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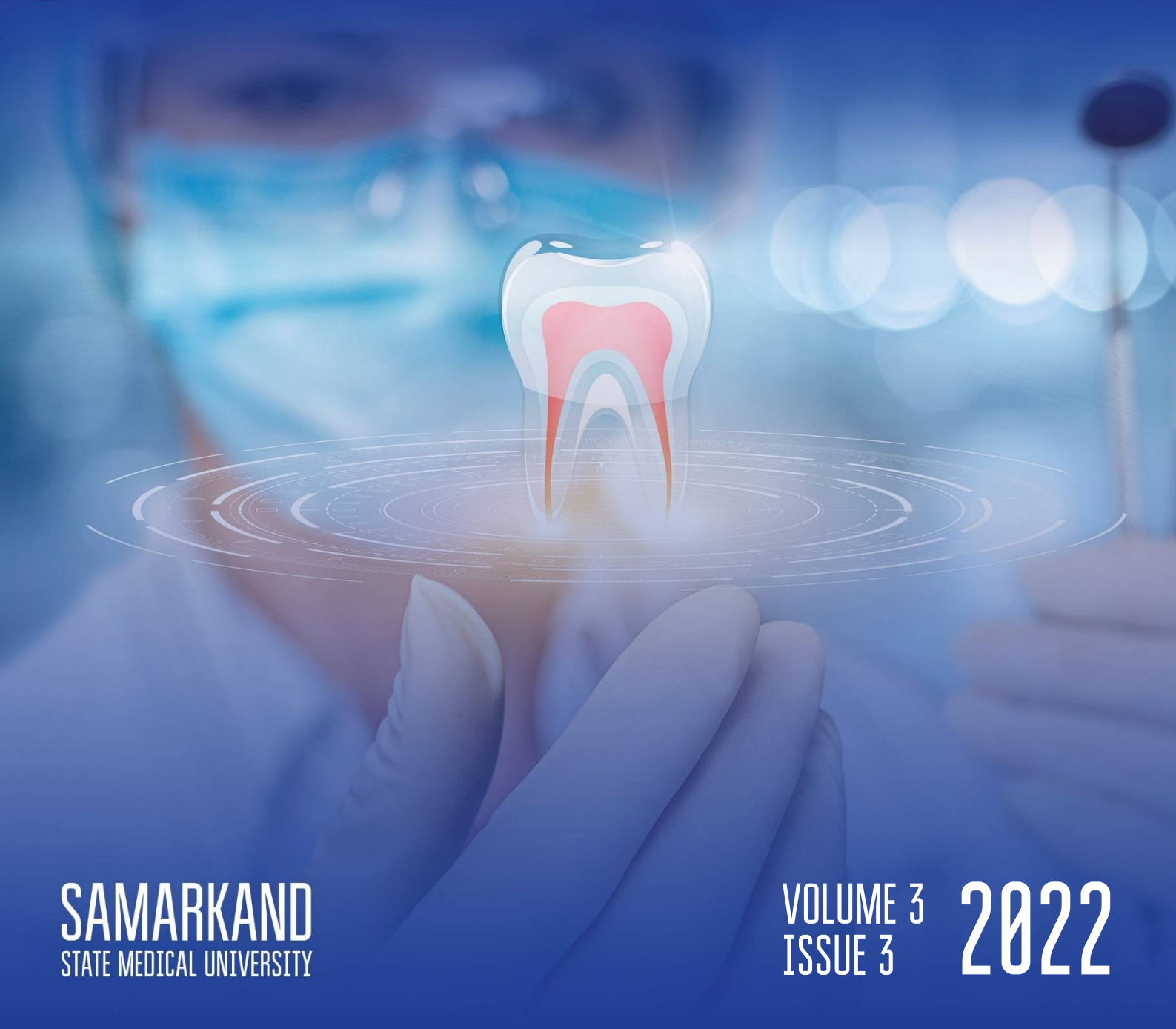

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Buzrukzoda Javokhirhon Davron
Samarkand State Medical University
Rizaev Elyor Alimdjanovich
Olimjonov Kamron Jasur ugli
Tashkent State Dental Institute

NEW APPROACHES TO DIRECTIONAL JAW BONE REGENERATION (LITERATURE REVIEW)

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ANNOTATION

This paper describes the process of reparative regeneration and the possibility of its regulation by various factors. The prospect of using membranes for directed tissue regeneration and osteoplastic materials in autodontoplastic surgeries is considered. The analysis of the literature allows us to approach the development of a method for guided tissue regeneration during tooth replantation, taking into account the phases of regeneration and the factors influencing this process, in order to reduce the time and increase the effectiveness of the developed treatment method.

Key words: regeneration, atrophy, dentoalveolar anomalies, guided bone regeneration.

Бузрукзода Жавохирхон Даврон
Самаркандский Государственный
Медицинский Университет
Ризаев Элёр Алимджанович
Олимджонов Камрон Жасур угли
Ташкентский государственный
стоматологический институт

НОВЫЕ ПОДХОДЫ К НАПРАВЛЕННОЙ РЕГЕНЕРАЦИИ КОСТНОЙ ТКАНИ ЧЕЛЮСТЕЙ (ОБЗОР ЛИТЕРАТУРЫ)

АННОТАЦИЯ

В данной работе описан процесс репаративной регенерации и возможность его регуляции различными факторами. Рассмотрена перспектива применения мембран направленной регенерации тканей и остеопластических материалов при аутоодонтопластических операциях. Проведенный анализ литературы позволяет нам подойти к разработке способа направленной регенерации ткани во время операции реплантации зуба с учетом фаз регенерации и факторов, влияющих на этот процесс, для сокращения сроков и повышения эффективности разрабатываемого метода лечения.

Ключевые слова: регенерация, атрофия, зубочелюстные аномалии, направленная костная регенерация.

Buzrukzoda Javohirxon Davron
Samarqand Davlat Tibbiyot Universiteti
Rizaev Elyor Alimdjanovich
Olimdjonov Kamron Jasur og`li
Toshkent Davlat Stomatologiya Instituti

JAG ' SUYAK TO'QIMASINI YO'NALTIRILGAN QAYTA TIKLASHGA YANGI YONDASHUVLAR (ADABIYOTLARNI SHARHI)

ANNOTATSIYA

Ushbu ishda reparativ regeneratsiya jarayoni va uni turli omillar bilan tartibga solish imkoniyati tasvirlangan. Avtodontoplastik operatsiyalarda to'qima va osteoplastik materiallarning yo'naltirilgan regeneratsiyasi membranalarini qo'llash istiqboli ko'rib chiqiladi. Adabiyotlarni tahlil qilish bizga tishni qayta tiklash operatsiyasi paytida regeneratsiya fazalari va ushbu jarayonga ta'sir etuvchi omillarni hisobga olgan holda, ishlab chiqilayotgan davolash usulining vaqtini qisqartirish va samaradorligini oshirish uchun to'qimalarni yo'naltirilgan qayta tiklash usulini ishlab chiqishga yaqinlashishga imkon beradi.

Kalit so'zlar: regeneratsiya, atrofiya, dentoalveolyar anomaliyalar, yo'naltirilgan suyak regeneratsiyasi.

The key to restoring tooth function and structure after injury or disease is regeneration. Regeneration can be reparative , physiological and pathological. Reparative regeneration is characterized by the healing of damaged tissues after the cessation of the action of the

pathogenic factor. Its result is the filling of the defect with a similar tissue or connective tissue. Physiological regeneration is the renewal of intracellular structures throughout life. Its result can be considered as ensuring the normal activity of cells and tissues. Pathological regeneration - renewal of intracellular structures against the background of the action of pathogenic factors, as a result - tissue healing in pathological conditions.

It is also necessary to distinguish between complete and incomplete regeneration. Regeneration is called complete, as a result of which a tissue defect is filled with a similar tissue, and the site of damage completely disappears. Incomplete regeneration is a type of regeneration in which a tissue defect is filled with another tissue (connective) [1].

In an experimental study on white rats, we established the fact of regulation of the regenerative process by periodontal polypeptides. Epithelialization and full repair of the defect mucous membrane, in animals receiving periodontal polypeptides passed almost 2 times faster than in animals receiving physiological solution. results given research gave impetus to a more detailed study of the process of reparative regeneration, methods of its regulation and application in dentistry [2].

AT process reparative regeneration we Can highlight three phases:

1) primary tissue response; 2) proliferation; 3) formation of osteoid and coarse fibrous bone tissue [3].

1. Primary tissue response - can be divided into three phases: 1) early - characterized by the death of damaged tissues, vasodilation , migration of leukocytes to the site of damage. 2) intermediate phase - the essence of which is local proteolysis; 3) - the recovery phase, during which the production of proteins and vascularization occurs .

1) Early phase: In this phase, alteration and exudation phases can be distinguished.

Alteration - under the influence of a traumatic factor directly on the bone tissue, as well as due to damage to blood vessels. Part of the bone tissue at the site of injury dies. The resulting defect is filled with blood.

Exudation - characterized by vasodilation, increased migration of macrophages and lymphocytes in lesion site, what causes immunological reactions involving cytotoxins . The increased content of prostaglandins, immunocytokinins (TNF-alpha, IL-1beta, IL-6) in the gingival fluid provokes the processes of bone tissue destruction by activating osteoclastic resorption.

2) Intermediate (cleansing) phase: circulating mononuclear cells cluster and fuse with each other to form multinucleated cells called osteoclasts that adhere to the surface of the bone. A corrugated or brush border forms under the osteoclast, limiting the space under the cell. In this space, the osteoclast produces hydrogen ions, lactate , and proteolytic enzymes which cause destruction protein matrix, this is accompanied by the release of bone mineral components [4].

3) Recovery phase: next, the initiation of osteogenesis occurs. Isolation of growth factors from serum and blood plasma: alpha2- HS glycoproteins; PDGF -proteins - stimulating mitosis of osteogenic cells, endothelial cells of bone capillaries, regulating the production of fibronectin by osteoblasts; proteins IGF group - which are "signal" receptors of cell membranes of osteogenic cells activating their activity on the endosseous surface of the bone. Secretion by osteoclasts in the process of matrix resorption of GCSF -factor, which activates the transition to the active form of inactive osteoblasts bordering resorption niches. Also, the release of TGF - β proteins inhibiting the action of osteoclasts [5,6,7]. The primary tissue response phase lasts 24-48 hours [8,7].

It is generally accepted that the standard sequence of local reactions to damage is to mobilize the resources of the body to deal with the actual damage to the integrity of the tissue. At the same time, the inflammatory process itself can have a damaging effect and cause pain and functional disorders, especially when the initial damage is supported by an autoimmune mechanism [9]. In this case, the immune system mistakenly produces antibodies against the macroorganism 's own antigens [10].

2. Proliferation - On the third day after injury, the synthesis of morphogenetic proteins occurs: BMP - 2; - 3; - four; - 5. These proteins initiate mitosis and differentiation of osteogenic cells into osteoblasts [11,7]. Proliferation of small vessels begins, at the same time there is a proliferation of osteogenic cells and their differentiation into osteoblasts. Proliferation of Haversian vessels and osteogenic cells occurs along the Haversian canals [12,13].

3. The formation of osteoid and coarse fibrous bone tissue - the synthesis of organic matrix by osteoblasts occurs. Isolation of bone morphogenetic proteins, in particular the BMP-1 protein, being an enzyme, it takes an active part in the synthesis of collagen [11,7]; Proteoglycans (bioglycan , versican , decarin , fibromodulin , osteoglycin and osteoadherin) - it is believed that they stimulate the formation of type I collagen fibrils [14]; Glycoproteins (osteonectin , thrombosepondin , fibronectin , vitronectin , fibrillin , osteopontin and sialoprotein) are non -collagenous proteins, attaching to collagen provide fixation of minerals to collagen fibrils, some of the proteins (osteonectin) regulate the growth of hydroxyapatite crystals and promote the mineralization of the organic matrix [15,16]; Phosphoprotein (phosphorine) - binding a large amount of calcium increases its local concentration, thereby stimulating the mineralization and growth of hydroxyapatite crystals [17]. Osteoblasts produce type I collagen (characteristic of bones) - the peptide chains of which form a triple helix like a rope, collagen fibers of the bone are formed mainly from glycine, as well as alanine, proline and hydroxyproline. This spatial structure of collagen provides mineralization along the peptide chains. Mineralization of the other 4 types of collagen does not occur [18]. After a 10 day period of osteoid secretion, mineralization of the organic matrix begins. It consists in the deposition of calcium salts in the finally formed matrix. In the finally formed bone, the mineral component is presented in the form of hydroxyapatite crystals, as well as sodium, potassium, magnesium, lead, and iron ions [19].

It should be noted that, upon activation, osteogenic cells within 3-5 days differentiate in dependencies from microenvironments in osteochondros or fibroblasts [12]. With sufficient blood supply and activation by osteoinductor proteins, osteogenic cells differentiate into osteoblasts, with impaired blood flow, reduced vascularization and absence adequate signal to osteogenesis - in chondro and fibroblasts [19,7]. In organic the matrix of bone tissue forms the conditions necessary for mineralization. Important factors that prevent this process are pyrophosphates, phosphonates, and diphosphonates, which inhibit mineralization [19]. In bone tissue, this action is removed by inorganic pyrophosphatase. The lack of mineralization in other tissues is explained by the absence of enzymes that hydrolyze calcification inhibitors.[20]

Considering the role of such cells as fibroblasts in periodontal regeneration, we can say that they are the most numerous periodontal cells capable of secreting collagen and intercellular substance [21]. Many factors growth produced fibroblasts :

1. Basic fibroblast growth factor (bFGF) has a positive effect on the growth of all types of cells in the wound, stimulates the production of extracellular components matrix fibroblasts (fibronectin and collagen).

2. Transforming growth factor (TGF -beta) stimulates fibroblast chemotaxis and their production of collagen and fibronectin (Caps C. et al .,)

3. Transforming growth factor (TGF -alpha) influences angiogenesis (Chen J.etal ., 1993). Consequently, it is fibroblasts that can participate in its regeneration, secreting that type of collagen and intercellular substances which the typical exactly for periodontal [22].

In studies conducted by D.L. Tokar under conditions of fibroblast cultures, it was found that with the introduction of periodontal polypeptides in Wednesday growth fibroblasts, increased proliferative activity of the latter. And also there was an increase in the synthesis of collagen and a decrease in the secretion of collagenase [23].

Each of the phases of reparative regeneration is regulated by various factors, such as cells of the immune system, inhibitors and activators of the activity of a particular type of cell, etc. Thus, by influencing the course of reparative regeneration in any of the phases through one or another regulator, we can not only reparative regeneration, but also to get what we need view fabrics. (Approx. Receipt periodontal fabrics at replantation, obtaining full-fledged osseointegration during implantation).

Thus, in the process of reparative regeneration, anatomical restoration of the bone and periodontal tissue defect occurs. In the process of physiological regeneration under the influence of a functional load, the bone and periodontium acquire the structure that was before the damage.

The term autoodontoplasty includes 2 terms denoting surgical interventions: tooth replantation and autotransplantation tooth. These problems were engaged in V.G. Weinstein, 1968; Kingsbuty , 1969; V.A. Malyshev, 1970; G.I. Khaikin, G.F. Nosach, 1972. V. In both cases, the donor and recipient is the same person.

Under the operation of replantation of a tooth, it is customary to understand its transplantation into the same hole in the jaw from which it was previously extracted. The operation of autotransplantation of a tooth involves its transplantation into a newly formed, but always different socket of the jaw of the same individual.

The strengthening of the tooth in the hole is carried out by means of three elements: the bone of the alveoli - the periodontal fibers - the cement of the tooth. With various diseases, trauma or surgery, there is destruction one or several from elements. By according to V.A. Kozlov during surgical interventions associated with the extraction of teeth, and then returning them to the dentition, in various clinical situations, 3 types of tooth fixation (i.e. fusion) in the alveolar bone are possible: 1. Periodontal - the most complete type of fusion with the restoration of periodontal fibers, is possible only if periodontal fibers are preserved, both from the side of the alveolar bone and from the side of the cement of the tooth. 2. Fibrous - periodontal - there is a partial, incomplete, restoration of periodontal fibers, possibly while maintaining periodontal fibers either from the side of the alveolar bone or from the side of the root cementum. 3. Osteoid - there is a restoration of the connection of the tooth root with the alveolar bone according to the bone-to-bone type, with further root resorption, possibly in the absence of periodontal fibers on both sides [24].

use of membranes for guided tissue regeneration and osteoplastic materials is a great prospect for autoodontoplastic operations. Their main purpose in autoodontoplasty is to control the processes of osteogenesis and create adequate anatomical and physiological conditions for replantation and autotransplantation of teeth, i.e. to contribute to subsequent secure fixation of the tooth in the alveolar bone.

Cells of the periodontal ligament, as shown by studies of foreign authors (Nyman S. _ Et al . 1982 Gottlow et al . 1984), have the ability to regenerate, provided that the gingival epithelium and connective tissue are separated, using an occlusal membrane (barriers), from the surface of the tooth root. The following materials were used as non - absorbable and absorbable barriers : cellulose, polytetrafluoroethylene (PTFE), lactic acid polymer, glycolide polymers, etc. (F.F. Losev, 1998).

Barrier materials or membranes should have the following criteria: tissue integration, cell impermeability, spaceability, clinical usability, and biocompatibility.

Distinguish between nonabsorbable barriers and resorbable barriers barriers. The first nonabsorbable membrane approved by the FDA was a polytetrafluoroethylene (PTFE) membrane, but the use of these membranes requires further surgical intervention to remove them. This fact has necessitated the development of resorbable membranes that avoid reoperations (Blumenthal N. , Stemberg J. , 1990). The first FDA -approved membrane of this type was a combined multilayer matrix composed of polymers of lactic and citric acids. Quinonnes and Caffesse proved that the results of treatment with absorbable membranes are comparable to nonabsorbable ones . It should be noted the excellent results obtained when using membranes in combination with osteoplastic materials [25].

There are a number of classifications of osteoplastic materials, in particular, according to their origin and ability to influence osteogenetic processes. All materials for the restoration of periodontal tissues by origin are divided into:

1. autogenous - source material is myself a patient.
2. Allogeneic - donor is another human.
3. Xenogenic - the donor is an animal.
4. Alloplastic - a) received from natural materials (corals, cellulose); b) synthetic (synthetic hydroxyapatite , calcium sulfate, biologically active glass, polymeric materials).

Classification of osteoplastic materials proposed by Edward Cohen (1988) based on the expressiveness osteoinductive potential of materials, subdividing them into 3 groups: osteoinductive , osteoconductive and osteoneutral .

Bioactive osteoplastic materials used for bone tissue reconstruction may have osteoinductive properties - the ability to cause osteogenesis or osteoconductive properties - to ensure the advancement of the front of osteogenesis on the surface of the material.

Bioactive materials can be divided into materials of biological and non-biological origin. Having dwelled in more detail on bioactive non-biological materials, it is these materials that we use in our studies, it should be said that they have pronounced osteoconductive properties, provide adhesion of proteins and bone tissue cells, actively participate in ion exchange and bone matrix metabolism, maintain ionic and covalent bonds with minerals bones, they are partially or completely replaced by bone tissue in the process of its regeneration.

The main component of osteoplastic materials is hydroxyapatite , the main inorganic component of bone tissue. The main biological properties of hydroxyapatite include its mitogenic and osteotropic action. In addition, collagen fibers of connective tissue elements can grow into the microporous surface of hydroxyapatite granules [26]. Gingival epithelial cells can form contacts similar to hemidesmosomes with hydroxyapatite [27].

Thus, our analysis of the literature allows us to approach the development of a method for guided regeneration during tooth replantation, taking into account the phases of regeneration and the factors that influence this process, in order to reduce the time and increase the effectiveness of the developed method of treatment.

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Tadqiqot LLC The city of Tashkent,
Amir Temur Street pr.1, House 2.
Web: http://www.tadqiqot.uz/; Email: info@tadqiqot.uz
Phone: (+998-94) 404-0000

Контакт редакций журналов. www.tadqiqot.uz
ООО Tadqiqot город Ташкент,
улица Амира Темура пр.1, дом-2.
Web: http://www.tadqiqot.uz/; Email: info@tadqiqot.uz
Тел: (+998-94) 404-0000