

## Tooth Implant an Alternative to Failed Implant Supported Prosthesis in a Smoker

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Rec date: Aug 23, 2016; Acc date: Sep 12, 2016; Pub date: Sep 16, 2016

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### Abstract

Chronic smoking can lead to failure of Osseo integration due to decrease in local blood flow and failure of cell proliferation by by-products of smoking. This along with immediate failure of a malpositioned implant, devitalization of adjacent tooth necessitating a call for endodontic treatment or the fracture of the adjacent tooth due to malpositioned implant, fracture of the prosthesis due to incomplete seating and occlusal discrepancies have a tremendous impact on the psyche of the patient. Some of them show reluctance to functional rehabilitation with implant supported prosthesis posing a tough challenge to the restorative dentist. A good alternative in such cases would be to save some of the natural teeth and place a precision stud attachment in the canal of selected teeth, which will act like a tooth implant, providing retention and stability similar to implant supported prosthesis.

**Keywords:** Smoking; Implant supported prosthesis; Precision attachment; Overdenture; Stud attachment

### Introduction

Treatment planning is an essential component of the diagnostic phase and, unless given the necessary commitment, would ultimately result in either absolute or relative failure of the case. Particularly, in case of implants where cost is a major factor of consideration, the immediate failure of the implant supported prosthesis due to inadequate treatment planning, negligence and incompetence in the placement of the implants might lead to loss of faith of the patient in the dentist and pose difficult challenge to the restorative/prosthetic dentist for functional rehabilitation. Hence, the pre implant Prosthodontic evaluation of the patient is very important to develop an organized treatment approach based on clinical oral condition and patient desires to achieve the predictable results [1].

Over the last 30 years, endosseous dental implants have provided a successful and viable option for the functional and esthetic rehabilitation of a partially and complete edentulous patients [2-4]. Their use in replacing single or multiple missing teeth avoid the preparation of the natural teeth as abutments and provides excellent support, stability and retention to different types of prostheses thereby offering the potential for improving patient's appearance as well as quality of life. In spite of high success rate of the implants, at times, the failures are inevitable. However, the failure which occurs due to improper case selection such as chronic smokers, presence of multiple unrestored carious teeth, improper placement of implants approximating the root of adjacent tooth with little or no vital bone between tooth and implant, unrestored contra-lateral side resulting in overloading of the implants and fracture of the prosthesis due to improper designing and occlusal adjustments have tremendous psychological effect on the patient. Few of such patients (as in this case) might never get convinced for any implant restoration in the

future. The successful rehabilitation of such patient is a great challenge to the restorative dentist.

An alternative to failed implant supported prosthesis in partially edentulous patients is a tooth implant (precision stud attachment) retained overdenture, which has retention, support and stability almost similar to an implant supported overdenture. The Stud attachment consist of a radicular part extending into the prepared root canal and a ball attachment projecting into the oral cavity which provide retention to the overdenture via a nylon cap embedded in metal housing which in turn is incorporated in to the fitting surface of the prosthesis. This case report describes the successful rehabilitation of a patient having multiple unrestored carious teeth and failed implant supported prosthesis with tooth implant retained prosthesis in a chronic smoker patient

### Case Report

A 55-year-old male patient reported to our dental center with a chief complaint of difficulty in chewing due to failed implant supported prosthesis on the left side of the mandibular arch and missing mandibular posterior teeth on the right side. He was also concerned about the unaesthetic appearance associated with carious mandibular remaining teeth.

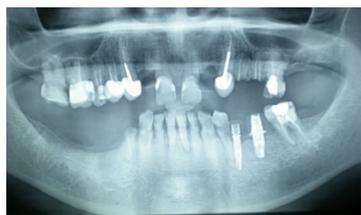
An intraoral examination revealed completely restored maxillary arch, exposed implant without cover screw in #35 and #37 region, unhealed extraction sockets related to # 31 and # 34 and carious #33 and #37 (Figures 1-4). His dental history revealed immediate loading of the implants and continuous pain in the tooth adjacent to the implant in #35 region. The concerned tooth was endodontically treated but was fractured within 4 weeks' post treatment. The implant on the right side along with crown had been dislodged and the implant supported prosthesis on the left side had got fractured during first 2 months of the loading. Radiographic evaluation (Figure 1) confirmed damage to #34 due to close approximation of the implant with the root,

loss of mandibular right implant (Figure 2), incompletely seated abutment on #35 implant, grossly carious #34. Due to loss of faith on the first dentist, he consulted a second dentist who removed the fractured prosthesis and extract the fractured and periodontally compromised teeth.



**Figure 1:** Orthopantomogram-Injury of an adjacent tooth by a malpositioned implant.

Keeping in mind the patients concerns and desire to have a well retained and stable prosthesis with good masticatory efficiency and the reluctance not to have an implant supported prosthesis due to earlier complications, and also not to stop smoking, the remaining teeth were saved and a tooth implant retained prosthesis was planned.



**Figure 2:** Orthopantomogram showing lost right implant and incompletely seated abutment on the premolar implant.

## Clinical Procedure

The remaining mandibular anterior teeth (Figure 3) were prepared after endodontic therapy and metal copings were fabricated for the selected favorable abutments (canines). The root canals of the abutments were prepared in a sequential manner using three drills (Figure 4) supplied with stud attachments (Preci-Clix Radicular RC, Ceka attachments Preciline, Alphadent NV, Waregem, Belgium) to receive the radicular post. The metal copings were cemented (Figure 5) using dual cure resin cement (allcem, FGM, Brazil) to protect the abutment from caries and fracture.



**Figure 3:** Intraoral view after extraction of periodontally compromised teeth and RCT of remaining teeth.



**Figure 4:** Preci clix attachment system.



**Figure 5:** Metal coping cemented on the abutment.

The stud attachment radicular post was cemented with dual cure resin cement (Allcem, FGM, Brazil) after etching and application of the bonding agent. The luting agent was properly applied on the radicular post and the remaining cement was placed in the canals with Lentulo spiral. The radicular post was then placed slowly into the canal in a rocking motion to minimize the hydrostatic pressure build up in the canal which prevents the proper flow of the luting cement, resulting in an inferior bonding. After the placement of the RC Post (Figure 6), the resin cement which extruded was carefully placed around the base of the stud attachment.

The primary impression was made with putty consistency polyvinyl siloxane (Aquasil soft putty/regular set, Dentsply, Germany) and a secondary impression was made over the same, using the light body polyvinyl siloxane (light body, Aquasil LV, Dentsply, Germany) after the cementation of the stud attachment. The analogues of the stud attachment were placed in the impression and a working cast was obtained after pouring the impression (Figure 7).



**Figure 6:** Stud attachment cemented with resin cement.

The working cast was duplicated and the prosthesis was fabricated at the determined vertical dimension and centric relation on the duplicated cast. The black 'O' ring spacers were then placed over the ball abutments on the master cast which prevent the direct contact between metal housing and tooth and also block the undercut of the ball attachment.



Figure 7: Master cast with analogues.

The metal housing was then loaded with the desirable polyacetal retention rings which are color coded depending on their retention quality. (Yellow-normal retention, white-reduced retention and red provides increased retention). The selected retention ring (yellow) was inserted into the metal housing with the help of specially designed insertion tool.

The retention ring (female clix) with metal housing was snapped on each ball abutment on the cast (Figure 8) and a hole was cut in the denture base exactly above each ball abutment with a round carbide bur (Figure 8). The hole was enlarged to create a window good enough to accommodate the metal housing over the ball abutment with no contact between the metal housing and the denture base. The denture with window over the metal housing was again inserted and verified for any contact between metal housing and denture base.



Figure 8: Mandibular denture with windows over metal housing.

The undercuts around the attachment assembly was blocked out with light body addition silicone (Aquasil LV, Dentsply) carefully to ensure that the acrylic may not flow into the undercut during incorporation of metal housing into denture base. This may result in locking of denture, making its removal difficult.

The self-cure acrylic resin was mixed according to the manufacturer instructions and applied over and above each metal housing as well as inside each window in the denture base. It was ensured that the external retention ridge on the outer surface of the metal housing was completely covered with the acrylic. The denture was then placed with great care on the cast to avoid any movement of the metal housing. After the acrylic was set, the denture was removed and the small voids surrounding the metal housing were filled with acrylic (Figure 9). The denture was finished, polished and delivered to the patient after the necessary occlusal adjustments (Figure 10).



Figure 9: Intaglio surface of denture showing retention cap with metal housing incorporated within denture base.



Figure 10: Final prosthesis in occlusion.

## Discussion

Professionally, there can be no greater pleasure than to experience the satisfaction and gratitude of the patients rehabilitated through the use of techniques and skills offered by modern dentistry. Often the hopes and aspirations of many patients, desperate to be helped for better dental health and fitness, are dashed by those in the profession who are unable to come to the terms with the demands of the modern dentistry.

Implant dentistry is unique as it provides additional foundation units for desired Prosthodontic results. Therefore, both the psychological and anatomical needs and the desires of the patient should be determined and a prosthesis that satisfies these goals and eliminates the existing problems should be designed. Hence, diagnosis and treatment planning are the most important steps of the entire implant therapy, determining the success or failure. Inadequate treatment planning might compromise the final treatment outcome. The final design of the implant prosthesis should be in the mind of the implant placement surgeon before the actual placement of the implants.

The failures of the implants which are multifactorial can occur, In spite of the high success rate. Chronic smoking is one of the relative/ absolute contraindication for the placement of the implant depending on the frequency of the smoking. Smoking reduces local blood flow by increasing peripheral resistance and increased platelet aggregation. This along with the smoking byproducts such as hydrogen cyanide and carbon monoxide inhibit wound healing, as does nicotine, which inhibit cellular proliferation. Smoking may interfere directly with osteoblastic function, and strong evidence exists of decreased, bone formation in smokers. In addition, smokers have a significant reduction of bone mineral content. Bone mineral density can be reduced to 2-6 times in chronic smokers. Overall, smoking may continue to poor available bone quality and poor healing capacity resulting from vascular and osteoblastic dysfunction.

So, Smoking may represent a relative contraindication because of the risk of wound healing, infection and resorption, and a reduced probability of osseointegration. So it is strongly recommended that if a decision has been made to place implants, then patient must refrain from smoking at least 15 days before surgery (the time it takes for nicotine to clear systemically) and 4 to 6 weeks after surgery.

The failure might also occur due to damage of the adjacent tooth due to improper axis of implant insertion or placement of excessively large diameter implant [3]. The damage of an adjacent tooth by implant placement may cause the tooth to become non-vital, and the tooth may require subsequent endodontic treatment. This will not only result in damage to an adjacent tooth but also in implant failure [4]. To avoid the failure of the implants in ideal clinical conditions due to improper placement of the implants, the use of surgical guides, radiographic analysis and CT scan to locate the exact location of implant placement, thereby avoiding damage to adjacent tooth is highly recommended [5]. The angulation of adjacent teeth and dilacerations of roots must be radiographically assessed prior to implant placement. Dilacerated roots and excessive tilting in the mesiodistal direction that invades the implant space often prevent ideal placement [6]. Discrepancies between the apical and crestal interdental spaces as a result of mesial or distal tipping of the roots must be corrected orthodontically before implant placement.

The failures which occur due to incompetence and negligence of the implant placement surgeon might force the restorative dentist to explore the other treatment options for the successful rehabilitation of patients with failed implant supported prosthesis in partially edentulous patients. Saving some of the periodontally sound teeth in patients with failed implants and fabricating a stud attachment retained overdenture is a viable alternative for the functional rehabilitation of such patients.

The stud attachment retained denture have excellent retention and stability, decreased trauma of underlying soft tissues, improved mastication and minimum interference in speech. Due to presence of root stumps, proprioceptors present in periodontal ligaments, provide an awareness of jaw space relationship and protection from accidental injuries on over closure of the jaws and also decreased alveolar bone resorption [7].

The success of stud attachment retained prosthesis depends on proper diagnosis and treatment planning which requires a thorough clinical and radiographic examination, selection of favorable abutments for their placement and evaluation of interarch space for the selection of the attachment. Stud attachments are usually retained by means of posts. Since they would be subjected to considerable displacement forces during removal of the prosthesis, greater care must be taken to ensure that they are sufficiently retentive [8]. Careful preparations of the root canals with corresponding size drills supplied with attachment is very important. A well prepared post space should resist removal by the denture without the aid of cement [9]. The adhesive chemically or dual cured resin luting cement should be used for the cementation to further resist any dislodgement by the prosthesis.

Evaluation of inter arch space for the selection of stud attachment (consists of a radicular post with ball attachment) is one of the critical step for the success of stud attachment retained overdenture. Sufficient inter arch space must be present (more than 12 mm) to accommodate ball attachment, metal housing, denture base and space for arrangement of teeth with required inter occlusal gap/closest speaking space. If insufficient inter arch space is present, metal housing might get exposed and continuously come in contact with the opposing teeth, resulting in trauma, pain and tenderness of the abutments, which might later on require removal of the post and even extraction of the tooth.

Precision attachments have been largely ignored by the dental professionals in the past due to inadequate knowledge and cost but an increase in the popularity of the implants, have brought a concomitant increase in the popularity of precision attachments. These attachments can be used for both implant and tooth supported prosthesis. The dental surgeon must familiarize himself with precision attachments to add a new dimension to the treatment options.

## Conclusion

An organized treatment approach based on the clinical conditions and desires of the patient is very important to achieve predictable results with implant supported prosthesis but failure of the implants due to negligence and incompetence of the surgeon forces the restorative dentist to think about other options. Saving the natural teeth and fabricating stud attachment prosthesis with retention and stability similar to an implant supported prosthesis is a viable alternative. The dental surgeon must familiarize himself with precision attachments to add a new dimension to the treatment options.

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