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Experience of Experimental Application of Rational Design of Domestic Dental Implant

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Abstract: The team of the Department of Hospital and Faculty Orthopedic Dentistry of the Tashkent State Dental Institute has created a domestic dental implant. Dental implant "Implant.uz" is made in two-stage and one-stage form. Implementation of the implant in one-stage and two-stage forms expands the range of implantation means, depending on the medical indications and the patient's wishes. Microscopic examination of the jaw bone tissue at 1, 3, 6 months after implantation at the implant-bone interface showed that the bone tissue adheres tightly to the metal surface of the implants, no foreign inclusions, overlays and cavities are detected in the contact zones.

Keywords: domestic implant; installation of a dental implant; mucous membrane when using the implant; blood counts.

Introduction

Over the past few decades, dental implantology has been an effective solution for restoring both tooth loss and aesthetics as well as masticatory function in patients with partial and total adentia [2,5,12]. In a number of cases, conditions arise in which traditional prosthetic techniques cannot be applied, and the use of various dental implant options can be an effective solution for restoring masticatory function, aesthetic appearance and psycho-emotional well-being in patients [1,3,9,11].

In Uzbekistan, there has been no scientific development in this direction so far. [4,5,6,7]. Foreign dental implants of such manufacturers as Dentium (South Korea), AlfaBio (Israel), Konmet (Russia) are widely used in the practice of dentists of the republic. Despite the fact that "prosthetics on dental implants provides a number of advantages compared to removable prosthetics, the cost of this treatment remains high" [7,8,10]. Unfortunately, due to the high cost, not all patients with indications for dental implants can afford them. These circumstances prompted the present study.

Purpose of the study: to carry out a histo-morphological study of a native dental implant in experiment.

Materials and methods of research: We used engineering, experimental, histo - morphological and statistical methods to solve the set tasks

Research results: The Implant.uz dental implant is made in two-stage (Fig.1) and one-stage (Fig.2) form, each of which has its own advantages and disadvantages. The execution of the implant in one-stage and two-stage forms expands the range of implantation means depending on the medical indications and the wishes of the patient. Based on the results of this engineering and design development, a utility model patent "Dental implant" FAP 00819 (2013) was obtained from the Intellectual Property Agency of the Republic of Uzbekistan.

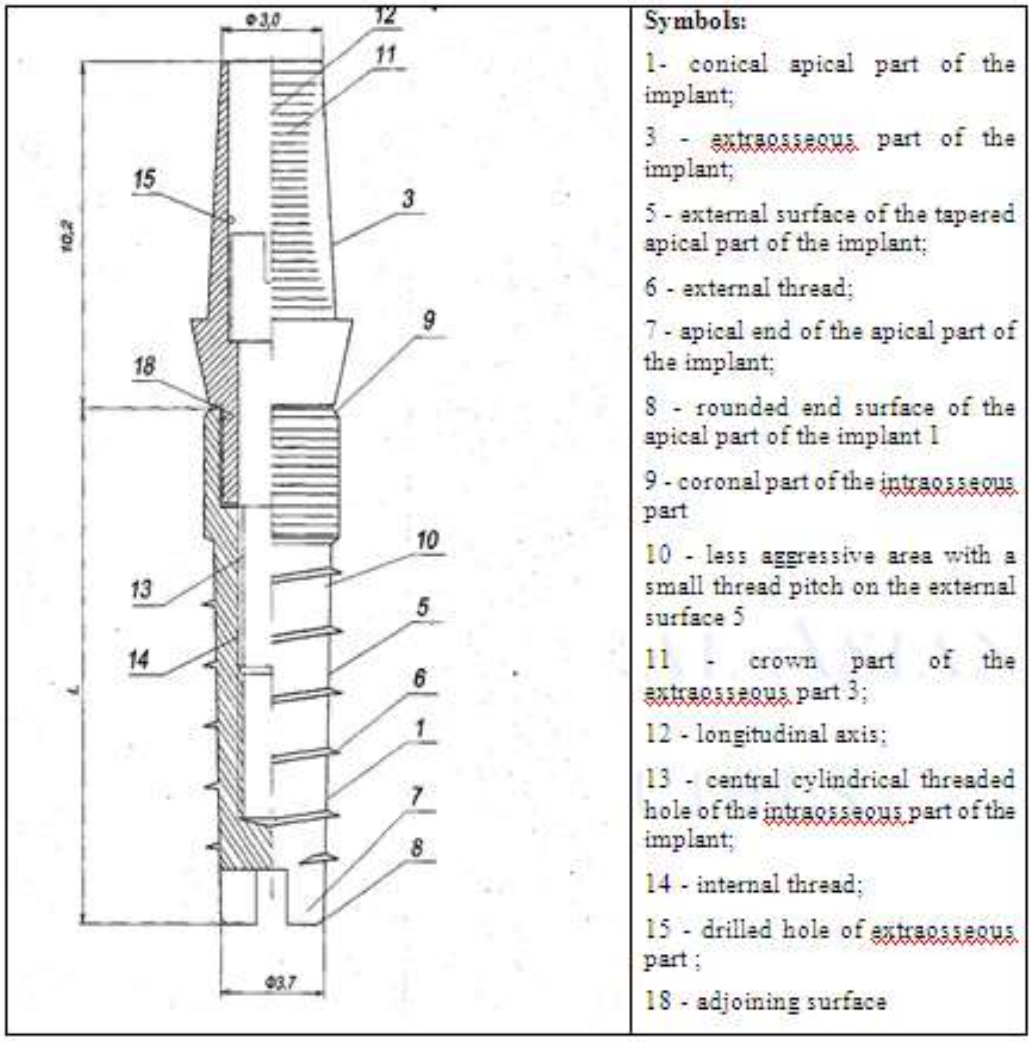

Fig.1. Drawing of the general view of the "Implant.uz" two-stage implant, combined with the longitudinal section.

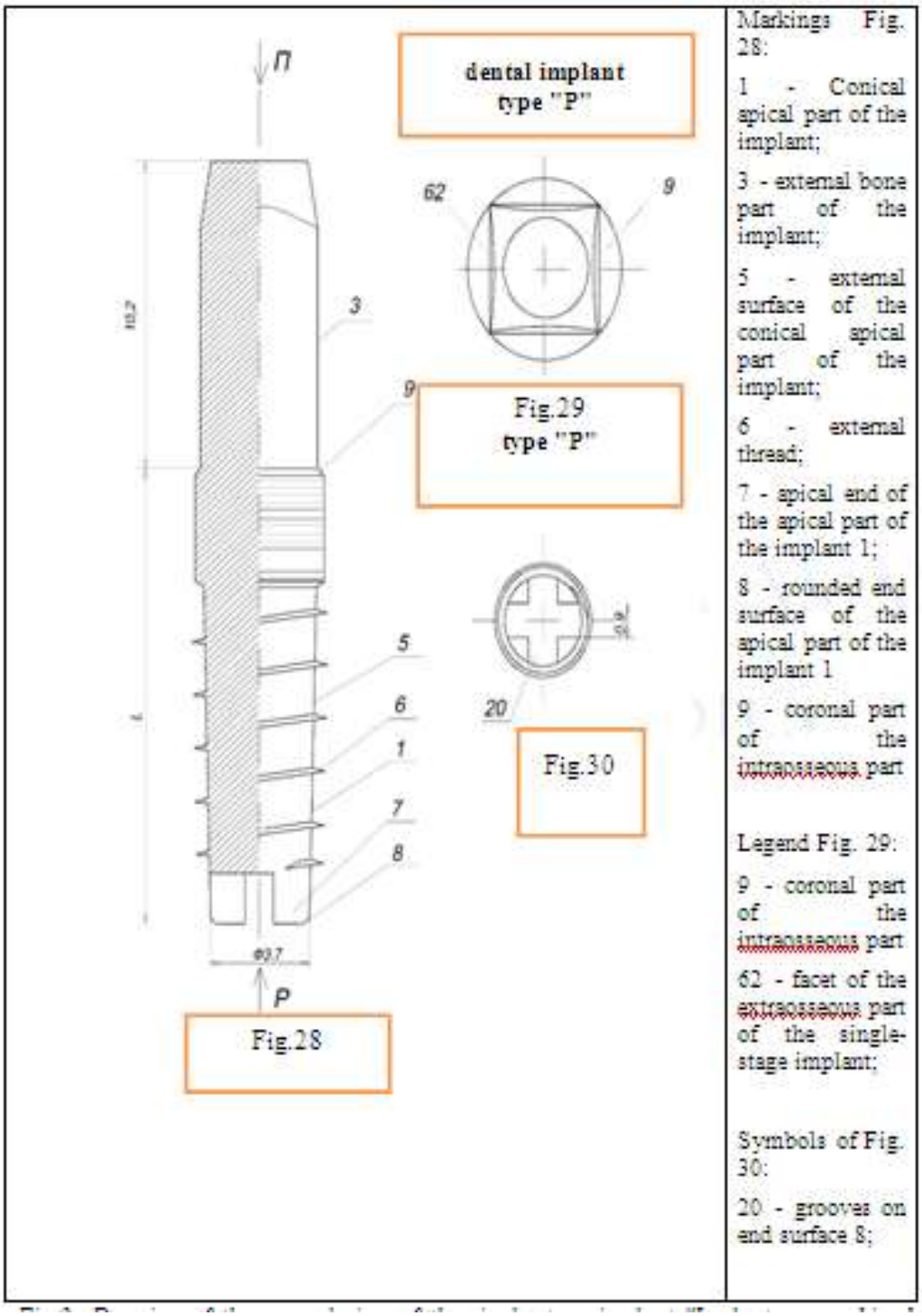

Fig.2. Drawing of the general view of the single-stage implant "Implant.uz, combined with the longitudinal section.

The two-stage implant consists of an intraosseous portion with a conical threaded apical portion with anti-rotation notches at the apical end and a coronal portion, and an extraosseous portion. The anti-rotation notches are in the form of cross grooves. The intraosseous apical part is threaded in 1 mm increments.

The implant is made as a two-stage implant, intraosseous and extraosseous parts are made as separate elements, the extraosseous part is an abutment. In the intraosseous part there is a hexagonal central

reception opening for the neck of the superstructure, passing into the central threaded hole for the screw that connects the intraosseous part to the superstructure. The execution of anti-rotation notches in the form of cross-shaped grooves (Fig. 3) provides increased reliability of the implant fixation by increasing the inhibition of intraosseous rotation, as the sprouted bone tissue in the form of cross-shaped ribs is a more rigid structure as compared to the round shape of the sprouted bone tissue in the closest analogue.

Figure 3-4: Cross-grooved anti-rotation notches at the apical end of the intraosseous implant

When using the proposed shape of the anti-rotation indentations, bone regrowth proceeds faster and without complications due to the smaller volume of the indentations.

The intraosseous apical incision with a 1 mm pitch ensures an even load on the bone and is favourable for the bone, which also has a favourable effect on the reliability of the implant fixation in the bone. The execution of the horizontal notches on the crown part increases the convenience of use in orthopaedic manipulations, the need for a second surgical intervention to remove the plug and insert the shaper, which leads to lower treatment costs.

Results of histomorphological studies

We studied the interaction of the jaw bone tissue with the implants in different periods after surgery (1,3,6 months). For this purpose, a stereoscopic microscope SMP-1 was used, which allows to simultaneously study the metal structures of the implants and the bone tissue adjacent to them. The microscopic findings showed that the surface of the implants showed discrete particles, which were fragments of bone tissue (crumbs) that appeared as a result of the separation of the implants from the main mass of the jawbone

The microscopic examination of the microscope showed that the bone tissue adheres to the implants very well already in the early period of observation (1 month). The implant surface appears quite smooth, without any extraneous inclusions or deposits (Fig. 5). After 3 months, the interaction of the implants with the jaw bone does not differ from that of the previous study period. The bone tissue adheres tightly to the metal surface of the implants and there are cavities of varying sizes at the edge of the bone to implant contact. The contact areas do not show any extraneous inclusions, deposits or cavities. The implant itself is not altered in any way (Fig. 6).

Fig.5. Microscopic examination of the Implant.uz dental implant after 1 month. Interaction of the native implant with the bone. 1 month. Bone tissue is tightly attached to the SMP-1 implant

Fig. 6. Microscopic examination of the Implant.uz dental implant after 3 months. Interaction of the native implant with the bone. 3 months. The bone tissue is tightly attached to the implant. SMP-1

Fig. 7. Microscopic examination of the Implant.uz dental implant after 6 months. Interaction of the native implant with the bone. 6 months. The bone tissue is tightly attached to the implant. SMP-1

After 6 months of follow-up, the bone tissue on the implant surface is homogeneous with a flat surface. The bone surface does not show any extraneous inclusions or impositions and there are no cavities between the implant surface and the bone. However, there are discrete particles on the implant surface as described above, which are fragments of jawbone that have broken away from the implant during specimen extraction (Fig. 7).

Conclusions: Thus, the data obtained allow us to conclude:

1. The domestic dental implant "Implant.uz" made of titanium of BT-1.00 grade, consisting of intraosseous part, containing conical apical part with thread and coronal part, and extraosseous part including crown part, has been developed. At the apical end of the apical part there are anti-rotation notches in the form of cross grooves.
2. The developed dental implant, implanted into the jaw bones of the experimental animals did not cause pathological changes in their organism, which allows to recommend it for clinical research;
3. Microscopic examination of the jaw bone tissue at 1, 3, 6 months after implantation on the implant-bone interface showed that the bone tissue adheres tightly to the metal surface of the implants; no extraneous inclusions, deposits or cavities are detected in the contact areas.
4. The studies performed allow us to recommend implementation of the developed domestic dental implant in the practice of surgical and orthopaedic dentistry.

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