Short Implants for Rehabilitation of Atrophic Maxilla and Mandible: A Systematic Review

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Introduction: Dental implants have been used as a treatment modality for oral rehabilitation in partially or completely edentulous patients with high survival rates. Presence of adequate bone after the loss of teeth is of prime importance for the selection of implant size. In the absence of bone volume various bone augmentation procedures such and direct and indirect sinus lift procedures, vertical augmentation and guided bone regeneration. Not all patients have sufficient bone volumes to be rehabilitated with fixed implant-supported prostheses. Long implants have always been considered more desirable in this respect but in patients with advanced alveolar bone resorption their placement is problematic due to the anatomic boundaries.[1] Anatomical limitation in resorbed maxilla includes the maxillary sinus posteriorly and nasal floor and nasopalatine canal anteriorly whereas in resorbed mandible it is inferior alveolar canal.[1] Various surgical techniques as well as new implant surfaces have been developed in the attempts to solve these problems[2-6], but it is unclear whether any of the various sinus lift procedures currently used are advantageous or superior to the others.[3]

There have been a lot of clinical studies focused on the use of short implants as an alternative to long implants requiring additional augmentation procedure. There have been a variability in the lengths of short implants from 6mm - 10 mm.

The general population is already apprehensive regarding the cost of the implant procedures, short implants have an advantage over the long implants as they bypass the additional surgical step.

Therefore the aim of this systematic review was to analyse the randomised control trials and prospective studies available in the literature for finding out whether short implants can be an alternative to conventional implants in posterior resorbed alveolar ridges.

Materials and methods: The study protocol followed the PRISMA (Preferred Reporting Items for Systematic Review and Meta-Analyses) guidelines, and the project was registered at PROSPERO with CRD42020169719. The focused question of the search was in a PICO (Population, Intervention, Comparison, Outcomes) format as follows: Can rehabilitation of resorbed ridges be successfully done by placing short implants?

Search strategy: A medline (PUBMED) search was done for the clinical studies which included the articles published from January 1990 to November 2020. The search was limited to English language with the following word combinations-

(edentulous jaws[MeSH Terms]) OR (partially edentulous jaws[MeSH Terms])) OR (resorbed maxillary arch[MeSH Terms])) OR (resorbed maxilla[MeSH Terms])) OR (atrophic maxilla[MeSH Terms])) OR (resorbed mandible[MeSH Terms])) OR (atrophic mandible[MeSH Terms]))) AND (short dental implants[MeSH Terms])) AND (conventional long dental implants[MeSH Terms])) OR (sinus augmentation procedures[MeSH Terms])) OR (bone augmentation procedures[MeSH Terms])) AND (marginal bone loss[MeSH Terms])) OR (dental prosthesis failure[MeSH Terms])) OR (dental implant survival rate[MeSH Terms])

After the electronic search, selection of articles was done on the basis of title and abstract and then the full text articles selected and were hand searched.

Inclusion criteria: Randomised clinical trials and prospective studies.

Partially edentulous subjects with implant restorations in the posterior mandible or maxilla.

Implants with ≤6 mm in length with moderate rough surface compared to implants ≥7 mm.

The studies included were at least 10 patients with a follow-up of at least 1 year after loading.

The studies included implant rehabilitation on the posterior maxilla and/or mandible of partially edentulous patients.

Exclusion criteria: Randomised clinical trials and prospective studies.

Partially edentulous subjects with implant restorations in the posterior mandible or maxilla.

Implants with ≤6 mm in length with moderate rough surface compared to implants ≥7 mm.

The studies included were at least 10 patients with a follow-up of at least 1 year after loading.

The studies included implant rehabilitation on the posterior maxilla and/or mandible of partially edentulous patients.

Selection of studies: Based on the inclusion criteria, two authors (KD and UR) screened independently the titles derived from the initial search. Subsequently, abstracts were screened and in case they did not provide sufficient information regarding the inclusion criteria, the full text was obtained. Any disagreements at the above stages of the search were resolved by discussion including a third reviewer (PT). Finally, the selection based on inclusion/ exclusion criteria was made for the full-text articles. The finally selected studies were screened, and data were extracted.

Data extraction and method analysis: Based on the inclusion criteria, two authors (KD and UR) screened independently the titles derived from the initial search. Subsequently, abstracts were screened and, in case they did not provide sufficient information regarding the inclusion criteria, the full text was obtained. Any disagreements at the above stages of the search were resolved by discussion including a third reviewer (PT). Finally, the selection based on inclusion/exclusion criteria was made for the full-text articles. The finally selected studies were screened, and data were extracted. The following data was extracted; name of authors, study year, study design, number of patients, number of implants, location of implant placement, procedure followed, duration of followup, number of implants, number of prosthesis, marginal bone loss, prosthesis survival and implant survival.

The primary outcome was the survival of short implants as compared to conventional ones. Additional outcomes were marginal bone loss and prosthesis survival.

Quality assessment: The quality assessment was done by both the reviewers using the Cochrane's tool for risk of bias assessment for randomised controlled trials and cochrane tool for risk of bias assessment of non randomised studies.

Discussion: The strength of the proposed study in transparency of the procedure for literature search for the systematic review. The protocol describes he studies and their types, intervention if any and the outcomes, data sources, search strategy and data extraction method.

The results shall provide the information regarding the success of short implants and also the reasons of failures. It will also give us a clear idea on the comparison of conventional and short implants which is quiet controversial. The potential limitation include the heterogenicity of the measures of outcome.

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Patient consent for publication: Not required.

References:

1 Naenni N, Sahrmann P, Schmidlin PR, Attin T, Wiedemeier DB, Sapata V,Hämmerle CHF, Jung RE. Five-Year Survival of Short Single-Tooth Implants (6 mm):A Randomized Controlled Clinical Trial. J Dent Res. 2018 Jul;97(8):887-892.

2 Thoma DS, Haas R, Sporniak-Tutak K, Garcia A, Taylor TD, Hämmerle CHF. Randomized controlled multicentre study comparing short dental implants (6 mm)versus longer dental implants (11-15 mm) in combination with sinus floor elevation procedures: 5-Year data. J Clin Periodontol. 2018Dec;45(12):1465-1474.

3 Felice P, Pistilli R, Barausse C, Bruno V,

Trullenque-Eriksson A, Esposito M. Short implants as an alternative to crestal sinus lift: A 1-year multicentre randomised controlled trial. Eur J Oral Implantol. 2015 Dec 1;8(4):375-84.

4 Perelli M, Abundo R, Corrente G, Saccone C. Short (5 and 7 mm long) porous implants in the posterior atrophic maxilla: a 5-year report of a prospective single-cohort study. Eur J Oral Implantol. 2012 Sep 1;5(3):265-72.

5 Bolle C, Felice P, Barausse C, Pistilli V, Trullenque-Eriksson A, Esposito M.4 mm long vs longer implants inaugmented bone in posterior atrophic jaws:1-year post-loading results from a multicentre randomised controlled trial. EurJ Oral Implantol. 2018;11(1):31-47.

6 Shi JY, Li Y, Qiao SC, Gu YX, Xiong YY, Lai HC. Short versus longer implantswith osteotome sinus floor elevation for moderately atrophic posterior maxillae: A 1-year randomized clinical trial. J Clin Periodontol. 2019 Aug;46(8):855-862.doi: 10.1111/jcpe.13147. Epub 2019 May 24.

7 Slotte C, Grønningsaeter A, Halmøy AM, Öhrnell LO, Mordenfeld A, Isaksson S,Johansson LÅ. Four-Millimeter-Long Posterior-Mandible Implants: 5-Year Outcomesof a Prospective Multicenter Study. Clin Implant Dent Relat Res. 2015 Oct;17Suppl 2:e385-95.