% per year [1, 8, 34, 35, 44]. Also, it can be noted that atraumatic tooth extraction in clinical practice allows preserving a significant volume of alveolar bone, leading to a decrease in the degree of bone resorption of the dental arches of the upper and lower jaws in the future [1, 19, 33]. Thus, in the presence of a dental row defect, the unified morphofunctional dental-mandibular system, manifests itself as a violation of its biomechanics, where quantitative tooth loss over time leads to impaired mastication function, which largely depend on the topography of dental arch defects and the amount of tooth loss. Compensatory-adaptive reactions in such clinical cases, where antagonist teeth are missing in the areas of the tooth row, condition the chewing or biting of food at the expense of the preserved antagonist groups. The above-mentioned features associated with tooth loss lead to impaired function of periodontal tissues and masticatory muscle groups according to Z. Khabadze (2021) et. all, A.R. Vieira (2021), F. Iaculli et. al (2022), as well as the constituent anatomical components of the temporomandibular joint [45, 46, 47]. The changes in mastication functions begin from the period of partial loss of teeth, which determine the state of the dental alveolar system or its individual links in the work of M.A. Danilova (2021) [48, 49, 50].

From the pathogenetic point of view, A.A. Korobkeeva et al. (2020), Sh. Musaeva et al. (2022), M.B. Fazylova et al. (2023) have established the occurrence of certain disorders in the metabolism of bone tissue of the jaws, which are manifested in the early period after partial tooth extraction, characterized by an increased level of calcium-phosphorus metabolism and a significant decrease in the content of total proteins [14, 16, 27]. With such changes, the compensatory-adaptive response of the jaw bone tissue to the changed conditions of functional load on the periodontium in secondary partial or complete adentia manifests itself as a violation of mineral and protein metabolism. The loss of teeth in the dental arch increases the compression pressure to some extent, where bone tissue atrophy increases with pronounced reduction of the alveolar process [1, 2, 21].

It should be mentioned that patients with tooth loss have an unfixed bite associated with the absence of antagonist teeth, as well as a decrease in the height of the lower face with certain displacements of the lower jaw in relation to the upper jaw [7, 8, 11, 12 , 16]. Also, Also, according to M.A. Danilova et al. (2021), A.Yu. Vasilyeva et al. (2022), in patients with partial and complete adentia, masticatory muscle groups due to disturbances in the biomechanics of the dentoalveolar system create preconditions for the formation of hypertonus with the development of discoordination and asynchrony of mandibular movements, which further leads to the formation of myofascial pain syndrome [7, 11, 49]. At the same time, these clinical situations contribute to the development of pronounced morphofunctional changes in the temporomandibular joint (TMJ) [46, 47, 48,]. There are clinically observed shifts in the position of the remaining teeth along the lines of the Popov-Godon phenomenon with subsequent atrophic processes of the alveolar process in the area of the missing teeth [1].

It is important to emphasize that one of the causes of changes in the anatomical shape and size of the alveolar process is complex tooth extraction, peri-implantitis, odontogenic inflammatory diseases of the maxillofacial region, traumatic injuries of the bones of the facial skeleton, congenital clefts of the upper lip and palate, and postoperative deformations of the upper and lower jaw bones due to various neoplasms [1, 19, 33]. According to the studies conducted, it was found that after tooth extraction on the mandible, the intensity of atrophy of the lingual and vestibular walls of the alveolar process is characterized by the presence of certain features [4, 19]. Thus, pronounced bone loss is determined on the vestibular side of the wall, as its thickness is much thinner than the lingual one, which contributes to a significant reduction in the width of the bone tissue of the alveolar process [1, 2, 4, 16, 19]. In this regard, non-invasive and atraumatic tooth extraction always contributes to the maximum reduction of bone tissue reduction of the alveolar process of the upper and lower jaws. In addition, the severity of atrophic processes of the alveolar process depends on the anatomical localization of extracted teeth within the dental arches, as well as the shape and type of dental defects [1, 19]. For example, in included defects of the jaw rows, bone atrophy is much less, as the remaining teeth act as a natural limiter of further bone resorption, and in terminal defects, bone resorption begins throughout the entire length of the defect. In such clinical cases, crater-shaped deep bone defects are formed in the alveolar process, and resorption is more pronounced in the lateral regions than in the anterior region. Studies have shown that the atrophy of the alveolar process of the dental rows in the mandible is faster compared to the maxilla [21, 33, 35, 44].

Today, the direct influence of a wide range of general and local factors related to the state of organs, tissues of the oral cavity and macroorganism on the loss of jaw bone volume has been proved and substantiated. Recently, correlations between osteoporosis severity indices and hormonal status imbalance in menopausal women have been proved, which are less pronounced in the trabeculae of jaw bones in men [1, 2, 14, 44, 46]. Thus, in individuals over 50 years of age with systemic osteoporosis, a change in the thickness of the cortical layer of the mandible

is determined, which becomes less than 3 mm, creating the need to take these features into account when performing dental implantation [19, 27, 40]. In addition, bad habits, taking various medications have a negative impact on mineral metabolism, contributing to the formation and development of osteoporosis, which worsen the qualitative parameters of bone tissue and increase the rate of its resorption [8, 16].

There are researches that endocrine disorders, hypo- and avitaminosis, disorder of phosphorus-calcium metabolism, as well as infectious diseases, which are risk factors for the development of complications of pathological processes of the organs and tissues of the oral cavity and maxillofacial region, can lead to the development of secondary deformities of the dental rows [6, 16, 34]. In these clinical situations, tooth displacements in various directions with a decrease in interalveolar height are found, which in adults are asymptomatic and last for a long time. After tooth loss in the above systemic diseases and pathologic processes, defects of tooth rows are formed, where the dental alveolar system ceases to function as a single functional unit [11, 18, 22, 29]. In this case, the group of teeth that have no antagonists does not take part in chewing food and forming a food clump, where the entire load of chewing pressure is transferred to the teeth that have antagonists, due to which the primary traumatic syndrome is formed. In the works of A.A. Korobkeev et al. (2020), V.A. Tishchenko (2023) dysocclusion of the upper and lower jaw teeth creates preconditions for the formation of premature occlusal contacts, which significantly aggravate further dysfunction of the dentoalveolar system [51].

It is important to emphasize that traumatic injuries of the bones of the facial skeleton can result in defects of the alveolar process of the maxilla and mandible, which form various acquired pronounced deformities of nonlinear shape, affecting the bone tissue areas adjacent to the dental arch [40, 41, 42]. A.A. Korobkeev et al. (2020) says that from the clinical point of view, defects were formed as a result of radical surgical treatment for various neoplasms pose a particular difficulty for the restoration of the alveolar process [42].

Some studies characterize the features of the mechanisms of bone and soft tissue reorganization after tooth extraction, where the nature of these reorganizations largely depends on the biological type of periodontal tissues [4, 13, 21]. Thus, C. Ochsenbein et al. (1969) introduced the concept of "periodontal biotype", which defined the morphological characteristics of belonging to one or another type of tissue structure [13]. In 2017, the term "biotype" was replaced by "phenotype" at the World Workshop of Periodontology periodontal disease convention, which is categorized into thin and thick [29]. The thin phenotype of periodontal tissues includes a narrow band of keratinized gingiva, thinning mucosa covering the alveolar bone, a shallow oral vestibule, and fenestration of alveolar bone over the roots of teeth [9, 13, 18]. At the same time, Belser U.C., Buser D., Hess D et all. (2000) think that the thick phenotype is characterized by a significant zone of attachment of keratinized gingiva, where it is defined as dense, prone to the formation of coarse-fibrous connective tissue in the form of scar deformities, flattened morphological architectonics of soft and bone tissues of alveolar outgrowths of the jaws [9, 10]. The studies have established their structural features, where thin gingival biotype is detected in 15% of the population, and thick gingival biotype is 85%, respectively.

In general, the development of secondary deformities of the dental rows contributes to the disruption of the functional activity of the entire dental alveolar system, where the main etiologic factor is the loss of teeth in various pathologic processes.

Some features of anatomical and topographic changes in the maxillofacial region during dental implantation. The main functional activity of medical specialists is aimed at preserving the functional state of the dental-mandibular system, which performs vital functions associated with the reception of food, the formation of food clump, the act of swallowing, the correct performance of respiratory movements, speech, as well as psycho-emotional status. In this case, the condition of organs and tissues of the oral cavity, maxillofacial region largely depends on the normal functioning of organs and body systems, which can be negatively affected by multiple local and general factors associated with working conditions, the level of education of the individual, living conditions, bad habits and behavior, the ecological situation of the environment, material security, health care development, social-economic status of the social system, etc. [20, 21, 22].

In a number of cases, defects of the jaw alveolar processes in vertical and horizontal directions may appear, which require additional surgical preparation with increasing the bone tissue of the alveolar process in height and width [11, 19, 24, 26, 28]. When restoring defects of dental rows using dental implants, specialists pay special attention to the qualitative parameters of bone tissue related to its architectonics, as well as the ratio of the cancellous and cortical layer. From the physiological point of view, the bone consists of the cortical lamina consisting of osteons and spongy substance including trabeculae, which are functionally oriented towards the increased occlusal load [18, 46, 51]. At the same time, a decrease in vertical functional load during tooth loss leads to a violation of metabolic processes in bone tissue with the subsequent formation of physiologic resorption of the alveolar outgrowth [11, 19, 24, 26, 28]. According to the research results of A.A. Dolgaleva, V.S. Kadurina, A.E. Mishvelova (2018) and M.A. Danilova, P.V. Ishmurzina (2021), the change in the thickness of the cortical plate of the bone tissue of the dental rows has a negative impact in ensuring the primary stability of dental implants [8, 11].

Defects of the maxillary dentition cause some anatomical-topographical changes, which are associated with the presence of maxillary sinus, nasal cavity, where low bone density is determined [1, 4, 16, 40]. Besides, simultaneously with the decrease in the height of bone tissue after tooth loss there is a decrease in the morphological parameters of the depth of the oral vestibule, where the shallow vestibule formed in this case promotes some mimic muscles to "attach" to the crest of the atrophied alveolar process, which creates certain clinical difficulties in the course of rehabilitation measures when installing dental implants. The reduction of the depth of the oral cavity anterodorsum is the main causative factor of ischemia and chronic secondary trauma of the mobile mucosa, which contribute to the development of the inflammatory process, resorption and accelerated atrophy of bone tissue around implants [16, 19]. In addition, further atrophy of the alveolar process in the maxilla leads to anatomical-topographical changes associated with the displacement of the neurovascular bundle coming out of the incisal aperture to the crest of the alveolar process, and the muscle group lifting the upper lip and the wing of the nose, the corner of the mouth can take an anatomical position closer to the alveolar crest [19, 26]. Meanwhile, the presence of postoperative keloid scars affecting the alveolar processes can cause certain difficulties during dental implantation.

Conclusion. The conducted evaluation and analysis of morphofunctional changes of the maxillofacial region in

partial and complete absence of teeth at dental implantation, characterizes the presence of individual anatomical-topographical features, which require a personalized approach to each patient and require further research to improve the restoration of dental rows with prosthetic constructions on artificial supports at pronounced atrophic changes in the alveolar bone tissue of the jaws.

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COMBINATION OF CHRONIC KIDNEY DISEASE WITH CHRONIC NON-COMMUNICABLE DISEASES

The scientific review examines chronic kidney disease (CKD) in combination with chronic non-communicable diseases. Chronic kidney disease is a serious and growing public health problem worldwide, characterized by a gradual and irreversible decline in kidney function and is one of the leading causes of death worldwide. The priority task of healthcare is the prevention of chronic non-communicable diseases, among which the most significant include cardiovascular diseases, bronchopulmonary diseases, diabetes mellitus, and oncological diseases. The association of CKD with chronic non-communicable diseases, in particular with cardiovascular diseases, makes this pathology especially dangerous, which leads to a deterioration in the quality of life of patients and an increase in mortality. The treatment of patients with comorbid pathology requires a comprehensive and interdisciplinary approach.

Keywords: chronic non-communicable diseases, chronic kidney disease, diabetes mellitus, arterial hypertension, oncological diseases, coronary heart disease, bronchial asthma, chronic obstructive pulmonary disease.

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Introduction. CNID is a long-term ongoing disease caused by prolonged exposure to various causes: environmental factors and genetic characteristics combined with an unhealthy lifestyle (smoking, alcohol abuse, unhealthy diet, low physical activity). The World Health Organization (WHO) estimates that 41 million people die from these diseases every year, accounting for 71% of all deaths; more than 15 million of them are people aged 30 to 69 years. CNID is the main cause of early death and disability of the population [14].

WHO identifies the following categories of NCDs with corresponding mortality rates:

- cardiovascular diseases (CVD): most often – arterial hypertension (AH), coronary heart disease (CHD) and CKD) claiming 17 million lives;
- oncological diseases lead to the death of about 9.3 million people annually;
- diseases of the respiratory system (chronic obstructive pulmonary disease (COPD) and bronchial asthma (BA)) cause 4.1 million deaths per year;
- diabetes mellitus (DM) is the cause of death of 1.5 million people.

Special attention should be paid to CKD, which is a persistent organ lesion for three or more months due to the action of various etiological factors, the anatomical basis of which is the process of replacing normal anatomical structures with fibrosis, leading to its dysfunction by CKD [20]. The causes of CKD include genetic factors and the consequences of concomitant diseases such as hypertension, diabetes, abdominal obesity and lipid metabolism disorders (dyslipidemia). Today, hypertension consistently holds a leading position among all the causes contributing to the progression of CKD, affecting about 10-15% of the world's population [28].

Arterial hypertension and CKD. The basis for the development of hypertension in patients with CKD is the activation of the sympathetic nervous system against the background of deterioration of kidney function. This, in turn, contributes to an even greater increase in blood pressure (BP) in people with CKD. In the process of decreasing glomerular filtra-

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