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Dental Implantation in Orthopedic Dentistry

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Abstract: With the advent of intraosseous dental implantation, the range of orthopedic options has significantly expanded. Instead of removable dentures, aesthetic bridges supported by implants can be installed that are more comfortable and outwardly indistinguishable from natural teeth. But, like other dental restoration methods, dental implantation has supporters and opponents, and before proceeding with it, you need to weigh the pros and cons.

Keywords: Dental implantation, orthopedic options, outwardly indistinguishable.

Introduction: With the advent of intraosseous dental implantation, the range of orthopedic options has significantly expanded. Instead of removable dentures, aesthetic bridges supported by implants can be installed that are more comfortable and outwardly indistinguishable from natural teeth. But, like other dental restoration methods, dental implantation has supporters and opponents, and before proceeding with it, you need to weigh the pros and cons.

Dental dental implantation – what is it

Patients often present the implant to them in the form of a self-tapping screw, which is twisted into the bone, and a ceramic crown is placed on top as a cap. And that's almost right. A dental implant is a rod that a doctor inserts under the gum and implants into the bone. This is an artificial root, the basis of the future tooth. The second part of the design is the abutment (head), the "adapter" between the base and the crown.

In 99% of cases, the implant is made of a toxicologically inert titanium alloy. The popularity of the material is due to the following:

• due to the absence of a negative reaction of the body, titanium is an alternative to gold;

• upon contact with air, an oxide film forms on the surface, which facilitates survival;

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• titanium abutment connects well with composite cements and porcelain, so the result of implantation will be a durable, almost indistinguishable from a real tooth with a "natural" crown.;

• the titanium rod has a small thickness and weight, its installation allows you to maintain diction.

Advantages of dental implantation

The main advantage of dental dental implantation is that a nearby tooth is not worn off (not dissected), and treatment is local, only in the area of the missing tooth. It is also significant for patients:

1. The implant in the bone prevents its resorption (bone without functional load quickly atrophies).

2. Artificial teeth on an implant are practically indistinguishable from their own.

3. Implantation can sometimes be performed immediately after tooth extraction. This is a one-step technique.

4. Implants replace missing teeth of any length.

5. The implants serve as the main one for a nonremovable (or removable) prosthesis. Instead of 3 missing teeth, 2 implants can be installed, and the middle part with a narrower chewing surface can be replaced with a bridge–like prosthesis to redistribute the load.

6. In some cases, replacing a tooth with a dental implant allows you to replace a removable prosthesis with a non-removable one.

7. It is the best fulcrum for a removable prosthesis, the fixation improves, and the functional value of the prosthesis increases by 20-25%.

Important: a dental implant in the bone, unlike a tooth, is rigidly installed in the bone and has no degree of mobility. Therefore, they try not to do the "implantbridge-tooth" design.

Indications for dental implantation

Dental implants are installed when skeletal formation has ended and bone growth has stopped. The upper age limit is individual. In orthodontics, there are cases when implantation was performed for people aged 70-85 years. If the patient is relatively healthy, the implant can be installed.

Implantation is indicated if:

• one tooth is missing, and next to it all are healthy (intact) or with limited defects;

• 3 or more teeth are missing in a row, up to complete absence;

• there is an allergic reaction to plastic;

• The patient has illnesses or psychological reasons

that make it impossible to wear a removable prosthesis.

Contraindications to dental implantation

Absolute contraindications:

1. Acute infectious diseases.

2. Systemic diseases of bone tissue (for example, autosomal dominant osteoporosis type 2), osteogenesis imperfecta, Paget's disease.

3. Blood diseases (polycythemia, leukemia).

4. Recent radiotherapy of the head and neck.

5. Malignant and benign tumors in the upper, lower jaw and soft tissues of the oral cavity.

6. Incomplete teething, incomplete growth of the skull bones.

7. Mental instability.

8. Drug addiction and alcoholism.

Relative contraindications to dental implantation:

1. Under the age of 20. The body is growing, and the implant will interfere with the normal development of the jaw. In addition, there is not enough bone tissue for implantation.

2. Unsatisfactory condition of the oral cavity (rehabilitation is required).

3. Immunological or hematological diseases, decompensated diabetes mellitus.

4. Smoking more than 15-20 cigarettes a day.

5. Bruxism and other parafunctional habits. After the implant is installed, patients are advised to use plastic mouth guards overnight.

6. Long-term use of antibiotics, antidepressants, anticoagulants.

7. Hormonal imbalance (menopause), because during this period the bones become more loose.

8. The period of pregnancy, after childbirth and during lactation. Due to hormonal changes, the implant can be installed no earlier than six months after the end of breastfeeding.

When a tooth is missing for a long time, the bone tissue resolves. About 20 years ago, this was considered grounds for refusal, but now, before implantation, an operation is performed to increase bone volume.

Bone buildup allows for the installation of implants even several years after tooth loss.

If it is a question of implantation on the lower jaw, to prevent the threat of damage to the mandibular nerve, it is moved to the side. Due to a possible nerve rupture, such an operation is performed very rarely and only in a hospital.

In various forms of periodontal disease, there is no gum

covering the tooth tightly. After implantation, food particles will enter the "pocket", which will lead to inflammation of the bone tissue. Therefore, the gum is formed:

• by transplanting a flap from the palate;

• by deepening the vestibule of the oral cavity between the cheek and teeth (vestibuloplasty).

Medical advice is recommended for people with endocarditis, heart failure, endocrine system pathology (thyrotoxicosis, diabetes mellitus, etc.). With hemorrhagic diathesis, blood clotting disorders (prothrombin time, or Quick reaction index (more than 30), implants are installed in a hospital setting

Types of implants

Non-removable implantable prostheses can be intraosseous and extraosseous.

Intraosseous

If you look at the implant carefully, as an orthodontist, you can distinguish not 2, but 3 parts in it.:

- the reference;
- through the middle;
- the largest is the intraosseous one.

The intraosseous shape of the implants varies, repeating or not repeating the shape of the tooth root. It is according to them that the types of dental implants are most often classified.

The shape of the intraosseous part of the prosthesis is usually made in the likeness of the tooth root. Then the engraftment after implantation will be rapid, and the chewing load will be evenly distributed in the jaw.

Lamellar

The surface of these implants is textured and/or corrugated. There is also a macrorelief resembling a snake. In order for the bone tissue to grow through the prosthesis after implantation, holes are provided in the structure. Their total area does not exceed one third of the area of the intraosseous part.

There are:

non-separable;

• collapsible, with internal or external thread for mounting the head.

Root - like

Root-shaped (endossal) implants include:

• cylindrical. The intraosseous part is smooth, with a small surface area. It is characterized by the lowest biomechanical parameters in the shear test, therefore, the cylindrical part is textured (bioactive coating). They are only available collapsible;

• screw type. With different thread profiles, detachable and all-in-one. The surface may be smooth or rough.;

• Basal. Longer ones, with a thread at the end to anchor into the deeper layers of the bone.

Mini implants, which are installed for a limited time, are also referred to as root-shaped. This is not to say that they are thinner or shorter than regular ones. They have a simplified and slightly lightened design for people with osteogenesis disorders.

If the root-shaped implants are not interconnected, their rotation can occur even after a period of bone regeneration. The most common causes are medical manipulations and chewing load. Therefore, antirotation locks (anchors, holes, longitudinal grooves, etc.) are provided in their design.

The intraosseous part of the implant can also be a combination of cylindrical and lamellar shapes.:

• the central part is a cylinder;

• "lateral roots" - 2 asymmetrically or symmetrically arranged plates.

The same type includes disc, transmandibular (in the design of a bracket and 2 pins) implants. Combined-form implants are usually detachable.

Extra - skeletal

For osteoporosis or osteonecrosis of the jaw, extrabony implants are sometimes used for patients of the older age group.

Subperiostal

These prostheses are used for rehabilitation of patients with significant bone atrophy of the jaws. They are screwed into the periosteum on the side of the gum.

Intralucosal

It is used for a lack of bone tissue, when the patient refuses to build up, sometimes as a temporary measure. A small and mushroom-shaped magnet is inserted into the gum. In the future, it serves as the basis for removable orthodontic structures.

Stabilization

During implantation, the prosthesis is mounted on the native root of the tooth, it takes root well, but it is considered temporary, since the "base" shrinks with age, like any bone tissue.

Stages of dental implantation

The installation of an implant is a lengthy process. It is necessary for it to take root in the bone, so the restoration of the dentition takes 3-6 months.

Planning and preparation

The preparation and planning of surgical intervention is:

1. X-ray examination (orthopantomogram, sighting images, determination of projection distortions). A steel ball is fixed in the area of the proposed non-removable prosthesis, and the length of the implant is selected based on its images.

2. Determination of the thickness of the alveolar process of the upper and lower jaw using an osteometer (under anesthesia), determination on diagnostic plaster models of the profile of the alveolar process or part of it at the site of the proposed implant. Based on these data, the diameter of the implant is selected for future implantation.

3. Production of a diagnostic plaster model with restoration of missing teeth (from wax or plastic), taking into account the inter-jaw interaction, on the basis of which a radiopaque plastic template is created.

4. Computed tomography examination. All removable metal dentures are removed before the scan, and dental dental implantation will be successful if the patient is scanned motionless with his mouth slightly open.

5. Creating a 3D jaw model. Axial sections are obtained on CT, then a computer program creates a threedimensional image and necessarily visualizes the neurovascular bundle. Since teeth, bones, and soft tissues differ in density, based on research data, the program provides an opportunity to visualize the outer skin and internal structures, as well as disable the visibility of various anatomical objects.

6. Determining the type of implants and their installation locations, taking into account the qualitative and quantitative composition of bone tissue (planning the surgical stage of implantation). Taking into account the indication of bone density, the optimal location for the placement of the implant is selected, and the distribution of the chewing load is evaluated. As a rule, they choose the largest implant that can fit in a given volume.

7. Jaw prototyping. Checking the ratio of the installed implants with antagonist teeth or counter implants.

8. Using a surgical prototypical template. When the location of the prosthesis is strictly limited (difficult anatomical conditions), the implant is positioned at a certain angle. Then, using rapid prototyping, a special surgical template is made, in which titanium cylinders are installed for drilling strictly at a given point and at the correct angle. In case of bone deficiency, sinus lift surgery is planned.

The surgical stage

Dental implantation surgery is performed under anesthesia:

• infiltration, a local "freeze" familiar to most; European International Journal of Pedagogics • conductive, when an anesthetic is injected into the paraneural space.

Most of the pain during implantation is associated with the crushing of blood through the spongy substance of the bone, as well as increased pressure on the nerve endings. To reduce pain during and after surgery, patients with increased blood viscosity are recommended to take instant aspirin (500 mg) 30 minutes before surgery. In addition, when installing an implant, a constant level of bleeding is important (for this purpose, the bone bed is often specially washed). Blood fills the voids between the surface of the implant and the bone, improving osseointegration (implant engraftment in bone tissue).

Dental implantation begins with an incision with a disposable scalpel and flipping aside the mucousperiosteal flaps. According to the method of wide flap folding, the incision is made in the middle of the crest of the alveolar process, while the interdental gingival papillae are carefully dissected. Thanks to this technique, it is not necessary to make a vertical incision that leaves a visible scar during healing.

Another incision technique for implantation is the use of a circular mucotome knife. This ensures minimal invasiveness (penetration of pathogenic microorganisms through the wound) and increases the resistance of the epithelium adjacent to the implant to pathogenic effects. The seams are not superimposed with this incision. Any preparation is carried out with copious cooling with sterile saline solution.

The location and position of the prosthesis depend on the defects of the dentition and anatomical conditions. For example, when installing multiple implants on a toothless upper jaw, they will have a fan-shaped discrepancy due to the anatomical shape and tilt of the jaw itself. Read more about the features of upper teeth implantation here.

With good preservation of the alveolar bone, several rules are followed when installing the prosthesis during implantation.:

1. The distance between the implants is at least 2-3 mm. Otherwise, the bone will remodel and atrophy.

2. The implants are placed at a slight angle to each other to evenly distribute the vertical load and reduce the concentration of excess stress.

3. The tilt of the implant is mesio-distal.

4. During implantation, bone tension is taken into account (the difference between the size of the prepared bone bed and the diameter of the subcostal part of the implant). The diameter of the endossal part should be larger by 0.2-0.5 mm. Then it is possible to avoid the mobility of the implant and achieve rapid

osseointegration.

Make sure that there is blood in the implant bed. This avoids the formation of air cavities between the bone and the implant. Understanding this fact is a guarantee of peace of mind during implantation.

Remember: dental implantation necessarily takes place with the formation of blood clots. This is the norm, you should not be afraid of blood.

Before the implant is inserted, its surface is moistened with saline solution to reduce friction. If the implantation is one-stage, very often a gum shaper is immediately installed instead of an obturation screw. During two-stage implantation, the mucous-periosteal flaps are hermetically sutured.

Orthopedic stage

The gum cuff shaper is replaced with a support head. On the day of implantation, it is possible to manufacture and fix a provisional orthopedic structure (or 1-3 days after surgery). Then, with the help of an impression mass, an impression is made, and then the prosthesis itself. This is done by an orthodontist, who completes the restoration of the dentition.

The entire sequence of actions (making an impression, making a model of a jaw, a crown, or a prosthetic frame) is exactly the same as making a crown. The production time depends on the material and the amount of work.

Postoperative period

On the 11th day after implantation, it is already possible to remove the sutures. In areas remote from surgery, patients keep the oral cavity clean and use chlorhexedine-containing products for rinsing. Temporary removable dentures can be worn on day 14, but the longer the patient goes without it, the better.

The soft lining, which gradually thickens, is changed after 6-8 weeks. In addition, for some implants, it is necessary to tighten the transocclusive screws, therefore, a dentist's check is required after 6 weeks, and then after 3 to 5 months.

Types of implantation

According to the mutual influence of implants and oral tissues (hard and soft), several types are distinguished.

Endodonto-endossal

Dental implantation, which uses a pin and various fixation elements in the bone tissue. The pin is placed in the dental canal, so this is one of the most difficult implantations for an orthodontist due to his special manual skills.

Endossal

Otherwise, it is intraosseous. The most popular implantation, with good results of engraftment and occlusal load distribution. The implant is inserted into the bone through the mucous-periosteal flap. The intraosseous part is made in the form of:

- screws;
- plates;
- the cylinder.

In addition to prosthetics of 1 tooth, this type is used in the all-on-four and all-on-six implantation techniques in the complete absence of teeth. The implants (4 or 6) will be the basis for fixing the bridge prosthesis. The new Allon-3 (Trefoil) implantation method has been used since 2017, 3 implants are used, the acrylic prosthesis is nonremovable, and production takes 1 day. It is also suitable for full dental implantation.

Which method of dental implantation should I choose?

The method, implant, and type of prosthesis are selected individually after examination, chosen not by the patient (although his wishes are listened to), but collectively by the surgeon, orthodontist, and dental technician. Therefore, you need to contact specialists with many years of experience.

They take into account the indications and contraindications to dental implantation based on X-ray and other studies, simulate the implantation process using dental computer programs. However, several options are usually offered (ceramic metal or zirconium dioxide crown, type of prosthesis, etc.), since the price of dental services depends on the materials used.

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