

REVIEW ARTICLE

IMPLANT SUPPORTED FIXED PARTIAL DENTURES: A COMPREHENSIVE REVIEW

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ABSTRACT:

The use of dental implants in the rehabilitation of partially edentulous patients has become a well-established and accepted contemporary clinical method with predictable long-term success. The majority of studies examining implant success have emphasized the integrity of implant-bone support and the quality of osseointegration typically evaluated using parameters such as implant mobility, inflammation, infection around the implant site, and peri-implant bone loss. Hence; in the present review, we aim to highlight some of the important aspect of implant supported fixed partial dentures.

Key words: Dental, Fixed partial denture (FPD), Implant

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INTRODUCTION

Restorative therapy using dental implants is considered a safe and predictable treatment procedure in edentulous and partially dentate patients. These therapies range from cantilevers, resin-bonded bridges, and bridges. Changes in the restorative treatment patterns and the introduction of new and improved restorative materials and techniques have greatly influenced the longevity and esthetic outcomes⁶ The focus of implant research is shifting from descriptions of clinical success to the identification of factors associated with failure.¹⁻³

Biomechanical considerations on tooth-implant supported fixed partial dentures

Several changes have been made since the introduction of implants for dental prosthetic rehabilitation. The initial concept introduced by Professor Per-Ingvar Brånemark and his associates recommended placement of six implants in the anterior mandibular or maxillary area and construction of a fixed detachable hybrid prosthesis, made of a metal substructure, denture teeth, and heat polymerized acrylic resin material.⁴⁻⁶

Since then, researchers and clinicians modified the initial implant treatment options. Implants are now being used for the restoration of maxillary complete edentulism, as well as for the rehabilitation of partial edentulism. Furthermore, connection between teeth and implant fixtures has been advocated as a feasible way to provide prosthetic reconstructions, when anatomical limitations—for example, sinus or mental nerve proximity and lack of sufficient bone quantity—or financial restrictions are present Biomechanics of the PDL.⁷⁻⁹

Several theories have been developed in order to explain the tooth intrusion phenomenon:

Disuse atrophy: The fibers of the PDL of the tooth may undergo a disuse atrophy due to the hypofunction of the

tooth, since the implant undertakes the majority of the occlusal forces.

Differential energy dissipation: There is an osteoclastic activity in the PDL due to very high stress transmitted to the tooth. The result of this osteoclastic activity is the intrusion of the abutment tooth.

Impaired rebound memory. This theory suggests that due to the constant pressure, the PDL loses its elastic memory and remodels in a new position. This position is more apical than the original one. The PDL's remodeling continues until the tooth is completely out of occlusion and stabilizes in that new position.

Ratchet effect: The abutment tooth moves apically due to the occlusal overload and stays in that new position, maybe because of the binding in the socket or in the semiprecision attachments that are very often used.¹⁰⁻¹²

TYPE OF CONNECTION (RIGID OR NON RIGID)

Connection of teeth with implants may take place either with an attachment system or with a telescopic crown. This type of connection is dictated by the need of implant prostheses retrievability for resurveying, replacement, or salvaging of the restorations and the implants. Attachment systems connecting two parts of a fixed prosthesis can be either rigid or non rigid. In rigid connectors, there is usually a fastening screw that fixes the matrix and the matrix parts rigidly. In non rigid attachments, there is a key and a keyway part that slide one into the other, but there is no screw to fix these two parts. Likewise if, instead of an attachment system, a telescopic crown is used, then this can be either fixed rigidly to the suprastructure with a screw or with a definitive cement.^{13,14}

LOADING ON TEETH VERSUS IMPLANTS

The biological differences between teeth and dental implants are clear. The natural tooth is suspended by the PDL whereas the dental implant is in direct contact with

the bone. Under loading, the resilient PDL provides a shock-absorbing feature for the teeth. On the other hand, for implants, a high stress concentration occurs at the crestal bone when loaded, due to the lack of a PDL. The mean value for axial mobility of the teeth is 25 to 100 μm , whereas the axial displacement of osseointegrated implants is 3 to 5 μm . During lateral loading, the tooth moves at the apical third of the root, and the force is instantly dissipated from the crest of the bone along the root. Conversely, the implant moves at 10-50 μm laterally; and the concentration of forces is at the crestal bone. Clinical signs of occlusal overloading of teeth include widening of the PDL, fremitus, and mobility of the tooth. On the other hand, signs of inflammation and crater-like bone defects have been associated with the overloading of implants. Occlusal overloading of implants may also lead to mechanical complications of the supported prostheses, such as screw loosening or fracture, abutment or prosthesis fracture, or even implant fracture.¹⁵⁻¹⁷

OCCLUSAL SCHEME AND MORPHOLOGY

There is little evidence to suggest that a specific occlusal scheme for ISFDPs is superior, since changes in occlusion may be easily adopted by the complex neurophysiological mechanism in the jaw muscle system. In addition, occlusal scheme design has minor or no importance to marginal bone loss of implant-supported prostheses. General recommendations for occlusal morphology include flat fossa and grooves for wide freedom in centric, shallow occlusal anatomy, a narrow occlusal table, and reduced cuspal inclination. It is recommended that the size of the occlusal table be 30% to 40% smaller for molars.¹⁸

CONCLUSION

Dental implants have gained increasing popularity over the years as they are capable of restoring the function to near normal in both partial and completely edentulous arches. With substantial evidence available, fixed implant-supported prosthesis are fully acknowledged as a reliable treatment option for the replacement of single or multiple missing teeth nowadays. While dental implants are increasingly becoming the choice of replacement for missing teeth, the impediments associated with them are progressively emerging too.

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