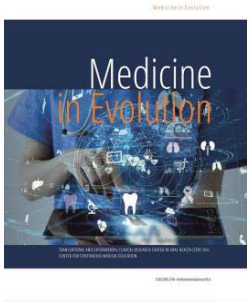
Oral rehabilitation by superstructures on dental implants



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Received: 18 July 2024; Accepted: 18 August 2024; Published: 30 September 2024

Abstract

Dental implants are today an indispensable part of clinical dentistry. The market is estimated to reach approximately USD 7.8 billion by 2030, with a compound annual growth rate (CAGR) of approximately 6-7% during 2023-2030 [1]. Recent studies indicate that dental implants have a survival rate of approximately 90-95% over a 10-year period. Some studies even report survival rates of 95-98% over a 5-year period [2]. The main concern is related to the aging of the population. Diabetes, osteoporosis, obesity, and medication use are all medical conditions that can prevent bone healing around dental implants. With this in mind, research to develop better methods to improve implant osseointegration needs to be continued, especially in the presence of compromised bone status. Current changes and their future outlook are discussed in this paper.

Keywords: dental implants, survival rates

INTRODUCTION

The dental implant market has experienced significant growth globally, supported by demographic, technological, and increasing oral health awareness factors. It is estimated that approximately 10-15 million dental implants are performed annually globally [3]. The number of procedures is increasing, supported by an aging population and increased access to dental health services in developing countries.

North America represents one of the largest markets for dental implants owing to its advanced healthcare infrastructure and high patient awareness. The United States dominates this region. Europe holds a significant share of the global market, with countries such as Germany, Italy and France leading the way. In these countries, the use of dental implants is well accepted and insurance systems may partially cover the costs. The Asia-Pacific region is the fastest growing geographic area, driven by emerging economies such as China and India as well as population growth and improved access to health care [4].

Purpose and objectives

The present study aims to determine the need for dental implant rehabilitation, evaluate patient selection criteria and analyze the impact of dental implant rehabilitation on patients' quality of life.

MATERIAL AND METHODS

The study includes 32 patients of different sexes, from different backgrounds and with different edentulous classes.

For each patient, the masticatory, phonetic and aesthetic dysfunctions were evaluated with the help of clinical and paraclinical examination. These included a series of questionnaires and investigations analyzing the heredocollateral, general personal, behavioral and personal dental antecedents as well as drug treatment if it currently exists. [5]

Inspection of the face from the frontal norm, in this aspect we are interested in facial symmetry, the shape of the face, the floors of the face, the appearance of the lips, of the furrows, the amplitude of the mouth opening and the color of the integuments and the dental exposure.

Facial symmetry analysis looks at whether the halves of the face are symmetrical. Asymmetries may suggest skeletal or dental abnormalities, such as dental midline deviation or malocclusion. Asymmetries can influence the placement of dental implants and, by implication, the final esthetics. Dental exposure assesses how much of the teeth the patient exposes when smiling or at rest, which can suggest problems with tooth positioning. The dental midline should be aligned with the facial midline. A deviation may indicate a malocclusion. Any deviation can affect the aesthetics and must be corrected by proper positioning of the implant. The lips must cover the teeth in a proportional way. If the teeth are very prominent or receding, this may be apparent from frontal inspection. The thickness of the lips and the way they cover or expose the teeth influence the choice of the shape and size of the dental crowns mounted on the implants. The arch of the smile must be harmonious, following the curve of the lower lip. An improper smile arch may suggest abnormal occlusions.

Inspection of the face from the lateral norm follows the patient's profile, the ratio of the lips and the lip-chin groove [6]. The analysis of the facial profile identifies the three variants: straight, convex or concave. These variations are usually related to the relationship between the maxilla and mandible and are important for orthodontic treatment planning. A

convex or concave profile can influence implant positioning and sometimes require surgical or prosthetic adjustments. The straight profile is characterized by a generally balanced occlusion, and the maxilla and mandible are correctly aligned. Convex profile may suggest a prominent jaw or a small mandible (mandibular retrognathism). Concave profile may indicate a prominent mandible or an underdeveloped jaw (mandibular prognathism) [7]. The relationship between the lips and the E line (Esthetic line - an imaginary line that joins the tip of the nose to the tip of the chin) is characterized by the lips that should be slightly withdrawn from this line [8]. If the lips are too prominent or too retracted, this may suggest abnormalities in the positioning of the teeth or jaws. In implantology, the relationship between the lips and the E-line is important to assess tooth projection. Implants must be placed so that they do not create an exaggerated protrusion or retraction of the lips from this line. Dental implants, especially for front teeth, must be placed in such a way as to maintain or improve the support provided to the lips. If the anterior teeth are too prominent or too receding, this can affect the aesthetic and functional appearance of the facial profile. A detailed evaluation of the thickness and quality of the bone tissue is essential for the long-term stability of the implant. In profile, one can see how well the soft tissues, such as the lips and cheeks, are supported by the bony structures. For a successful aesthetic result, it is important that the implants are placed in such a way as to ensure harmony between the upper and lower jaw. This includes assessing the occlusion and position of the posterior teeth, which help support the face.

Palpation of the trigeminal nerve emergence points, sinus points, maxillary and mandibular bone outline, palpation of the soft points of the face, palpation of the TMJ, of the masticatory muscles and we will observe the excursion of the chin to be symmetrical [9].

Endo-oral examination, specifically, the color and appearance of the tongue, floor of the mouth, mucosa of the hard palate, lutea and palatine veil. The call of the teeth, here we followed the presence of carious processes, present fillings, tartar deposits and staining as well as edentations if they are present, after which we moved on to the radiological examination and the diagnosis of the patient. I drew up a treatment plan related to the reasons for the presentation, and then to the practical part.

Anesthesia related to the working areas was performed. Specific incisions were made to make the flap. The bone ridge was regularized, according to the surgical guide, with the help of bone nippers and ball burs.

The drilling of the neo alveolus was done following the manufacturer's surgical instructions according to the bone density, after which Straumann BLX implants were inserted through the surgical guide, obtaining a minimum torque of 35Ncm. The Straumann BLX Implant System is designed for immediate placement and loading, offering high primary stability even in challenging bone conditions. MUA prosthetic posts were screwed into the implants respecting the screw tightening torque of 30Ncm [10].

The provisional work was provisionally cemented, intraorally, over the titanium caps screwed into the MUA. After the provisional cement set, the work was unscrewed to be finished. [11]

The digital impression of the work was carried out using the Trios 4 intraoral scanner and Straumann Revex scannable digital analogues. Based on the fingerprint, the laboratory performed the definitive titanium and composite work [12,13].

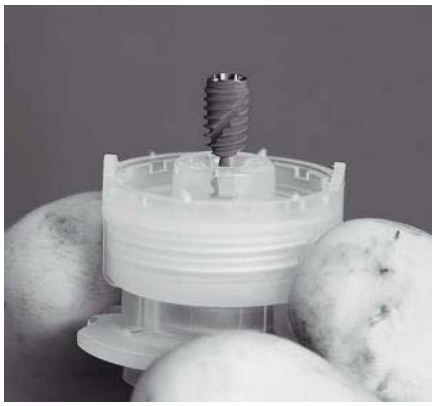

Figure 7. Straumann BLX implant

RESULTS

We present in the following graphs the distribution of the group of patients present in our study according to the environment of origin (Fig. 1) and according to their age group (Fig. 2):

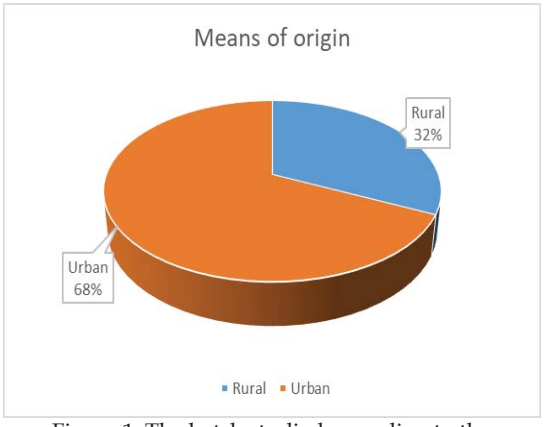

Figure 1. The batch studied according to the environment of origin

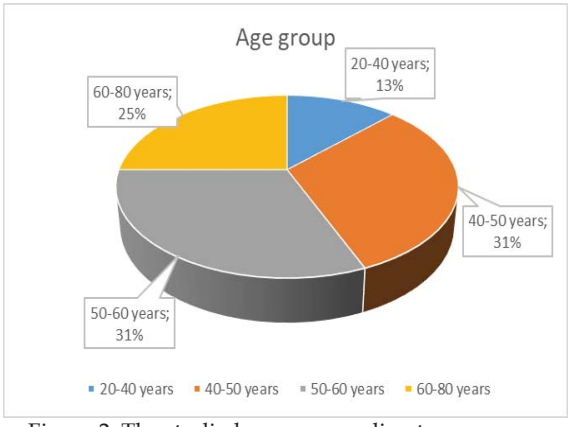

Figure 2. The studied group according to age group

Function of the etiology [14] of the studied group, 14 patients presented periodontopathies, 13 had carious diseases and 5 presented a multiple etiology (Fig.3). The reasons for the presentation of the patients in the dental office (Fig. 4) and the etiology of the batch was as follows:

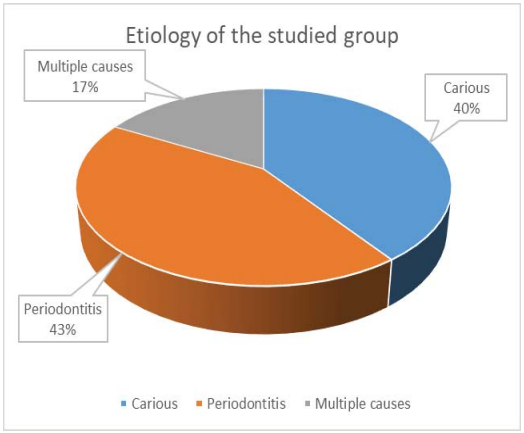

Figure 3. The studied group distribution according to etiology

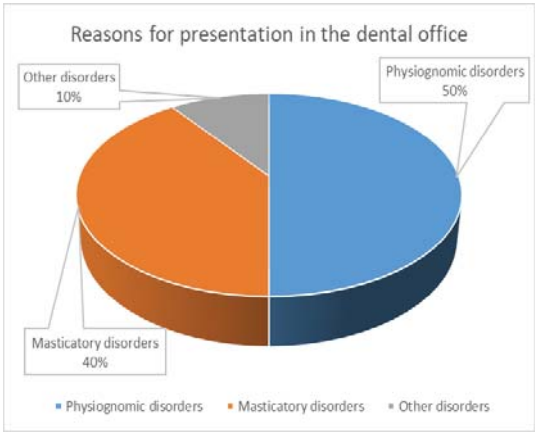

Figure 4. The studied group distribution according to the reason for presentation in the dental office

According to the edentulous classes according to Kenedy [15], 7 patients had edentulous class I, 13 edentulous class II, 10 edentulous class III and 2 of class IV (Fig. 5). Proposed prosthetic restoration types such as (Fig. 6) and corrected edentulous classes are shown in the following graphs:

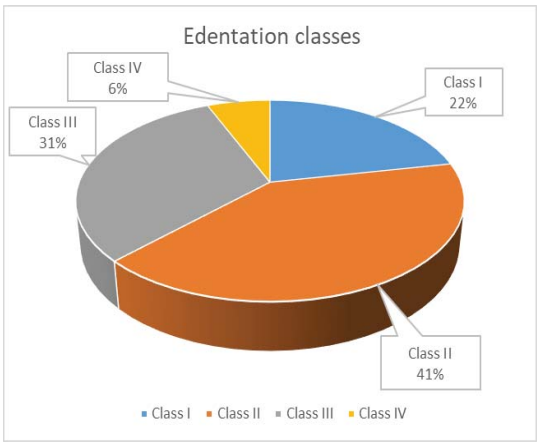

Figure 5. The studied group according to the edentulous classes registered in the dental office

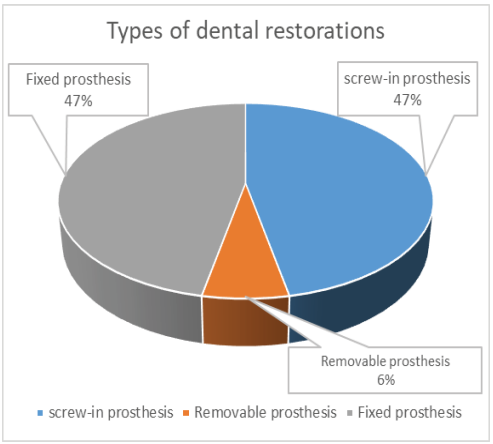

Figure 6. The lot studied according to the type of dental restoration proposed

The main result obtained on the patients present in our study was the restoration of the masticatory function. Dental implants completely restore masticatory function, allowing patients to chew food efficiently, which contributes to proper digestion and optimal nutrition. Compared to mobile prostheses, which can slide or move during chewing, implants are fixed directly in the bone and provide the patient with superior stability [16].

DISCUSSIONS

Dental implants support the facial structure and help prevent bone resorption, which can lead to unwanted facial changes (such as the "aged face" look). Dental crowns fixed on implants are designed to fit perfectly with the rest of the natural teeth, offering a natural and aesthetic appearance [17].

Dental implants eliminate the discomfort and irritation associated with traditional removable dentures, which can rub the gums and cause injury or pain. Since implants become

part of the bone structure, they offer a feeling of stability and naturalness comparable to that of natural teeth [18].

Dental implants have a high survival rate of 90-95% over a 10-year period with proper maintenance. This aspect makes them a durable solution for oral rehabilitation, with stable long-term results. Regular check-ups with the dentist ensure long-term monitoring and maintenance of the health of the implants.[19]

Dental implants contribute to clear and natural speech, preventing pronunciation difficulties that can occur with removable dentures that move. Patients regain confidence in public speaking as there is no risk of implants slipping or falling out. Dental implant patients experience a significant improvement in quality of life, reporting increases in self-confidence and satisfaction with social and personal life. Providing stability and functionality comparable to natural teeth, implants allow patients to enjoy a varied diet and participate in social activities without anxiety [20].

Dental implants stimulate the jawbone, preventing the bone resorption that often occurs after tooth loss. This stimulation helps maintain the bone structure and overall health of the jaw. Removable prostheses do not provide this benefit, which can lead to progressive bone loss. Unlike traditional dental bridges, which require the grinding of healthy adjacent teeth, dental implants allow the replacement of missing teeth without affecting the natural teeth, which helps preserve the integrity of the natural teeth and prevent future dental problems [21].

Oral rehabilitation with dental implants is a modern and effective solution for patients suffering from tooth loss. Caring for dental implants is similar to caring for natural teeth, requiring daily brushing and flossing. No special cleaning solutions or adhesives are required, as is the case with removable dentures.

Although dental implants may have a higher initial cost compared to other prosthetic solutions, their long lifespan and reduced need for replacement make them a cost-effective option in the long term. Patients avoid the cost and inconvenience associated with frequent replacement or repair of removable prostheses.

Oral rehabilitation with the help of dental implants offers multiple advantages that significantly improve the masticatory function, facial aesthetics, comfort and quality of life of patients. As a durable and cost-effective solution, dental implants are a preferred option for replacing missing teeth and for complete oral rehabilitation. With proper care and regular check-ups, patients can benefit from the remarkable long-term results of dental implants [22,23].

Osseointegration is particularly important in order to achieve long-lasting dental implants and a strong bone that can withstand the prosthetic load. In situations of cases with moderate or severe atrophy of the alveolar ridges, we have at our disposal numerous methods of bone addition and surgical techniques to be able to increase in height and width the bone volume necessary for the insertion of dental implants. The methods for bone augmentation techniques are chosen according to the topography of the edentulous dentition, the anatomical shape of the alveolar ridge and the peculiarities of the maxillary bone, as well as the cause of tooth loss [24,25].

The goal of modern dentistry is to restore the patient to normal profile, function, comfort, aesthetics, speech and health, regardless of atrophy, disease or injury to the stomatognathic system.

CONCLUSIONS

In conclusion, research conducted on implants inserted with the help of surgical guides has highlighted several significant advantages compared to traditional implantation

methods. Among the main benefits are increased accuracy of implant positioning, reduced risk of post-operative complications and shorter recovery time for patients. Case studies and literature review have demonstrated that the use of surgical guidelines contributes to more rigorous planning and more predictable execution of interventions.

Guided surgery is shown to be predictable and less error-prone than the analog protocol. Working times are considerably reduced by fixing the provisional in the same session as the surgical stage.

The digital technology used throughout the cases proved to offer more advantages than disadvantages.

We also identified some challenges and limitations associated with the use of surgical guidelines, such as high costs and the need for additional training for medical staff. However, as technology advances and becomes more accessible, it is anticipated that these barriers will be significantly reduced.

Based on the conclusions drawn, we recommend the continuation of research in the field of digitally guided implantology, with an emphasis on process optimization and cost reduction. At the same time, we suggest the integration of this type of technology in the continuing education of dentists to ensure widespread adoption and effective use in clinical practice. Finally, we highlight the transformative potential of surgical guides in dental implantology, marking an important step toward a future in which dental procedures will be safer, more efficient, and more precise.

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