A LITERATURE REVIEW ON DENTAL IMPLANTS ITS DIMENSIONS AND SUCCESS RATE.

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Abstract: Initially proposed in 1986, implant success criteria—concerning marginal bone loss and other factors—are still widely referred to as the "gold standard" for implant success today. However, these criteria are incorrect for the wide range of implant systems, as shown by the current abundance of data on marginal bone loss and a better understanding of bone and soft tissue behaviour around the implant neck and body. This article's goal is to review some of the pertinent research on cumulative survival rate of dental implants of varied dimensions. 5 articles of different studies from 2007 to 2021 with follow up period of more than 3 years to analyse different length and diameter to evaluate survival rate of dental implants. Results states that These included studies consist of 5 clinical studies out which 3 were retrospective. Out of the included studies, 3 included studies have long follow-up of more than 3 years. 4 studies only included implant diameter. In included RCT both implant length and diameter were included. Cumulative survival rate was found to be 98.7%.

Keywords: dental implants, survival rate, dimensions, retrospective, prospective.

INTRODCTION

Worldwide, there is a problem with tooth loss brought on by severe caries and periodontal disease. Endosseous implants are a popular alternative to a fixed bridge and a removable denture for replacing lost teeth. A dental implant is a metal piece that is surgically placed in the jawbone to fill a gap left by a missing fixed bridge, crown, or set of dentures. It works by dissipating force against nearby bone.[1] Primary stability of implants is a key factor for achieving successful osteointegration. The use of implants has been shown to help prevent bone loss after tooth extraction. The quantity and quality of the bone determines where to place dental implants. Anatomical oral dimensions, which frequently specify the need for implants of short lengths (10 mm or less) in areas of reduced alveolar bone height, affect the choice of implant size. The areas of less bone are frequently also areas of less bone quality. Primary implant stability may not be obtained if the bone is too soft; without early stability, integration

success rates and implant function may suffer[2]. Implants have been dubbed the "third set of teeth" due to their resemblance to natural teeth in appearance, comfort, and chewing efficiency. Dental implants are a great option for treating edentulousness, as evidenced by their long-term survival rates, which range from 93.3 to 98% in extensive studies. A key factor in determining whether dental implants are successful is implant longevity. However, continuous marginal bone loss (MBL) could make it more difficult for implants to survive over time. In 1986, a study proposed success criteria for MBL along with other features. After the first year of abutment connection, it allowed 0.2 mm/year, then 1 mm MBL. These criteria are still frequently referred to as the "gold standard" for implant success today. The stability of the surrounding tissues is a crucial factor in determining the implant's success according to radiologic standards[4]. Marginal bone resorption is crucial for the mechanical implant's stability, thus the more bone that surrounds it, the better the stability, sanitary, and cosmetic outcomes will be. Implant placement is known to be risky in the maxillary and mandibular posterior regions, which are usually described by strong occlusion, poor bone quality, and a lack of remaining bone quantity.

The stability of the surrounding tissues, as evaluated by radiologic standards, is a crucial component of the implant's success. One of the toughest issues in dental implant therapy is marginal bone resorption. One of the elements adding to the complexity of the cause could be heat creation.[5] Overheating in the implant insertion area frequently leads to thermal damage to bone structures. Every drilling and insertion procedure damages the bone, which also affects the implant's stability and mobility. There is disagreement about a number of issues, most notably marginal bone loss (MBL), which has an impact on implant success. The size of the implants, the patients' ages and genders, and the presence of cantilevers are all debatable contributing factors. It has been demonstrated that using implants can stop bone loss after tooth extraction. After tooth loss, bone resorption is inevitable, which limits the alternatives for implant diameter.[6]

Thus, the aim of this article is to evaluate implant survival of dental implants with different dimensions.

METHOLOGY

The English-language literature on MBL and long-term implant success evaluation from 2005 to 2021 served as the foundation for this investigation. The PubMed bibliographic index was used for this. The selection of articles was based on information about implant success, length of follow-up, age, implant length, and implant diameter. The key words used in the search included a combination of ‘‘retrospective studies,’’ ‘‘survival rate,’’ ‘‘survival analysis,’’, ‘‘dental implants,’’ ‘‘implants length,’’ ‘‘oral implants,’’ ‘‘implants diameter,’’ and ‘‘short length.’’ A manual search of implant-related journals, including Clinical Implant Dentistry and Related Research, International Journal of Oral and Maxillofacial Implants, Clinical Oral Implants Research, Implant Dentistry, European Journal of Oral Implantology, Journal of Oral Implantology, International Journal of Oral and Maxillofacial Surgery, Journal of Oral and Maxillofacial Surgery, Journal of Dental Research, International Journal of Prosthodontics, Journal of Prosthetic Dentistry, Journal of Clinical Periodontology, Journal of Periodontology, and Restorative Dentistry,

Inclusion criteria- clinical controlled study with age of patients, implant length and diameter, year of study and follow up periods of more than 2 years. Exclusion criteria- Animal studies, retrospective human trials with

insufficient data, studies employing smooth-surface implants, and studies requiring instantaneous implant placement and/or loading were all excluded.

Two reviewers separately retrieved pertinent data from relevant papers, and the same two reviewers then double-checked the accuracy of their findings. Authors, publication year, study design, number of implants inserted, number of implants failed, percentage of implants surviving after insertion, problems encountered, participant age range, and gender distribution were among the information gathered. Discussion and communication with a third reviewer were used to settle disputes that arose during the data collection process. Studies with missing data were not included in the analysis.

Several factor such as year of study, follow up of more than 2 years, age of patients, implant length and implant diameter, survival rate were extracted from the articles. Due to a lack of knowledge regarding the characteristics of the implants, such as their placements and the types of prosthesis they supported, multivariate analyses could not be carried out. Therefore, without taking into account other potential variables, statistical software was utilised to determine the weighted mean implant survival rate, estimated cumulative implant survival rate, and hazard rate for short and standard implants. The cumulative survival rate was plotted using the Kaplan-Meier estimator, which also included the predicted standard deviation and the 95% confidence interval (CI). The survival rates (ranging from 0 to 1, with 1 representing no failures) between short and standard implants were compared using the log-rank test. At 0.05, the significance value was established. The number of incidents per unit of time divided by the total number of people at risk was used to establish the hazard rate. It displayed failure rates throughout various time periods of the observation period and reflected the number of failures over a brief period of time.

RESULTS:

The selection procedure is outlined after the search method yielded a total of 310 articles. These articles were then cross-checked to weed out any duplicates. Following a duplication review, 192 articles were eliminated. Studies that didn't match the eligibility requirements or the question of the study were eliminated from the final screening of the review. The same rules applied to articles written in any language other than English, as well as to grey literature and conference proceedings. The study designs of many of the omitted studies prevented an objective evaluation of the intervention's efficacy, even though they contained valuable contextual and intervention-related information. After publications were assessed for full text screening, 100 were investigated in accordance with the study topic, and 20 were excluded. Case studies and 86 articles that followed the inclusion criteria format of the review were included for qualitative analysis after 23 publications that were reviews were eliminated. 20 were excluded as review case report. 25 assessed for eligibility but 15 out of which were excluded as the outcome was not clear. Studies included in review 5 of which were suitable.

DISCUSSION:

This review gathers a variety of prospective, retrospective, and clinically controlled studies to assess the impact of numerous factors on dental implant survival rates as well as their extensive supporting documentation of the long-term clinical outcomes. The implant prognostic criteria were previously described by **Zarb et al**[14] implants were considered successful if the following criteria were met: with absence of mobility, absence of paraesthesia or pain, absence of peri-implant pathology or radiographic radioluncies, and marginal bone loss <1mm during the

first year and >0.2mm/year in following years. For analysis of implant survival minimum follow-up period of more than 1 year whereby excluding the studies with less than 1 year follow-up.The rehabilitation of single missing mandibular molars by immediately placed and restored wide-diameter implants was associated with a relatively high failure rate as stated by **Atieh et al**[16] in his controlled clinical study in year 2011, were 42 implants with 7mm,9mm,11mm and diameters of 8mm,9mm shows the success rate of 83.3% and 66.7% Following surgery, implants that were implanted right away were shown to be more stable thanks to assessments of implant stability. In contrast, following an 8-week healing period, the implants that were inserted later were more stable. The quick placement and restoration of wide-diameter implants for the rehabilitation of a single missing mandibular molar was linked to a rather significant failure rate. **Selim et al**[17] in year 2018 with 85 implants using 6mm,7mm which shows the success rate of 92.32% The early survival rate of implants in retrospective study of **Ronald et al**[18] cohort exceeded 95%, with risk factors including age, tooth position, bone quality, and immediate implantation. When the above factors coexist, implant placement should be treated carefully. In the study, all feasible implant locations were used, with the exact placement depending on the needs of each individual patient. When compared to implants in the anterior maxilla, implants in the posterior maxilla (HR =0.26) and posterior mandible (HR =0.31) had a lower failure risk. The strong and hard cortical bone, inadequate blood flow, and difficulty in operating the anterior teeth could all be contributing factors to this condition. The insertion torque can be used to gauge the implant's stability. Mechanical connection between the implant threads and the bone bed characterises insertion torque. According to the literature, 30 Ncm is the ideal torque for effective osseointegration. Low insertion torque values are associated with inferior mechanical primary stability because there is less Osseo compression and tension, which reduces the area of contact between the bone and the implant.52 In the current investigation, we discovered that, in comparison to high insertion torque (>50 Ncm), normal torque (15–50 Ncm), and low insertion torque (15 Ncm), the probability of implant loss increased with insertion torque. In the study variable diameter and length to calculate the success percent of dental implant. The statistical results indicate that the higher survival rate was (95%) in the Anterior incisors area due standard diameter and length of dental implant. The mean difference is significant at 0.05 level **Paul et al**[19] in the retrospective study compared wide diameter 4 mm implants to conventional diameter 3.5 mm implants in order to see if there were any differences in the marginal bone . According to the materials and methods section, on a sample of 27 patients who had surgery, 25 implants were placed in maxillary or mandibular molar region. Results: During initial implant surgery, 3 implants, including one with a large diameter & 2 with a standard diameter, failed because they did not Osseointegrate. We discovered no indication of fixture fracture throughout the 6 year follow-up. Following loading, we observed a survival rate at 6 years of 97.29%, which was statistically equivalent to survival rate of 94.87% for implants with a standard diameter. Conclusions: This study reveals that 6-mm diameter implants may be considered if alveolar ridge width is sufficient in posterior maxillary & mandibular areas.

CONCLUSION

Variation in Dental implant geometry provided by many companies to overcome the limitation in use of dental implant in certain area. Large size dental implant increases the area of contact with bone and better distribution of occlusal load which required for osteointergation. This makes considerable increases in overall success rate.

REFRENCES

1. Schwartz-Arad D, Herzberg R, Levin L. Evaluation of long-term implant success. Journal of periodontology. 2005 Oct;76(10):1623-8.
2. Kasemo B, Lausmaa J. Biomaterial and implant surfaces: a surface science approach. International Journal of Oral & Maxillofacial Implants. 1988 Dec 1;3(4).
3. Barikani H, Rashtak S, Akbari S, Badri S, Daneshparvar N, Rokn A. The effect of implant length and diameter on the primary stability in different bone types. Journal of dentistry (Tehran, Iran). 2013 Sep;10(5):449.
4. Arısan V, Bölükbaşı N, Ersanlı S, Özdemir T. Evaluation of 316 narrow diameter implants followed for 5–10 years: a clinical and radiographic retrospective study. Clinical Oral Implants Research. 2010 Mar;21(3)
5. Trullenque-Eriksson A, Guisado-Moya B. Retrospective long-term evaluation of dental implants in totally and partially edentulous patients. Part I: survival and marginal bone loss. Implant Dent. 2014 Dec;23(6):732-7.
6. Shatkin TE, Shatkin S, Oppenheimer BD, Oppenheimer AJ. Mini dental implants for long-term fixed and removable prosthetics: a retrospective analysis of 2514 implants placed over a five-year period. Compendium of continuing education in dentistry (Jamesburg, NJ: 1995). 2007 Feb 1;28(2):92-.
7. Li T, Hu K, Cheng L, Ding Y, Ding Y, Shao J, Kong L. Optimum selection of the dental implant diameter and length in the posterior mandible with poor bone quality–A 3D finite element analysis. Applied Mathematical Modelling. 2011 Jan 1;35(1):446-56.
8. Liang R, Guo W, Qiao X, Wen H, Yu M, Tang W, Liu L, Wei Y, Tian W. Biomechanical analysis and comparison of 12 dental implant systems using 3D finite element study. Computer methods in biomechanics and biomedical engineering. 2015 Sep 10;18(12):1340-8.
9. Marques D. Short Dental Implants: An Umbrella Review of Current Systematic Reviews and Meta-Analysis on.
10. Wang N, Li H, Lü W, Li J, Wang J, Zhang Z, Liu Y. Effects of TiO2 nanotubes with different diameters on gene expression and osseointegration of implants in minipigs. Biomaterials. 2011 Oct 1;32(29):6900-11.
11. Kotsovilis S, Fourmousis I, Karoussis IK, Bamia C. A systematic review and meta-analysis on the effect of implant length on the survival of rough-surface dental implants. Journal of periodontology. 2009 Nov;80(11):1700-18.
12. Jemt T, Johansson J. Implant treatment in the edentulous maxillae: a 15-year follow-up study on 76 consecutive patients provided with fixed prostheses. Clinical Implant Dentistry and Related Research. 2006 Jun;8(2):61-9.
13. Bischof M, Nedir R, Szmukler-Moncler S, Bernard JP, Samson J. Implant stability measurement of delayed and immediately loaded implants during healing. A clinical resonance-frequency analysis

study with sandblasted-and-etched ITI implants. Clinical oral implants research. 2004 Oct;15(5):529-39.

14. Albrektsson T, Zarb G, Worthington P, Eriksson AR. The long-term efficacy of currently used dental implants: a review and proposed criteria of success. Int j oral maxillofac implants. 1986 Jan 1;1(1):11-25.
15. Henry PJ, Tolman DE, Bolender C. The applicability of osseointegrated implants in the treatment of partially edentulous patients: three-year results of a prospective multicenter study. Quintessence International. 1993 Feb 1;24(2).
16. Lindquist LW, Carlsson GE, Jemt T. A prospective 15-year follow-up study of mandibular fixed prostheses supported by osseointegrated implants. Clinical results and marginal bone loss. Clinical oral implants research. 1996 Dec;7(4):329-36.
17. Kaptein ML, De Putter C, De Lange GL, Blijdorp PA. A clinical evaluation of 76 implant-supported superstructures in the composite grafted maxilla. Journal of oral rehabilitation. 1999 Aug;26(8):619-23.
18. Buser, D., Mericske-Stern, R., Dula, K. & Lang, N. (1997) Long-term evaluation of non submerged ITI implants. Part 1: eight year life table analysis of a prospective multicenter study with 2359 implants. Clinical Oral Implants Research 8: 161–172