

Rate of Residual Ridge Resorption in Complete Denture Wearers: A Narrative Review

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Abstract:

The aim of the present narrative review was to gather the available information on overdentures in order to find an answer to the question, "Does overdenture affect residual ridge resorption?" The study also identifies the elements that affect the rate of residual ridge resorption in individuals who wear overdentures. Search strategy application, inclusion and exclusion criteria definition, and study selection for findings summarization were all part of the approach. Each author collected the literature from the database on their own, and the application of the exclusion criteria resulted in seven literatures. When taken as a whole, the studies show how complicated a combination of variables, such as prosthetic support type, implant presence, and length of edentulism, influence alterations in the bone of edentulous individuals. Compared to conventional complete dentures, implant-supported overdentures—especially those with several implants—seem to be associated with decreased bone resorption. All of the reviewed study findings highlight how important it is to utilise prosthetics, how occlusal pressures and implant use affect bone alterations in an individual's edentulous maxilla and mandible. The results deepen our knowledge of the challenges associated with caring for edentulous patients and emphasise the need for personalised treatment plans based on a range of patient-specific variables as well as ongoing investigation to better understand and treat residual ridge resorption in denture wearers.

Keywords: Edentulous Patients, Residual Ridge Resorption, Overdentures, Conventional Dentures.

1. Introduction:

Residual Ridge Resorption (RRR) is a progressive, irreversible, multifactorial, biomechanical condition caused by a combination of anatomical, functional, metabolic, and prosthetic variables⁽¹⁾. The edentulous ridges are distinguished by a rapid resorption rate following tooth extraction, followed by a remarkable declining rate during the first year⁽²⁾. Both local and systemic variables can influence the degree of alveolar bone resorption after tooth extraction, and as with a completely edentulous ridge, the reduction is the consequence of a number of variables interacting with one another⁽³⁾. The fundamental goal of prosthodontic treatment is to preserve the remaining structures. However, a remodelling phase occurs after natural tooth extraction, which usually results in some decrease of residual ridge height⁽⁴⁾. Furthermore, after the teeth have been extracted, the nature of the stresses that are imparted on the alveolar ridge changes. The force exerted is delivered to the surface of the bone rather than the entire bone, and

these compressive forces may result in more rapid resorption followed by atrophy. As a result, there may be inadequate bone to support future prostheses ⁽²⁾. These two therapy methods are always available when treating edentulous individuals either conventional dentures or an overdenture supported by implants. The implant-supported overdenture has been receiving more attention in denture therapy over the past several years, and it may be the treatment of choice for patients who are edentulous ⁽⁵⁾. Given their excellent rates of survival and success over the short, medium, and long terms, dental implants serve as a long-term, sustainable alternative for the prosthetic rehabilitation of both partially and completely edentulous patients. Rehabilitation with implant-supported prostheses, in particular, can successfully restore chewing function and aesthetics in completely edentulous individuals, leading to a considerable increase in quality of life on both a social and personal level ⁽⁶⁾. Several studies have proved the success rate of overdentures; some of these investigations have also compared overdentures with traditional dentures on a variety of factors in order to assess the effectiveness and success of the overdentures. A current narrative review had been carried out with the aim of compiling existing data on overdentures in order to address the question, "Does overdenture affect residual ridge resorption?" The factors influencing the rate of residual ridge resorption in overdenture wearers are additionally identified by the study.

2. Methods:

2.1. Information source and search strategy:

The primary database used was PubMed Central and google scholar. The keywords used were Complete edentulous patients AND Complete dentures OR Implant supported dentures OR Overdentures AND Residual ridge resorption. The research year was not limited, however only freely accessible English-language papers were included in the review.

2.2. Eligibility criteria:

The current literature review includes studies that satisfied the following criteria:

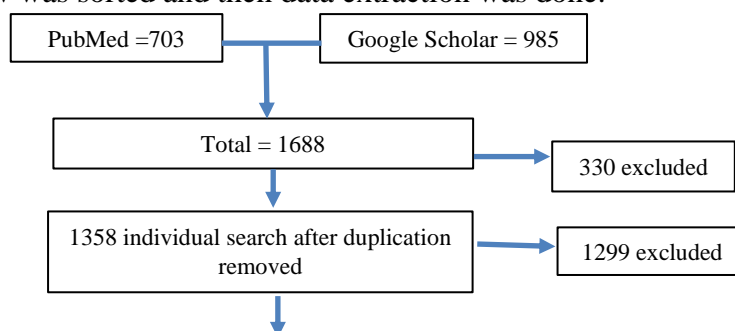
Type of Participants: Patients who are completely edentulous and have either received standard complete dentures or implant supported dentures or overdentures.

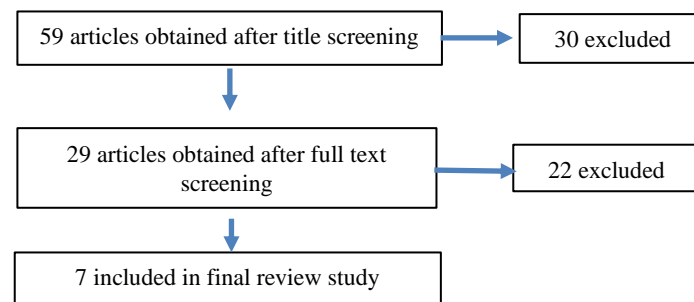
Intervention type: In order to sustain the overdentures, root form implants were inserted. There are no limitations on the number, location, size, or form of implants or loading procedures.

Outcome: The primary objective was the residual ridge resorption rate, whereas the secondary outcome concerned the factors influencing the residual ridge resorption.

2.3. Search strategy:

From the database the articles were selected using title and abstract; articles that qualify the inclusion criteria was sorted. The selected articles were proceeded with full text analysis. The articles that are eligible for the review was sorted and then data extraction was done.





3. Discussion:

Numerous research works have looked into the rate and progression of bone resorption and residual alveolar ridge changes in people with edentulous conditions. In the study by NÄRHI et al ⁽⁷⁾ the width of the residual alveolar ridge decreased significantly over the follow-up period, with a notable percentage of subjects experiencing a decrement exceeding the critical value, especially in the incisor area. For those with implant-mucosa-supported overdentures, subjective denture looseness correlated with residual ridge width reduction in the incisor and canine areas. No such correlations were found for subjects with implant-supported overdentures or complete dentures.

In N. T YMS T R A et al ⁽⁸⁾ study, the results showed that on average, bone resorption occurred in the anterior maxilla for patients in all three groups at the 10-year evaluation. No significant differences were observed between the groups in terms of anterior maxillary bone resorption. Regarding posterior mandibular residual ridge resorption, significant resorption was noted in all groups over 10 years. However, the extent of resorption did not differ significantly between the groups.

In JACOBS et al ⁽⁹⁾ study, annual bone resorption did not exhibit a linear relationship with the duration of edentulism based on simple regression analysis. No significant correlation was found between the patient's age and annual bone resorption, making an age-dependent effect unlikely. Specifically, annual jaw bone resorption was more prominent in the FD group than in the ODi group, as confirmed by the Tukey-Student range test. However, in the maxillary anterior region, bone resorption showed a linear relationship with the time elapsed since implant installation in both Overdenture with implants (ODi) and Fixed Full-arch Prosthesis with implants (FFPi) groups.

In the study by T Khuder et al ⁽³⁾ Multivariate linear regression analyses demonstrated that bone change in the anterior maxillary and posterior mandibular ridges was significantly associated with Percent of Occlusal Force (%OF) distribution. An increase of 1% in %OF distribution corresponded to a 0.3% increase in bone change in the maxillary anterior ridge and a 0.2% increase in the posterior mandibular ridge. Regression analyses also indicated a significant association with the treatment group (CD vs IOD) in both maxillary and mandibular posterior ridges. IOD groups showed smaller bone changes, with an 8.5% chance of less change in the posterior maxilla and 7.8% in the posterior mandible ridges.

In Gilan Youssef Altonbary's ⁽⁴⁾ study the result using the Tukey Post Hoc Test demonstrated that the conventional complete denture group (Group I) exhibited a statistically significant difference in resorption compared to both the two-implant overdenture group (Group II) and the four-implant supported overdenture group (Group III). Additionally, a significant difference was reported between the two-implant overdenture group (Group II) and the four-implant supported overdenture group (Group III).

Subin KM et al study ⁽¹⁰⁾ the results indicated statistically significant difference in ridge resorption between group I and group C in various maxillary and mandibular locations at the end of the 12-month follow-up, a statistically significant difference in ridge resorption was found between the two groups in various

maxillary and mandibular locations. This suggests that the prosthetic approach may influence ridge resorption differently in different anatomical locations.

Ahmed et al. study specifically compared Implant-Retained Overdentures (IRO) and Conventional Dentures (CD), revealing that the IRO group exhibited a more pronounced reduction in bone volume compared to CD over a one-year period. The study evaluated the bite forces in IRO group and CD group which influence the residual ridge resorption.

The studies collectively highlight the complexity of factors influencing bone changes in edentulous individuals, including the type of prosthetic support, implant presence, and duration of edentulism. Implant-supported overdentures, particularly those with more implants, appear to be associated with less bone resorption compared to conventional complete dentures.

4. Limitations:

The studies have diverse methodologies and patient characteristics, making direct comparisons challenging. Factors like patient compliance, oral hygiene, and prosthetic maintenance may contribute to variability in outcomes. The observed changes may not solely be attributed to prosthetic factors, as systemic conditions and individual variations play a role.

5. Conclusion:

The reviewed studies collectively emphasize the importance of prosthetic approaches, occlusal forces, and the use of implants play significant roles in influencing bone changes in edentulous maxilla and mandible of an individual. The findings contribute to our understanding of the complexities involved in managing edentulous patients and highlight the need for individualized treatment strategies based on various patient-specific factors and continued research to better understand and manage residual ridge resorption in denture wearers.

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