



Use of Single-Stage Dental Implants for Varying Degrees of Alveolar Atrophy

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Annotation: The function and condition of the oral organs are closely connected with other systems of the human body, and tooth loss is one of the most common pathological conditions and affects not only the function of chewing and the whole jaw system. Missing teeth impair a vital function in chewing, which affects digestive processes and causes other diseases. The dental, periodontal and oral mucosa health has been linked to the condition of other parts of the gastrointestinal tract as well as other body systems (motor system, cardiovascular, endocrine), higher nervous activity, infectious diseases, cancer, sleep quality, obesity and the state of general defences.

Oral health is regarded by scientists as a useful marker of general health and healthy ageing. When teeth are missing, the structural, functional and aesthetic balance of the maxillofacial region and many body systems is impaired, leading to social consequences and a reduced quality of life for the individual.

Keywords: radiography, odontometry, height of bone.

Introduction. Implantology today is one of the most dynamically developing areas of modern dentistry; the use of modern technology has allowed a new level to approach the problem of treatment of missing teeth and partially missing teeth. Defective teeth must be restored in the shortest possible time and in the most functional way, and here dental implants and prosthetics are the most modern way to preserve the stable condition of the masticatory and oral system, and in the spectrum of high-tech treatment methods it justifiably occupies a priority position.

According to researches of leading analytical agencies in Europe and USA, the demand for dental implants is expected to exceed the demand for all other kinds of dental treatment. And the market for dental implants and bone grafting materials is the fastest growing segment in dental technology analytics.

According to the world's leading analytical agencies, prices in the implant market are steadily decreasing and this trend is not expected to change yet, which contributes to the spread of this treatment method. Due to the trend of steadily ageing population in the developed world and the accumulation of unmet needs for dental restoration, a large number of companies see an opportunity to

develop these promising and sophisticated dental care methods. The market for dental implants and bone grafting materials is the fastest growing segment in dental technology and we are constantly being offered new products.

Being under pressure from manufacturers, one of the most important tasks of practical dentistry today is the objective and unbiased development of treatment tactics and methods to restore the function of the dento-alveolar system in case of tooth loss, timely and quality restoration of dental defects and prevention of complete loss of natural teeth. It is also important to remember that dental implants are not a full-fledged substitute for natural teeth and should by no means be removed prematurely (as is often the case in the recent past). The survival rate of dental implants, according to some studies, does not exceed that of even problematic but successfully treated natural teeth. Thus, the high clinical prevalence, practical relevance and insufficient scientific understanding of the treatment and rehabilitation of patients with missing teeth were the scientific and theoretical prerequisites for our chosen research.

Purpose of the study: To improve the effectiveness and quality of treatment of patients with dental defects and varying degrees of alveolar atrophy using a single-stage dental implant technique and single-stage dental implants.

Materials and Methods: Patients were divided into 3 groups depending on the degree the atrophy and the types of dental implants and surgical treatment protocols used (Table 1).

Table 1. Distribution of study prospective patient groups by sex and age (2018-2022)

Gender	Total number of patients	Group 1	Group 2	Group 3
Male.	30 (50%)	8 (40%)	5 (25%)	10 (50%)
Female.	30 (50%)	12 (60%)	15 (75%)	10 (50%)
TOTAL:	60 (100%)	20 (33,33%)	20 (33,33%)	20 (33,33%)

$p > 0.05$ No statistically significant difference between the groups

Results of the study. The first group consisted of patients in whom a single-stage surgical protocol for dental implantation and monolithic dental implants were used. These patients had dental defects of varying lengths and sufficient bone volume. There were 20 patients in this group.

The second group included patients with dentition defects in whom a one-stage surgical protocol of dental implant surgery and non-disassembled (monolithic) dental implants were used. In these patients, varying degrees of atrophy of the alveolar processes of the jaws were detected. The group included 20 patients.

A subgroup of 5 patients was included in this group, in whom we used our proposed minimally invasive method of placement of the dental implant and our patented new design of the dental implant (see below). These dental implants were demountable, but were placed by us according to a single-step protocol, simultaneously with gingiva shapers and/or abutments and modern crowns.

The third (control) group consisted of patients with dental defects in whom the traditional two-stage surgical protocol of dental implant surgery and collapsible dental implants were used. These patients had dental defects of varying lengths and varying degrees of atrophy of the maxillary alveolar bone. There were also 20 patients in this group. In total, 103 dental implants were placed in these 60 patients aged from 18 to 59 years: 24 in position of lower jaw premolars; 16 in position of upper jaw

premolars; 27 in position of lower jaw molars; 16 in position of upper jaw molars; 12 in position of upper jaw frontal teeth group; 8 in position of lower jaw frontal teeth group.

During the dental implant surgery, we used a surgical physiodispenser, surgical handpiece and original surgical implant system kits.

We proposed a minimally traumatic one-stage dental implant surgery. This technique was used in an additional subgroup of 5 patients.

At the third stage of the study, a comparative analysis of the effectiveness of treatment of patients using different surgical techniques of dental implantation was carried out. A comprehensive study was carried out on the 103 dental implants placed at the previous stage of the study. The study was performed in the same 60 patients previously operated on using different methods of dental implantation for comparative evaluation of treatment results using different methods of surgical protocol of implant treatment using monolithic and collapsible dental implants in patients with defects of dental rows and different bone volume. When analyzing dental implant surgery protocols, predominance of the single-stage protocol ($p < 0.05$) was noted. Out of 274 dental implants placed according to the one-stage protocol, 179 (65, 33%) were placed, out of them, 160 were monolithic (indestructible), which was 89, 38% of the number of the implants placed in a single-stage manner. Using the two-stage technique, in cases of bone grafting operation in case of significant atrophy of the alveolar ridges and more multi-stage techniques, 95 dental implants (34, 67%) were placed, all of them being demountable. Thus, non-dismountable (monolithic, single-stage) dental implants accounted for 58.40% and dismountable implants accounted for 41.60% of the total number of implants placed (Table 10). It should be noted that the non-dismountable (monolithic) dental implants demonstrated a lower survival rate compared to the demountable implants placed according to the two-step protocol (92.94% and 95.86%, respectively), however, these differences were not statistically significant ($p > 0.05$). Of particular importance is the fact that about half of the lost implants were unlinked single retention elements for locking removable prostheses in bone of insufficient volume and quality. A comparison of single-stage and two-stage surgical protocols for dental implants also showed no statistically significant differences in implant survival, with survival rates of 93.6% for the single-stage and 95.1% for the two-stage surgical protocols. In turn, the results of a study of the survival rate of non-dismountable (monolithic) implants used as supports for fixed prostheses show their superiority over fixed demountable implants over the period from 2018 to 2021. This can be explained by the more frequent use of temporaries in the placement protocol and functional ligation (splinting) of non-dismountable dental implants, which leads to improved survival due to a more even distribution of functional loads.

Examining the long-term results of dental implantation in patients up to 10 years after the surgery, 93,6% of one-stage implants retained their ability to function (their clinical consistency corresponded to 3-5 according to the five-point scale). The main cause of disintegration was

Developed inflammation around the implant (peri-implantitis), possibly due to inappropriate prosthetics and/or improper distribution of the masticatory load. It is worth mentioning that very rarely, implant mobility was also observed without symptoms of inflammation, which can be attributed to non-axial osseointegration, i.e., fibrointegration. The condition of the jawbone was assessed mainly by means of orthopantomograms available at the time of surgical treatment, which unfortunately did not always provide complete and reliable information on the bone structure and density. Complications developed when the available anatomical conditions were optimistically overestimated, contraindications were not identified at the preoperative stage or the masticatory loads during prosthetics were unevenly distributed, due to lack of experience and insufficiently thorough examination of the patient.

In an assessment of patient satisfaction with treatment, the following was observed: the greatest satisfaction was observed in patients with fixed prostheses, with the fitted

Conclusions: The results obtained allow us to conclude that the clinical evaluation of the single-stage and two-stage surgical protocols of dental implants in patients with sufficient bone volume in the alveolar processes of the jaw is comparatively the same and the level of patients' satisfaction with the performed treatment is higher in case of using the single-stage surgical protocol. The obtained data show that the degree of atrophy of the maxillary ridges has no significant impact on the clinical suitability of the placed dental implants.

Retrospective studies have shown that single non-removable dental implants (end and inlay prostheses and removable denture retainers) are the most at risk of insolvency (mobility). The retrospective data obtained allow us to consider a single-stage surgical protocol for dental implant surgery and non-detachable implants as an objective self-sufficient method of dental implantation in patients with varying degrees of atrophy of the alveolar ridges.

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