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Short Communication

Implant Body Designs

Joshua Narde[1], Sahil Singh[2]

1, 2 Student, Department of Prosthodontics, SDM College of Dental Sciences and Hospital, Dharwad- 580009, Karnataka.

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ABSTRACT

The implant stability is dependent on a variety of factors some of which are patient centric and others which are clinician centric. The micro and macro geometry of the implant can be controlled by the dentist. By choosing the optimum design of the implant body, the dentist can achieve the best possible results for the procedure. Numerous types of designs are available depending on the size in millimeters and the other is based on the type of thread designs that are available. Studies also show how the thread morphology at the time of placement is helpful in sliding the implant in the correct position. This literature review has been done to aid the clinician in selecting the correct body design while treatment planning which would lead to best possible outcomes.

Keywords: Body designs; macro; geometry; threaded; non-threaded

Address for Correspondence:

Dr. Joshua Narde

Department of Prosthodontics, SDM College of Dental Sciences and Hospital,

Dharwad- 580009, Karnataka

E.mail: 2897josh@gmail.com

INTRODUCTION:

The prevalence, life and success of an implant restoration is governed by a list of factors mainly associated with the primary stability that has been obtained. This stability is dependent on a variety of conditions that include the amount of the bone remaining and the quality of the bone[1]; these factors are dependent on the patient, the technique that has been carried out to complete the procedure which includes the implant which includes the size and type of the drill used, the length of the preparation done and if tapping of the implant site has been done or not and lastly the macrostructure of the implant which includes the length, shape and body designs[2].Since the factor related to the bone are fixed, it is these factors based on the macro and microgeometry of the implant that can be controlled by the clinician to achieve an optimal primary stabilization. A very crucial factor is the design of the implant body.

DISCUSSION:

Today the most widely used form of implants are endosseous implants.[3] These implants are classified based on their sites which are further sub-classified into intraoral and extraoral implants. These intraoral implants can be further divided into two categories; conventional and special implants. [4] The size of the implant used depends on the amount of bone level remaining and the spacing present [3]. The types available are narrow platform implants, regular dental implants, wide dental implants and mini dental implants. The narrow implants are those that are used in cases the where the site is small or owing to the inadequacy of good bone and have a size of the implant does not exceed 3.5mm. These implants are not narrower than 3mm and are made up of titanium alloys rather than unadulterated titanium due to reported fractures in a study conducted.[5] Regular sized platform implants have a size that ranges from 3.5-4.2mm and are the most frequently used in practice.[6] The two other common sizes of implants are wide, which are more than 4.7mm in diameter and mini dental implants which have a diameter of 1.8-2.4mm. Implants that have a very wide diameter of over 6mm can lead to a phenomenon which is known as stress shielding due to the absorption of all the forces by the implant alone posing a detrimental effect to the bone.[6,7]The part of the dental implant that lies between the crestal module and the apex is known as the body. The framework of the body of the implant can be based on the taper, thread design and different special features 46. The taper of the implant is the parallelism that is seen present between its two walls. They can further be split into three types namely cylindrical which has a uniform diameter throughout, root-form implants that have a fixed diameter up to the middle third and just like a natural root shows tapering towards that is completed in the apical third and a bioimplant which is a particularly milled in a CAD-CAM according to the size of the extraction socket prior scanning of the maxilla and mandible.

Depending on the types of threads they are classified into threaded and non-threaded types. Most manufacturers produce threaded implants of various types and they are described using the terms thread shape, thread pitch, thread depth, thread width, face angle, thread angle and flank angle, thread lead, thread count and thread diameter. The thread shape can be of many types like square shaped, Buttress or Breech lock design, V-shaped, spiral or reverse buttress. The most important function of these threads is to aid and amplify the mechanical retention and primary stability and cause stress distribution to the peri-implant area. According to study conducted by McCullough and Klokkevold, The threads of the implants seem to have a huge relevance in the accomplishment of implant osseointegration improving initial stability, maximizing BIC, and favoring stress distribution at the bone-implant interface. A very striking role is demonstrated by the characteristics such as the variations in that of length, diameter, the number of threads, the depth of threads, its pitch and helix angle.[8,9] These threads have a greater effect on the chances of acquiring the best possible osseointegration. This in turn plays a part in enhancing the stability, increasing the bone implant contact present and leads to better distribution of the stress reducing the prevalent stress shielding effect and any other damage at the bone-implant interface.

Another study conducted by Huang et al displayed how the thread morphology at the time of the insertion of the implant lead to better sliding in at the correct site. This in turn lead to reduce the load on the peri implant bone which showed better results in the stability leading to increased duration of implant survival[10]These results obtained from the above two authors were also verified by Lee et al[11] where an increase in the thread depth provides better characteristics post the implant placement leading to increased condensation of the bone. The study by Menini et al which concluded that deeper threads might be useful in areas with reduced bone quality and in those cases where immediate loading had to be carried out[2]. These results were also verified by Makary et al which stated how using implants which have a larger thread depth can lead to an increased amount of drilling in bone type D1 which is noted as a disadvantage whereas be an advantageous feature in those with bone type D3 and D4 where there is little or no bone density and fine trabeculae[12]. A study conducted also showed how varied thread depth but tapered implants showed to be efficient in the long term

scenario seen both clinically and radiologically[12,13].

CONCLUSION:

The macro-geometrical features of an implant play a crucial role in the primary stability of the prosthesis. Since it is among the few factors that are in the hands of the clinician, selection should be done correctly leading to long term success. The features like taper, thread designs and its angles are key in providing a good placement. More studies are required to know what is the ideal thread depth or helix angle that is required but we can conclude that these factors can prove to be the difference when it comes to the life of an implant retained prosthesis.

Authors' contribution

Joshua Narde: manuscript editing, literature search, data collection

Sahil Singh: data analysis, manuscript drafting

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Conflict of interest

The authors have nothing to disclose or any conflicts of interest.

References

[1] Romanos GE, Bastardi DJ, Moore R, Kakar A, Herin Y, Delgado-Ruiz RA. In vitro effect of drilling speed on the primary stability of narrow diameter implants with varying thread designs placed in different qualities of simulated bone. Materials. 2019 Jan;12(8):1350.

[2] Menini M, Bagnasco F, Calimodio I, Di Tullio N, Delucchi F, Baldi D, Pera F. Influence of implant thread morphology on primary stability: A prospective clinical study. BioMed Research International. 2020 Aug 5;2020. [3]Nallaswamy D. Textbook of prosthodontics. JP Medical Ltd; 2017 Sep 30.

[4] Misch 3rd CE. Contemporary Implant Dentistry–3rd Edition, Mosby. South Asia edition. 2008.

[5] Davarpanah M, Martinez H, TECUCIANU JF, Celletti R, Lazzara R. Small-diameter implants: Indications and contraindications. Journal of Esthetic and Restorative Dentistry. 2000 Jul;12(4):186-94.

[6]Bathla S. Textbook of periodontics. Jaypee Brothers Medical Publishers; 2021 Feb 10..

[7]Eckert SE, Meraw SJ, Weaver AL, Lohse CM. Early experience with Wide-Platform Mk II implants. Part I: Implant survival. Part II: Evaluation of risk factors involving implant survival. International Journal of Oral & Maxillofacial Implants. 2001 Mar 1;16(2).

[8]Hermann JS, Buser D, Schenk RK, Cochran DL. Crestal bone changes around titanium implants. A histometric evaluation of unloaded non-submerged and submerged implants in the canine mandible. Journal of periodontology. 2000 Sep;71(9):1412-24.

[9]McCullough JJ, Klokkevold PR. The effect of implant macro-thread design on implant stability in the early post-operative period: a randomized, controlled pilot study. Clinical Oral Implants Research. 2017 Oct;28(10):1218-26.

[10]Huang HL, Hsu JT, Fuh LJ, Tu MG, Ko CC, Shen YW. Bone stress and interfacial sliding analysis of implant designs on an immediately loaded maxillary implant: a non-linear finite element study. Journal of dentistry. 2008 Jun 1;36(6):409-17.

[11]Lee SY, Kim SJ, An HW, Kim HS, Ha DG, Ryo KH, Park KB. The effect of the thread depth on the mechanical properties of the dental implant. The journal of advanced prosthodontics. 2015 Apr 1;7(2):115-21.

[12]Makary C, Menhall A, Zammarie C, Lombardi T, Lee SY, Stacchi C, Park KB. Primary stability

optimization by using fixtures with different thread depth according to bone density: a clinical prospective study on early loaded implants. Materials. 2019 Jan;12(15):2398.
[13]Blume O, Schnödt EM, Back M, Wildenhof JI, Probst FA, Otto S. Long-Term Efficacy of Variable-Thread Tapered Implants—A Retrospective, Clinical and Radiological Evaluation. Medicina. 2020 Nov;56(11):564.

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