LUPINE PUBLISHERS

Modern Approaches in Dentistry and Oral Health Care

DOI: 10.32474/MADOHC.2023.06.000227

ISSN: 2637-4692

Review Article

Important Criteria for The Success of Dental Implants - Literature Review

Anis Thodhorjani[1,2], Ramazan Isufi[1], Edit Xhajanka[1*], Neada Hysenaj[1,2], Silvana Bara[1], Fatmir Lela[1] and Renato Isufi[1,2]

[1]*Faculty of Dental Medicine, University of Medicine, Tirana*

[2]*University Dental Clinic, Tirana*

***Corresponding author:** Edit Xhajanka, Faculty of Dental Medicine, University of Medicine, Tirana

Received: November 14, 2023 **Published:** November 24, 2023

Abstract

The correct placement of dental implants based on scientific evaluations began at the time of Branemark. In the beginnings of implantology, osseointegration was the main factor that determined the success of the dental implant in the mouth, but from numerous subsequent studies it has been proven that there are many factors that determine the success of the dental implant. Many criteria have been proposed, but none is so decisive as to be based on it alone. This literature review will compare the various factors that influence dental implant success and what are some of the most important criteria derived from research studies for implant success.

Keywords: Dental Implants; Literature Review; Bone Health; Success Factors

Introduction

The history of dental implants begins a long time ago. Since from the beginning, efforts have been made to replace missing teeth. The real implantology start in 1952 when Branemark studied bone healing. First studies were done on animals and then after verifying the direct connection between the surface of titanium and bone it was applied to human beings where it resulted in high success and unpredictable results [1-3]. During the last decades, scientific documentation was a good base for implant therapy if they are properly used, with the right indications, good oral hygiene and good periodontal health. From the many studies done in the following decades, it emerged that the role of several factors that influence the prognosis of the dental implant is very important to be taken into consideration before placing the implant.

Material and Method

For this article, electronic searches were done in Pubmed, Citation Index, Google Scholar and Web of Science from 1990 to 2022. Only articles published in the English language were taken into consideration. The success of dental implants has been evaluated through imaging examination to evaluate the loss of crestal bone, the presence of peri-implant, the stability of the prosthetic work, the survival of the implant [4-6]. The criteria that must be taken into consideration to evaluate the dental implant derived from scientific investigations include: Durability; the condition of the gingiva; the depth of the pockets; bone loss; the effect on neighboring teeth; aesthetics; function; the presence of infection; paresthesia or anesthesia; patient satisfaction.

Although these are defined as correct criteria to evaluate the implant, they are insufficient because there is no evaluation guide for each criterion in particular. Some of the parameters that must be carefully evaluated for the success of the dental implant are:

Marginal Bone Loss

From numerous studies, the loss of marginal bone after the first year in operation varies from 0-0.2mm. Each implant must be

studied separately when evaluating the loss of marginal bone. The easiest method to assess the marginal bone is through periapical imaging done before implant placement and one year after implant placement. Bone stability is a very important criterion to determine the success of the implant.

The author Adel et al has determined that the bone loss in the first year is 1.5mm accompanied by a bone loss of 0.1mm in each subsequent year, this is also supported by the author Zarb.

Mobility

Studies have shown that when the implant has mobility, it becomes sensitive to percussion and pressure.

Normally, the mobility increases and the implant moves towards removal [7-10]. According to the studies of Hugo Chaves, the mobility of the implant comes from the cushioning of the bone-implant connecting surface. From the studies and evidence cited, one of the most important criteria for the success of the implant is the lack of mobility.

Gingiva Condition

Studies have shown that a slightly increased inflammation of the gingiva does not have a major impact on the success of the implant. Studies have shown that a slightly increased inflammation of the gingiva does not have a major impact on the success of the implant.

Depth of Sulcus

Most implants can be 1-2mm of sulcus depth, sulcus depth is not related to bone stability or tissue response. Increased sulcus depth over the years may indicate bone loss but not an implant problem. A sulcus depth around the implant greater than 5mm indicates the presence of anaerobic bacteria and may require surgery and antibiotic therapy [11-16]. Despite numerous studies in this field, further research is needed to include the depth of the sulcus as an important criterion in the success of the implant.

Damage to Adjacent Teeth

A poorly placed implant that may have damaged the neighboring teeth is an iatrogenic problem and cannot be used as a criterion for the success of the implant, including damage to various anatomical structures such as the Mandibular Canal, Mental Foramen or Maxillary Sinus.

Chronic Infection

Implants that have chronic infection are not considered successful, regardless of some surgical methods that can be done to save the implant, these implants are not considered successful.

Anatomical Vital structures:

Normally when dental implants penetrate the anatomical structures such as maxillary sinus or nasal cavity and the implants near the nerve has a decreased level of success [17-24]. In these criteria should not include the cases the surgeon does sinus bone grafting, regarding the inferior alveolar canal there are no studies but in cases of damage of it, it's considered a serious complication and must be corrected immediately.

Duration

The duration of the implant is an important criterion in its success, most implants are successful in 1-2 years after placement. The studies done by the authors Zarb and Adell talk about a success of 86-97% for the first 5 years in the mandible and a success of 93% for the first 10 years [25-27]. In the maxilla the above authors talk about a success of 80-85% for 5 - the first 10 years.

Defining success according to Zarb:

a. Single unattached implant that is immobile when clinically tested.

b. Absence of radiolucency in the chart

c. Bone loss of less than 0.2mm after the first year of placement

d. The implant has no pain, infection, paresthesia or damage to the mandibular canal.

e. In 5 years there is a success rate of 85% and in 10 years there is a success rate of 80%

Even Esposito has defined the criteria for success as follows:

a. Lack of mobility

b. A marginal bone loss of 1.5mm in the first year

c. Less than 2mm of bone loss after the first year

d. Absence of pain or paresthesia

Other authors have also given many criteria for evaluating the success of implants. Previously, the secrets of implant success were evaluated in a 5-year period, while nowadays, with technological development and the knowledge we have about tissue behavior, the criteria for the success of implants are calculated for a 10-year period.

Discussions

Describing the criteria for implant success is very difficult, each criterion must be evaluated separately to determine success. The main criterion to evaluate that an implant is healthy is the lack of mobility and pain around the implant. To evaluate peri-mucositis or peri-implant, the most important criterion is probing the depth of the sulcus. Regarding the assessment of bone loss, the assessment is done through imaging. In the prosthetic prospective the main criteria for success are function and aesthetic, in the meantime patient satisfaction is archived when has comfort and a good appearance. The more parameters that are included in the evaluation of the success of the implant, the more the ratio of its success in longevity decreases. It is easier to evaluate the failure of

the implant than to evaluate its success, the criteria that evaluate the failure are: pain; vertical mobility and progressive bone loss.

Conclusions

To evaluate the success of the implant, the implantologist must strictly evaluate which of the criteria mentioned above. Control of the implants must be done every month during the first six months and every 6 months in the following years. When the implant is evaluated based on the above criteria as failed, it should be removed, and the patient should be given other alternative solutions.

Acknowledgements and Funding

We would like to express our sincere gratitude to the Ministry of Education and Sport of Albania, which, based on Order No. 468, dated 02.08.2022, for "Financing/Co-financing of Joint Projects in the Framework of Internationalization of Study Programs", financed the study and the project entitled "Evaluation of fixed metal-ceramics and all-ceramics implant supported restorations".

References

1. Smith DE, Zarb GA (1989) Criteria for success of osseointegratedendosseous implants. The Journal of prosthetic dentistry 1;62(5): 567-572.
2. Misch CE, Perel ML, Wang HL, Sammartino G, Galindo-Moreno P, et al. (2008) Implant success, survival, and failure: the International Congress of Oral Implantologists (ICOI) pisa consensus conference. Implant dentistry 1;17(1): 5-15.
3. Chavez H, Ortman LF, DeFranco RL, Medige J (1993) Assessment of oral implant mobility. The Journal of prosthetic dentistry 1;70(5): 421-426.
4. Salvi GE, Lang NP (2004) Diagnostic parameters for monitoring peri-implant conditions. International Journal of Oral & Maxillofacial Implants 2;19(7).
5. Schwartz Arad D, Herzberg R, Levin L (2005) Evaluation of long-term implant success. Journal of periodontology 1;76(10): 1623-1628.
6. Papaspyridakos P, Chen CJ, Singh M, Weber HP, Gallucci GO (2012) Success criteria in implant dentistry: a systematic review. Journal of dental research 91(3): 242-248.
7. Karthik K, Sivaraj S, Thangaswamy V (2013) Evaluation of implant success: A review of past and present concepts. Journal of pharmacy & bioallied sciences 2: 5.
8. Babita Y, Sonali P, Nazish B, Sonali G, Anand S, et al. Dental Implants-Classification, Success and Failure
9. Albrektsson T, Brånemark PI, Hansson HA, Lindström J (1981) Osseointegrated titanium implants: requirements for ensuring a long-lasting, direct bone-to-implant anchorage in man. Acta Orthopaedica Scandinavica 1;52(2): 155-170.
10. Albrektsson T, Jacobsson M (1987) Bone - metal interface in osseointegration. Journal of prosthetic dentistry 57(5): 597-607.
11. Buser D, Sennerby L, De Bruyn H (2017) Modern implant dentistry based on osseointegration: 50 years of progress, current trends and open questions. Periodontol 2000 73(1): 7-21.
12. Nevins M (2014) Implant dentistry: a continuing evolution. Int J Periodontics Restorative Dent 34 (3) :s7.
13. OMahony A (1999) Spencer P Osseointegrated implant failures. J Ir Dent Assoc 45(2): 44-51.
14. Esposito M, Hirsch JM, Lekholm U, Thomsen P (1998) Biological factors contributing to failures of osseointegrated oral implants. (II). Etiopathogenesis. Eur J Oral Sci 106(3): 721-764.
15. Diz P, Scully C, Sanz M (2013) Dental implants in the medically compromised patient. J Dent 41(3): 195-206.
16. Grisar K, Sinha D, Schoenaers J, Dormaar T, Politis C, et al. (2017) Retrospective Analysis of Dental Implants Placed Between 2012 and 2014: Indications, Risk Factors, and Early Survival. Int J Oral Maxillofac Implants 32(3): 649-654.
17. Chanavaz M (1998) Patient screening and medical evaluation for implant and preprosthetic surgery. J Oral Implantol 24(4): 222-229.
18. Gómez de Diego R, Mang de la Rosa Mdel R, Romero Pérez MJ, Cutando Soriano A, López Valverde Centeno A, et al. (2014) Indications and contraindications of dental implants in medically compromised patients: update. Med Oral Patol Oral Cir Bucal 01;19(5): 483-489.
19. Triplett RG, Frohberg U, Sykaras N, Woody RD (2003) Implant materials, design, and surface topographies: their influence on osseointegration of dental implants. J Long Term Eff Med Implants 13(6): 485-501.
20. Drew HJ, Alnassar T, Gluck K, Rynar JE (2012) Considerations for a staged approach in implant dentistry. Quintessence Int 43(1): 29-36.
21. Rios HF, Borgnakke WS, Benavides E (2017) The Use of Cone-Beam Computed Tomography in Management of Patients Requiring Dental Implants: An American Academy of Periodontology Best Evidence Review. J Periodontol 88(10): 946-959.
22. Deeb G, Antonos L, Tack S, Carrico C, Laskin D, et al. (2017) Is Cone-Beam Computed Tomography Always Necessary for Dental Implant Placement?. J Oral Maxillofac Surg 75(2): 285-289.
23. Bornstein MM, Horner K, Jacobs R (2017) Use of cone beam computed tomography in implant dentistry: current concepts, indications and limitations for clinical practice and research. Periodontol 2000 73(1): 51-72.
24. Lang LA, Hansen SE, Olvera N, Teich S (2019) A comparison of implant complications and failures between the maxilla and the mandible. J Prosthet Dent 121(4): 611-617.
25. Jin T, Wang Y, Li S, Cai Q, Huang Z, et al. (2019) Removal of the Dental Implant Displaced Into the Maxillary Sinus Through the Inferior Nasal Meatus via Transnasal Endoscopy. J Craniofac Surg 30(4): 1178-1179.
26. Carr AB, Arwani N, Lohse CM, Gonzalez RLV, Muller OM, et al. (2019) Early Implant Failure Associated With Patient Factors, Surgical Manipulations, and Systemic Conditions. J Prosthodont 28(6): 623-633.
27. Kirtay M, Yolcu U, Dundar S (2017) Displacement of Dental Implant Into the Submental Space After Surgical Integration. J Craniofac Surg 28(4): 403-405.

DOI: 10.32474/MADOHC.2023.06.000227