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MANAGEMENT OF MECHANICAL COMPLICATIONS IN IMPLANT SUPPORTED OVERDENTURE

Dental Science

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ABSTRACT

Even though implant is consider as successful and predictable treatment modality to rehabilitate partially and completely edentulous patient, failures do occur with this form of treatment.one of common mechanical failure associated with implant supported prosthesis is fracture of implant abutment screw.fracture fragment remaining inside implant renders the implant and prosthesis useless. This case report describe a procedure of retrieval of fractured implant abutment screw fragment so that same implants can be utilize for further prosthetic rehabilitation

KEYWORDS

Abutment screw, Fracture, Dental implant

INTRODUCTION:

Dental implants are a preferred and predictable treatment modality for rehabilitating partially and completely edentulous patients. With comprehensive surgical and prosthetic planning, optimal placement and proper maintenance, dental implants have been reported to have high success rate.[1]

In treatment of completely edentulous patient, implant supported overdentures offer a simpler and more cost effective solution than implant-supported fixed prosthesis.Van Steerbergh proposed two implant supported overdenture in edentulous mandible.He reported 98% success rate in 52 months. Atterd et al also reported 100% cumulative survival rate of over dentures at 15 years with longevity of prosthesis being 10.39 ± 5.59 years. However, despite high survival rates, biological and mechanical failures and complications may occur.[2]

Berglundh et al reported a 4-10 times higher incidence of prosthetic complications with implant-supported or implant retained overdentures in comparison to implant fixed prostheses. The following complications were reported (listed in order of frequency): overdenture loss of retention or adjustment (30%), clip or attachment fracture (17%), overdenture fracture (12%), opposing prosthesis fracture (12%), acrylic resin base fracture (7%), prosthesis screw loosening (7%), abutment screw loosening (4%), abutment screw fracture (0.5-8%), and implant fracture (1%).[3] Successful management of these complications is challenging task for the restorative dentist.

An abutment screw fracture is one of the common complication and to salvage the implant and re-establish the restoratibility, retrieving the fractured fragment is critical. It is also crucial to eliminate all causative factors which were responsible for previous failure of treatment.
This case report describes the prosthodontic management of implant supported overdenture with a fractured abutment screw.

CASE REPORT

A 60 year male patient presented to the Department of Prosthodontics and Crown and Bridge,Terna dental college,Navi mumbai with chief complaint of ill fitting lower implant denture. Patient reported using the implant dentures for about 3 years.He reported loss of attachements,one after the other over a period of about 2 months Clinical examination revealed two implants in mandibular lateral incisor regions with fractured stud attachment/abutment screws.(figure 1)IOPAs confirmed Fractured apical part of the abutment screw below the level of internal hex.(Figure 2)

Figure 1:pre-operative intra oral photograph

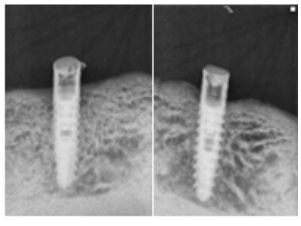

Figure 2:IOPA showing fractured abutment

Patient was informed about the clinical situation and its implications.He was presented with following treatment options.

1) Fabrication of a simple conventional complete denture over the present sleeper implants.
2) Retrieval of fractured screw, replacement with new attachments on the same implants and fabrication of new prosthesis
3) Explantation of the implants, placement of new implants and fabricating a new prosthesis.

Patient opted for retrieval of fractured screw and replacement with new stud attachment and fabrication of new implant supported overdenture.

Commercially available Easy screw retrieval(ESR) kit(Osstem implant systems,Korea)was used to successfully retrieve fractured fragment.(figure 3)

Figure 3:Screw retrieval kit

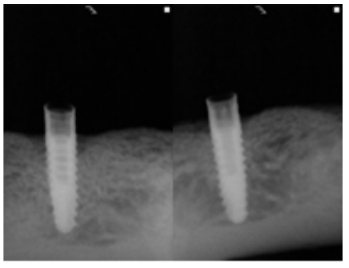

Figure 4: post screw retrieval IOPA

Prosthetic rehabilitation was planned with implant retained overdenture.(figure 4-10)To better manage the stresses and to prevent further complications, following changes were made from the previous prosthetic design.

(1) A cast framework was fabricated in Cobalt chromium using CAD-CAM technique and incorporated in the denture base.[11](figure 5)

Figure 5: Metal framework

(2) To minimize effect of dislodging horizontal forces and improve denture stability,bilaterally balanced occlusal scheme was chosen[6](figure 6)

Figure 6: Mandibular denture with balanced occlusion

(3) The ball attachment(Uniti™ Equinox Medical Technologies,B.V.) of specific dimension were chosen according to prosthetic space analysis(figure 7)and torqued as per the manufacturers recommendations.

Figure7: prosthetic space analysis

(4) The silicone replica technique was used to check the integrity of internal threads and complete seating of new abutment screw was radiographically verified.[9](figure 8,9)

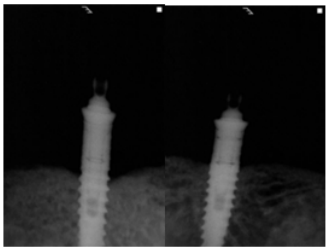

Figure 8:checking integrity of internal threads by seating new abutment screw

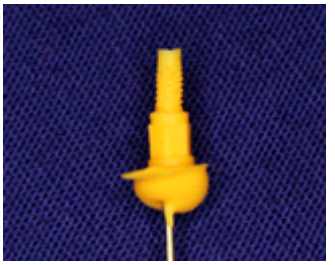

Figure 9: Bernese silicon replica technique

(5) The Female components (metal housing & o-ring) were picked up chairside using autopolymerizing resin.(DPI Pvt Ltd) .The occlusion was refined and the denture delivered.(figure 10)

post treatment maintenance instructions & recall schedule was explained to the patient. SEM analysis was performed to evaluate probable cause of failure of screws. Fractography revealed possibility of inherent manufacturing defect in retrieved screw.(figure 11 a,b)

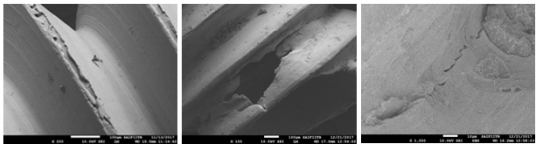

Figure 11 (a)SEM analysis of fractured screw

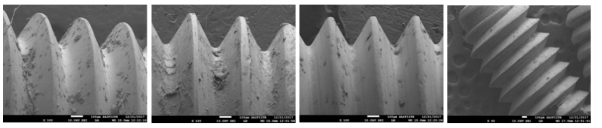

Figure 11 (b) SEM analysis of random unused screws

DISCUSSION

Conventional complete dentures have been the standard option of care for more than a century.[1,8,10] Complete denture wearers are usually satisfied with the maxillary denture but the majority of them often struggle to eat with the mandibular denture because of the lack of retention. In the treatment of edentulous patients, Mc Gill's consensus recommends use of two mandibular implants as the minimal standard of care.[10]

As the patient population, able to benefit from implant therapy increases, the clinician is faced with increasingly complex situations. Though the success rates reported with this form of therapy are relatively high, failures do occur. Hence, a thorough knowledge regarding the various aspects of failure & it's management is deemed necessary.[1]

Common mechanical problems can be related either to the implant or prosthetic components.The number, position, dimension, and design of implants, as well as the design of the prosthesis, are critical factors to be considered during the treatment planning phase. Mechanical failures due to the fracture of implant components have been reported to occur more frequently in the posterior region and in partially dentate

patients compared to completely edentulous patients.[5]

The abutment screw fracture presents a rare, but quite unpleasant failure.The remaining fragment may render the implant and prosthesis useless.

Using commercially available screw retrieval systems as presented here is a simple and predictable way of bail out than free hand retrieval.The sleeves help in guiding the bur/drill and protect the hex and internal structures within the fixture. After successful retrieval of fracture screw, integrity of internal implant threads and need for retapping is checked with Bernese silicon replica method and complete seating of new attachment is confirmed radiographically by seating new attachment.[9]

Some of the complications inherent in the utilization of implant components,which cause screw fracture can be the unrecognized loosening of the screw aggravated by nonaxial movements during prosthetic loading, culminating in the fracture.

Analysis for fractured abutment screws in the present case revealed the following probable causes

1) Unbalanced forces on denture due to uneven occlusal plane of existing natural maxillary teeth leading to non axial stresses on implants- attachment interface.
2) Flexural forces on acrylic prosthesis, which lead to excess bending load at implant abutment interface.
3) Inadequate application of torque which can lead to screw loosening and continuous use of prosthesis after screw loosening might have resulted in fracture of screw.
4) Improper selection of attachment could be another factor responsible for failure of prosthesis.
5) Inadequate space for prosthetic components can result in an overcontoured prosthesis, excessive occlusal vertical dimension, fractured teeth adjacent to the attachments, attachments separating from the denture, fracture of the prosthesis and overall patient dissatisfaction.

Thus to prevent complication with new implant supported overdenture certain measures were incorporated. Prosthetic space evaluation was done to select optimum attachment dimension and to reduce possibility of fracture of implant component or prosthesis.CAD/CAM fabricated metal framework was incorporated in prosthesis to reinforce the denture and prevent deleterious effect of flexural forces. Rigidity of the denture will reduce the flexural forces thus reducing the chances of abutment screw loosening.[11] Further to minimize amount of non axial dislodging horizontal forces and improve denture stability ,bilaterally balanced occlusal scheme was chosen.[6]

Application of the correct torque to an implant screw is translated into a preload that holds the components together.Manufacturers instructions were followed while torquing the abutment screw.Retightening an abutment screw 10 min after the initial torque applications was performed to improve stability of implant abutment interface and to decrease the possibility of the screw becoming loose.[12]Routine post treatment maintenance & follow up visits are extremely important for long term prognosis of prosthesis.

An SEM imaging of fractured stud attachment was done. Along with it random unused samples of stud attachment of same and four different manufacturers was also done to compare the surfaces.Surface imperfections are noticed on at least one of the attachments. Machining errors at the manufacturers level may lead to the loss of the initial preload applied.

Theses surface imperfections can lead to improper torque, screw loosening and failure of the implant prosthesis.[13] The above finding leads to important question about the maintenance of manufacturing standards of implants and prosthetic components. With the growing popularity of dental implants around the world there is mushrooming of implant companies and a few trying to manage the competitive edge by making the treatment cost effective. Important question is, if with the increasing number, the basic standards of the implants and components are being monitored by the manufacturers or a governing body? Any compromise at the production level will lead to more failing cases, but only this, time with factors not in control of the treating clinician. Thus it is important in our efforts to give better quality care with dental implants, quality of manufacture of these products should be monitored in a more stringent manner

CONCLUSION:

The burning problem that all the implantologists are confronted today is the complications and failures occurring with the treatment of implants. Abutment screw fracture, although uncommon, occurs in clinical practice. The aim of prosthodontic management is diagnosing etiologies and factors associated with the failures.The identification of causative and related factors can allow early intervention and minimize injury, besides increasing prognosis of prosthesis. To optimize treatment plan careful elimination of causative factors is atmost important. The management of such complications has given rise to scope to decrease failure rate of treatment.

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