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REVIEWS

The Periodontal Health of Abutment Teeth Retaining Overdentures: A Systematic Review

Siham Kouji [a], Amal El Yamani [a], Faiza Benfdil [b]

[a] Department of Fixed Prosthodontics, Mohamed V University, Faculty of Dental Medicine of Rabat.
[b] Department of Prosthetic Rehabilitation, Faculty of Dentistry, Rabat, Morocco.

ABSTRACT

Objective: This systematic review aims to evaluate the effect of the overdenture on the periodontal state of the dental roots supporting the prosthesis.
Sources: This report followed the PRISMA Statement. A systematic search was done using a search equation in different databases: PubMed/MEDLINE, Web of Science, EBSCOhost, and Science Direct. The search was limited to publications in English and French.
Study selection: All observational clinical studies that were interested in evaluating the effect of the overdenture on the periodontal health of abutment teeth were included in our systematic review. Of the 694 articles initially identified, eight studies met our inclusion criteria and were included in the systematic review.
Results: There was no significant change in the alveolar bone surrounding the pillar root. The difference in pocket depth and dental mobility was insignificant. However, the loss of attachment increased over time and the height of the attached gingival decreased, especially in the mandible. This decrease was statistically significant.

KEYWORDS: Abutment, periodontal health, overdenture

Correspondence: Dr Siham Kouji, Address: Department of Fixed Prosthodontics, Mohamed V University, Faculty of Dental Medicine of Rabat. Email: siham_kouji@um5.ac.ma

INTRODUCTION

Despite preventive efforts in oral health, treating total and subtotal edentulism has always been necessary. Bimaxillary complete dentures seem to be the most common solution for restoring masticatory function and aesthetics in edentulous patients. However, even with the advantages offered by this therapeutic choice, several major complaints are expressed by patients, such as a lack of retention and stability, which are most often due to the progressive resorption of the alveolar bone over time. Consequently, the masticatory function is reduced by tilting movements of the prosthesis, which are added lingual movements that exacerbate the sensations of prosthetic instability and patient discomfort. For some patients, the simple fact of making a new conventional prosthesis corrects these complaints. For others (partial edentulism), additional retention devices are required.

In these circumstances, one of the prosthodontic treatment options available is using natural root-supported overdentures (RODs), as the shortening of the abutment teeth might increase their survival (1). According to the Academy of Prosthodontics, overdenture (OD) is defined as “any removable dental prosthesis that covers and rests on one or more remaining natural teeth, the roots of natural teeth, and/or dental implants; a dental prosthesis that covers and is partially supported by natural teeth, natural tooth roots, and/or dental implants” (2).
The covered roots are always prepared, usually depulped and treated. They can be used just for support and have no role in the retention of the prosthesis, in which case they may or may not be protected by a metal cap. They can be used for retention and are always covered by a cap and support attachment system (axial attachment or conjunction bar).[3] RODs can easily be transformed into

complete dentures if further tooth loss occurs. This can provide a smooth transition to edentulousness without overstretching patients' adaptive capacity.

Overdentures are indicated when the remaining natural teeth are located symmetrically in terms of the sagittal median axis (3,4), whose number is less than or equal to 4 (5). The teeth must also be periodontally favorable with the possibility of adequate endodontic treatment (4).

Overdentures offer several advantages over conventional prostheses in terms of bone maintenance. Crum and colleagues (6) showed that bone resorption in the complete mandibular dentures wearers was eight times higher than that in overdenture wearers, whereas in the maxilla, it was almost the same (6). This preservation of alveolar bone, especially in the lower arch, improves the stability and retention of the prosthesis, which increases patient comfort, mastication, phonation, and aesthetics for a better quality of life (7).

The retention of natural roots also preserves some sensory input from periodontal receptors, which is more accurate than the one obtained from oral fibromucosa (8,9). This proprioception confers functional benefits (10,11) (12) to patients, including mastication, which is 33% better than complete denture wearers (11) and equivalent to implant-supported overdentures (IODs) wearers (12).

However, despite the advantages of this concept, the periodontium of the tooth-supported overdentures seems to be affected throughout the treatment, which is why several longitudinal studies focused on the effect of this type of treatment on the periodontal health of the abutment teeth and the different factors that influence the prognosis of RODs.

This systematic review aims to evaluate the effect of the overdenture on the periodontal state of the dental roots supporting the prosthesis.

MATERIALS AND METHODS

This systematic review was conducted in accordance with the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines (13),

We used the PICOS (population, intervention, comparison, outcomes, and studies) method to develop a research strategy and to establish inclusion and exclusion criteria (Table 1).

Table 1: Question PICOS.

P (population)	**Patients with overdentures**
I (intervention)	Overdenture insertion
C (comparison)	Between the initial status of the abutment teeth and their evolution over the follow-up time
O (outcome)	Evaluating the periodontal health of teeth supporting overdentures
S (study design)	Clinical studies

Search strategy

The following keyword combination was used to interrogate each database according to its requirements: (Overdenture AND ("periodontal health" OR "root" OR "bone")) NOT (implant). The following electronic databases were searched: PubMed/MEDLINE, Scopus, EBSCOhost, and Science Direct, without any publication date limitation but with a language restriction, including only French and English. The search was conducted from 10 to 15 March, 2020.

Study selection

Two review authors independently assessed the titles and abstracts of all documents. All observational clinical studies (cross-sectional, longitudinal, case-control, cohort, retrospective, and prospective) that were interested in evaluating the effect of the overdenture on the periodontal health of abutment teeth were included in our systematic review. They were also required to report at least: the number of participants, the duration of the study, the type of coping and attachment, and the condition of the abutment teeth at the beginning and the end of the observation period. Excluded studies were as follows: literature reviews, clinical case series, opinion articles, book chapters, and articles evaluating supraradicular partial dentures.

Data extraction

The results obtained were exported and referenced in the bibliographic software Zotero. The clinical studies were first selected based on their titles and abstracts in the various databases consulted. Of those selected, articles not relevant to the subject of our review were eliminated from the start. Then, the full manuscripts of the preselected studies were read in their entirety by two authors to decide on their inclusion. Any disagreement was solved by a consensus discussion. Only studies that fulfilled all of the eligibility criteria were included.

After plenary reading and analysis of the latter studies, the articles finally retained in our systematic review met all the above inclusion criteria and were not included in any exclusion criteria. The following information was extracted: name of the author/s and year of publication, sample size, patient age, mean observation period, number of cast root caps, number of overdentures, survival rates, overdenture attachment type, and prosthetic and biological complications. The number of natural abutment teeth with biological complications, such as caries, periodontal disease, endodontic failure, fracture, and mobility, was assessed.

Quality assessment

The risk of bias assessment was performed by two different operators for the longitudinal studies and the cohort study. The risk of bias assessment was based on the NIH (The National Institutes of Health) Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies (National Heart, Lung, and Blood Institute) (14,15).

RESULTS

Study selection

To introduce the results of the review, a flowchart (Fig. 1) was created to recapitulate the different stages of article selection leading to the final body. The titles of the 694 articles found were examined. After eliminating 402 duplicates using the bibliographic software Zotero, the titles and abstracts of the remaining 292 articles were verified to identify the articles eligible for a full evaluation. Of those identified, those that did not address the subject of the study were eliminated, and the number of these equaled 277. In total, 15 studies were retained and read in full to assess their eligibility. In the end, eight studies were included in this systematic review.

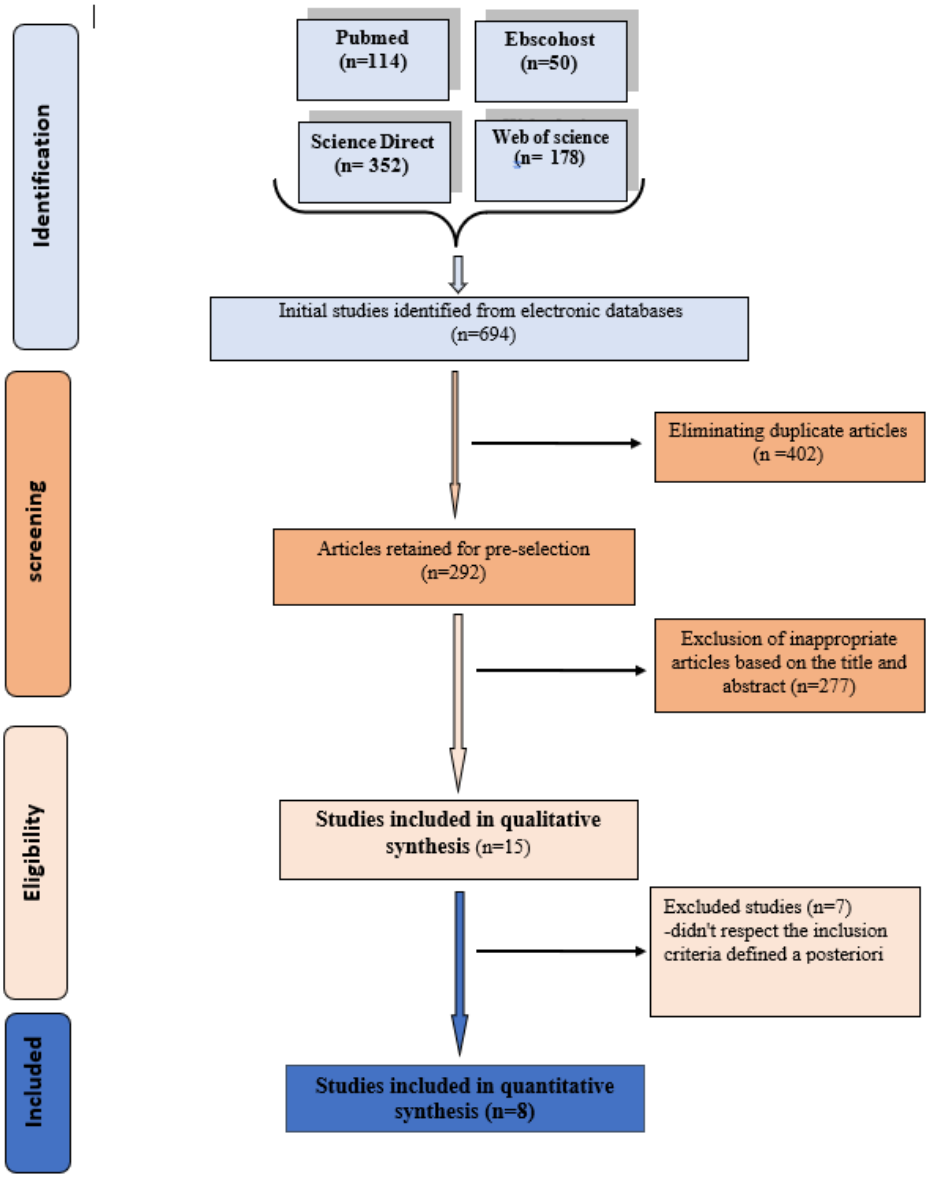

Figure 1: Flowchart illustrating the search process and identifying the studies included in the systematic review.

Study characteristics:

- Population and intervention

The eight eligible studies included a total of 198 patients who had overdentures after complete periodontal cleaning and tight endodontic treatment of the abutment teeth (4, 34), with an observation period ranging from 1 year to 10 years (Table 2).

The studies included in our systematic review recorded periodontal change in the abutment teeth over an observation period ranging from 1 to 10 years. Several parameters were assessed: alveolar bone height, attachment loss, pocket depth, tooth mobility, attached gingiva, plaque index, and gingival index.

- Bone loss

Two studies (6,16) with a follow-up period of 5–10 years presented data on bone loss around the abutment teeth. A cohort study by Crum RJ and colleagues (6) found that bone loss in the mandibular was eight times greater in the complete dentures-bimaxillary group (5.2 mm) than in the that in overdentures-bimaxillary group (0.6 mm), while in the maxilla, it was almost the same. Brkovic-Popovic S. et al. (16) studied the effect of overdentures on the alveolar bone of the abutment teeth over an observation period of six years for the first group and 10 years for the second. The difference in the mean value of bone loss was statically insignificant for the 10-year period group ($p > 0.05$). Conversely, a statistically significant difference ($p < 0.01$) was noted distally and mesially ($p < 0.05$) in the six-year group (Table 3).

- Loss of attachment/pocket depth

Davis RK et al. (17) reported that the difference in pocket depth was considered statistically significant for individual mandibular teeth ($p < 0.001$), which is similar to the results found by Renner RP(18). In contrast, L. Brian Toolson et al. (19, 20, 21) noted a slight nonsignificant bimaxillary increase in pocket depth during the two-year, five-year, and 10-year recall. At the end of the observation period, 94% of the abutment teeth had less than 3 mm of pocket depth, 3% had between 3.3 and 3.4 mm, and 1% seemed to be at risk of an excess pocket depth and the tooth averaged 7.5 mm.

Ronald L Ettinger and collaborators (22) studied the incidence of attachment loss at the canines supporting overdenture. For an observation period of 43 months and during the three recalls (T1, T2, and T3), continuous attachment loss was noted at all four sites (mesial, distal, mid-vestibular, and mid-lingual), except at the first recall (six to eight months) where a decrease in attachment loss at the mesial and distal levels was noted (4.16 mm and 4.30 mm, resp.) compared to the initial value (4.35 mm and 4.41 mm). The difference was statistically significant at the vestibular and lingual levels ($p < 0.05$) during the three recalls. While distally and mesially, the difference was statistically insignificant.

- Tooth mobility

This was recorded in the studies of Renner RP(18) and L. Brian Toolson (19, 20, 21) that tooth mobility was reduced in patients with overdentures, except in the study of David RK (17) who reported that the mobility of 5% of the abutment teeth increased, 50% of the teeth decreased in mobility, and 45% showed no change during the two-year observation period.

- Attached gingiva (GA)

Previous studies showed that the attached gingiva progressively decreases over the observation periods, and this decrease is more significant in the mandibular region (17, 18, 19, 20, 21).

- Gingival inflammation

L. Brian Toolson and collaborates (19,20,21) noted no statically significant change in the gingival inflammation index during the five-year and 10-year recall (8% = normal; 76.4% = mild; 11.7% = moderate; 2.9% = severe).

- Tooth loss

Most of the articles included in our systematic review noted abutment teeth loss during the observation periods, with prevalence ranging from 5.1% to 15.1%. The causes vary from endodontic treatment failures to carious lesions and periodontal problems.

- Dental caries

The incidence of dental caries was 20% in the study by Davis RK (17) and 35.7% in the Renner RP study (18) L. Brian Toolson et al. (19,20,21) during the five-year recall and a statically significant difference ($p < 0.001$) was noted between the group using fluoride gel whose caries incidence was 2.7%, while it was 21.27% in the second group not using fluoride gel. At the 10-year recall, when all patients were no more using fluoride gel, the incidence of caries was 12%.

- Bleeding on probing

Davis RK (17) showed that only 25% did not have bleeding throughout the observation period. Renner RP (18) noted mild bleeding in all teeth at the end of the study.

Risk of bias

The risk of bias in most of the included studies was also moderate, mainly because of the retrospective study designs and the absence of control groups (Table 4).

Table 2: Characteristics of the studies included in our systematic review.

First author	Type of study	Observation period	Description of the sample	Type of overdenture	statistical analysis
Davis RK (17)	Longitudinal study	2 years Recall at 6-month intervals	- 11 patients - 23 roots (9 mand, 11 max)	- Gold caping - Amalgam - Composite	----------
Toolson LB (19).	Longitudinal study (cohort)	2 years One-year recall = T1 2 years = T2	• 89 patients • 233 roots • Between 31 and 82 years • NB of overdenture: 104	----------	Student's *t*-test
Brkovic-Popovic, S et al. (16)	longitudinal study	6 and 10 years	- 22 patients G1=15 G2=6 - NB of the abutment teeth G1 = 33 G2 = 17	• Amalgam. • Gold caping	----------
Ronald L Ettinger. (22)	Longitudinal study	3 years et ½ Recall 3 times: T1: 6-18 months T2: 19-30 months T3: 31-42 months	- 53 patients - 116 canines. - Mean age of participants: 61.6 years (67.9% male.)	• Gold caping: 3.4% • Uncovered abutment teeth [96.6%]	One-way ANOVA
Crum RJ (6)	Cohort G1 = RODs G2 = complete denture CD	5 years	• 16 patients G1 = 8 (RODs) carriers G2 = 8 CD carriers - Mean age: 46 to 67 years	Uncovered teeth	----------
Renner RP (18)	Longitudinal study	4 years T0 = time of insertion T1 = after 4 years	- 7 patients - 12 abutments teeth: - 6 maxillary - 6 mandibular	- Low-viscosity amalgam - Composite resin - Gold coping	Student's *t*-test
L. Brian Toolson (20)	Longitudinal study	5 years T1 = 2 years T2 = 5 years	- 54 patients - 133 abutments teeth	----------	----------
L. Brian Toolson (21)	Longitudinal study	10 years	- 28 patients: 11 men 17 women - 77 abutments teeth. At the end of the study 66 remaining	----------	----------

Table 3: Results of the studies included in our systematic review.

STUDIES	BONE LOSS	ATTACHED GINGIVA	POCKET DEPTH/ATTACHMENT LOSS	TOOTH MOBILITY	GINGIVAL INFLAMMATION	BLEEDING ON PROBING	DENTAL CARIES	TOOTH LOSS
Davis RK et al. [17]	----------	• ↓ Of GA - max =NS - mand = S, P<0,001	For all teeth = **NS** - mand canines = **S,** P < 0, 001	• 50 %: ↓ of mobility • 45 %: no change • 5%: ↑ mobility	•30%: N /N •30%: E /E •5%: E / N •35%: N/E	• 40%: S/ S. • 35%: SN/ S. • 25%: SN/ SN	20 %	13%
Renner RP et al.[18]	----------	Diff = S (p < 0.5) comparing the GA of Max/mand (+++)	Diff = S (p < 0.5) comparing the GA of max/mand (+++)	• 50 %: ↓ of mobility • 50 %: no change in initial mobility	Slightly edematous	Slight bleeding on probing in all teeth	35.7%	----------
Ronald L Ettinger et al.[22]	----------	----------	-PA important at : ♣ T0 = Mi vest > Mi ling >D> M ♣ T1 = same, except in D (T1< T0) ♣ T2, T3 Mi vest > Mi ling >D> M -PA: M+D → diff: NS Mi vest/ Mi ling → diff: S -PA at mand (4,83mm)> PA at max (4.73 mm) and T0 ♣ T1 : max >mand ♣ T2 and T3 same at T0	----------	----------	----------	----------	5.1%
Toolson LB et al.[19]	----------	Diff: **NS**	PP: Mand: ↗ diff = **NS** Max: ↗ diff = **NS**	Diff= **NS**	• ↗ in the gingival index during the observation period diff = **NS**	----------	----------	0 %
Toolson LB et al.[20]	----------	↓ Of GA Diff = S	PP Diff = NS	↓ In the Mobility	Diff = NS	----------	G1: 2,7% G2: 21, 27%	12.03%
Toolson LB et al.[21]	----------	- 78% no change in attached gingiva - 21% GA between 0.5 mm and 4.5 mm	Diff= NS: • 94%: PP < 3 mm. • 3%: PP between 3.3 and 3.4 mm. • 1.5% : PP = 7.5 mm	Diff: NS -90% = physiological mobility - 6% = mobility degree 1 - 1,5% = mobility degree 2 - 1,5% = mobility degree 3	- 8.8% = normal - 76.4% = mild - 11% = moderate - 2.9% = severe	----------	12%	14%
Crum RJ [6]	G1: (diff between T0 and T1) Max = 1.8 mm Man = 0,6 mm G2: Max = 1.7 mm Man = 5, 2 mm	----------	----------	----------	----------	----------	----------	----------
Brkovic-Popovic,S et al.[16]	**G1:** Diff in M: t = 2,174, p < 0,05 (diff S). Diff in D: t = 3.596, p < 0.01 (diff S). **G2:** Diff in M: t = 0.140, p > 0.05 NS. Diff in D : t = 0,114, p > 0,05 NS.	----------	----------	----------	----------	----------	----------	----------

Nb = number; NR = not reported; Max = maxillary; Mand = mandibular; PP = pocket depth; PA: attachment loss, GA= attached gingiva; NS= nonsignificant; S = significant; diff= difference; GP =group; N =normal; E= edematous; M = mesial; D = distal; V = vestibular; L = lingual. HOA=alveolar bone height, CD = complete denture, RODS = natural root-supported overdentures.

Table 4: Risk of bias assessment.[14,15]

NIH Quality Assessment Tool [14,15]	Davis RK[17]	Toolson LB[19 20 21]	Brkovic-Popovic, S et al.[16]	Ronald L Ettinger[22]	Crum RJ[6]	Renner RP[18]
Was the research question or objective in this paper clearly stated?	Yes	Yes	Yes	Yes	Yes	Yes
Was the study population clearly specified and defined?	Yes	Yes	Yes	Yes	Yes	Yes
Was the participation rate of eligible persons at least 50%?	NR	NR	NR	No	NR	No
Were all the subjects selected or recruited from the same or similar populations (including the same time period)? Were inclusion and exclusion criteria for being in the study prespecified and applied uniformly to all participants?	Yes	Yes	Yes	Yes	Yes	Yes
Was a sample size justification, power description, or variance and effect estimates provided?	No	No	No	No	No	No
For the analyses in this paper, were the exposure(s) of interest measured prior to the outcome(s) being measured?	Yes	Yes	Yes	Yes	Yes	Yes
Was the timeframe sufficient so that one could reasonably expect to see an association between exposure and outcome if it existed?	Yes	Yes	Yes	Yes	Yes	Yes
For exposures that can vary in amount or level, did the study examine different levels of the exposure as related to the outcome (e.g., categories of exposure, or exposure measured as continuous variable)?	No	No	No	No	Yes	No
Were the exposure measures (independent variables) clearly defined, valid, reliable, and implemented consistently across all study participants?	Yes	Yes	Yes	Yes	Yes	Yes
Was the exposure(s) assessed more than once over time?	Yes	Yes	Yes	Yes	No	No
Were the outcome measures (dependent variables) clearly defined, valid, reliable, and implemented consistently across all study participants?	Yes	Yes	Yes	Yes	Yes	Yes
Were the outcome assessors blinded to the exposure status of participants?	No	No	No	No	No	No
Was loss to follow-up after baseline 20% or less?	No	Yes: for the two-year recall year booster No: for the 5, 10 years	Yes	Yes	Yes	No
Were key potential confounding variables measured and adjusted statistically for their impact on the relationship between exposure(s) and outcome(s)?	No	No	No	No	No	No
Risk of bias	57.1%: medium-level bias risk.	57.1%: medium-level bias risk.	64.2%: medium-level bias risk.	64.2%: medium-level bias risk.	57.1%: medium-level bias risk.	50%: medium-level bias risk.

DISCUSSION

This systematic review aims to evaluate the effect of the overdenture on the periodontal state of the dental roots supporting the prosthesis.

The studies included in our systematic review recorded periodontal changes in the abutment teeth over an observation period ranging from 1 to 10 years. Several parameters were assessed: alveolar bone height, loss of attachment, pocket depth, tooth mobility, attached gingiva, plaque index, and gingival index.

Bone resorption is one of the most serious problems in the prosthetic treatment of patients who have lost the majority of their natural dentition.[23,8,24] Retaining natural teeth or roots and fabricating overdentures offer the most beneficial result concerning the preservation of the residual alveolar bone and improved prosthesis stability, as shown by the studies included in our systematic review.[6,16]

Crum RJ et al. [(6)] reported that the reduction in the height of the anterior part of the mandible in those patients wearing complete upper and lower dentures amounted to 5.2 mm, as compared with 0.6 mm for the overdenture patients. This represents eight times more loss in patients with complete dentures. These results are similar to the findings of **Van Waas et al.**[25] Data analysis showed that the average bone reduction in the lower canine regions in the first year was 0.9 mm in the immediate-overdenture group and 1.8 mm in the immediate complete denture group.[28] In the posterior parts of the mandible, the bone reductions were 0.7 mm and 1.9 mm, respectively. The differences were statistically significant in all measured regions. During the second year, no significant differences in bone reduction were found. The sums of the differences in the first two years were significant in all regions except the molar region, preserving the initial difference. The results of the studies indicate the advantage of retaining teeth in the anterior part of the mandible to preserve the alveolar process.

Ronald L Ettinger et al.[22] studied the incidence of attachment loss at the canines supporting an overdenture. During the study period, they noted a continuous increase in attachment loss at all four sites (mesial, distal, mid-buccal and mid-lingual). Attachment loss was greater on the mandibular abutments than on the maxillary abutments. It was the least in the mesial-distal areas and greater in the buccal areas, followed by the lingual areas. This may be related to excessive movement of the mandibular prosthesis, especially in the anteroposterior direction. **Renner RP**[18] and **Davis RK**[17] also concluded that they found no significant change in pocket depth in their studies. However, when mandibular canines were evaluated independently, the pocket depth for those abutments increased significantly ($p < 0.001$).

There was no significant decrease in the width of attached gingiva in maxillary teeth, but there was such a decrease in mandibular teeth.[17 18 19 20 21] The loss of attached gingiva in the mandibular arch correlates well with the increased pocket depth of the mandibular teeth.

Tooth mobility seems to be decreasing at the root, supporting an overdenture, which has been shown by RP Renner's[18] and L. Brian Toolson's[19,20,21] studies. This is in contrast to the finding by Fenton and Hahn.[26] They compared control teeth not involved with the overdenture with those involved with an overdenture in a study of periodontal health status. The shortened tooth roots under overdentures were considerably less mobile than the control tooth crowns of the same patients.[26]

This reduction in mobility is due to the sectioning of the coronal part down to the gingival level, which provides a more favorable leverage system. The residual roots only participate in the retention and/or prosthetic sustentation. This solution reduces the stress on the teeth with a reduced periodontal and improves their prognosis.

It is concluded that the periodontal health of the individual abutment teeth was only slightly altered in the different studies included in our systematic review. This is due to adequate follow-up and constant reinforcement of home care instructions during each recall. There is also the longitudinal study by Renner RP[27], which agrees with our studies. The author assessed the bacterial ecology in addition to the periodontal status. The periodontal changes were statically insignificant. This is the result of the rigorous involvement of the patients. However, the gingival microbial flora changed after prosthesis placement.

So, as with any form of dental treatment, patient selection is an important step when overdentures are a treatment consideration. Patients must be able to demonstrate that they are motivated and have the ability to clean their teeth. Patients are unlikely to change their oral hygiene habits after denture insertion, and poor hygiene can lead to loss of abutment teeth due to caries and/or periodontal disease, whereas rigorous oral hygiene improves the prognosis and success of overdentures. This was demonstrated in the study by E BudtzJørgense,[28] which investigated the effect of controlled oral hygiene in patients with overdentures over a one-year observation period. Periodontal treatment was carried out with intensive teaching and oral hygiene motivation throughout the observation period. At the end of the study, the author noted a significant reduction in gingival index scores, plaque index, and pocket depth, which proves that abutment teeth can be retained for a long time if good maintenance is maintained.

However, the development of carious lesions on the surfaces of the abutment teeth is one of the complications encountered, which, in the absence of treatment, can lead to the loss of teeth and consequently to the failure of the treatment.

The articles included in our systematic review also recorded the incidence of caries lesions in the abutment teeth, with the highest rate in the Renner RP[18] study (35.7%) and 20% in the Davis RK[17] study. In other reported overdenture studies, there was a lower range of dental caries. Ettinger RL et al.[29] reported 6.5%, Mericske and Mericske-Stern[30] 6%, and Reitz et al. 16%. This difference is explained by the more rigorous follow-up sessions in the Mericske and Mericske-Stern study, as well as by covering the roots with copings. This maintenance plays a crucial role in the success of the treatment realized. However, L. Brian Toolson et al.[19,20,21] reported on the value of using fluoride gel in the prevention of caries lesions. At the five-year recall, a statistically significant difference ($p < 0.001$) was noted between the group using fluoride gel, whose incidence of caries was 2.7%, and the group not using fluoride gel, whose incidence was 21.27%. At the 10-year recall, for all patients who did not use fluoride gel, the incidence of carious lesions was 12%. Fenton AH et al. made similar observations; they

compared the presence of carious lesions in two groups. Patients in the first group used fluoride gel during the study period (five years), while patients in the second group did not. The incidence of carious lesions was 5% in the first group and 21.6% in the second group.

Loss of abutment teeth during the observation periods was noted in most of the articles included in our systematic review, with prevalence ranging from 5.1% to 15.1%. The causes vary from endodontic treatment failures to carious lesions and periodontal problems.

CONCLUSION

The studies included in our systematic review reported a slight change in the different periodontal parameters. The difference in pocket depth and dental mobility was insignificant. However, the loss of attachment increased over time and the height of the attached gingival decreased, especially in the mandible. This decrease was statistically significant.

The change in the alveolar bone around the abutment teeth was insignificant, and the difference in resorption compared to the conventional prosthesis was significant, which is the major advantage of this therapy: maintenance of bone support.

In contrast, some complications were noted in the different studies, notably carious lesions and tooth loss. These complications can be prevented by rigorous involvement of the patients, regular monitoring, appropriate therapy, and the use of fluoride gel to prevent carious disease. These parameters determine the success and prognosis of the overdentures.

Furthermore, the length of the follow-up of the studies included in the systematic review was considered short to justify the success of this therapy adequately, and the absence of a comparison group in our longitudinal studies is a limitation of our systematic review. More research is needed to answer questions such as the influence of attachment systems on periodontal status change and the effect of denture-wearing habits and oral hygiene on the survival of tooth roots supporting overdentures.

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AUTHORS' CONTRIBUTIONS

The participation of each author corresponds to the criteria of authorship and contributorship emphasized in the Recommendations for the Conduct, Reporting, Editing, and Publication of Scholarly Work in Medical Journals of the International Committee of Medical Journal Editors. Indeed, all the authors have actively participated in the redaction and revision of the manuscript and provided approval for this final revised version.

COMPETING INTERESTS

The authors declare no competing interests in this case.

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None.

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