# EFFECT OF COMPLETE MANDIBULAR OVERDENTURE ABUTMENT DESIGNS ON DENTURE SUPPORTING STRUCTURES

**Thesis**

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# *تأثير التصميمات المختلفة لدعامة الأطقم الفوقية السفلية على البنية الداعمة للاطقم*

**رسالة مقدمة لكلية طب الأسنان**
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# *Introduction*

Despite the recent development in dental implantology the conservative approach to root preservation is still valid, especially in complex occlusal situation (such as sever attrition and bruxism) or when implant retrained or supported prosthesis is not feasible for economic or anatomic reasons.

Preservation of roots of teeth that are destroyed by caries or compromised by periodontal disease to support an overdenture is preferred alternative to extraction of these teeth and construction of complete denture.

Complete denture wearer suffer from functional problems because of dependence of the prosthesis on mucoperiosteal support only, whereas over denture drives additional support and retention from the retained root. The retained roots were nominated as natural or physiological implant. These physiologic implants with their intact properioceptive feed back mechanisms offer best solution to function, retention, support, stability and also training effect for complete dentures that may be necessary by preparing the neural path way for appropriate patterns.

However, the usefulness of overdentures has been limited by susceptibility of abutment teeth to caries and progressive periodontal disease.

In an attempt to control caries and periodontal disease various abutment designs have been suggested, hence it was imperative to study the effect of different overdenture abutments on denture supporting structures.

# Review of Literature

Complete overdenture is a removable prosthesis that overlies the retained teeth, tooth root or dental implant. This treatment modality is not a new concept. Dentists have successfully used existing tooth structures or retained roots to support complete denture for more than a century ***(Burns, ٢٠٠٤).***

An overdenture is defined as a dental prosthesis that covers and is partially supported by natural teeth, roots, and/or dental implant. It has been called also a biologic denture, overlay denture, overlay prosthesis or superimposed prosthesis ***(Rhan & Heartwell, ٢٠٠٢ and the Academy of Prosthodontic terms, ٢٠٠٥).***

***Miller (١٩٥٨);*** re-introduced the concept of using teeth to stabilize complete dentures by using vital teeth with coping thimble arrangement without necessitating root canal therapy.

***Morrow et al. (١٩٦٩),*** suggested that teeth should be reduced to a few millimeters above the free gingival margin with elective root canal therapy and then they covered with gold thimbles.

Today with the stress on preventive measures in prosthodontics the use of overdentures has increased to the point where it is now a feasible alternative to most treatment plan outline in which the construction of a prosthesis for patients with few remaining teeth which were previously considered inadequate to support fixed or removable partial dentures ***(Winkler, ١٩٨٨ and Budtz-Jorgenson, ١٩٩٩).***

The overdenture approach has also other applications beside the obvious replacement of complete or partial denture; it is used as an effective prosthodontic means for correcting disparities in dentition, between two dental arches, for treating occlusal disharmony and in patients with congenital and acquired defect ***(MacEntee, ١٩٧٩; Winkler ١٩٨٨; Lunger & Langer, ١٩٩; Mericske-stern, ١٩٩٤ and Zarb et al., ١٩٩٧).***

## *Treatment Goals with Overdentures*

The goals of overdenture therapy are to preserve alveolar bone, improve function and comfort by maintaining few roots or placing implants to prevent abuse of soft tissue of the residual ridge ***(Mericske et al., ١٩٩٣; Preiskel, ١٩٩٦; Burns, ٢٠٠٤ and Misch, ٢٠٠٥),*** providing better load transmission, better masticatory function and improving stability ***(Mericske-Stern, ١٩٩٤).*** The retention of prosthesis can also be secured by using precision attachment. These advantages are reflected on psychological condition of the patient ***(Preiskel, ١٩٩, and Burns, ٢٠٠٤)***

## *Value of Preserving Teeth or Roots*

Extraction of the last remaining teeth and their replacement with complete dentures has many advert consequences. The patient has to adapt to new situations with respect to speech, chewing and swallowing. The patient also has to accept edentulousness, which may lead to psychological problem and social isolation ***(Van Waas, ١٩٩٠ a,b,c and Kalk et al., ١٩٩٠).*** Furthermore, extraction of the teeth leads to reduction of alveolar ridge ***(Klemetti, ١٩٩٦; Van Waas et al., ١٩٩٦ and Atwood, ٢٠٠١)*** which causes changes in denture base adaptation, vertical

dimension of the occlusion and occlusal contact ***(Tallgren, ١٩٧٢; Van Waas, ١٩٩٦ and Fenton, ١٩٩٨)*** and subsequent need for prosthodontic care ***(Winkler, ١٩٨٨ and Burns, ٢٠٠٤).***

On the other hand, retention of teeth or roots in the alveolar ridge aids to preserve bone around and in between these structures. Bone maintenance is the most significant advantages of overdentures because bone maintenance can improve retention and stability of the prosthesis ***(Thayer& Caputo et al, ١٩٧٩).*** Moreover, sensory feed back of periodontal ligaments of retained teeth is maintained and masticatory performance is enhanced ***(Rissin et al, ١٩٧٨; Nagasawa, ١٩٧٩; Fenton, ١٩٩٨; and Budtz-Jorgensen ١٩٩٩).***

Tooth supported overdentures also minimize down and forward settling of denture which otherwise occurs with alveolar bone resorption. The overdenture occlusion is maintained rather than shifting forward to simulate the appearance of an angle class III malocclusion ***(Fenton, ١٩٩٨).***

Tooth-borne overdenture the patients are not rendered completely edentulous so psychologically the patients may perceive the preservation of few teeth as an important factor in maintaining a more positive self-image ***(Warren & caputo, ١٩٧٥; Rissin et al, ١٩٧٨ and Preiskel, ١٩٧٩, ١٩٩٦).***

## *Drawbacks of Overdentures:*

There are few drawbacks provided that overdenture, are properly designed and constructed. These are:

١- Adequate inter-arch space is required to accommodate overdenture prosthesis and for the underlying teeth or tooth roots ***(Robbins, ١٩٨٠; Basker et* al.*, ١٩٨٣(a) and Winkler, ١٩٨٨).***

٢- Compared with conventional denture, overdenture may be bulkier, although the base is trimmed very thin around abutment teeth making overdenture base more susceptible to fractures ***(Preiskel, ١٩٩٦).***

٣- Prominent osseous tissue undercuts in the area of abutment teeth, especially in anterior region of the mandible, may cause difficulties developing proper denture extensions. In this case the denture base is likely to be under extended, negatively influencing prosthesis retention and esthetic outcome ***(Preiskel, ١٩٧٩, ١٩٩٦ and Burns, ٢٠٠٤).***

٤- Contact between denture base and abutment either by design or because of tooth eruption, can produce a fulcrum in denture base where contact occur. Movement of the denture base around this fulcrum can interfere with denture retention and stability or contacts may create fatigue related maintenance problems that are generally unique to overdentures. For this reason denture base contact with abutment teeth should be avoided or should occur only under condition of heavy occlusal loading forces ***(Burns, ٢٠٠٤).***