

ANALYSIS OF THE EFFECTIVENESS OF IMPLANT TREATMENT IN PATIENTS WITH TOOTH LOSS

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SUMMARY

This article presents an analysis of the survival rate of implants widely represented on the Russian market. The authors summarized the statistical material for the last 8 years.

KEY WORDS. dental implantation, tooth loss, implant surgery, implant types.

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Introduction

For the last 30 years the method of dental implantation has become one of the leading methods of filling in dental defects [2, 4, 5, 6,7,8]. The problem of rehabilitation of patients with dental diseases accompanied by the destruction of dental and periodontal tissues is largely solved by this method today. This method of treatment is especially relevant for our country, since in Russia the prevalence of major dental diseases – dental caries and periodontal diseases – among the population of different age groups is high [3] and continues to increase, as well as the need for adequate dental care [1].

Clinical trial material

During the 5 years from 2012 to 2020 4134 screw implants made by Dentium (RK) LIKO-M (Russia), Straumann (Switzerland), Astra Tech (Sweden), were inserted (tab. 1).

Two-stage screw implants (4134) were divided into four clinical groups accordingly. The first group, where 1562 implants were placed in favorable anatomical conditions, served as a control group. In the second, third, fourth groups the implants were set in the unfavorable anatomical conditions: in the second group – in the conditions of the immediate or early delayed implantation (378 implants); in the third group – in the conditions of the maxillary bone atrophy (1457 implants); in the fourth group – in the conditions of the closed and open sinuslifting (226 and 511 implants). (Table 2).

Clinical evaluation of the effectiveness of dental implantation using different techniques of implant surgery.

A total of 1,056 patients were operated on. In accordance

with the objectives, we analyzed the degree of atrophy of the alveolar processes of the jaws in 462 patients. These patients constituted the main group of the clinical study. In order to determine the differences in the intensity of atrophic processes and detection of some age-specific features there was formed the control group of 594 patients aged 16–65 years old in whom the reaction of the complex of tissue structures in forming the defects of dental rows was assessed as normal.

When analyzing the general characteristics of the main group with a pronounced type of atrophy, the following was found. More often, with a multiplicity of 2:1, the phenomena of pronounced atrophy were more frequent in men (68.2%) than in women (31.8%).

When analyzing the frequency of included and terminal defects with the phenomena of pronounced atrophy, we found that these phenomena were observed twice as often in the lower jaw than in the upper jaw (65.3% and 34.7%, respectively). In terms of the severity of the cumulative signs, the most intense atrophy of the alveolar process was observed in the included dentition defects in the incisors of the lower jaw in 36.6% of the examined persons. The second place was occupied by end defects within the mandibular premolars and molars (28.2%). In the third place – within the premolars and first molars of the upper jaw – 18, 9%. In the fourth place – within the frontal group of upper jaw teeth – 16, 3%.

According to the survey data obtained within the age groups studied, the incidence of included dental defects within teeth 1–3 was 55.7% and within teeth 3–5 was

Table 1
Types of intraosseous implants used

Implants	«Dentium»	«LIKO-M»	«Straumann»	«Astra Tech.»	Total
Screw two-stage	1406	1242	852	634	4134

Table 2
Frequency of implants use in different clinical settings

	Favourable anatomical conditions	Immediate and early delayed implantation	Alveolar ridge atrophy	Sinuslifting (closed/open)	Total
Implants	1562	378	1457	737 (226/511)	4134

Table 3
Results of examination of patients in the control group after performed dental implantation (lower jaw, 641 implants)

Indicators	After 3 months.	After 6 months.	In 1 year	In two years.
Bone resorption (in mm)	Not detected	Initial signs	< 1 mm	<1.5 mm
Volumetric velocity blood flow (in ml/sec)	0,143±0,015	0,143±0,005	0,139±0,018	0,141±0,018

Table 4
Results of examination of patients in the control group after dental implants (upper jaw, 921 implants)

Indicators	After 3 months.	After 6 months.	In 1 year	In two years.
Bone resorption (in mm)	Not detected	Initial signs	< 1 mm	<2 mm
Volumetric velocity blood flow (in ml/sec)	0,174±0,002	0,173±0,014	0,169±0,006	0,172±0,021

44.3%. Overall, in the 16–39 age group, included defects accounted for 62.0% and end defects for 38.0%.

It should be noted that the examination of 594 patients revealed 714 included and terminal dental defects, with 1 patient having 1.2 ± 0.1 defects. However, no age-specific distribution of the frequency of the pathology under study was revealed. There were no significant differences in the incidence of combined dental row pathology either. Only at the age of over 30 years, a stable tendency to the increase of end defects was detected, the share of which in relation to the included ones averaged 34.5%.

In a targeted study of intense atrophy of the alveolar process after tooth loss in patients aged 16–39 years, it was found that the studied pathology is found in 2–8% of patients. These patients need primarily correction of the areas of pronounced atrophy of the alveolar processes.

To study the effectiveness of bone replacement materials, all patients were divided into two groups (main and control). In the main group, porous hydroxyapatite ceramics, undemineralized spongiosa and allogenic HAP (Lioplast series) were used to intensify bone tissue regeneration during dental implantation. In the control group, implantation was performed according to the standard protocol.

The volume of ACL bone in the control group of patients (462 people) was optimal for dental implantation. A total of 1,564 dental implants were placed in this group, 641 (41.1%) on the lower jaw and 921 (58.9%) on the upper jaw.

According to the data of X-ray examination, the alveolar height of the mandible ranged from 14.0 to 19.0 mm, width from 8.5 to 11.0 mm, bone density from 900 to 1200 HU according to the Hounsfield scale, which corresponds to D2 bone type. The usable height of the maxillary alveolar process was 15 to 22 mm, width 11 to 16.5 mm, bone density 350 to 850 HU according to the Hounsfield scale, which corresponds to bone type D3.

Volumetric blood flow velocity of the bone tissue according to the results of Doppler flowometry was $0,144 \pm 0,015$ ml/sec on the lower jaw, $0,175 \pm 0,002$ ml/sec on the upper jaw, which corresponds to normal blood supply indices.

All patients in the control group underwent intraosseous dental implantation. The results of control examination after 3 months, 6 months, 1 and 2 years are shown in Tables 3 and 4.

As studies have shown, in the control group patients after dental implantation there were no significant disturbances of blood supply, and bone resorption around the implant neck did not exceed 1–2 mm. The long-term results (up to 5 years) were as follows: 47 implants out of 921 implants placed on the upper jaw (5.1%) and 24 implants (3.7%) out of 641 implants placed on the lower jaw were removed. The total number of removed implants in the control group was 71 (4.5%).

Patients in the main group underwent immediate and distant implantation with the use of bone substitutes. Surgery was performed on the lower jaw in 1234 (48%), on the upper jaw in 326 (52.4%) patients. A total of 2572 implants were placed, 377 (49.2%) on the lower jaw and 1338 (52%) on the upper jaw.

The preoperative bone density ranged from 350–850 HU (maxilla) to 850–1250 HU (mandible) on the Hounsfield scale.

The baseline volumetric blood flow rate averaged 0.151 ± 0.024 ml/sec (mandible) and 0.174 ± 0.005 ml/sec (maxilla).

According to the survey of patients in the intraoperative period, the patients evaluated pain and swelling of soft tissues as mild (1 point). Five patients who underwent mandibular implantation noted impaired sensitivity of the skin of the lower face (chin area, corner of the mouth and lower lip). Decreased sensitivity in the zygomatic suborbital region was reported by 2 patients out of those patients who underwent implantation on the upper jaw.

Table 5
Analysis of the effectiveness of the dental implant systems used

Type of implants	«LIKO-M»	«Dentium»	«Straumann»	«Astra Tech»	Total
Installed	1242	1406	852	634	4134
Deleted	59 (4.8%)	67 (4.8%)	39 (4.6%)	31 (4.9%)	196(4.75%)
Effectiveness	95,2%	95,2%	95,4%	95,1%	95,25%

In the main group, vertical resorption of the newly-formed bone tissue around the implants in 1 year after implantation averaged 1.1 ± 0.01 mm, in 2 years – 1.6 ± 0.02 mm, which is a little higher than in the control group.

Long-term results: 54 implants out of 1234 implants placed on the lower jaw (4.4 %) and 71 implants out of 1338 placed on the upper jaw (5.3 %) were removed. The total number of implants were removed 125 (4.9 %).

Clinical analysis of the main dental implant systems used

The paper analyzes the effectiveness of four different screw-type dental implant systems approved for use in the Russian Federation.

In total, during the 8 years of work, 4134 screw implants, including 1242 implants manufactured 1406 by «Dentium company» (Republic of Korea), by «LIKO-M company» (Russia, Moscow), 852 by «Straumann company» (Switzerland), 634 by «Astra Tech company» (Sweden) were placed.

Long-term results: 196 implants out of 4134 were removed (4.75 %). Out of 1242 screw implants manufactured by the company «LIKO-M», 59 (4.8 %) were removed. About 22 implants were removed due to the lack of signs of osseointegration up to 4 months after placement. 18 implants were removed along with the prosthesis between 4 and 12 months after prosthetics, 12 implants were removed along with the prosthesis between 12 months and 3 years. Seven implants were removed between 3 and 5 years. Out of 1406 screw implants placed by Dentium, RK, 67 (4.8 %) were removed. Out of 852 screw implants of the company «Straumann» (Switzerland) 39 (4.6 %) were removed, out of 634 screw implants placed by Astra Tech, Sweden, 31 (4.9 %) were removed. It should be noted that there is no significant difference in the effectiveness of screw implants of Russian and foreign manufacturers (Table 5).

It should be noted that the Switzerland system «Straumann» showed the best engraftment rate (about 95.4 % during the 5-year follow-up), the Russian system «LIKO-M» was practically as effective as the best European analogues. All the patients who underwent implantological care with the use of osteoreparation are satisfied with the functional and esthetic results of the treatment. The patients did not complain of pain or discomfort condition in the area of implants

and prostheses. The examination showed that there were no pathological changes in the oral tissues, mobility of prostheses and implants in these patients.

Conclusion

Thus, as the results of our studies have shown, the positive effect in the rehabilitation of patients with partial and complete loss of teeth with the help of implants averaged 95.25 %. All patients were satisfied with the functional and aesthetic results of treatment. The patients did not complain of pain, discomfort condition in the area of implants and prostheses. Clinical examination showed that there were no pathological changes in the oral tissues, mobility of prostheses and implants in these patients.

Besides, the main advantage of early and delayed dental implantation in combination with bone grafting using bioresorbable materials is the possibility of full restoration of the functional, functional-protective and cosmetic status of the maxillofacial region as soon as possible after teeth extraction.

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