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Dynamics Of Stability Indicators of Dental Implants With A Hydrophilic Surface In Patients With Somatic Pathology

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Abstract: At present, little attention is paid to the pathology of bone tissue and the development of resorption in diseases of the thyroid gland in comparison with other endocrine osteopathies. A history of thyrotoxicosis is one of the contraindications to dental implantation due to the influence of thyroid hormones on the processes of regeneration and bone formation and calls into question the successful osseointegration of implants. The above factors prompted us to conduct this study and study the effect of dental implants with a hydrophilic surface on osseointegration parameters in patients with thyroid pathology. Purpose of this study is analysis of stability indicators of dental implants with a hydrophilic surface and SLA surface in patients with thyroid pathology. Objectives of the study is to determine the effectiveness of prosthetics using dental implants with a hydrophilic surface in patients with thyroid pathology.

Keywords: osseointegration, dental implantation, prosthetics

Introduction

In orthopedic dentistry, one of the most pressing problems is the restoration of dentition [1]. One of the modern methods of orthopedic treatment of complete and partial absence of teeth is dental prosthetics using dental implants. The first experiments in creating screw dental implants and implanting them into bone began in the 60s of the last centuries. In the 90s, the possibility of osseointegration, or implantation of an artificial root, was experimentally proven. This marked the beginning of the era of implant prosthetics. However, diseases of the skeletal system and other pathological conditions that cause disruption of trophism and weakening of the regenerative ability of bone tissue are contraindications to dental implantation.

According to many authors, osteoporosis complicates the integration of dental implants [2], and a detailed study of the problem after prosthetics revealed the fact that 25% of patients with peri-implantitis had thyroid dysfunction [3]. In thyrotoxicosis, as a result of an increase in thyroid hormones, bone resorption prevails over bone formation, which leads to a decrease in bone mass (Masalova, R.V. Zakharenko; 2009) and worsens the prognosis of implantation. In experimental studies V.V. Novochadova et al. (2015) showed that the balance of thyroid hormones affects the osseointegration of screw titanium implants with a bioactive surface and the remodeling of the adjacent bone. Quantitative morphological and immunohistochemical methods were used (detection of osteoclasts, osteonectin, caspase-3). It has been shown that when modeling hyperthyroidism with the administration of L-thyroxine, the processes of osseointegration and bone remodeling around the implants deteriorate; in hypothyroidism caused by the administration of Thiamazole, implant healing occurs under more favorable conditions. The results of the experimental study indicate that when placing screw titanium implants into the bone of laboratory animals with different levels of thyroid hormones, features

of osseointegration of the implants and remodeling of the adjacent bone are revealed. Against the background of thyrotoxicosis, the results of osseointegration of screw titanium implants worsen (Novochadov V.V. 2015).

The main approach to increasing the osseointegrative properties of implants is to actively modify their surface, resulting in a maximum contact area with the adjacent bone tissue and, at the same time, stimulating the process of remodeling of this bone [Alekhin et al 2000; Novochadov et al. 2013;]. Thanks to these properties, modern materials allow successful osseointegration with early periodontal loads, which can be achieved through intensive remodeling of a dense bone coupling around the implant [Carlsson 2014]. Currently, little attention is paid to the pathology of bone tissue and the development of secondary osteoporosis in diseases of the thyroid gland compared to other endocrine osteopathies, which may be due to many reasons, including the relatively slow development of bone pathology, low severity of clinical manifestations and lower frequency of severe clinical manifestations. forms compared, for example, with glucocorticoid osteoporosis or bone damage in diabetes mellitus [4].

The above data substantiated the relevance and prompted us to study the dynamics of stability indicators for the objective diagnosis of osseointegration processes when using implants with a hydrophilic surface in patients with thyroid pathology.

Materials and Methods

Relevance of the study: at present, little attention is paid to the pathology of bone tissue and the development of resorption in diseases of the thyroid gland in comparison with other endocrine osteopathies. A history of thyrotoxicosis is one of the contraindications to dental implantation due to the influence of thyroid hormones on the processes of regeneration and bone formation and calls into question the successful osseointegration of implants. The above factors prompted us to conduct this study and study the effect of dental implants with a hydrophilic surface on osseointegration parameters in patients with thyroid pathology.

Purpose of the study: analysis of stability indicators of dental implants with a hydrophilic surface and SLA surface in patients with thyroid pathology

Objectives of the study: to determine the effectiveness of prosthetics using dental implants with a hydrophilic surface in patients with thyroid pathology

Materials and methods of research: We performed dental implantation in 59 patients of different sexes with a history of thyrotoxicosis. Where, by randomization, 24 implants with an SLA surface and 35 implants with a hydrophilic surface were distributed. For prosthetics, we used dental implants with a hydrophilic surface from Osstem TS III CA and implants with an SLA surface Osstem TS III SA and a Penguin RFA device to determine the stability of dental implants.

Results and Discussion

Results of the study: for prosthetics, we used implants from Osstem (South Korea) with a helical cutting edge, which allows for close contact with the bone bed. Hydrophilic implants from Osstem (TS III CA) undergo sandblasting with aluminum particles and acid etching, which gives the surface a slight roughness and in turn increases the area of contact between bone tissue and the implant, resulting in increased secondary stability. After the acid etching stage, the surface of the implant is coated with calcium ions and placed in a special calcium solution to impart hydrophilic properties. Hydrophilicity promotes the attachment of negatively charged plasma proteins, which in turn accelerates the formation of a full-fledged blood clot, in maximum volume and on the entire surface of the implant [5].

Implantation was performed by cutting the mucous membrane and periosteum and exposing the alveolar process of the jaw. The bone bed was first formed with a guide drill or bur. During drilling, the thickness of the cortical bone layer and its density were determined. Then drills were used to create the required diameter and length of the bone canal. After which the implant was installed by instrumental screwing. (Fig.1)

The stability of dental implants was measured using a Penguin RFA instrument. It is a wireless, handheld device for assessing the effectiveness of osseous integration and stability of dental implants. The RFA method involves the use of a pin (peg) that is attached to the implant and charged with electromagnetic waves toresonance frequency measurements. The underlying RF measurements in Hertz are translated into an implant stability quotient (ISQ) on a scale from 1 (lowest level of stability) to 100 (highest level of stability). The ISQ indicator (KSI) directly correlates with micromobility and for the reliability of the data must be determined several times beforeprosthetics.

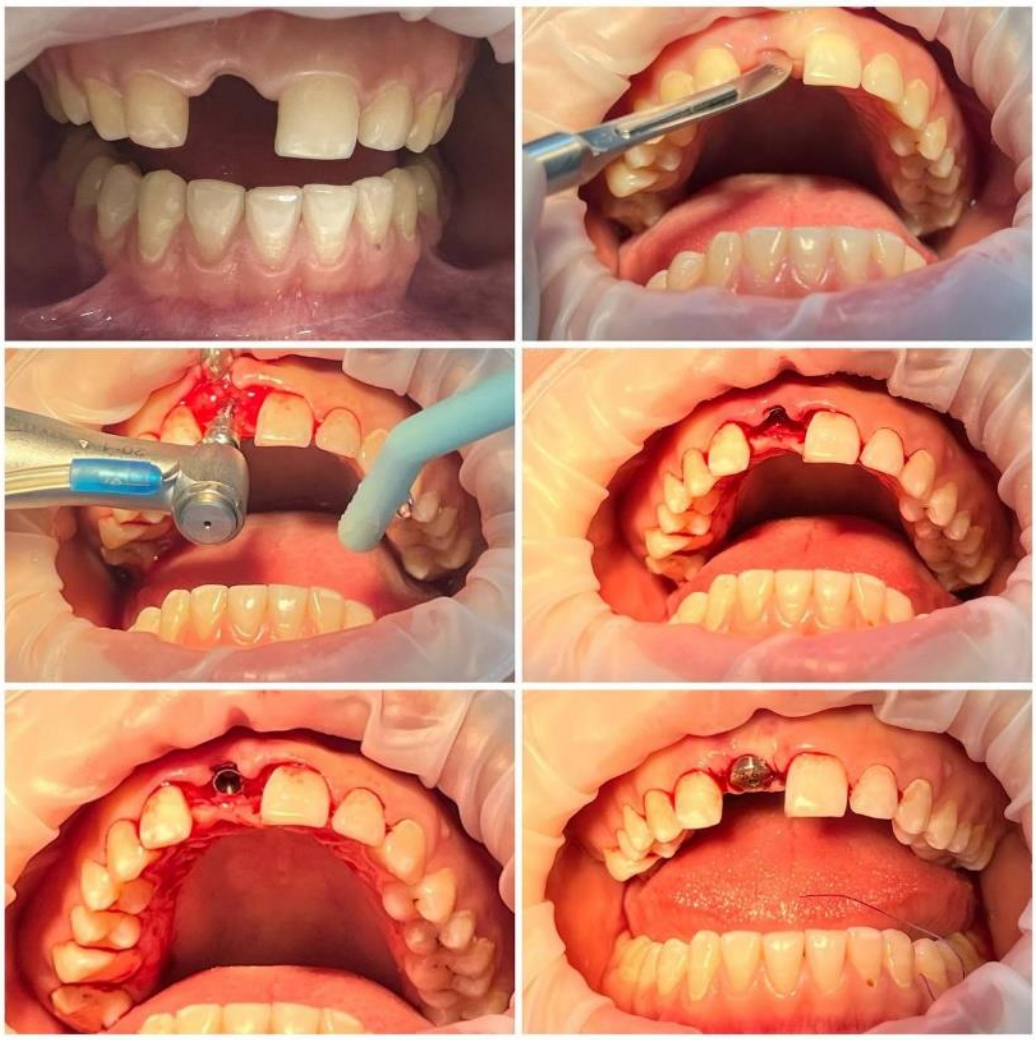
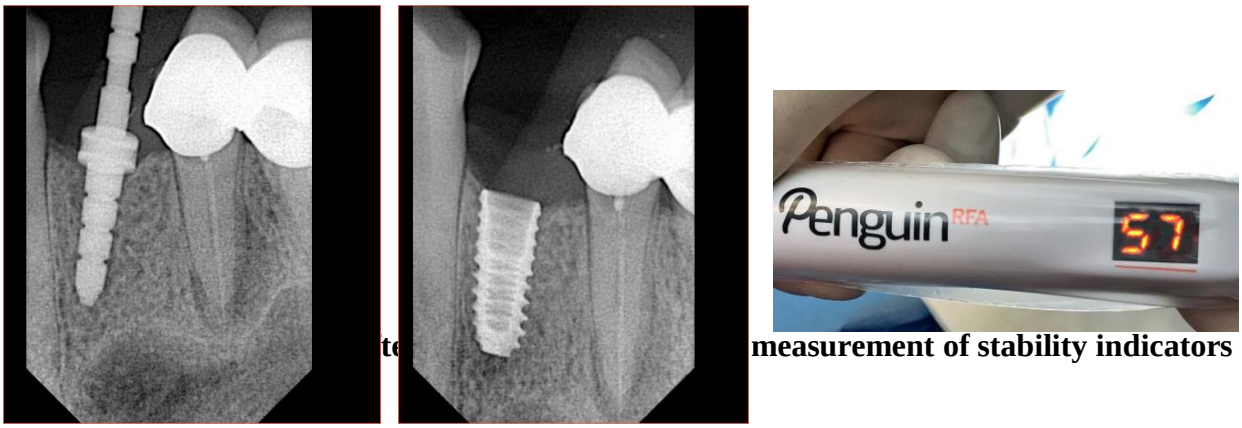


Fig.1 Stages of implantation

Values above 70 ISQ indicate a very stable implant with low levels of micromotion. Scores above 75 indicate that the implant is already stable and osseointegration cannot increase the level of stability. Evidence of the ongoing process of osseointegration is the absence of a drop in ISQ values. A low initial implant stability score, such as 55 ISQ, means that the process of osseointegration may increase the level of stability over time. Implants with

low or falling ESI scores are associated with an increased risk of failure compared to implants with high scores. In patients who received standard implants, primary stability indicators were 57 ICQ - when measured immediately after dental implantation. (Fig.2)



measurement of stability indicators

Fig.2. Sight radiography after implant placement and measurement of stability indicators

Three months after dental implantation, a repeat study of stability indicators was carried out, the value of which was adjusted to 76 ICQ. (3.Fig.)

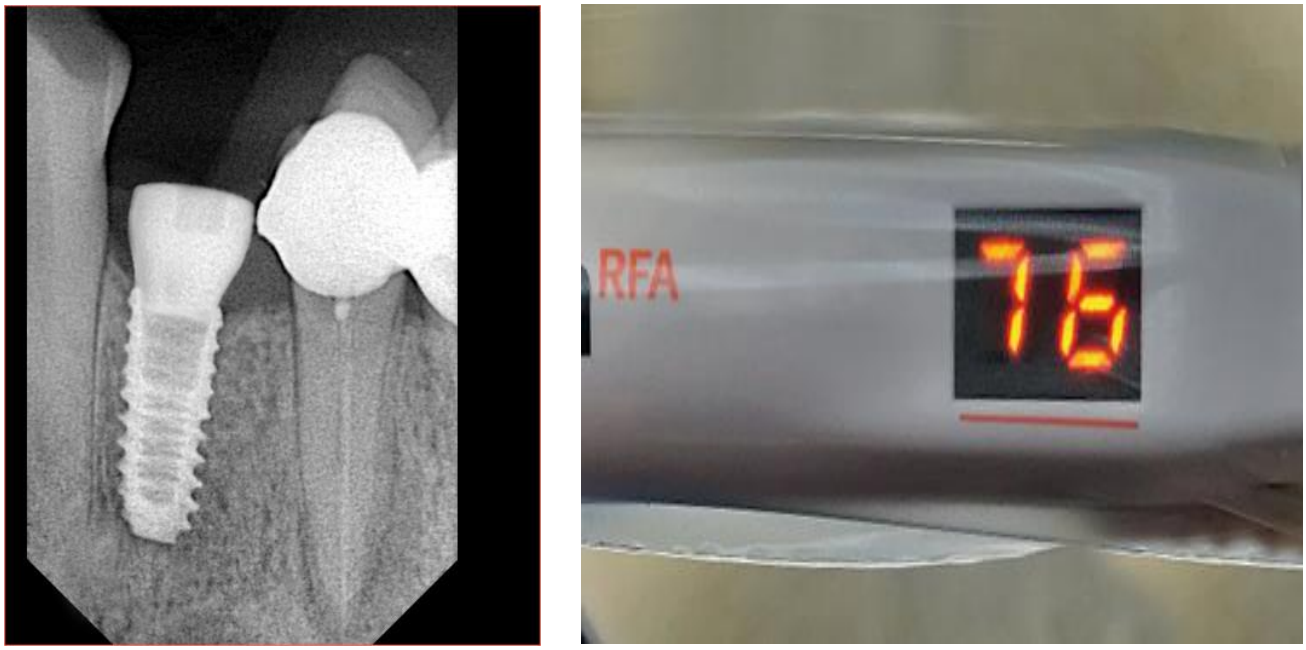


Fig. 3.View of standard Osstem SA implants and measurement of stability after 3 months

Patients who received implants with a hydrophilic surface also had the primary stability of the implant measured immediately after dental implantation and 3 months later; the stability indicators were 67 ICQ and 82 ICQ, respectively. (Figure 4.,5.)

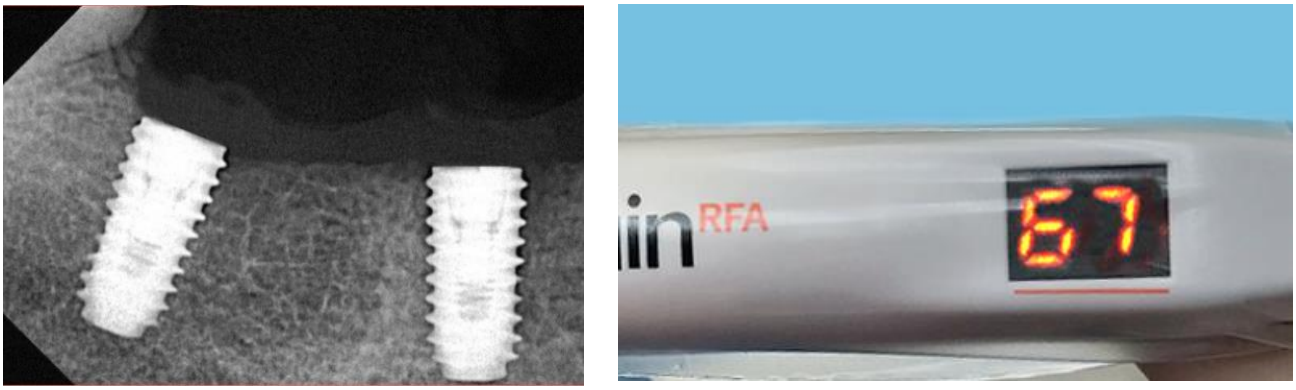


Fig. 4. Installation of Osstem CA III hydrophilic implants and measurement of stability indicators

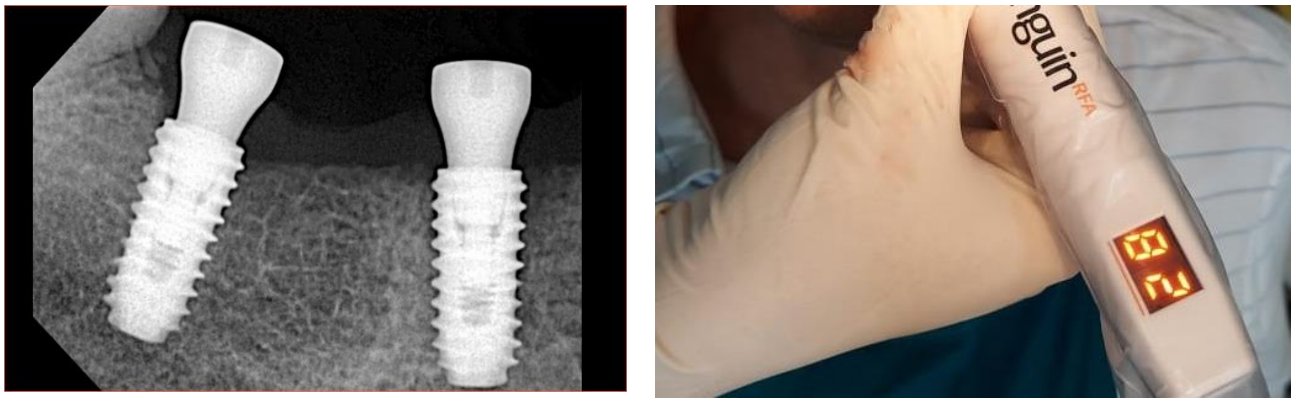


Fig.5. View of Osstem CA III hydrophilic implants and measurement of stability indicators after 3 months

Conclusions

Based on the results of dental implantation, it was found that the stability indicators after implantation of implants with a hydrophilic surface are 58% more stable than those of implants with a standard surface. When implanted with implants with an SLA surface, the average value of stability indicators after 3 months was 76±2, and for implants with a hydrophilic surface it was 82±2. These studies have shown that when carrying out implantation using implants with a hydrophilic surface, we can achieve optimal both primary and secondary stability of the implant.

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