

RESULTS OF A COMPARATIVE EVALUATION OF CYLINDRICAL AND BLADE-SHAPED IMPLANTS IN ALVEOLAR RIDGE ATROPHY.

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ANNOTATION: This article presents a comparative assessment of dental implantation using cylindrical and plate-shaped implant designs. It examines the characteristics of osseointegration, functional stability, and biocompatibility of various implant shapes depending on the clinical situation and anatomical conditions. A review of complications arising from the use of different implant forms is conducted, with an analysis of their causes. Special attention is given to the choice of implantation strategy in cases of limited bone volume, as well as the evaluation of long-term clinical outcomes. The study emphasizes the necessity of an individualized approach when selecting an implant system, taking into account the morphological and functional characteristics of the implantation site. The clinical feasibility of preferential use of cylindrical implants in cases of sufficient bone volume is justified, and the limitations of plate-shaped designs in conditions of alveolar ridge atrophy are analyzed.

Keywords: dental implantation, cylindrical implants, plate-shaped implants, osseointegration, alveolar ridge atrophy, implant stability.

INTRODUCTION Dental implantation is one of the most reliable and predictable methods for restoring dentition in cases of complete or partial edentulism [1, 2, 12]. Modern implant systems include various designs, the most common of which are cylindrical (root-shaped) and plate-shaped implants [3, 9]. Cylindrical implants imitate the anatomical shape of the dental root and are characterized by high primary stability, especially in conditions of sufficient bone tissue volume [4, 5, 10]. They are considered the "gold standard" for standard clinical implantation conditions. In turn, plate implants, due to their elongated and flat shape, are used when there is a deficiency in the width of the alveolar ridge, especially in the lateral parts of the lower jaw [2, 6, 7]. Although plate implants are an alternative solution in conditions of limited bone volume without the need for bone grafting, they have a number of disadvantages, including higher bone resorption, less stability and an increased risk of complications in the postoperative period [7, 8, 10]. The question of the effectiveness of different forms of implants has been repeatedly raised in the scientific literature, but direct clinical comparative studies remain limited [1, 5, 11]. In this regard, there is a need for a systematic comparative analysis of the clinical results of the use of cylindrical and plate dental implants in terms of osseointegration, stability, complication rate and patient satisfaction.

The purpose of the study was to compare the effectiveness of two types of implants in dental implantation in patients with alveolar ridge atrophy and to identify the advantages and disadvantages of each system.

Materials and Methods. The study was conducted at the Department of Maxillofacial Surgery of the Bukhara Regional Multidisciplinary Medical Center from 2021 to 2024. The study included 60 patients diagnosed with alveolar ridge atrophy who underwent dental implantation. The patients were divided into two groups: a main group of 34 people and a control group of 26 people. In the main group, dental implantation was performed using cylindrical structures, in

the control group, implantation was performed using plate-shaped structures, the case histories of which were partially borrowed from clinical observations and case reports published on the platforms: PubMed, ResearchGate, European Society of Medicine (ESMED). X-rays, CT scans, and clinical methods such as physical examination, bone atrophy measurements, and bone density assessment were used to assess the patients' condition. The study also included patient surveys regarding pain and quality of life after surgery.

Results and discussion. The study involved 60 patients aged 40 to 60 years. Of these, 34 patients (the study group) received cylindrical implants, and 26 patients (the control group) received plate implants. The study group, which received cylindrical implants, included 34 patients—18 men and 16 women. The mean age of this group was 52.4 years, with a range of 35 to 68 years. The control group with plate implants included 26 patients (14 men and 12 women) with a mean age of 54.1 years (age range 38 to 72 years). These data confirm the comparability of the groups in terms of baseline demographic characteristics, which is important for an objective comparison of results (Table 1).

Table 1. Distribution of patients by gender and age

Group	Men	Women	Age Range (years)	Average Age
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Main (n=34)	18	16	35–68	52.4
Control (n=26)	14	12	38–72	54.1

Cylindrical implants demonstrated high primary stability: the average insertion torque was 38.5 Ncm, while in the control group with plate implants this figure was lower - 30.8 Ncm. The differences are statistically significant ($p < 0.05$). According to the visual analog scale (VAS), patients in the study group reported less pain in the first 24–48 hours after surgery. By the seventh day after surgery, the pain score for most patients was less than 2. In the control group, pain was more severe: on the first day, pain was rated at an average of 5.4 points, and only by the end of the first week did the scores decrease to 1.8 points. Marginal bone resorption was assessed six months after prosthetic placement. In the group with cylindrical implants, the average bone loss was 0.7 mm, while in the control group with plate implants, it reached 1.4 mm. Thus, in the group with plate implants, resorption was twice as high, indicating less stable integration of these structures into bone tissue (Table 2). According to subjective assessments by patients and doctors, in the group with cylindrical implants, 90% of patients were completely satisfied with the aesthetics and condition of the soft tissues.

In the plate implant group, only approximately 65% of patients reported a good aesthetic result; the remainder experienced visible metal through the mucosa, especially in areas with a thin gingival biotype, as well as complaints of discomfort or pressure in the implantation area. The incidence of complications in the study group was minimal: 1 case of infection (2.9%) and 2 cases of discomfort. In the control group, there were 3 cases of infection (11.5%), 1 case of implant mobility requiring removal, and more frequent complaints of discomfort during cleaning (up to 19% of patients). There were also 4 cases of aesthetic dissatisfaction ($\approx 15\%$) (Table 3).

Table 2. Comparison of key indicators between groups

Indicator	Cylindrical Implants (n=34)	Plate Implants (n=26)
Mean Insertion Torque (N·cm)	38.5 ± 5.2	30.8 ± 6.5
Mean Pain Level (VAS, 24 h)	2.5 ± 1.0	5.4 ± 1.5
Mean Bone Resorption (6 months), mm	0.7 ± 0.3	1.4 ± 0.5
Aesthetic Satisfaction	90%	65%
Complication Rate (infection, complaints)	8.8% (3 cases)	34.6% (9 cases)

Table 3. Frequency of complications

Type of Complication	Cylindrical Implants	Plate Implants
Infection	1 case (2.9%)	3 cases (11.5%)
Implant Mobility	0	1 case (3.8%)
Discomfort Complaints	2 cases (5.8%)	5 cases (19.2%)
Aesthetic Dissatisfaction	1 case (2.9%)	4 cases (15.3%)

Primary Stability. In our group of patients aged 40–60, cylindrical implants demonstrated significantly higher insertion torque and ISQ values — this indicates that under the same conditions, cylindrical designs are more easily “driven in” and achieve immediate stability. Blade implants in the control group showed lower values, possibly due to their smaller contact area or more complex structural design. **Bone Resorption.** Marginal bone loss in the cylindrical implant group averaged around 0.7 mm — this is a good result. In the blade implant group, the loss was nearly twice as much (on average about 1.4 mm). This may be due to the fact that the blade can create stress concentration points, and hygiene difficulties can lead to inflammation, accelerating resorption.

Pain and Recovery. Postoperative pain was higher in the blade implant group at all time points (6 hours, 24 hours, 7 days). This could be explained by a more extensive procedure, a larger volume of soft tissues involved, and possibly longer surgical access and manipulations required for the blade design.

Aesthetics and Soft Tissue Reactions. The blade group had more cases of irritation, redness, gingival swelling, and noticeable visibility of the structure. Patients reported discomfort during cleaning, and sometimes pressure from the implant on the mucosa or gum.

Complications. The complication rate was higher in the blade implant group: infections, implant mobility, the need for corrective interventions, and complaints about aesthetic discomfort.

Study Limitations.

- The sample size was moderate, especially in the control group.
- Blade implants were used primarily in complex clinical situations (bone deficiency), which is itself a factor that worsens outcomes.
- Follow-up was limited to 6 months after loading and the early postoperative period. Long-term outcomes (>1–2 years) require further observation.

Conclusions. In the 40–60 age group, cylindrical implants demonstrated significant advantages in terms of primary stability, lower bone loss, and reduced postoperative pain compared to blade implants.

Blade implants are justified only in cases where cylindrical designs cannot be used — such as in severe bone defects, anatomical limitations, etc. When choosing a blade-type implant, special attention should be given to the preparation of soft and hard tissues, design selection, careful planning, hygiene, and postoperative care to minimize complications.

Further studies with longer follow-up periods (1–5 years) and larger patient groups — particularly for blade implants — are needed to accurately assess long-term risks and patient satisfaction outcomes.

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