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# PROSTHETIC MANAGEMENT OF MECHANICALLY FAILED OSSEOINTEGRATED IMPLANT IN ESTHETIC ZONE: A CASE REPORT

Prosthodontics

**Dr. Srishti Garg** BDS, MDS, Post graduate student, Department of Prosthodontics & Crown and Bridge and Oral Implantology, ITS Dental College Hospital & Research Centre , Knowledge Park III, Greater Noida, UP.

**Dr. Anju Aggarwal*** BDS, MDS, Reader, Department of Prosthodontics & Crown and Bridge and Oral Implantology, ITS Dental College Hospital & Research Centre , Knowledge Park III ,Greater Noida ,UP*Corresponding Author

**Dr. Tushar** BDS, MDS, Post graduate student Department of prosthodontics, ITS Dental College Hospital & Research Centre ,Knowledge Park III , Greater Noida ,UP

**Dr. Punit RS Khurana** BDS, MDS, Professor & HOD, Department Of Prosthodontics, ITS Dental College Hospital & Research Centre ,Knowledge Park III,Greater Noida ,UP

## ABSTRACT

With the growing use of dental implants, the incidence of implants failure rate increases. Late treatment complications, after reaching full osseointegration and functionality, include mechanical failures, such as fracture of the implant and its components. Those complications are deemed severe in dentistry, often considered as rare, and therefore seldom addressed in the clinical literature. The introduction of dental implants into clinical practice fostered a wealth of research on their biological aspects. Cold welding is a very useful mechanical effect in dental implant therapy when abutments are fixed. However, this effect may cause very challenging situation for the clinicians when occurring in the 'wrong place, wrong time.' The incidence of cover screw complications was reported to range 0.5%-8%. Some manufacturers offer so-called retrieval kits, in some cases, these are very time-consuming and not always effective, and when the complication occurs, the planned dental implant therapy could be in danger. This article summarizes a case report when the conical connected cover screw was affected from cold welding was managed "Sleeping Implant Concept."

## KEYWORDS

Implant failure, Cold welding, Sleeping implant, Mechanical failure

## INTRODUCTION

The goal of modern dentistry is to restore the patient's oral health to normal contour, function, aesthetics and speech.[1] The era of dental implants have ushered in a new treatment concept where the patients no longer have to use removable dentures, or sacrifice healthy adjacent teeth. The success and predictability of osseointegrated implants have forever changed the philosophy and practise of dentistry.[2]In the late 1950's, Per Ingvar Branemark, a Swedish professor who predictably achieved an intimate bone to implant apposition that ordered sufficient strength to cope with load transfer. He called this phenomenon "osseointegration".[3] A report published by the American Dental Council on Scientific Affairs recognized a consistently high rate of success in human clinical trials. Trials spanning from three to 16 years involving over 10,000 dental implants had an overall mean survival rate of 94.4% with a range between 76% to 98.7%.[4]However, dental implants have some complications as well. Implant complications are categorized into two groups of mechanical and biological complications. According to Jung et al, peri.implant mucosal lesions are the most common biological complications while the abutment or occlusal screw loosening, fracture of the implant body or prosthetic components, degradation of the luting cement, and fracture of the veneering are the most common mechanical complications.[5] Fracture of implant components is rare with a prevalence rate of 0.4% to 2% over a 5.year period. It more commonly occurs in the posterior region in partially edentulous patients[6] and can be due to material flaw, poorly fitted prosthetic framework, acute trauma, screw loosening, and chronic mechanical and physiological overload.[7-9]Cold welding refers to an increase in the loosening torque with respect to the tightening torque, which complicates the abutment retrieval.[10] Cold welding occurs as the result of bone debris and dried blood remaining on the surfaces of implant components such as the abutment screw and implant hex; the blood fibrin serves as a glue.[11]

Various methods have been introduced for easy retrieval of the retained component without damaging the internal surface such as ultrasonic tool under a liquid coolant, dental extraction forceps, casting self made screwdriver, drilling instruments, submerging implants, or complete implant removal.[9-11]In clinical reports and reviews, occlusal overload has been suggested as a major factor contributing to peri-implant bone loss and even implant failure (Adell et al. 1981; Lindquist et al. 1988; Naert et al. 1992; Quirynen et al. 1992; Kim et al. 2005). Sleeping implants are submerged and thus not in contact with the microbiota of the oral cavity, plaque-related inflammation cannot occur along them. Moreover, as these implants are not in function, they are not subjected to the same loading forces as the ones who retain a denture.[12-14] The aim of this case report was to describe a technique to manage the cold welded cover screw of dental implant by **"SLEEPING DENTAL IMPLANT CONCEPT".**

## CASE REPORT:

A female patient named Shashi Aggarwal and age 65 yrs reported to the Department of Prosthodontics and Crown & Bridge and Oral Implantology for the prosthetic rehabilitation of Implants(Fig 1). On clinical and radiological examination implants were placed in the Department of Periodontics and Oral Implantology about 3 months ago. The patient had a medical history of Epilepsy and Hyper tension. The patient was under 100 mg Alzepam b.i.d and 50 mg Tenromin q.d.

## CLINICAL EXAMINATION:

On intraoral examination, missing teeth were 31,32,33,41,42 and implant (ADIN Dental implant) placed irt 32,33,41,42. Second stage surgery was already performed irt 33,41,42(Fig 2). Intraoral examination also revealed poor hygiene status with deposits and calculus and gingival recession. Patient also had hyper salivation.

## RADIOLOGICAL EXAMINATION:

On radiological examination, Implant (ADIN Dental Implant) was placed #32(3.5*8 mm), #33(4.25*10 mm), #41(3.2*8 mm) and 42(3.2*8 mm).(Fig 3-4)

The bone around the implants was osseointegrated with no sign of radiolucency or pain.

The main concern was the Dental implant placed #32, the cover screw was not unscrewing at the time of second stage surgery, due to cold welding of the cover screw. Cold welding is a very challenging situation due to the high risk of the internal thread damage. Causes for cold welding may be various: nonvisible defect of the cover screw, overtorquing during inserting the screw, but the false direction of unscrewing may also cause cold welding. Unfortunately, in this case,

we also could not unscrew the cover screw.

So we formulated the treatment plan for keeping the #32 implant as "SLEEPING IMPLANT"(Fig 4). After a detailed discussion on the risks, benefits, alternatives, costs and treatment time, the patient was explained about the failure of the implant and that the implant will not be included in the Prosthetic Treatment Plan.

**PROSTHETIC PHASE:**

The healing abutments were removed, and impression copings placed #33, #41, # 42(Fig 5). Radiographic verification (Fig 6) of seating of the impression copings was performed which was followed by splinting of impression coping with pattern resin (GC AMERICA PATTREN RESIN) (Fig 7). Final implant level impressions were made with PVS material using a heavy (Dentsply Aquasil Soft Putty) and light (Dentsply Aquasil Ultra LV) body wash technique, to capture implant positions(Fig 8).

The impressions were sent to the lab and jig trial was made on the master cast. The jig trial was verified by radiographs (Fig 9-10).

Once, the jig trial was verified intraorally via radiographs, then the prefabricated stock abutment were placed onto the implant side on the cast. They were checked for parallelism.

In #33 $15^0$ angulated, #41 and #42 straights abutment were selected.

The final prosthesis was a cement retained porcelain fused to metal prosthesis. The abutment screw was then tightened in force equal to 10, 20 N cm, and finally 30 N cm(Fig11-12). The prosthesis (Fig 13) was first checked for the passive fit. Cotton pellet was placed over the screw head of the abutment, and the prosthesis was cemented with resin cement(3M ESPE RelyX U200), keeping in mind that there is no excess cement.(Fig 14-15)

Prosthesis was then checked for the esthetic appearance, and functional adaptability to the patient's occlusal scheme(Fig 16).

**DISCUSSION**

Failures and complications with implant and implant components as well as with material of prosthesis result in frequent repairs and remakes. Mechanical complication and fatigue of implant components is considered a sequel of biological overload.[14-15]

The connection between abutment/healing cap and implant is termed as screw joint. The screw is a simple machine that has been used for centuries and follows the mechanics of a spiral ramp and is highly efficient. Tightening of the screw creates the tension in the screw to retain the components together. This friction fit is necessary to preserve the integrity of two components. The pretightening has been referred to as preload. Preload is the initial load created by the application of a torque and causes elongation of screw. Preload places the screw intention and leads to an overclamping force between the healing cap and the implant. Large magnitude of the preload have been seen to cause plastic deformation or permanent change in the material, at which point the screw is no longer retrievable referred to as cold welding.[17]

Cold welding is defined as the increase in loosening torque with respect to tightening torque which will result in lack of retrievability. This is due to increased resting friction and stress generation between implant and screw.[17]

The amount of torque suggested by manufacturers for healing cap range from 5 to 15 Ncm and a torque wrench is required to attain a consistent torque value. Torque wrench provided by different companies is not completely accurate and components may corrode after autoclaving multiple times, which may increase torque applied to screw joint.[18]

For this case, instead of going for second surgical procedure, the logical treatment plan was to keep a SLEEPING IMPLANT, free of loading forces.

**CONCLUSION**

While the manual retrieval of cover screw removal failed, analyzing the risk-benefit ratio, and the wish of the patient to avoid second surgical site of the implant, we decided to not touch the implant. Even for a practicing clinician facing complications in the management of cover screw removal may be very challenging. Submerged, unloaded implants to the fact that the amounts of bone loss mentioned are indeed negligible. This method was safe, cost-effective, and not time consuming. Therefore, we suggest this method only in cases where there is complete osseointegration.

**Fig 1: Preoperative view**

**Fig 2: Intraoral view after second stage surgery**

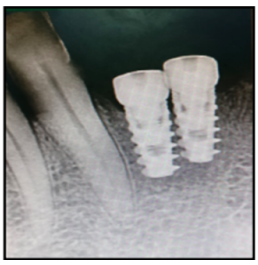

Fig 3: IOPA of implant #41 and #42

Fig 4: IOPA of implant #32 and #33

Fig 5: Intraoral view impression coping placed #32,#41,#42

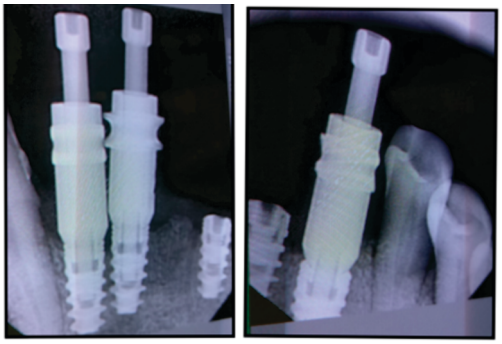

Fig 6: IOPA of transfer coping #32,#41,#42

Fig 7: Splinting of impression coping via Pattern resin (GC AMERICA PATTREN RESIN)

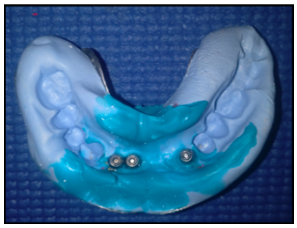

Fig 8: Final implant level impression via PVS Impression material(Dentsply Aquasil Soft Putty+Dentsply Aquasil Ultra LV)

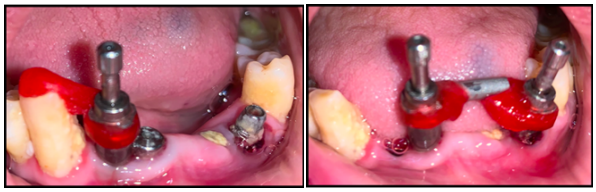

Fig 9: Jig trial #33, #41, #42

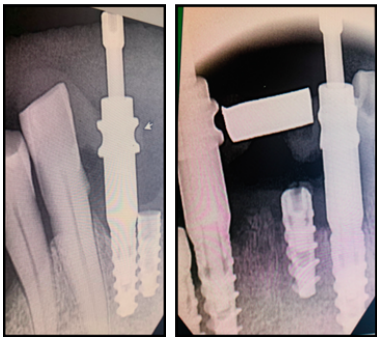

Fig 10: IOPA verification of Jig trial #33, #41, #42

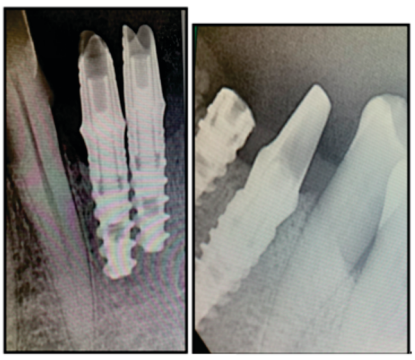

Fig 12: IOPA verification of placement of prefabricated abutments #33, #41, #42

Fig 11: Placement of prefabricated abutments #33, #41, #42

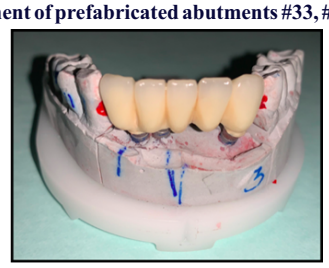

Fig 13: Final PFM Cement retained prosthesis on master cast

Fig 14: Facial view of Implant prosthesis after cementation

Fig 15: Lingual view of Implant prosthesis after cementation

Fig 16: Postoperative Extraoral view

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