Abstract

Introduction: Unilateral or bilateral distal-extension removable partial dentures present complex biomechanics. The movements in different directions, associated with the alveolar ridge shape and soft tissue resilience can lead to damaging forces on the supporting structures. The association between implants / removable partial denture aims to provide better mechanical and biological properties to the stomatognathic system. Objective: The aim of this paper was to review the articles about the effect of implant support on distal extension removable partial dentures. Literature review and conclusion: Studies have shown that this combination provides greater support, retention and stability to the prosthesis, thus limiting their approach movement toward supporting tissues and providing functional and psychological comfort to patients.
Introduction

Oral rehabilitation of subjects presenting very large edentulous spaces by using removable partial denture draws special attention by the dentist. If treatment is not well planned and executed, this type of therapeutic procedure can lead to serial problems, such as: injuring of the support periodontium of the abutment teeth, due to the difference of resilience between the alveolar ridge mucosa and its periodontal ligament [31], associated with the lack of proper adaptation of the denture bases to the support tissues.

The continue resorption of the residual alveolar ridge damages the stability, support, and retention; also, it alters the occlusal condition of distal-extension removable partial denture. Moreover, cases showing an edentulous maxilla rehabilitated by a complete denture opposing a Kennedy class I partially edentulous arch result in gradual resorption of the alveolar bone under the denture’s base, which promotes changes in the occlusal planning, leading to anterior teeth overload. The occlusal overload contributes to the additional resorption of the maxilla’s anterior area and modifies the position of the remnant mandibular teeth, characterizing the combination syndrome or Kelly’s syndrome [14].

Due to the Implantodontontology evolution, it is possible to enhance the biomechanical behavior of distal-extension removal partial dentures. The presence of the osseointegrated implant, at the posterior area, prevents bone resorption, helps in the denture’s retention and stability increase, and reduces the tension on the abutment teeth and the number of extracoronal retainers, besides being more comfort and safer for the patient [4, 15].

Previous investigations evaluating the behavior of implants on the support structures, through finite element analysis, have evidenced dental implants advantages in reducing the tensions on the residual ridge [8-32]. Although the benefits of implant-supported partial dentures are clearly proved in complete edentulous subjects, there is a lack of studies on the association of implants and removable partial dentures in partially edentulous patients; clinical case reports are more prevalent [15, 11-22].

Further researches are necessary for assessing the advantages that this association would provided to partially edentulous subjects. Therefore, the literature review of laboratorial and clinical studies may collaborate for the clarification of frequent questions appearing during the diagnosis and planning of this therapeutic approach.

Literature review and discussion

A literature review was carried out using PubMed database. The following terms was used: removable partial dentures, implant, and support. The search was performed in the articles published between 1972 and 2009. Ninety-seven reports were found, and initially, no exclusion criteria were applied. After the reading of the title and abstract, 26 articles were selected, because they seemed to have a greater correlation with this study. Besides PubMed database, the references of the library collection of the Araraquara School of Dentistry of the Sao Paulo State University (Unesp) were used.

Unilateral or bilateral distal-extension removable partial denture presents complex biomechanics. The movements into different directions, associated with the alveolar ridge shape and soft tissue resilience can lead to damaging forces on the supporting structures [2]. One alternative used since the 19th century for favoring the biomechanics and improving the prognosis of these therapeutic procedures has been the removable dentures association with posterior residual roots. In such cases, the residual roots are maintained under the distal-extension dentures, aiming to preserve the support structures and the periodontal ligament, as well as, to increase this denture’s retention and stability, the so-called overdenture [18].

Based on the positive results observed for treatments with overdenture and on the evolution of osseointegrated implants, the association of removable dentures with dental implants becomes an alternative for partially edentulous patients [6-10]. The procedure aims to provide a better denture’s support, retention, and stability, limiting its approximation movement towards the support tissue, therefore decreasing the tension on soft tissue and bone ridge. Also, there is a reduction of the tension forces generated on the abutment teeth, mainly in the rehabilitation of partially edentulous arches presenting large spaces [23-25]. This occurs due to the modification of the masticatory forces transmission on alveolar ridge, transforming a tooth-mucosa borne denture into a tooth-implant borne denture [16].

Although osseointegrated implants and their different types of attachments seem to provide the reduction of the tensions on the abutment teeth of distal-extension partial dentures, this is still a literature’s controversial issue [17, 19]. Rocha (2001) [27] and Verri et al. (2007) [32] assessed the influence of the occlusion force, through finite element analysis, and verified that there was no reduction in the tension forces on the abutment teeth after the procedures comprising the association of distal-extension removable dentures with implants.
These authors observed a reduction of the support structure demanding, especially at the posterior half of the residual bone ridge. It is worth noting that these studies simulating the oral structures behavior involve a very complex analysis, due to the features of the elements composing the masticatory system. Mostly, these studies assessed the employment of the forces, intending to simulate the functional and non-functional masticatory loads, such as vertical (0°) and oblique (45°) forces, applying both in mesiodistal and distomesial direction. The forces, according to some authors [1, 20], show an axial direction; the horizontal force are present in almost 25% of the total forces generated during mastication [30].

Despite of the literature controversies, it is perceived that the implant's positioning at molar, or even bicuspid area improves the occlusal support of distal-extension removable dentures, resulting in a greater occlusal stability and functional comfort for patients [15, 24]. However, it is necessary to evaluate the long-term efficacy of implants' installation associated with removable partial dentures. Other aspect to be respected is which type of attachment would be better in the association with implants, aiming to favor the removable denture's retention, support, and stability. Among these attachments, the O’ring type was the most used for partial dentures with retainers or transmucosal abutments and for implant-supported prosthesis, without retention [5].

Mitrani et al. (2003) [24], during a 4-year evaluation of 10 partially edentulous patients (Kennedy class I and II) who were unsatisfied with their distal-extension removable dentures, found a significant increase in their satisfaction's degree after the association with dental implants. In order to assess the patients' satisfaction, the researchers used physical, clinical, and complementary (radiographs) examinations of the oral cavity's tissues. Besides the improving of satisfaction, they observed a small weariness of the attachments and minimum radiographic evidence of peri-implantar alveolar ridge resorption. Kuzmanovic et al. (2004) [16] also found positive results in subjects presenting partially edentulous arches (Kennedy class I) rehabilitated by removable dentures and bilateral posterior implants. No complications were observed during the follow-up period of two years.

Despite of the aforementioned information, the association of osseointegrated implants with removable partial dentures is lesser employed than fixed partial prosthesis. Factors, such as individual preference, treatment cost, cultural differences, comfort, age, and accessibility to the services should be considerate during this type of rehabilitation procedure planning. This therapeutic option type uses a limited number of implants, reducing the total cost of the treatment, therefore presenting a favorable risk-benefit ratio [3]. It is highlighted that implants maintain the integrity of the vertical occlusion dimension and prevent a faster bone resorption, a very common pattern in patients wearing distal-extension removable dentures [13, 33].

Due to the elective character of the combined therapy with osseointegrated implants, it is important to inform the patient about all its benefits and limitations. Physiologic elements must be taking into account. Bone availability and quality, as well as patient's general health, especially in users of corticosteroids and biphosphonates, is very likely to modify the results of implant therapy. Besides that, the costs of the therapies associated with osseointegrated implants should be discussed with the patient, so that the patient is able to participate in the decision on the treatment to be executed.

Conclusion

Based on the literature review and discussion on the osseointegrated implants usage in association with removable partial dentures, it can be concluded that:
• there is a higher denture's support, retention, and stability in order to limit the denture's movement towards the support tissues and provide patient's functional and psychological comfort;
• there is a reduction of the tension forces generated on the abutment teeth, favoring the maintenance of the supporting periodontium;
• further longitudinal studies should be carried out, due to the lack of researches on this therapeutic alternative.

References

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