The idea of dental implantation is as old as the world, as confirmed by archaeological finds.

In 1931, in the area of the De Los Muertos Plateau in the territory of modern Honduras, Dr. D. Popenoe found a fragment of the Inca lower jaw, dated to the 6th century. BC. In the sockets of the 42nd, 41st and 31st teeth, implants made from the shell of sea mussels were preserved. There is also evidence of the use of dental implants in the 1st-6th centuries. AD on the territory of Europe. In 1998, E. Crubezy, G. Murail and J.-R Bernadou reported the discovery of the skull of a 30-year-old woman who lived in the 1st century in the province of Chantambre (France). AD, with a metal implant in the canine socket of the upper jaw. Based on archaeological research in Anatolia (Turkey), G. Atilla (1993) provides a description of a dental implant carved from stone (mid-6th century AD).

Direct evidence of the use of dental implants in the VI-XVIII centuries. AD Not yet. At that time, dentists were more concerned with transplantation rather than dental implantation. Indirect mention of implantation is found only in G. Bauer, who, in his treatise on the history of medicine, published in 1556, wrote about the use of metal dental implants in Sicily.

At the end of the 19th century. Some scientists have returned to the idea of dental implantation. S. Perry studied the possibility of using dental implants made of gold, porcelain and platinum, installed in surgically formed sockets in the jaws. N. Znamensky reported on his own experience of using implants in 1891 in St. Petersburg at the IV Pirogov Congress. In the same year, A. Hartmann reported on the possibility of using an intraosseous implant to replace a missing tooth and proposed an original method of fixing an artificial crown to the implant using a screw. And in 1909, U. Greenfield developed another version of the implant design and a method of fixing an artificial tooth to it using a special lock. A sketch of this design has survived to this day.

It is difficult to summarize and objectively evaluate the results of implantation in those years, since before Lister introduced the concept of “antiseptics” into surgery

Surgical wound infection almost always occurred, and implant failure was common.

The use of antiseptics has significantly reduced the risk of infection of the surgical wound, which has ensured enormous advances in all areas of medicine, including implant surgery. Already in 1914, traumatologist W Lane obtained positive results in treating fractures using stainless steel plates fixed to the bone with screws. At the same time, he formulated one of the fundamental principles of implant surgery - “a good effect can only be achieved with a careful surgical technique.” The introduction of the concepts of antiseptics and careful, atraumatic treatment of tissues made it possible to begin a targeted search for implantation materials.

The first patent for a metal that is relatively resistant to corrosion in body fluids and suitable for implantation—molybdenum steel—was received in 1926. Surgeons began to use this steel quite widely for osteosynthesis. In 1936, S. Venable and W Struck found a new alloy, “Vitalium,” that was practically immune to the electrochemical effects of the tissue fluid of the body. And already in 1939, A. Strock implanted a screw implant from this material, installing it in the socket of an extracted tooth.

In the early 40s. Swedish dentist N. Dahl proposed a subperiosteal implant resting on the bone tissue of the alveolar process (Fig. 1-4). The idea of subperiosteal implantation is based on the strength of attachment of the collagen fibers of the periosteum (Charpie fibers) to the bone tissue, which, when the supporting elements of the implant and the relief of the alveolar process of the jaw are congruent, are able to ensure the stability of the implant itself and the denture resting on it. In Sweden, N. Dahl's invention was met with hostility by the dental community. In the USA, on the contrary, this idea found wide support and was recognized by such famous experts as N. Goldberg and A. Gercshkoff.

The modern period of development of dental implantology began in 1947, when the Italian doctor F Formiggini, using in practice an implant of his own design, documented the possibility of functioning of intraosseous implants as a support for dentures. In addition, he formulated the main tasks

Implantology is still a nascent area of dentistry:

1) study of the general and local reaction of bone tissue to the implant;

2) determining the optimal tissue response to the implant;

3) determination of the optimal material and design of the implant.

The efforts of specialists over the following years were aimed at solving precisely these problems.

In 1955 in Padua, at the 1st symposium “Use of alloplastic implants,” A. Hammer and G. Pallazi, based on their own morphological studies, proved the absence of any pathological reactions to implants made of cobalt-chrome alloy.

In 1956 A. Bodine at a conference in Dallas

e (USA) presented the results of a morphological study of the tissues surrounding a subperiosteal implant installed on the upper jaw of a dog that had been functioning for several years. The author made the following conclusions:

1) the epithelium does not extend deeply, and the formation of a capsule around the implant support strips does not occur;

2) the tissue in contact with the parts of the implant located under the periosteum is typical connective tissue;

3) the tissue around the neck of the implant in the area of communication with the oral cavity is similar in structure to the tissue that forms the dentogingival contact;

4) the pattern of inflammation in the area of the gingival cuff of the implant neck is similar to that in the area of gingival pockets of natural teeth.

In the early 50s. Experimental studies were carried out to study the morphology of the tissue response to intraosseous implants. U. Pasqualini was one of the first to conduct a series of experiments on dogs, formulating the following questions:

1) what is the reaction of surrounding tissues to various implantation materials?

2) what materials are best to use for retention of artificial roots?

3) what is the reaction and condition of the mucous membrane in the area of contact with the implant protruding into the oral cavity?

4) how will the implant and surrounding bone behave under the influence of chewing load?

1. U. Pasqualini used implants made of acrylic plastic, porcelain, gold, binary alloys - gold with platinum and platinum with iridium, as well as vitalium implants. The results of the experiments turned out to be very interesting:

1) the most positive reaction of bone tissue and mucous membrane is observed when using vitalium and binary alloys. The morphology of the mucous membrane resembled the dentogingival attachment, and at the level of bone tissue, both trabeculae (about 50% of the contact area) and fibrils of collagen nature were observed to adhere to the implant. The use of these materials made it possible to achieve a high degree of implant retention without visible mobility. In cases where plastic and porcelain were used, deviations from the normal morphology of the surrounding tissue were often recorded. Most of these implants were surrounded by a fibrous capsule, and their mobility was observed;

2) after a functional load applied to implants made of binary alloys and vitalium for several months, the following tissue reaction of the bone took place: in some areas the bone matrix of the trabeculae is absorbed, but their osteocytes are preserved and surrounded by a basophilic halo. A very thin layer of collagen fibers emanating from the bone matrix was found between the surface of the implant and the adjacent bone. The space between some of the trabeculae is filled with normal lamellar bone, and it appears that a layer of compact bone without medullary spaces is formed around the implant.

A - radiograph of a camera installed in the tibia for vital microscopy;

B - titanium chamber overgrown with bone;

B - the result of one of the first experiments showing the integration of a screw dental implant with bone tissue.

Thus, U. Pasqualini noticed a fundamentally new, previously unknown reaction of bone to implants - the adhesion of bone tissue to the implant without the formation of a connective tissue capsule and the preservation of this adhesion after the application of a functional load.

Since 1951, titanium has been used as a material for implants. It was also used in the manufacture of special optical cameras for vital microscopy, used by physiologists and biologists to study the processes of blood circulation and cell activity directly in living tissues. Since 1952, such studies have been carried out by RI. Branemark in the laboratory of vital microscopy, and then in the department of experimental biology of the University of Gothenburg (Sweden). During these works, one of the fundamental discoveries of implantology was made: in the bone bed, which is prepared atraumatically and exactly matches the shape of the titanium structure being installed, a strong “fusion” of the metal surface with the bone occurs. R.I. Branemark and his colleagues fully appreciated the significance of this phenomenon, later called “osseointegration,” and devoted the next 30 years of their work to studying it. Under the guidance of prof. R.I. Branemark discovered the mechanism of interaction of the implant with surrounding tissues and formulated the conditions for achieving osseointegration, based on the modern understanding of biology and the use of the laws of bone tissue regeneration.

60-70s — a time of active development of designs for implants of various shapes. Some of them became the prototype of dental implants now produced by many companies, others are still used in their original form today.

One of the most successful designs of an intraosseous implant was proposed in 1959 by the Italian dentist S. Tramonte (Fig. 1-7). Initially, these thin, with a diameter of only 2.5 to 3.0 mm, implants were made of cobalt chromium alloy, and then, since 1964, they began to be made of titanium.

In 1962, the French doctor R. Chercheve adapted the design of the spiral implant F. Formiggini and proposed his own version of the screw implant, the intraosseous part of which resembled a corkscrew (Fig. 1-8). In the same year, the French dentist J. Scialom invented needle implants, which are still used by some specialists today (Fig. 1-9).

Another version of screw implants, developed on the basis of the implants of A. Strock, R. Chercheve and S. Tramonte, was created in 1963 by L. Linkow (Fig. 1-10). This implant, with a diameter of 3.5 to 4.0 mm, had a hole in the lower third of the splanchnic portion, which improved its retention in the bone.

In 1965 R.I. Branemark proposed using a collapsible design of a screw implant, consisting of an intraosseous part and a support head screwed to it (Fig. 1-11). This dismountable screw implant has become the basic design for the vast majority of dental implants produced today.

In 1969, L. Linkow invented another implant with an intraosseous part in the form of a plate (Fig. 1-12), which made it possible to use it with narrow alveolar processes of the jaws. Plate implants have become quite widespread since the early 70s. and improved by many specialists.

except for screw, cylindrical and plate imylantates in the 70s. A number of combined-shaped implants have been created. For example, an international group of specialists at the Straumann Institute (Switzerland) developed an original system of hollow implants with plasma spraying of titanium on the surface of the intraosseous part.

Implants have been proposed that have a disc-shaped base, designed for installation into the alveolar process from the side and resting with their lower part on the area of ​​the inner and outer compact layers of bone.

In addition, implant designs have emerged that are designed for patients with extremely atrophied lower jaws. In 1964 I.A. Small began to develop an orthopedic plate to prevent pathological fractures that can occur due to extreme atrophy of the mandible, while simultaneously providing fixation of removable dentures. The implant, which was a plate with retention and transosseous pins, I.A. Small was used for the first time in 1968. His idea was further developed thanks to the work of Dutch maxillofacial surgeons N. Bosker and L. VanDijk, who proposed a collapsible version of the I.A. implant design. Small, calling it a transmandibular implant.

Unlike other dental implants, its base - an arched bracket - is installed on the lower edge of the body of the lower jaw through extraoral surgical access. Two implant pins are inserted into the bone, passing through it. Protruding into the oral cavity, they serve to fix removable dentures. Another original design of an implant, specifically designed for an atrophied lower jaw, was proposed in 1970 by N. Roberts. This implant has the shape of a branched plate and is designed to be inserted into the bone in three places: in the frontal region and in the area of the branches of the lower jaw. It can serve as a support for both removable and fixed dentures.

By the end of the 70s. extensive clinical experience has been accumulated in the use of intraosseous dental implants, numerous experimental studies have been conducted on the morphology of the tissue response to implants, their interaction with the surrounding bone tissue, and large-scale monitoring and statistical analysis of the results of using implants as a support for dentures has been carried out. In addition, several clinical approaches have been developed:

- “multi-type” approach, formulated by L. LinkowH G. Muratori, implying the use of several types of implants (not only intraosseous, but also subperiosteal), different in shape (screw, plate, disk, etc.), depending on anatomical conditions ;

- the concept of “bicorticalism” proposed by D. Garbaccio, which involves the use of screw implants with installation in the area of the upper and lower compact layers of bone;

- the concept of “implantation isotopy” by G. Muratori, the essence of which is that the number of implants installed must correspond to the number of missing tooth roots.

However, dental implantation was not recognized by the official medical structures of many countries as a scientifically based area of dentistry. A paradoxical situation arose – with

On the one hand, the implantation method was widely introduced into clinical practice (according to some data, from 1965 to 1975, more than 300,000 implantations were performed), and on the other hand, many authoritative experts were skeptical about it. In 1978, a consensus conference “Implantation: benefits and risks” was held at Harvard University, where points of view “for” and “against” were heard. And although the results of the use of only four types of implants were discussed and analyzed (subperiosteal, transmandibular, cylindrical from glassy carbon and lamellar from chromium-nickel alloys) and data from clinical observations of the leading groups of specialists at that time - RI - were not presented. Branemark, R. Adell, U. Lekholm (Sweden); A. Schroeder, O. Pohler, F. Sutler (Switzerland); G. Muratori, U. Pasqualini, D. Gorbaccio (Italy), the final resolution noted the feasibility of further research in the field of dental implantation. Based on the statistical analysis of the use of implants, the following conclusion was made:

1. Subperiosteal implants can function successfully in 90% of cases within 5 years and 65% within 10 years (data based on the results of the use of 200 implants by five specialists).

2. Implants developed by LA. Small, can function for 5 years in 95% of patients (results of only one researcher who treated 43 patients).

3. Cylindrical implants made of glassy carbon have an average 55% survival rate for 3 years (data from two specialists who installed 133 implants for single dentition defects).

4. Plate implants used for terminal defects of the dentition, subsequently included in the prosthetic structure along with the teeth, function successfully for 5 years in 90% of cases (data from two authors reporting 200 observations). At the same time, it was noted that the use of plate implants as a support for a fixed bridge prosthesis with complete edentia is effective in approximately 75% of cases.

To evaluate various implant designs and the possibility of their use in clinical practice, a survey of conference participants was conducted. 4 main assessment categories were identified:

Category “A” - unlimited use of implants for any form of edentia. No implants were included in this category.

Category “B” - use with additional recommendations depending on the clinical situation. This category included subperiosteal, lamellar (only for end defects) implants.

Category C (clinical trials only) included cylindrical glassy carbon implants and LA implants. Small.

No implants were included in category “D” (implants contraindicated in clinical practice).

Thus, the final resolution adopted by the participants of the Harvard conference was the first step towards overcoming the psychological barrier on the part of those dentists who considered implantation an outlandish, ineffective method of treatment. And finally, dental implantology has been officially recognized in a number of countries as a promising and scientifically based approach in the occlusal rehabilitation of patients suffering from various forms of edentia. University programs began to develop, departments of dental implantation were established and research centers on implantology problems were organized (universities of New York, Chicago, Toronto, Milan, Tokyo). Large research institutes were created that became leading specialized centers for the study of dental implantation - the Institute of Applied Biotechnology (Gothenburg, Sweden), the Straumann Institute (Waldenburg, Switzerland), Columbia University (New York, USA).

In 1982, a conference was held in Toronto (Canada) on the problems of morphological interaction of implants with bone tissue. Its result was the recognition of osseointegration as the most scientifically sound option for the coexistence of an implant with bone tissue, ensuring long-term and predictable functioning of implants as a support for dentures.

Design of two-stage RI screw implants. Branemark has found wide application in practice, was officially recognized and approved by dental associations in most countries of the world, which predetermined the further development of design ideas in dental implantation.

In the 80s A huge number of designs have been proposed, most of which are modifications of the Branemark system implant and only a few have original elements. These include:

- cylindrical implant with shock absorber, developed by A. Kirsch;