Periodontal Considerations in Removable Partial Denture Treatment: A Review of the Literature

Haralambos Petridis, DDS, MSc[a]
Timothy J. Hempton, DDS[b]

Purpose: A critical review of the literature on the periodontal considerations in removable partial denture (RPD) treatment is presented. **Materials and Methods:** A MEDLINE search was conducted for studies pertaining to the effects of RPDs on the periodontal tissues during the various phases of prosthetic treatment. The review included both in vivo and in vitro studies. **Results:** The use of RPDs leads to detrimental qualitative and quantitative changes in plaque. There seems to be a lack of information regarding the effects of RPDs on the status of periodontally compromised abutments. A number of studies, mainly in vitro, have failed to agree on the ideal RPD design. Clinical trials have shown that if basic principles of RPD design are followed (rigid major connectors, simple design, proper base adaptation), periodontal health of the remaining dentition can be maintained.
Conclusion: Removable partial dentures do not cause any adverse periodontal reactions, provided that preprosthetic periodontal health has been established and maintained with meticulous oral hygiene. Frequent hygiene recalls and prosthetic maintenance are essential tools to achieve a good long-term prognosis. More prospective clinical trials are needed on the effect of RPDs on the condition of periodontally involved abutment teeth. *Int J Prosthodont 2001;14:164–172.*

There are a number of ways to treat the partially edentulous patient to restore function, health, and esthetics.[1] A fixed partial denture supported by the adjacent teeth can be constructed. In the case of long edentulous spans or posterior edentulism, osseointegrated implants can be used to support the fixed reconstruction.[2] There are situations, however, when financial, systemic, or local conditions preclude the use of dental implants.[2] Although a fixed prosthesis may be more desirable from a psychologic point of view, a well-constructed removable partial denture (RPD) can be an excellent treatment alternative.[3,4] Successful treatment necessitates thorough knowledge of the interactions of the RPD with the oral tissues. The purpose of this article is to review the dental literature regarding periodontal considerations in RPD treatment.

Using a MEDLINE search, a total of 884 papers pertaining to "removable partial dentures" were identified in peer-reviewed journals. The MEDLINE search became more specific by relating the key phrase "removable partial dentures" with the key words "plaque," "splinting," "stress," "tooth mobility," "periodontal stability," "maintenance," and "clinical trial." Empirical articles and case reports were excluded. Both in vivo and in vitro studies on the periodontal aspects of RPD treatment were included.

[a]Doctoral Candidate, Department of Fixed Prosthodontics, Aristotle University, Dental School, Thessaloniki, Greece.
[b]Assistant Professor, Department of Periodontology, Tufts University, Boston, Massachusetts.

Reprint requests: Dr Haralambos Petridis, 16 Petrou Levandi Street, Neo Panorama, 55236 Thessaloniki, Greece. Fax: + (3031)341077. e-mail: lpetridis@the.forthnet.gr

Periodontal Considerations
Prior to Prosthetic Treatment

Periodontal Screening

The periodontal screening of a patient who is a candidate to receive RPDs does not differ in any way from that of any other patient in need of other types of prosthetic treatment.[5] Oral hygiene, the presence of plaque and gingival inflammation, attachment loss, remaining osseous support, and mobility should be assessed. The goal at this phase is to diagnose any periodontal conditions that would compromise the long-term prognosis for a successful therapeutic outcome.[6] One of the most important parameters is the patient's level of oral hygiene. It is critical that the patient is educated with regard to oral hygiene. This learning process and encouragement should continue throughout the treatment and posttreatment phase. Oral hygiene appears to be even more crucial for the RPD patient compared to a patient treated with fixed partial dentures.[7] It has been observed that RPDs can result in detrimental changes in the quality and quantity of plaque, which necessitate a higher level of plaque control on the part of the patient.[8–10]

Definitive Periodontal Treatment

The goal of definitive periodontal treatment is to eliminate periodontal disease, treat any defects that hinder plaque control, and create a better environment for cleaning.[5,11] Strategic extractions of severely weakened teeth should be performed, especially in cases when the treatment plan does not change.[5] For example, a compromised maxillary second premolar could be extracted if the first premolar is healthy. The new RPD will have the same design for retention with an additional denture tooth.

Periodontal pockets should be eliminated or reduced via surgical or nonsurgical therapy.[5] Kaldahl et al[12,13] compared osseous resective therapy to open-flap debridement and nonsurgical treatment. Their 7-year investigation revealed that osseous resective surgery for pocket elimination results in a greater reduction of probing depths and improved retention and maintenance of the treated dentition than the other modalities of treatment examined in the study. This was especially true for sites with pocket depths exceeding 4 mm.

Pocket-elimination surgery also includes root-resective therapy. A root and its accompanying crown portion may be removed to facilitate establishment of positive osseous contours around the remaining root or roots still invested in the alveolar bone.[14] If a multirooted tooth is treated in this fashion, residual periodontal support may not be able to withstand additional forces placed on it by an RPD. There is scarce information in the literature concerning this issue. One study[15] reported clinical observations of root-resected maxillary molars followed for 11 to 84 months. These teeth stood alone and were not splinted to adjacent teeth. The study showed increased mobility for these teeth used as RPD abutments.

Clearly, not all patients are amenable to surgical intervention that involves osseous resection; however, this treatment should be considered in the treatment-planning phase as a tool to provide the patient with more easily maintainable abutments. Open-flap debridement and nonsurgical therapy may provide only pocket reduction, but they are certainly advantageous in contrast to no decrease in pocket depth prior to insertion of an RPD.

Regarding guided tissue regeneration (GTR), there are no studies examining the effects on healing when a tooth also serves as an abutment for an RPD. It should be noted, however, that wound healing is delayed in these procedures, as the membrane placed during the surgery serves to exclude the ingress of gingival epithelium from the healing area, thereby slowing down the process of wound closure.[16] This effect is intentional, allowing the slower-healing tissues of the periodontal ligament and the adjacent osseous structures to close the wound. The result is regeneration of the attachment apparatus rather than a repair via a long junctional epithelium.[16] Early wound healing stability seems to be an important factor for successful periodontal regeneration.[17] The possible torquing action of the RPD could interfere with the regenerating periodontal ligament, resulting in a long-term failure. As a result, insertion of an RPD should be delayed if GTR is used on an abutment tooth.

Crown lengthening is indicated in instances of altered passive eruption of the abutment teeth to establish better crown contours, as well as to create minimal space required for the different RPD components.

Gingival augmentation might be considered when there is a lack of attached gingiva around abutment teeth. It must be stressed that the available body of scientific evidence does not substantiate the claimed importance of a certain gingival dimension around abutment teeth.[18] The retentive arms of an RPD, though, can be a source of plaque accumulation and can present an inflammatory challenge to the soft tissue.[19] This is especially true for infrabulge retentive arms, like I bars, that approach the abutment teeth from a gingival direction. Another use of gingival grafts is on the lingual portion of the anterior mandible to provide increased keratinized tissue for the placement of major connectors.

Effects of RPDs on Periodontal Indices

Effects on Plaque

Several studies show an effect of RPDs on the quantity and quality of plaque. One study showed that plaque formation is enhanced on teeth in contact with RPDs and pointed out the need for teaching patients how to keep the endangered teeth clean.[8] The same investigator, using the subjects of the previous study, showed that RPDs promote the proliferation of spirilla and spirochetes at the expense of cocci and short rods, thereby altering the composition of plaque.[9] In a third study,[20] that author and a coworker demonstrated that by implementing intense toothbrushing, plaque can be kept at a low level. The hygiene measures included brushing after each meal, using special toothbrushes for proximal surfaces, and frequent cleaning of the dentures.

One group of researchers[21,22] studied 46 RPDs and their effects on plaque accumulation. They concluded that a higher level of oral hygiene is needed for RPD patients and that the denture design should be as simple as possible, covering only the essential hard and soft tissues. Similar observations were made in a 1-year study of three maxillary RPD designs.[23] The designs differed only in the relationship of the palatal plate to the gingival tissues. The study concluded that gingival areas that are covered by parts of the RPD without relief show the most adverse periodontal reactions, both clinically and histologically, whereas the uncovered areas are the least affected. Based on the results, a distance of 5 to 6 mm away from the gingival margins for all RPD components was proposed. A short-term, single-blind cross-over experimental gingivitis trial suggested that the cingulum bar has fewer detrimental effects on gingival tissues than the lingual apron major connector.[24] The increased tissue coverage by the latter major connector resulted in more plaque accumulation. Another group of investigators[25] demonstrated that the ecologic changes brought about by RPDs are not offset by toothbrushing as it is commonly practiced; extra hygiene measures are needed. They also suggested simpler designs, less tissue coverage, and frequent recalls. A number of clinical studies have concluded that proper plaque control in RPD wearers depends on strict recall and oral hygiene.[19,26–34]

Effects on Forces Exerted on Teeth and Tooth Mobility

There has always been a concern in the literature regarding the biomechanical aspects of RPD design. Bilateral or unilateral distal extension RPDs share their support between the abutment teeth and the edentulous

ridge.[35,36] The differences in the resilience between these supporting elements[35] have prompted examination of many laboratory and clinical models and their effects on forces exerted on the abutment teeth.

It has been reported that RPD design affects the distribution of force on abutment teeth and residual alveolar ridges.[37–42] However, most studies involve the use of laboratory models, and there is no clear consensus regarding the ideal RPD design. The authors agree that rigidity of major connectors and maximum coverage of denture-bearing areas with denture bases are of great importance in reducing stresses on abutment teeth.[37,38,41,43] Two similar photoelastic studies[44,45] compared the stresses induced on the abutment teeth by different RPD designs of direct retainers. The first study[44] tested seven clasp assemblies, whereas the second[45] tested two clasp assemblies and four intracoronal attachments. Both studies concluded that the typical "RPI" retainer design (mesial rest seat and buccal I bar) produces the lowest torquing forces on abutment teeth.[44,45] The RPI retainer was used as a control in another photoelastic study[46] in which Extracoronal Resilient Attachments (Sterngold) semiprecision attachments with light retention elements, splinted teeth, and rest seats compared favorably with it. This study also showed an increase in stress concentration on abutment teeth as periodontal support diminishes.

One group of investigators[47] using intraoral strain gauges measured the lateral horizontal forces applied to abutment teeth by RPDs during function. They showed that forces exerted on abutment teeth during swallowing are almost twice those exerted during mastication on a daily basis. They did not mention the practical effects of their findings on the teeth. Another investigator[48] stressed the fact that not only occlusal force but also tongue, cheeks, and lips contribute to generating torque and forces exerted on abutment teeth.

The literature[45,49] suggests that clasp-retained designs produce less torque on abutment teeth than intracoronal attachment designs. Clinical studies[36,48,50] suggest a tendency of reduction of torque exerted on abutment teeth as the denture-wearing period proceeds. This "settling" period lasts about 1 to 1.5 months from the time of insertion of new RPDs and is attributed to changes of jaw movement in the frontal plane, adaptation of the oral tissues to the denture, properties of the alveolar mucosa, or changes in the chewing points of the RPDs.[36,48,50]

Tooth mobility of abutment teeth was measured intraorally in a 200-day experiment using two different RPD designs in a cross-over experiment.[51] Both RPDs were mandibular distal extension, anchored on the canines. The first design had a mesioocclusal rest and a buccal cast circumferential clasp arm, while the second design used an elastic wire clasp arm with no rest

seat. Both designs elicited significant acute or gradual changes of abutment tooth mobility. There was no mention of control measures or maintenance, and the small sample size precluded any definite conclusions regarding design influence on the changes observed. Other investigators[52] have reported stabilizing periodontally mobile teeth with properly designed RPDs over a 2-year period. According to the authors, parallel guide planes are a prerequisite for success, along with rigid major connectors. Complete palatal coverage was used on the maxillary arch, and "fingers" were placed over the incisal edges of the mandibular anterior teeth. This report, however, produced no control or proper statistics.

In a 4-year longitudinal study[27] of RPD patients, it was reported that patients who were wearing their dentures had on average 18% of their teeth mobile and 25% with a tendency for increased mobility by the end of the study period. Patients who did not wear their dentures had no significant changes in tooth mobility. The study concluded that when patients have a high standard of oral hygiene, RPDs can be used for rehabilitation for long periods without major risk of damage to the remaining teeth. Several investigators have reported, with in vitro and in vivo studies, that the forces exerted on abutment teeth are also influenced by the inclination of the residual ridge.[53–55]

One group[56] studied the effects on tooth mobility of three bilateral distal extension RPD clasping systems in five patients. The first system consisted of a cast circumferential buccal retentive arm, a distal rest, and a lingual bracing arm. The second system used an 18-gauge wrought wire buccal retentive arm instead of the cast arm. The third clasping system had a buccal I-bar retentive arm, a mesial rest, and a distal plate contacting a guide plane. The authors did not record any change in abutment tooth mobility after 1 month of using each RPD clasping system. A slight initial increase in tooth mobility was attributed to settling of the dentures and was diminished later. The authors stress the importance of following sound principles during RPD fabrication (altered cast, proper design, proper occlusion) and maintaining a strict recall.[56]

A short-term clinical study[57] of five patients with mandibular Kennedy Class I RPDs reported a small increase of abutment mobility. However, the abutments were single-standing premolars, and there was no mention of controlled final impressions or oral hygiene measures. The author suggests splinting of primary abutments used in distal extension dentures.[57]

A cross-sectional study[58] concluded that RPDs might be associated with increased tooth mobility in an elderly population. The nature of the study, though, precluded any definite conclusions. However, some of the same investigators followed the same group of patients for 6 years and reported that the longitudinal effects of fixed or removable partial dentures on the periodontium were similar and inconsequential.[31]

A clinical study[59] with a cross-over design studied the effects on tooth mobility and other periodontal parameters of three RPD designs that produced different stresses on the abutment teeth. Each design was used for 19 weeks. There was no difference among the three designs in plaque accumulation and periodontal condition of abutment teeth. All prostheses caused an initial increase of tooth mobility, which later returned to normal.

Several long-term clinical studies have shown that properly designed RPDs do not have any detrimental effects on tooth mobility, provided that strict oral hygiene and frequent recalls are implemented.[26,29,30,32,33,60]

Splinted Versus Nonsplinted Abutments

There is no scientific evidence to point to one treatment over the other.

Carlsson et al[27] suggested splinting primary abutment teeth to withstand the forces of the RPDs. They based the recommendation on the observation that during their 4-year clinical study, no deterioration of the periodontal condition occurred on the splinted abutments.[27] Goodkind[57] made the same suggestion.

An in vitro study[61] of a photoelastic model concluded that fixed splinting of adjacent abutment teeth is an important factor when attachment retainers are used for an extension RPD. Similar results were obtained from a study[62] of the strains induced on abutment teeth when extracoronal attachments are used in distal extension RPDs. An in vitro model with strain gauges was used, and the suggestion was that at least two teeth should be splinted for a reduction of stresses. One more photoelastic study[63] looking at the same issue concluded that a distal abutment with moderate periodontal support should be splinted to one sound adjacent tooth to decrease the load transfer by a distal extension RPD.

No clinical studies compare splinted and nonsplinted abutments for RPDs. There is no clinical evidence that torquing forces transmitted to the abutment teeth from distal extension RPDs pose any threat to their periodontal status, provided that oral hygiene is maintained. It also seems that laboratory models cannot accurately predict actual forces in vivo and their effects on oral structures.[64–66] Literature[67] has shown that in the absence of plaque and inflammation, traumatic forces on teeth do not cause attachment loss. An initial increase in tooth mobility may be the result of adaptive, not pathologic, changes.[67] However, sound principles should be followed during the fabrication of

RPDs to minimize stresses. The framework should be adjusted properly,[68,69] and distal extension bases should be constructed using an altered cast.[70–72] An in vivo study[72] compared the vertical movement occurring during loading of distal extension RPD bases made by three impression techniques. The impressions studied were the altered-cast impression, an impression made from a border-molded custom tray, and a stock tray irreversible hydrocolloid impression that served as a control. The results showed a statistically significant difference between the first two techniques, with the altered-cast technique producing less vertical movement. However, the authors suggested that the 0.19 mm difference in displacement may not be clinically significant.[72] In any case, mucosal support seems to have an indispensable role in sharing the occlusal load with the abutment teeth in distal extension RPDs.[42,43,73,74]

Clinical Studies of RPDs

There are a number of clinical studies on longevity and reactions of oral structures to RPDs (Table 1).

A 4-year longitudinal study[27] of RPD patients concluded that, in patients with a high standard of oral hygiene, RPDs can be used for rehabilitation for long periods without major risk of damage to the remaining teeth.[27] Derry and Bertram[60] recalled patients 2 years after fabrication of their RPDs and found that in no instance had the dentures contributed to the destruction of the supporting structures. The weakness of the study was that there were no pretreatment readings for comparison.

A team of investigators studied[26] a group of patients after 2 years of RPD use. They reported an increase in plaque and gingival inflammation, but stressed that their patients did not receive regular hygiene instructions. There was also no mention of recall during the 2 years. All other indices remained stable. Different investigators examined the same group of patients 8 to 9 years after initial treatment.[19] Although the turnout was low (40%), the authors concluded that there were no significant longitudinal differences between patients wearing RPDs and those not wearing them. Poor oral hygiene caused increased levels of gingival inflammation in regions covered by the dentures and apical to clasp arms. A cross-sectional study[28] of a group of RPD patients reported poor maintenance and oral hygiene for the majority of patients that led to gingival inflammation. However, there was a very small turnout of patients.

The results of a well-controlled 10-year longitudinal study on 30 patients with mostly bilateral distal extension RPDs were presented in 1982.[29] Patients were recalled on a yearly basis, and emphasis was given to proper oral hygiene and prosthetic service

(occlusal adjustment, relining, and repairs). No deterioration was found in any of the periodontal parameters. The same authors presented the follow-up results after 25 years.[30] No apparent changes took place regarding the periodontal condition.

A retrospective study[75] examined RPD patient populations from England, the Netherlands, and the United States with samples of 1-year and 5-year posttreatment data. There was no mention of recall. This group of investigators found some statistically significant differences in some periodontal indices, but the values were not clinically significant and fell within the range of interexaminer variability. Two cross-sectional studies of the same patient population reported increased pocket depths around remaining teeth in RPD patients.[76,77] The group of patients in these studies did not follow any recall and maintenance protocol, and most RPDs did not have a metal framework.

Isidor and Budtz-Jörgensen[7] presented the only study that evaluated long-term (5-year) periodontal changes in two groups of patients with moderate to advanced bone loss. One group was treated with distally extended, fixed cantilevered partial dentures, and the other was treated with RPDs. Both treatment groups showed no progression of periodontitis, and all clinical indices remained stable over the observation period.

One study[78] compared two matched groups of regular dental attendees and concluded that patients using RPDs were no more likely to have poor periodontal health than those who did not wear dentures. A cross-sectional study[79] reported a deterioration in three indices (Plaque Index, gingival index, and loss of attachment) for abutment teeth in a group of RPD patients. The RPDs were in use for 1.5 to 8 years, and the group had been maintained only for a short-term basis. The absence of hygiene recalls led to a deterioration of the level of oral hygiene. The importance of frequent hygiene and prosthetic maintenance appointments for RPD patients was also stressed in another cross-sectional study.[80]

In a well-designed randomized clinical trial, Kapur et al[33] compared the effectiveness of two different RPD designs for 134 patients with Kennedy Class I and II edentulous conditions. One design used a distal occlusal rest seat and guide plane along with a buccal cast circumferential clasp retainer. The other design used an I-bar retainer and a mesioocclusal rest seat. No clinically significant changes were reported for any periodontal component in the two groups after 60 months. It must be noted that in this particular study, patients were selected to meet fairly rigid general and periodontal health criteria, most of the abutment teeth were splinted, and a rigid quality-control system was followed for the fabrication of the RPDs.

Table 1   Clinical Studies on the Effects of RPDs on the Periodontal Condition

Study	Type	Period	No. of patients	No. of RPDs	RPD design	Effects of RPDs
Carlsson et al[27]	Prospective	4 y	88	129	Maxillary and mandibular clasp retained	RPD patients presented with an increased No. of mobile abutment teeth. Periodontal conditions depend on strict personal oral hygiene, recalls, and motivation.
Derry and Bertram[60]	Retrospective	2 y	54	65	Maxillary and mandibular clasp retained	Sound principles of denture construction followed, but no pre-treatment readings. RPDs caused no tissue damage.
Schwalm et al[26]	Retrospective	1–2 y	92	102	Maxillary and mandibular clasp retained	No regular recall or hygiene instructions. RPD design followed sound principles. Plaque and gingival inflammation increased. All other indices remained stable.
Benson and Spolsky[28]	Cross sectional	—	77	135	I-bar retainers	Low turnout of patients (< 10%). No control recall. Poor oral hygiene was accompanied by gingival inflammation.
Tebrock et al[56]	Prospective	1 mo	5	5/ design	Cast retainer, wrought wire, or RPI	Mobility of abutment teeth after 1 mo remained same as baseline. No difference among designs.
Kratochvil et al[75]	Retrospective	1 and 5 y	137	203	No information	No mention of recall. Average measurements presented. No clinically significant changes in periodontal indices.
Bergman et al[29]	Prospective	10 y	30	33	Maxillary and mandibular clasp retained	Proper principles of RPD design and recall. Emphasis on prosthetic maintenance. No deterioration of any periodontal parameter.
Chandler and Brudvik[19]	Retrospective	8–9 y	38	44	Maxillary and mandibular clasp retained	Same group of patients as in Schwalm et al.[26] Low turnout (40%). No recall program. No significant longitudinal changes between RPD patients and non-RPD patients.
Rissin et al[31]	Prospective	6 y	238	25	No information	No mention of recall. No differences or longitudinal deterioration in periodontal status in RPD vs fixed prosthesis abutments.
Markkanen et al[76] and Tuominen et al[77]	Cross sectional	—	1468	No mention	No information	Both acrylic and cobalt-chrome RPDs used. No maintenance. RPDs associated with poorer periodontal condition.
Isidor and Budtz-Jörgensen[7]	Prospective	5 y	25	25	Mandibular clasp retained	Only study with patients with moderate to advanced bone loss around teeth. RPDs compared favorably to fixed cantilevered partial dentures. Only minor periodontal changes.
Hosman[59]	Prospective, cross over	19 wk	25	25	Mandibular clasp retained	Three RPD designs produced different torque and cleaning environments. No difference in plaque or periodontal condition.
Drake and Beck[80]	Cross sectional	—	211	No mention	No information	No hygiene recall or maintenance. RPDs, especially defective ones, associated with periodontal problems.
Kapur et al[33]	Prospective	5 y	122	122	I bar or circumferential	Well-controlled study. Strict patient selection criteria. Regular recall. Similar success rates for two designs. No periodontal deterioration.
Mullally and Lindén[78]	Cross sectional	—	28	14	No information	Two matched groups (RPD and non-RPD) compared for periodontal health; no differences found.
Yusof and Isa[79]	Cross sectional	—	18	18	No information	Periodontal health in abutment and nonabutment teeth in individual patients compared. RPDs associated with reduced periodontal health in patients with less-than-adequate oral hygiene.
Mojon et al[34]	Cross sectional	—	120	52% of patients	Maxillary and mandibular clasp retained	No hygiene or recall protocol. Majority of RPDs were defective and periodontal condition had been compromised.
Bergman et al[30]	Prospective	25 y	23	25	Maxillary and mandibular clasp retained	Same group as in Bergman et al.[29] No apparent changes of periodontal condition during follow-up period.
Bassi et al[32]	Cross sectional	—	57	57	No information	No recall. Only 10% of patients maintained optimal oral hygiene and showed no differences in periodontal condition of abutment and nonabutment teeth.
Yeung et al[82]	Cross sectional	—	87	87	No information	No control. Need for strict oral hygiene measures for RPDs stressed.

A cross-sectional study[34] emphasized the importance of strict hygiene recall and maintenance with RPD wearers. Most of the patients examined had lost contact with their dentists, and as a result, the majority of dentures were defective and the periodontal status had been compromised. The same conclusions were drawn in a cross-sectional study of a group of periodontally compromised RPD wearers.[81]

Another cross-sectional study[32] examined a group of patients who had been treated with RPDs 6 to 12 years before. The authors reported that without regular recall, only 10.5% of the patients had maintained optimal oral hygiene. The periodontal condition of abutment teeth was identical to nonabutment teeth in the group of patients with optimal oral hygiene. As oral hygiene had deteriorated in the other groups of patients, so did the periodontal condition of abutment teeth. A recent cross-sectional study[82] stressed the special need that RPD wearers have regarding oral hygiene reinforcement, scaling, and prophylaxis.

Periodontal Therapy After Delivery of RPDs

All of the clinical studies have clearly emphasized the need for frequent recall and maintenance for patients wearing RPDs.[69] The frequency of hygiene recalls should be tailored to the individual patient's needs and ability to keep plaque under control. A very important aspect of recall appointments is prosthetic maintenance. Ill-fitting dentures or malocclusion can alter the function of the RPD and cause undesirable stress and pressure on the remaining teeth and soft tissues.[34,82]

Conclusions

This literature review suggests the following conclusions:

1. The use of RPDs leads to detrimental changes in the quality and quantity of plaque. Implementing meticulous hygiene of both the oral cavity and dentures can offset these changes.
2. Factors that affect force distribution from the RPD to the abutment teeth and edentulous ridge include denture design, denture base adaptation, and residual ridge inclination.
3. The wearing of a new RPD is followed by a "settling" period that lasts about 1 to 1.5 months and leads to a reduction of the initial torque exerted on the abutment teeth.
4. Splinting of abutment teeth is indicated when the periodontal support has been reduced or when increased stresses are expected, as in the use of intracoronal attachments.

5. Properly designed and maintained RPDs can provide long-term clinical service without any detrimental effects on the periodontal condition of the remaining dentition, provided that preprosthetic periodontal health has been established and maintained with meticulous oral hygiene. Frequent hygiene recalls and prosthetic maintenance are essential tools to achieve a good long-term prognosis.

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Literature Abstract

Implant-supported overdentures, A prevention of bone loss in edentulous mandibles? A 5-year follow-up study.

The purpose of this article was to analyze *(1)* the changes in bone mineral content (BMC) in mandibles with implant-supported overdentures when compared with the physiologic age-related mandibular BMC loss; *(2)* whether the BMC changes were different in groups with or without a bar connecting the implants; and *(3)* whether the presence of mandibular osteoporosis affected the loss of bone height around the implants. The material consisted of 22 long-term edentulous healthy subjects, 18 women and four men aged 54 to 79 years, all with one Astra Tech implant in both mandibular canine regions. The BMC in the mandible and the forearm was measured by dual-photon absorptiometry. The treatment with implant-supported overdentures seemed to minimize mandibular bone loss. No significant difference was noted between the two different retentive systems (bar or ball attachments). However, presence of mandibular osteoporosis may be a risk factor for loss of bone height around implants. Still, the authors recommend treatment with implant-supported overdentures even in osteoporotic subjects.

Von Wowern N, Gotfredsen K. *Clin Oral Implants Res* 2001;12:19–25. **References:** 37. **Reprints:** Nina von Wowern, Department of Oral and Maxillofacial Surgery, School of Dentistry, University of Copenhagen, 20 Nørre Allé, DK-2200 Copenhagen N, Denmark—*SP*