**O. M. PAVLOV, F. A. GORBACHEV**

# DENTAL IMPLANTATION



Minsk BSMU 2019

МИНИСТЕРСТВО ЗДРАВООХРАНЕНИЯ РЕСПУБЛИКИ БЕЛАРУСЬ
БЕЛОРУССКИЙ ГОСУДАРСТВЕННЫЙ МЕДИЦИНСКИЙ УНИВЕРСИТЕТ
КАФЕДРА ЧЕЛЮСТНО-ЛИЦЕВОЙ ХИРУРГИИ

**О. М. Павлов, Ф. А. Горбачев**

# ДЕНТАЛЬНАЯ ИМПЛАНТАЦИЯ

# DENTAL IMPLANTATION

Учебно-методическое пособие

Минск БГМУ 2019

УДК 616.31-089.843(075.8)-054.6
ББК 56.6я73
П12

Рекомендовано Научно-методическим советом университета в качестве учебно-методического пособия 19.12.2018 г., протокол № 4

Р е ц е н з е н т ы: каф. ортопедической стоматологии и ортодонтии с курсом детской стоматологии Белорусской медицинской академии последипломного образования; канд. мед. наук, доц. каф. челюстно-лицевой хирургии Белорусской медицинской академии последипломного образования О. С. Яцкевич

**Павлов, О. М.**

П12 Дентальная имплантация = Dental implantation : учебно-методическое пособие / О. М. Павлов, Ф. А. Горбачев. – Минск : БГМУ, 2019. – 20 с.

ISBN 978-985-21-0234-6.

Содержит план изучения темы и блок современной информации по видам, истории и клиническим основам дентальной имплантации.

Предназначено для студентов 4–5-го курсов медицинского факультета иностранных учащихся по специальности «Стоматология», врачей-интернов, клинических ординаторов, обучающихся на иностранном языке.

**УДК 616.31-089.843(075.8)-054.6**
**ББК 56.6я73**

Учебное издание

**Павлов** Олег Михайлович
**Горбачев** Федор Александрович

# ДЕНТАЛЬНАЯ ИМПЛАНТАЦИЯ

# DENTAL IMPLANTATION

Учебно-методическое пособие

На английском языке

Ответственный за выпуск А. С. Ластовка
Переводчики О. М. Павлов, Ф. А. Горбачев
Компьютерная верстка А. В. Янушкевич

Подписано в печать 11.02.19. Формат 60×84/16. Бумага писчая «Xerox office».
Ризография. Гарнитура «Times».
Усл. печ. л. 1,16. Уч.-изд. л. 1,1. Тираж 50 экз. Заказ 68.
Издатель и полиграфическое исполнение: учреждение образования
«Белорусский государственный медицинский университет».
Свидетельство о государственной регистрации издателя, изготовителя,
распространителя печатных изданий № 1/187 от 18.02.2014
ул. Ленинградская, 6, 220006, Минск

**ISBN 978-985-21-0234-6**

## MOTIVATIONAL CHARACTERISTIC OF THE SUBJECT

**The total time**: 225 minutes.

Achievements in dentistry are connected with development of many interdisciplinary sciences: biomedical physics, dental materials science, biomechanics, mathematics and many others. Today our society gets not only in the way of maintaining health of the nation, but also in the guard of the normal social status of the person who cannot be satisfactory without self-confidence. Confidence very often can be absent because of thoughts of some disfiguration. Emotional rest of people is guarded by many doctors, among them dentists and maxillofacial surgeons hold specific place.

Presently patients have alternative to removable prostheses — dental implantation. It allows not to injure intact teeth at recovery of defects of the lost teeth. Now this procedure was widely included even into daily practice of dentists of Republic of Belarus.

Abroad dental implantation actively is implemented into practice from 60th years. In the USSR implantation of teeth has been prohibited by the order of the Ministry of Health of the USSR, and ban has been withdrawn only in 1986. By this time such prominent scientists as Branemark, Linkow, Zarb, Albrektsson and many others have already achieved considerable progress in development and deployment of different types of designs of implants in production and practical dental implantology.

Since 1986 treatment using implants began to gain popularity and at us in the country. So, at that time in BSSR, the first implant has been put in 1987, and since 1989 «Projektion» has begun production of the dental implants registered later under the Radix trademark.

In recent years interest in implantation does not decrease. According to special committee of the International congress of implantologists from 2001 to 2006 the number of operations on dental implantation will increase in the USA by 1,11 times, in EEC — by 2,08 times, in Japan — by 1,79 times.

**Purpose**: to study principal views of dental implants, history of development of dental implantation, morphological bases of dental implantation, stages of preparation for surgery of dental implantation, technique of carrying out one-stage and two-stage operations on dental implantation.

**Tasks**:

1. To get acquainted with history of dental implantation.
2. To consider principal views of dental implantation.
3. To cover morphological the bases of detailed implantation.
4. To study technique of carrying out and stages of operations on dental implantation.

**Requirements to the initial level of knowledge:** for full development of subject it is necessary to repeat material of the following sections:

– anatomy of front department of skull
– types of fixed orthopedic designs
– surgical preparation of oral cavity to orthopedic treatment

**Control questions on occupation subject:**

1. When do dental implants have for the first time begun to be used? What evolutionary stages were at development of dental implantation?
2. What types of dental implants exist now?
3. What features of integration and functioning of dental implants exist?
4. To call techniques of carrying out operations on dental implantation, the main stages of operations.

## HISTORY OF DENTAL IMPLANTATION

The person constantly aimed to replace the lost teeth with various materials, since ancient times. These materials were animal, human and mineral origin. Data on materials of implants are confirmed with archeological finds.

Implantation designs have been found at excavation in Egypt, Central America, China and other countries. In the museum Tibodi Garvardskogo of University of the USA the skull of the person of before columb era with the gemstones implanted into mandible is shown, and in the museum Peru there is exhibit of skull of the person of era of Inca with 32 implanted teeth from quartz and amethyst.

In the territory of modern Honduras the mandible fragment inka (6th century BC) has been found where on site teeth 42, 41 and 31 implants from armor of sea mussels have remained. The woman's skull is found in Shantambr (territory of France), it is dated 1st century AD, with metal implant in hole of canine of upper jaw. In the 18th century scientists have tried to return to implantation of teeth, but before introduction of the concept «antiseptic agents» by Lister, as a rule, there was infection of operational wound and rejection of implants.

The problem of retransplantation and transplantation of teeth by the first was put forward in 1100 by Spaniard Alabusasim. But till 18th centuries she did not find the practical solution. There took place broad search of implantation materials. J. Magilio used implant from gold, and J. Edmuns and H. Harris have offered porcelain implant on platinum basis, J. Bonwell — implant in the form of gold and iridic tubes, I. Pedchelon — the silver capsule as implant for porcelain crown.

In 1886 J. Magilio has made one-stage operation on statement of gold implant in hole of the extracted tooth after its removal and immediately fitted

a prosthesis on implant crown. However soon after operation has begun periodontitis in this connection, it was necessary to remove implant design.

The big contribution to development of techniques of implantations in the 19th century was made by J. Edmuns, H. Harris, R. Pajme, A. Hartmann, S. Perry, N. N. Znamensky and many others. At this time techniques and designs in the form of fang were developed. Berry in 1888 worked on biocompatibility. In 1891 at the IV Pirogovsky congress, and then in the «Meditsinskoye Obozreniye» journal the report of the privatdozent N. N. Znamensky «Implantation of false teeth» has been provided. Znamensky paid attention that for implantation by the best not the hole of the extracted tooth, and the bone recovered after removal is. Material has to be inert for organism, that is not react to physiological processes in bone. He has for the first time offered fenestrated design of implant in which apical part there was through hole for germination of bone tissue. The discovery made more than a century ago widely is used at production of modern designs of implants.

At the end of the 19th century wide use of different types of biological materials for production of implants begins. Medical practice includes titanium which is one of the only metals inert for human body. Besides, it has ease and resistance to corrosion.

At the beginning of the 20th century of J. Schol has offered implant design from corrugated porcelain, E. Greenfield has developed platinum implant in the form of basket which connected over gingiva by means of gold framework. Such implant could be used both for replacement of single tooth, and for replacement of group of teeth, that is was peculiar prototype of design of Ramus frame.

In the form of fang which are used now it is possible to carry designs of the American doctors of R. Adams and A. Strock. R. Adams in 1937 to implant prototypes has invented implant with screw thread on surface, and A. Strock in 1939 has offered implant from cobalt (Co), chrome (Cr), modibden (Mo).

The Swedish scientist of P. Branemark has formulated in 1952 necessary conditions for success of denture with support on implants — sterility, surface finish, non traumatic, geometrical equality of bed and design leads to the strong merging of surface of metal with bone called later «osteointegration».

Further time of active development of designs of implants varied in form begins. In 1963 on the basis of implants of A. Strock, R. Chercheve and S. Tramonte the American scientific L. Linkow has created screw implant with opening in the lower third of intra bone part that has allowed to improve its retention.

In 1965 P. Branemark suggests to apply the folding design of screw implant consisting of intra bone part and the basic head (abatmen) fastened to it. In 1969 L. Linkow has invented one more implant with intra bone part in the form of plate that has allowed to apply it at narrow alveolar shoots of jaws.

I. A. Small has begun to develop the implant representing plate with retentsionny and chrezkostny probes for atrophied mandible, and the Dutch sur-

geons of H. Bosker and L. VanDijk have offered folding option of this design, having called it transmandibular implant.

So H. Roberts has offered in 1970 one more design of implant for atrophied mandible, representing the arc-shaped plate calculated for implementation in three places of mandible. This design has received the name Ramus frame later.

In the 80th years huge number of designs, the majority of which are modifications of implants of the Branemark system, has been implemented.

## MAIN TYPES OF DESIGNS OF IMPLANTS

Implantation is introduction to organism of inorganic substitutes of the lost bodies.

Implant — in surgery transplant from artificial materials alien to organism (plastic, metal, etc.). D. F. Williams and R. Roaf (1973) have offered alternative formulation: the subject from not biological material entered into organism for performance of certain function for a long time.

The dental implant (fig. 1) is the false tooth consisting of crown and titanic pin. Thanks to the last world developments in the field of implantology, installation of implant is painless absolutely and quickly. According to the esthetic and functional characteristics the implant not only does not concede to natural teeth, but also in many respects exceeds them.


*Fig. 1.* Dental implant (Radix-Gimlet-IIS implant):
*1* — intra bone element; *2* — screw cap; *3* — gingiva shaper; *4* — head; *5* — artificial crown of tooth; *6* — screw which fastens crown

Now there is big variety of forms of the dental implants applied in surgical dentistry and maxillofacial surgery. Below we will stop on designs of modern dental implants.

**Classification of endoossalny implants:**

I. In form of designs:

1) implants in the form of body (fig. 2, fig. 3):
 – cylindrical;
 – screw;

2) implants flatness (fig. 4):
 – ramus frame type;
 – designs like ramus blade;
 – provisional implants.

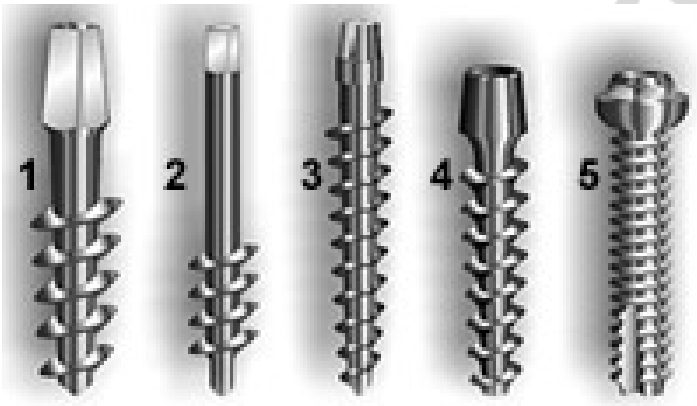



*Fig. 2.* One-stage screw implants:
*1* — the doctor's implant S. Tramonte (Italy), is applied since 1952; *2* — the doctor's implant D. Garbaccio (Italy), is applied since 1972; *3* — the implant of MTI (corporation IMTEC, USA), is issued since 1999; *4* — the implant of Radix-Gimlet-DM (Belarus), is issued since 1989; *5* — the implant of SSDI (Israel), is issued since 2000


*Fig. 3.* The folding implants of screw form expected two-stage technique of operation:
*1* — the implant of the Branemark system (Sweden), is issued since 1965; *2* — the implant of Replace (Steri-Oss, USA), is issued since 1995; *3* — Radix-Gimlet-IIS implant (the Radix system, Belarus), is issued since 1996; *4* — the Ankilos system implant (Degussa, Germany), is issued since 1997

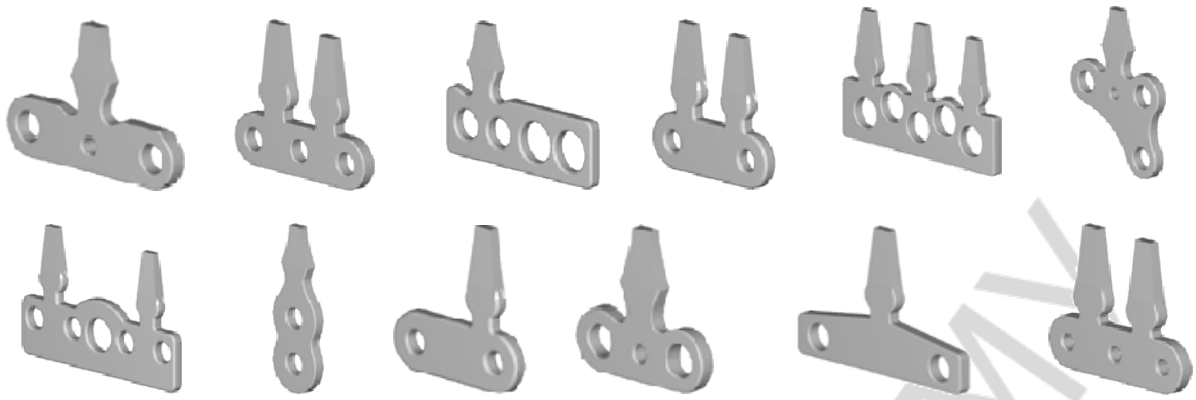


*Fig. 4.* The flatness implants «Plasma of the Volga region» made in the Russian Federation. These designs are expected various anatomic conditions of prosthetic bed and the number of the absent teeth

II. By quantity of stages of operations:

1) designs for one-stage operations (fig. 2, fig. 4);

2) designs for two-stage operations (fig. 3).

III. By production technique:

1) the implants made of pure titanium;

2) the implants made of titanium alloys with other metals;

3) the implants made of titanium alloys with hydroxiapatities or titanic dusting.

Each design has number of advantages and shortcomings. So the most ancient in modern implantology are designs of plate shape which use with success for a long time. For more than thirty years they keep in the market of dental products.

Implants of flatness can substitute defect not single of the absent tooth, and at once several teeth therefore they find broad application at implantation in distal groups of teeth as more atraumatic designs. Besides, designs of flatness have long endurance. There are examples when these designs served more than 40 years, and the subsequent observations have been interrupted for the sad reason — the death of the patient. That is designs served to death. However, these implants are capable to maintain heavy loads at shift in the transversal plane, but are unstable at action of loadings in the vertical and sagittal planes.

In comparison with them implants in the form of fang are capable to maintain loadings in all planes of approximately identical force.

## PREPARATION FOR SURGERY ON IMPLANTATION

Preparation for surgery one of the most important stages as success, both the operation, and the postoperative period depends on completeness of collection of information about the patient. In all clinics which specialize in implantation there is a number of questionnaires which before operation the patient that the doctor could collect the full anamnesis has to fill out.

After questioning and conversation with the patient, collecting the anamnesis pass to survey of the patient. Outer inspection is begun with survey of the person in fullface and profile, pay attention to ratio of departments of the person among themselves and symmetry of its separate elements. Number of authors consider that it is necessary to study anthropometrical parameters of the person as relationship between shape of face and length of dentitions not any. Further estimate mobility of mimic muscles, symmetry of the movement of muscles on both sides of the person, the nature of exposure of teeth at conversation and smile, the line of smile. Pay attention to color of integuments and red border of lips, corners of lips and their symmetry, existence of cracks. Consider expressiveness of folds of the person — nasolabial and mental, wrinkles, condition of oral cavity, symmetry of lips. At partial or full secondary edentia in mandible register height of the lower third of the person.

All above-mentioned factors directly influence the choice of systems for implantation by means of which it is possible to reduce esthetic outtcomings. The analysis of face proportions and aberrations is considered when scheduling treatment.

After outer inspection pass to survey of oral cavity. Define shape of lips, color of mucous membrane and degree of its moisture content, existence of cracks and folds in the field of mouth corners. Examine the line of biting of teeth on oral mucous of cheeks, character of bite, dental health, the periodontologichesky status of the patient. Carefully study bridles of lips and language, condition of bone structure of alveolar shoot of upper jaw and alveolar part of mandible.

On the basis of conversation and survey of the patient make the preliminary diagnosis. At initial inspection there can be serious contraindications for performing implantation: existence of carious cavities, periodontium diseases, bad oral hygiene of oral cavity and damage of mucous membrane. The majority of these contraindications can be removed after treatment of oral cavity.

After the main methods of inspection of the patient pass to additional methods. The most informative of them is the X ray — intra oral, panoramic, occlusal. Recently digital pictures which receive on the basis of computer tomography, cone-beam computed tomography, magnetic resonance imaging, interactive computer tomography and OPG research of teeth and bone tissue of jaws enter practice.

If the patient has serious pathologies (the analysis of the questionnaire), then additional inspection of problem systems of bodies is necessary. Consultation with other doctors, specialists in this type of pathology is obligatory.

Depending on quantity of the established designs allocate four degrees of complexity of operation:

The I degree of complexity of surgical manipulations — statement of 1 implant of flatness or 1–2 implants in the form of fang. Manipulations do not constitute danger, but it is necessary to consider mental condition of the patient. There can be following complications — injury of bone, bleeding, damage of peripheral branches of n. trigeminus or perforation of sinus maxillaris, perforation or otly walls of bone bed of implant. Mean time of operation up to 40 min.

The II degree of complexity — statement of 2–3 implants of flatness or 3–4 implants in the form of fang. Complications are such, as well as at operations I of degree of complexity. Time of carrying out operation of 40 minutes till 2 o'clock.

The III degree of complexity — statement more than 4 implants in difficult anatomic conditions or with plastics of soft tissues, autoplasty of soft tissues, autoplasty bone and mucous transplants from oral cavity and jaws or with use of allograft materials for reconstruction of alveolar bone, maxillary sinus, reposition of n. alveolaris inferior. Complications: the same, as at I and II degrees of complexity, possibility of injury of arteries, veins and their textures. Operation duration — 2–3 hours.

The IV degree of complexity — operation on statement more than 5 implants with plastics of jaws auto-or allograft. It is made in hospitals. It is multistage operation with use of crest of ileal bone, edge, fragments of fibula, free mucous transplants and their combinations with allograft materials, reconstruction of upper jaw with bosom bottom raising, reconstruction of mandible with reposition of the lower alveolar nerve. In these operations the microsurgery — the microvascular equipment can be used. Duration of operative measures — 3–4 hours and more.

## TECHNIQUES OF ONE-STAGE AND TWO-STAGES OPERATIONS ON IMPLANTATION

Implantation consists of three main stages — installation of body of implant, statement of abatmen of implant and prosthetics on implant. Success of all three stages depends on many factors, including on respect for the principles of asepsis and antiseptics. At operations it is necessary to follow rules of protection against dangerous infections, such as syphilis, tuberculosis, hepatitis, HIV infection and others.

Before operation on implantation at the patient the oral cavity has to be debrided. Surgical interventions carry out under local anesthesia. Use of premedication and anesthesia is possible. At implantation it is possible to use all methods of local anesthesia applied in dentistry.

At one-stage operations the implant body connected with abatment as the design represents whole — body of implant and abatment at one time is established.

At two-stage operations (fig. 5) at the I stage establish implant body in bone tissue and close it the screw cap. At the II stage make replacement of the screw cap at first on the gingiva shaper, and in 1–2 weeks on abatment and fit a prosthesis on implant. As a rule, the II stage is carried out after integration of implant that for upper jaw averages 6–12 months, for mandible — 3–6 months.

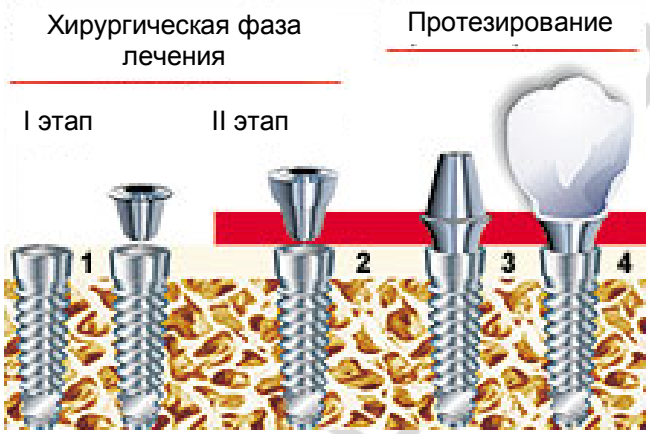



*Fig. 5.* Two-stage technique of implantation:
*1* — installation of intra bone element and screw cap (I stage); *2* — installation of the shaper of gingiva instead of cap (the II stage); *3* — installation of head of implant instead of the gingiva shaper; *4* — installation of the made crown on implant head

**Technology of operation.** For each operation the implant design according to anatomic conditions of surgery field is chosen. In the absence of distal group of teeth quite often in the CIS use plate- designs of implants. Operation begins with section scalpel on the middle of alveolar shoot of upper jaw or alveolar part of mandible on site of the absent tooth or group of teeth. By means of the spatula separate mucous and periosteal flap and create bone bed under implant of the corresponding design. Preparation of bone bed can be performed in the manual or machine way by means of special purpose tools — titanic burs, or is more often than them call titanic drills. The choice of type of preparation in many respects is defined by condition of bone bed and experience of the surgeon — the implantologist. So at narrow alveolar bone on upper jaw and small distance between bed of implant and genyantrum (sinus maxillaries) it is recommended to prepare manually for avoidance of perforation of bosom. The more experience at the surgeon, the is less danger of use of machine tools in its

daily practice. After forming of bone bed it is necessary to check its depth and for the best primary fixing of implants to make notches on its walls. On site necks of implants should be expanded the site of bone bed. Creation of notches for flatness designs because of their anatomic features is especially important. For final check of the sizes of the created prosthetic bed under certain design of implant often use analogs of implants operating rooms which by the sizes precisely match constant designs, but it is used only for sizing of prosthetic bed that the constant design was not damaged during checking.

After installation of body of implant in bone (fig. 16–20) there is removal of surplus of mucous and periosteal flap. Further establish caps and put stitches.

At the II stage of operation after integration of implant remove screws caps and install gingiva shapers. Further, in 7–10 days they are replaced with abatmens on which there will be further prosthetics. As a rule, before prosthetics for control of success of operation dental X-ray is taken.

Now, techniques of implantation allow to fit a prosthesis patients fixed prostheses at full secondary edentia (fig. 6, 7) and give the chance to eliminate defects single missed tooth, without injuring at the same time intact.

*Fig. 6.* Fixed gingiva formation

*Fig. 7.* Fixed metalceramic bridge

## MORPHOLOGICAL BASES OF DENTAL IMPLANTATION

At statement of implants the bone (fig. 8) is always injured. In the course of its regeneration at first is formed retikulo-fibrous (fig. 9), and then the lamellar bone tissue (fig. 10).

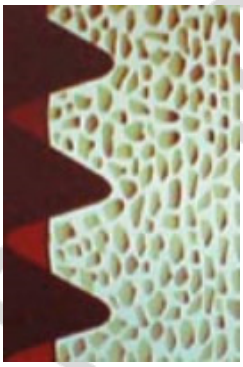


*Fig. 8*. Bone damage after implantation

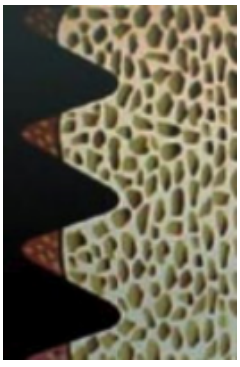


*Fig. 9.* Formation reticulo-fibrosis structures

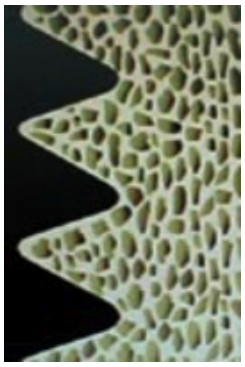
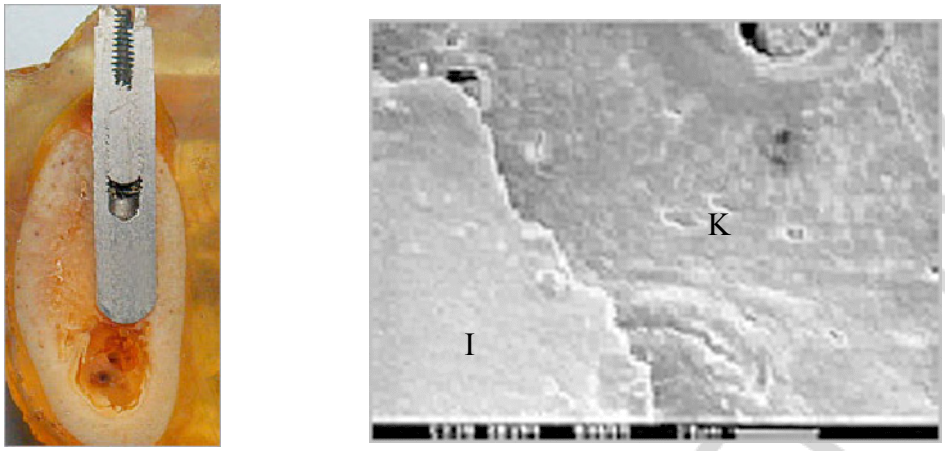


*Fig. 10.* Bone after healing

Normal regeneration of bone has to come to an end with formation of direct contact of implant and bone tissue (fig. 11), that is osteointegration.




***a*** ***b***

*Fig. 11.* Experiment on dogs on studying of integration of implants with bone (it was carried out in 1991):
*a* — the implant integrated into bone of mandible of dog. The implant served as denture support within 8 months; *b* — the interfaces of implant (I) and bone (K) received by means of submicroscopy. Osteointegration of implant is observed

Earlier believed that integration of implant happens at the expense of the fibrous fabric surrounding it. Was considered that collagen fibers grow into it and they connect implant through fibrous fabric to bone like sharpeevsky fibers. Fibrous integration was at the heart of use of flat implants of Linkow, Weiss. For this reason their surface is specially done uneven, it has bends and openings that the bone burgeoned through implant.

In case of failure, between surface of implant and alveolar bone the thick layer of connecting fabric at premature or excessive load of implant can be formed, causes its disintegration (fig. 12). Fibrous fabric, is not capable to be reliable support of implant, and the maximum term of functioning of this design at such support is 10 years.

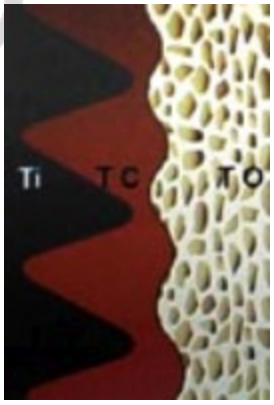



*Fig. 12.* Disintegration of dental implant

Separate type of engraftment of implants of flatness of Linkow and Weiss consider osteo-fibrous integration. At the same time partially direct contact, generally due to germination of bone tissue in implant openings is formed. Not less than 22 % of the area of support of body of implant have to fall to the share of direct contact with bone tissue. And the option of integration depends on initial loads of implant. The basic layer at osteo-fibrous integration receives properties of the shock-absorber due to elasticity of the fibrous capsule. Experimentally fibration between fibrous fabric of implant and directly bone is not proved. Success of implantation of planar constructions is not rather studied and his explanation is based only on clinical data. Flatness implants quite often function for up to 25 years.

Stages of healing of bone wound after surgery of implantation correspond to the general patterns of wound repair after fracture of jaws. Features of healing can be connected with materials of implant and features of surgical procedures.

Process of healing of bone wound takes place three main stages: inflammations, proliferation, healing. They can be combined with each other, but during every period one of them dominates.

**Inflammation stage**: begins as the response to alien intervention and stay in fabrics of foreign body, that is implant. Usually the stage of inflammation proceeds about 10 days, but maybe more long. In inflammation stage the implant entered into bone bed causes alteration which is considered as unity of the changes caused by damage of cellular structures and defense reactions of cells and organism in general. The various biochemical and morphological changes proceeding mainly in the form of local vascular reactions, necrosis of fabrics in the defeat center and also reactions of integral regulatory systems of all organism are characteristic of this stage. The major role in these reactions is played by vasoactive and hemotoxical substances. They influence expressiveness of inflammation and depend on concentration of the bacterial gemattraktant who have got to internal environment together with implant. During alteration there occur dystrophic changes of cells and intercellular substance which promote fast absorption of proteins on surface of implants. Then there is increase in aggregation of thrombocytes at implant surfaces, strengthening of coagulation of cascade character, release of cytokines, nonspecific and specific cellular reactions proceed. It is difficult to establish early manifestations of processes of exudation and alteration as for the first time 5–7 days domination of reparative processes is possible.

Processes of this stage can lead to emergence of tissue acidosis and increase in osmotic pressure. Products which collect in contact zone bone implant lead to disturbances of homeostasis, change of permeability of vessels. The permeability of vessels will be key factor upon transition from alteration to exudation and cellular infiltration. Exudation is expressed in disturbance of hemodynamics. Under the influence of mediators of inflammation the arterial vascu-

lar hyperemia therefore outflow of blood and lymph can be broken develops. Impact on these processes is exerted by serotonin and histamine. At stagnation of blood local thrombosis is observed.

The acidosis caused at this time usually leads to increase in hydrophily of fabric colloids, generally proteins of isokollagens, and, as a result, it collagen fibers. It leads to delay of blood-groove in small vessels because of weakening of walls. The stop of blood-groove can pass in stasis. At inflammatory stage there is activation of system of compliment, generally stages $C_3$ and $C_5$. On fractions $C_1$ and $C_{35}$ it is possible to judge response of system of complement to presence of implant. Response can be both positive, and negative.

Exudation and strengthening of hypostasis play protective role, but always lead to increase in blood pressure in vessels and osmotic pressure in adjacent fabrics. It promotes migration of leukocytes in the damage center. The movement of leukocytes has pattern to be sent to zone of the greatest damage of fabrics.

At favorable current of wound process approximately for the 3rd day after operation blood circulation in the place of surgical damage of fabrics is already recovered. Metabolic changes of cells (fibroblasts, osteoblasts, etc.) cause relative hypoxia which is most shown at edges of wound. If in the center of damage there are no foreign antigens, then aseptic inflammation can develop.

With inflammation stages the first barrier function of cells is replaced by specific reactions in which the major role is played by lymphocytes and monocytes. They usually join in process for 6–7 day after operation on statement of dental implant.

In the beginning specific immunological reactions go in parallel with nonspecific. All cells populations react to specific antigenic substances, such as material of tooth plaque, the resident microflora which has got to the inflammation center during operation. Immunocompetent cells and macrophages perform the regulating, inflammatory, cytotoxic functions.

Important role in inflammatory reactions is played by macrophages who appear for 5–6 day after operation. They are formed of the monocytes circulating in blood. Macrophages show phagocytal activity, absorbing and digesting various biological particles. When carrying out experiments on animals fagotsitirovanny fragments of titanium, chrome, molybdenum which did not cause atypical changes of cells are found. And fagotsitirovany particles of cobalt, nickel and cobalt alloy with chrome promoted considerable changes of cells. Consider reaction of macrophages to implant the main function of fabric.

In closing stage — stage of regeneration fabric similar with initial or connecting fabric of consistenter structure can be formed. In the course of wound repair and forming of bone periosteum osteoblasts and also blood plasma have major importance.

**In stage of proliferation** there is differentiation of cells and recovery of trophicity of fabric that testifies to the beginning of healing of bone wound. This stage can proceed up to 6 weeks, and the first signs can be shown for 3–4 day after operation. In the connecting fabric adjacent to implant the new growth of vessels, differentiation and proliferation of cells, collagen synthesis strengthening, migration of cells to the inflammation center is observed.

Regional lymph nodes, generally submandibular, cause differentiation of cells and epithelization of wound and also growth of epithelium and its keratinization. Development of anastomosis of vessels leads to recovery of local microcirculation and improvement of oxygen providing fabrics that improves delivery of nutrients.

From reparative processes at stage of proliferation reconstruction of unripe elements of connecting fabric with formation of young granulyatsionny fabric, forming and reorganization of young cicatricial fabric is observed.

**The stage of regeneration** is observed in the first week after implantation and reaches maximum on the 3–4th week. In the absence of loads of implant body around it slowly there is formation of new bone tissue and recovery of its blood circulation. The formed bone callosity consists of fibrous cartilaginous tissue that reminds process of enchondral ossification.

Improvement of trophicity and delivery of oxygen to the place of damage stimulate local hemodynamics and blood circulation that promotes reconstruction of bone. The mineralization of bone tissue depends on load of implant. The bone without loading which is in contact with implant differs in large number of marrowy spaces and nutrient canals of spongy substance. The loaded implants are surrounded with the consistenter created bone tissue.

At differentiation of unripe mezenkhimny cells in fibroblasts, osteoblasts and cytogenesis from thrombocytes, macrophages and other cells are formed consisting of collagen, glycoproteins, glycolipids, matrix glikozaminoglikan which are exposed to reorganization. Reconstruction of unripe matrixes of bone happens in response to existence in bone of implant and on loading which it bears and also on physiological bone recession. Such resorption is considered indicator of engraftment of implant.

At good adaptation of implant adventitious cells on its surface are differentiated and fill sites of the injured or unimpaired bone. In bone at the same time there are processes of resorption and ossification. Process of mineralization of neogenic bone reaches 1 mm a day.

In such a way that there is implantation good or the evil? Many still argue on it. It will not be possible to come to certain conclusions, probably, still very long.

From our point of view in implantation there are both positive, and negative sides.

Positive moments of prosthetics on implants:

1. Tissues of intact teeth are not injured.

2. Endurance of prostheses on implants of 10–15 years, and functioning of prostheses on natural teeth of 5–7 years.

3. At high level of atrophy of alveolar shoot of upper jaw and alveolar part of mandible it is possible to recover their relief and structure.

The negative moments of prosthetics on implants:

1. At non-compliance by the patient or doctor of rules of expluatation and installation of implants the probability of development of periimplantit is high.

2. The cost of treatment is 2–3 times higher, than prosthetics by «classical» prostheses.

3. Difficult manipulations at the choice of abatmen with certain axis of inclination to implant body at partial or full secondary adentiya of jaws and at position of teeth not according to the group accessory.

Long terms of prosthetics (on upper jaw on average 6–12 months, on mandible of 3–6 months).

## LITERATURE


1. *Alexandrov, N. M.* Upper jaw operations // the Guide to operational maxillofacial surgery / Under the editorship of V. V. Balin. / N. M. Alexandrov, Saint-Petersburg, 1999.

2. *Paltsev, M. A.* Inflammation, healing, recovery. In prince : M. A. Paltseva, N. M. Anichkova / M. A. Paltsev, A. A. Ivanov. Pathological anatomy. Moscow : Medicine, 1999. P. 140–179.

3. *Paukov, V. S.* Inflammation morphology. Inflammation stages // Inflammation / Under. Edition of V. V. Serov. / Paukov V. S., Kauffman O. Ya. Moscow : Medicine, 1995. P. 176–199.

4. *Pereverzev, V. A*. Medical esthetics. Volgograd, 1987. 238 p.

5. *Perova, M. D.* The main accents of examination and standardization of intra bone dental implantation//the Report at the 5th international conference «Implantology Problems Are More Modern». Saratov, 2000.

6. *Per* Heden Encyclopedia of plastic surgery. Nuclear heating plant. Astrel ; Moscow 2001. P. 327.

7. *Olesova, V. N.* The directed bone regeneration in implantologists // V. N. Olesova, P. V. Kashchenko / Tez. Dokl. 4th International conference. Saratov, 1998. P. 121.

8. *Robustova, T. G.* Tooth and maxillofacial implantation // T. G. Robustova, V. S. Bezrukov / Management on surgical stomatology and maxillofacial surgery. 2000. T. 2. P. 1040–1072.

9. *Robustova, T. G.* Implantation of teeth (surgical aspects). / T. G. Robustova. Moscow : Medicine, 2001. 560 p.

12. *Robustova, T. G.* Classification of degree of complexity of operative measures at tooth implantation // Modern problems implantologists. Saratov, 1998. P. 10–13.

13. *Robustova, T. G.* Interrelation of parameters of soft tissues of the person, anthropometrical indicators of facial skeleton, PKT and MPT at tooth implantation // T. G. Robustova, A. R. Fekh / Messenger of the Russian stomatology. 2000. No. 5. P. 21–23.

14. *Savich, V. V.* Modern materials of surgical implants and tools / V. V. Savich, M. G. Kiselyov, A. I. Voronovich, the 2nd prod. reslave. and additional. Minsk : Doktordizayn, 2004. P. 104.

15. *Serov, V. V.* Inflammation. / V. V.Serov, V. S. Spiders. Moscow : Medicine, 1995. P. 630.

16. *Sidelnikov, A. I.* Planning of operation of implantation taking into account anthropometrical parameters of the person : Autoref. yew. … edging. medical sciences. Moscow : 1992. 20 p.

17. *Fogs of Accusative*, Serov G. G., Runova V. P. Cytologic characteristic of culture of fibroblasts of the person and optimal conditions of preparation of transplants for clinic//News of clinical cytology of Russia. 1997. № 1. P. 34–36.

18. *Albrektsson, T.* Direct bone anchorage of dental implants // J. Prosthet. Dent. 1983. Vol. 50. P. 255.

19. *Albrektsson, T.* Microcirculation in grafted bone. A chamber technique for vital microscopy of rabbit bone transplants / T. Albrektsson, B. Albrekttsson //Acta. OrthoP. Scand. 1978. Vol. 49. P. 1–7.

20. *Babusch, Ch.* Dental Implants. The art and science. / Ch. Babusch. Philadelphia ; London : W. B. Saunders Company, 2001. P. 532.

21. *Branemark, P.-I.* Tissue-integrated prostheses. Osseointegration in clinical dentistry. / P.-I. Branemark Chicago-London-Berlin : Quintessence, 1985. P. 29.

22. *Cook, S.* Interface mechanics and histology of titanium and hydroxyapatite coated titanium for dental application / S. Cook [et al.]. // Int. J. Oral Maxillofac. Impl. 1987. Vol. 2. P. 15–22.

23. *Cranin, A.* Comparison of incision made for the placement of dental Implants / A. Cranin [et al.]. //, JDR. 1991. Vol. 70. P. 279.

24. *Dharmar, S.* Locating the mandibular canal in panoramic radiographs/ S. Dharmar // Int. J. Oral Maxillofac. Impl. 1997. Vol. 12. P. 113–117

25. *Drago, A.* Implant restorations : A step by step. — Implant Innovations Inc. / A. Drago // Texas, 1997. P. 219.

26. *Frost, H.* Mechanical determinants of bone remodeling / H. Frost // Metab. Bone Dis. 1982. Vol. 4. P. 217.

27. *Levels* of osseointegration of blade-plate-form implants / L. Linkow [et al.]. 1993. P. 21–31.

28. *Linkow L.* Intra-osseous implants utilized as fixed bridge abutments / L. Linkow // J. Oral Impl. Transp. 1964. Vol. 10. P. 17.

29. *Malamed, S.* Handbook of Local Anesthesia / S. Malamed. // Mosby, 1997. P. 327.

30. *Evaluation* of Maxillory Sinus, Condition after Ligomaticus Implant Placement / V. Okazaki [et al.]. //16th Annual Meeting. 2001. Toronto, Canada. P.64.

31. *Ray, T.* The machrophuge response to implants materials — with special refeence to used in orthopedics/ T. Ray //CRC Crit. Rev. Biocompat. 1986. Vol. 2. P. 97

32. Rigdon R. Tissue reaction for tissue materials//Crit. Rev. Food Sci. Nutr. – 1975. – Vol. 7. P. 435.

33. *Color* Atlas of Dental Medicine Implantology. / H. Spiekermann [et al.]. New York : Thieme, 1995. P. 14, 59–76.

34. *Weiss, Ch.* Fibro-osteal and osteal integration: A comparative analysis of blade and fixture type dental implants supported by clinical trials / Ch.Weiss // J. Dent. Educ. 1988. Vol. 52, N. 12. P. 706–711.

35. *Weiss, Ch.* Tissue integration of dental endosseous implants: Description and comparative analysis of the fibro-osseous integration systems / Ch.Weiss // Oral Impl. 1986. Vol. 12. P. 169–1621.

**CONTENTS**

ISBN 978-985-21-0234-6