Journal of Dentistry 57 (2017) 4–13

Contents lists available at ScienceDirect

Journal of Dentistry

journal homepage: www.intl.elsevierhealth.com/journals/jden

Review article

Complete overdentures retained by mini implants: A systematic review

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ARTICLE INFO

Article history:
Received 25 July 2016
Received in revised form 31 October 2016
Accepted 21 November 2016

Keywords:
Overdentures
Edentulous mouth
Mini implants
Marginal bone loss
Quality of life
Systematic review

ABSTRACT

Objective: The purpose of this systematic review was to evaluate the use of mini implants to retain complete overdentures in terms of survival rates of mini implants, marginal bone loss, satisfaction, and quality of life.
Data: This report followed the PRISMA Statement and PICO question. This review has been registered at PROSPERO under the number CRD42016036141.
Source: Two independent reviewers performed a comprehensive search of studies published until September 2016 and listed in the PubMed/MEDLINE, Embase, and The Cochrane Library databases. The focused question was: is the use of mini implants feasible for prosthodontic rehabilitation with complete overdentures?
Results: The 24 studies selected for review evaluated 1273 patients whose mean age was 65.93 years; these patients had received 2494 mini implants and 386 standard implants for retaining overdenture prosthesis. The mean follow-up time was 2.48 years (range: 1–7 years). There was a higher survival rate of mini implants (92.32%). More frequent failures for maxillary (31.71%) compared with mandibular arches (4.89%). The majority of studies revealed marginal bone loss values similar to those of standard implants (< 1.5 mm). All studies verified an increase in satisfaction and quality of life after rehabilitation treatment with mini dental implants.
Conclusion: The present systematic review indicates that the use of mini implants for retaining overdenture prosthesis is considered an alternative treatment when standard treatment is not possible, since it presents high survival rates, acceptable marginal bone loss, and improvements in variables related to satisfaction and quality of life.
Clinical significance: Based on the results of this study, the use of a minimum 4 and 6 mini implants can be considered a satisfactory treatment option for rehabilitation of the mandibular and maxillary arches respectively with a complete overdenture.

1. Introduction

Although there has been significant development in preventive treatments of complete edentulism still affects a large fraction of the population [1], and may be related to income [2]. In cases of edentulism, conventional dentures are a possibility for rehabilitation and restoring aesthetics and physiological functions. However, this type of rehabilitation is associated with reduces masticatory efficiency and discomfort that influences the quality of life of patients due to the limited stability of the prosthesis, especially in mandibular dentures [3].

Implant-retained overdentures are another possibility for rehabilitating patients with edentulism in which it is possible to improve functional activity and consequently characteristics that influence in the psychological of patients. Furthermore, according to the McGill consensus, the use of two standard implants is recommended with a first choice for making an overdenture prosthesis in edentulous patients [4,5]. Although there have been studies reporting that the longevity of single implant-retained overdentures is similar to that of implant-retained overdentures over two implants [6].

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http://dx.doi.org/10.1016/j.jdent.2016.11.009
0300-5712/

The quantity and quality of bone tissue available in the jaw typically defines the characteristics (diameter and length) and the number of implants [7]. Overdentures retained by conventional implants exhibit good long-term results but also present some limitations such as: cost [8], difficultly with placing the implant in reduced buccolingual dimensions of bone without the need for bone-grafting procedures [9], and the presence of chronic systemic diseases that can prevent most advanced surgeries as bone grafts and lateralization of the inferior alveolar nerve [9,10].

Mini implants may be considered for the rehabilitation of patients who express dissatisfaction with conventional dentures and have limitations in terms of the placement of standard implants [9,11–13]. Mini implants presents a reduced diameter (<3 mm), while narrow/conventional diameter implants typically has diameter greater than 3 mm [11,14]. Therefore, the use of mini implants to retain overdentures enables the use of less-complex surgical techniques since the reduced diameter of the implant permits its placement in areas with low bone thickness [11]. Concomitantly, sometimes it is not necessary to open flaps, decreasing morbidity during the postoperative period [8]; these aspects are some of the attractive factors that increase patient acceptance of mini implants treatments to retain overdenture prosthesis.

However, there is no consensus about the use of mini implants to retain overdentures in the literature; some studies on this topic have demonstrated high survival rates for overdentures retained by mini implants [9,12], and other studies have reported low survival rates compared with conventional implants [13].

Therefore, the aim of this systematic review was to verify the viability of using mini implants to retain overdentures. The hypotheses of this study were: (1) There is no influence on the survival rates of mini implants retaining overdenture prosthesis compared with standard implants; (2) Mini implants do not affect marginal bone loss, satisfaction, or quality of life.

2. Materials and methods

2.1. Registry protocol

This present systematic review, which was structured based on the preferred reporting items for systematic reviews and meta-analyses (PRISMA) checklist [15], in accordance with models proposed in the literature [16–20]. Furthermore, the methods used in this systematic review were registered with PROSPERO (CRD42016036141).

2.2. Search methods

The selection of articles was conducted individually by two of the authors (C.A.A.L. and V.E.S.B.) using the databases PubMed/MEDLINE, Embase and The Cochrane Library, checking articles published until September 2016. The following terms were used in the search strategy: “mini dental implants OR narrow diameter implants OR mini implants overdentures OR mini implants and prosthodontics.”

The same researchers manually searched for articles published until June 2016 in the following specific journals: *Clinical Implant Dentistry and Related Research, Clinical Oral Implants Research, International Journal of Oral and Maxillofacial Implants, International Journal of Oral and Maxillofacial Surgery, International Journal of Prosthodontics, Journal of Dental Research, Journal of Dentistry, Journal of Oral Rehabilitation, Journal of Prosthodontics, The International Journal of Prosthodontics* and *The Journal of Prosthetic Dentistry*. A third author (E.P.P.) analyzed all of the differences in choices between C.A.A.L. and V.E.S.B., and a consensus was attained via discussion.

2.3. Eligibility criteria

Eligibility criteria included clinical human studies, randomized controlled trials (RCTs) or prospective studies that evaluated the use of mini implants for rehabilitation with overdenture prosthesis and studies published in English. The exclusion criteria were retrospective studies, in vitro studies, animal studies, biomechanical studies, case reports, and review papers.

2.4. Study selection and risk of bias

Clinical studies were selected based on their titles and abstracts from the electronic searches by two independent researchers. For studies presenting insufficient data in their title and abstract to make a decision about inclusion, the full manuscript was obtained. Studies that did not meet the inclusion criteria after the researchers read their title and abstract were excluded.

A specific question was formulated based on PICO (population, intervention, control, and outcomes) criteria. The focused question was: “Is the use of mini implants feasible for prosthetic rehabilitation with overdentures?” According to these criteria, the population consists of edentulous patients rehabilitated with overdentures; the intervention was edentulous patients rehabilitated with overdentures retained by mini implants; the comparison was edentulous patients rehabilitated with conventional dentures or overdentures retained by standard implants; the primary outcome was the survival rates of the mini implants; and the secondary outcomes included marginal bone loss, satisfaction and quality of life with the mini implants when they were used for retaining overdenture prosthesis.

2.5. Quality assessment

Two investigators (C.A.A.L. and V.E.S.B.) assessed the methodological quality of studies according to their level of evidence as proposed by the National Health and Medical Research Council (NHMRC) levels of evidence and grades for recommendations establish the levels of evidence according to the type of research question, taking into account: Intervention; Diagnostic accuracy; Prognosis; Etiology; Screening Intervention. The hierarchy of the studies are classified into scores (I; II; III-1; III-2; III-3; IV) [21,22]. In addition, also Newcastle-Ottawa scale (NOS) was used to assess risk bias of the selected studies based on three major components: selection, comparability, and outcome for cohort studies. According to that quality scale, a maximum of nine stars can be given to a study, and this score represents the highest quality. Five or less stars represent a high risk of bias, while six or more stars were considered of low risk of bias [19,23].

2.6. Data collection and analysis

The data extracted from the articles were sorted as quantitative or qualitative by one of the researchers (C.A.A.L.) and then checked by two other researchers (J.F.S.J. and F.R.V.). Any disagreements were solved via discussion until a consensus was obtained. The quantitative and qualitative data were tabulated for ease of comparison.

2.7. Additional analysis

Additional analysis was performed using a kappa coefficient calculated to determine the inter-reader agreement in the study-selection process for publication in the PubMed/MEDLINE, Embase and The Cochrane Library databases. The inter-investigator agreement (Kappa) was calculated by evaluating the selected titles and abstracts, and then obtaining a value for selected articles