JOURNAL OF AERONAUTICAL MATERIALS
ISSN: 1005-5053
Vol. 43, Issue-01, 2023
pp. 1103-1109

MANAGEMENT OF A PERISHED IMPLANT USING CUSTOM TITANIUM POST AND CORE SUPPORTED SPLINTED PROSTHESIS WITH 3 YEARS FOLLOW UP: A RARE CASE REPORT

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Abstract:

Abutment screw loosening and fracture areamong the most serious and prevalent problems associated with the restorative aspect of dental implants. Management of fractured abutment screws is challenging and time-consuming and also poses various degrees of risk to implant and prosthesis, which must be analyzed. Here is a case report of a 22-year-old male patient reported to the Department of Prosthodontics with missing teeth in the mandibular anterior tooth region and a history of root canal treatment. A CBCT scan was taken, revealing adequate bone height and width to place one narrow-diameter implant. The implant was placed, and after successful osseointegration, a screw for the healing abutment fractured during final torquing. Retrieval attempts failed, and the screw hole was used as a channel for custom-fabricated nickel-chromium post and core followed by the fabrication of a metal-free crown, splinted with the adjacent root canal-treated tooth. The internal threads of the implant were eliminated, and a custom post was fabricated using pattern resin and endodontic files. The core build was done extra-orally to avoid any detrimental force on the underlying implant, and the pattern was cast in nickel-chromium alloy. The fit was verified intraorally and luted with resin cement. Tooth preparation of the adjacent root canal-treated tooth was done, and two splinted metal-free crowns were fabricated and luted using resin cement after occlusion adjustments. All interferences in protrusive and lateral excursive movements were eliminated.

Keywords: Fractured abutment screw, perished implant, Custom post & core, nickel-chromium alloy.

Introduction:

Implantology is the most successful treatment for replacing missing teeth, and the success of an implant-supported prosthesis depends on both biological and mechanical factors[1]. Early failures occur immediately after implant placement due to a lack of osseointegration, while late failures occur after prosthetic rehabilitation and a period of function. The two leading causes of late implant failures are biological and mechanical complications. Mechanical issues can arise from the loosening or fracture of prosthetic screws, wear and tear on the prosthesis, or the fracture of various system components. Biological complications occur due to losing supporting tissues from infection or peri-implantitis[1,2].A review of in vivo butt-joint implant studies found that abutment screw or prosthesis screw loosening is the most frequent mechanical complication[3], and recent studies show that abutment screw loosening ranges between 7% and 11%, while abutment screw fracture is relatively rare, occurring in only 0.6% of cases[4]. When a fractured abutment screw occurs, rotating tools can be used to retrieve the fractured screw. However, this method may damage the screw hole's internal threads, making the implant unusable. Clinicians may opt to leave the implant in place and cover it with soft tissue or remove the implant and replace it with a new one[5].Implant component fracture may be caused by biomechanical overload fatigue, improper placing techniques, passive superstructure fit issues, or manufacturing flaws. The fractured end may typically be recovered and replaced with a fresh abutment screw. Rotating tools can be used to retrieve the fractured screw if it cannot be removed cautiously. However, it could damage the screw hole's internal threads, rendering the implant unusable. Clinicians may therefore decide to either leave the implant and cover it with soft tissue or remove the implant and replace it with a new one[5]. This method provides a secure connection between the implant and the prosthesis while avoiding damage to the screw hole's internal threads. Recovering the fractured end and replacing it with a fresh abutment screw is typically the preferred method, but the new technique provides an alternative solution for clinicians facing this issue[5].

This article focuses on a new method for rescuing an implant with a fractured abutment screw. This technique involves using a custom titanium post and core-supported splinted prosthesis.

Case History:

A male patient aged 22 years visited the Department of Prosthodontics, Subharti Dental College, Meerut, complaining about missing teeth in the mandibular anterior tooth region. He had previously undergone root canal treatment in the same area. An intra-oral examination revealed an edentulous area about tooth 41 and root canal-treated teeth in relation to 31, without any prosthesis (Figure 1).

Figure 1. Intraoral photograph showing missing 41 and root canal treated 31

The patient demanded the placement of an implant in the edentulous region, so a CBCT scan was taken which confirmed the presence of adequate bone height and less mesiodistal width (Figure 2).

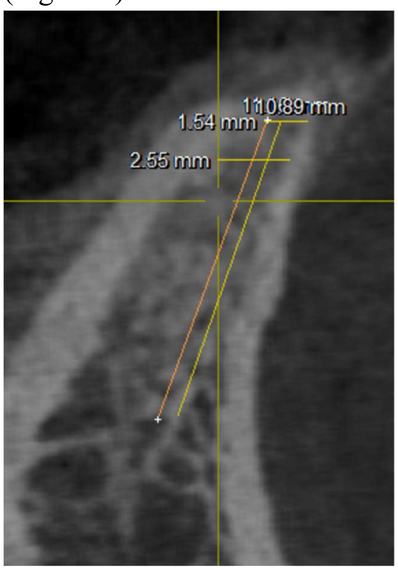

Figure 2. Cross-sectional view of CBCT

Accordingly, a narrow diameter implant of size 2.9mm X 13mm (Bioline) was placed under local anesthesia, and the surgical site was closed using sutures after tightening a cover screw (Figures 3a and b).

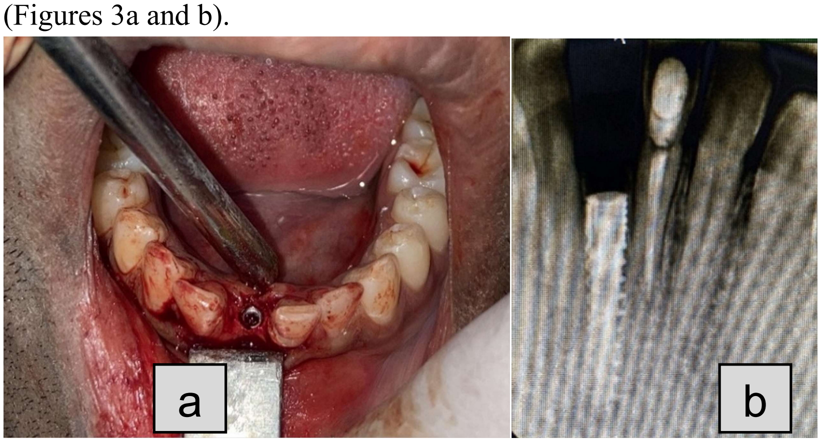

Figure 3 (a and b). Clinical and radiographic images showing the placed implantAfter 15 days, the patient was recalled for follow-up. The implant had successfully osseointegrated after 3 months. During the final torquing of the abutment screw on the day of prosthesis cementation, the screw fractured at the apical third of the abutment channel (Figure 4) but attempts to retrieve it using an ultrasonic scaler tip failed.

Figure 4. Radiographic image showing fractured abutment screw

The patient was unwilling to undergo implant removal to avoid catastrophe and placement of a new implant, so it was decided to use the screw hole as a channel for a custom-fabricated nickel-chromium post and core, followed by fabrication of a metal-free crown and splinting it with the adjacent root canal-treated tooth which was very firm (tooth 31). To eliminate the internal threads of the implant, a tungsten carbide bur at low speed using an electric handpiece was used. Custom posts were made using pattern resin and endodontic files. Once retention was achieved, the core build was done using pattern resin and was prepared extra-orally to avoid any detrimental force on the underlying implant (Figure 5a and b).

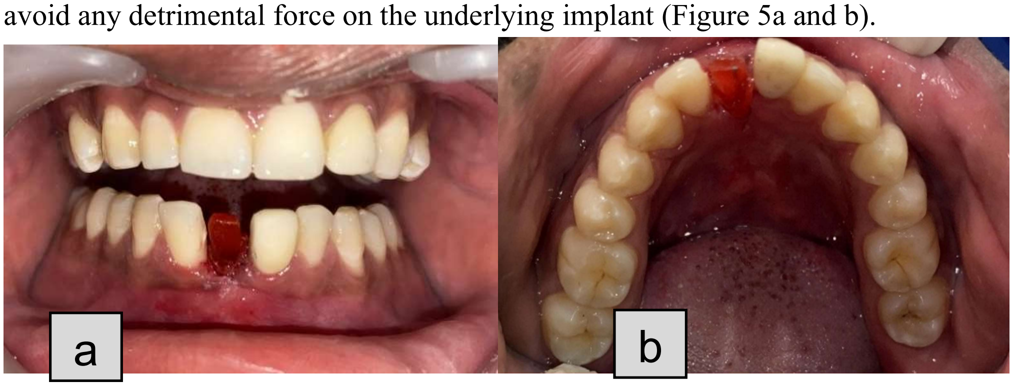

Figure 5(a and b). Intraoral photograph showing custom post and core fabrication

The pattern was then cast in nickel-chromium alloy and verified intraorally before luting with variolink cement (Figures 6a and b).

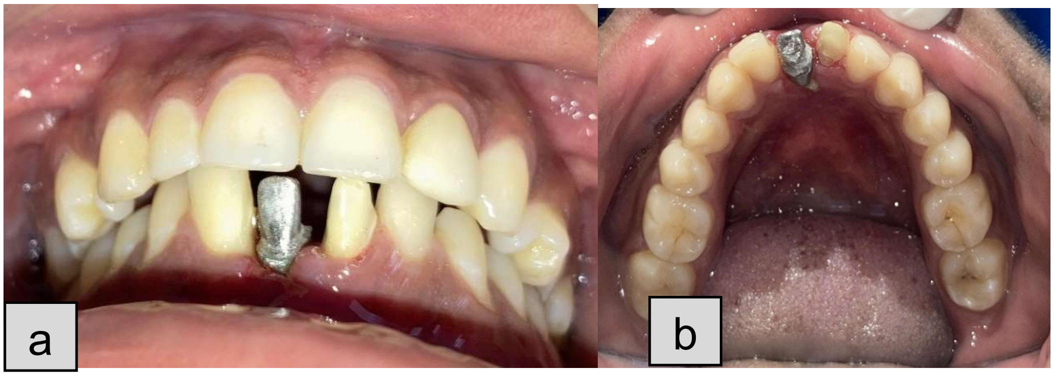

Figure 6 (a and b).Intraoral photograph showing luted nickel-chromium cast post and core

Tooth preparation of the adjacent root canal-treated tooth was done and the final impression was made using polyvinyl siloxane impression material, and two splinted metal-free crowns were fabricated and tried for fit, with occlusion adjusted intraorally. All the interferences in protrusive and lateral excursive movements were eliminated (Figures 7a and 7b).

Figure 7(a and b) Intraoral photograph showing final cemented prosthesis in relation to 31 and 41

An intra-oral periapical radiograph confirmed the fit of the final prosthesis (figure 8).

Figure 8 Intraoral periapical radiograph showing cemented final prosthesis

The patient was scheduled for routine check-ups for a period of three years, during which no issues were detected regarding function or appearance (Figure 9).

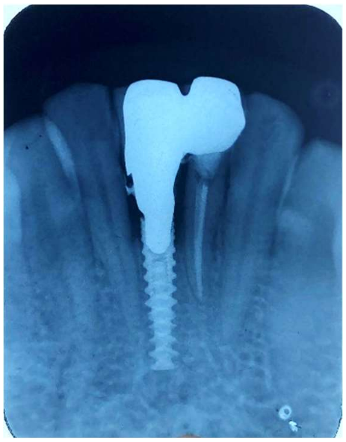

Figure 9 Intraoral periapical radiograph after 3 years of follow up

Discussion:

Due to their ability to serve as a substitute for the restoration of areas where bone loss has occurred after dental extraction, regions affected by periodontal disease, dental trauma or agenesis, reduced space for prosthetic restorations, or limited space between roots, narrow-diameter implants have become a popular option in the field of dentistry[6]. Despite their popularity, narrow-diameter implants have certain drawbacks. In terms of biomechanical performance, these implants are found to be less structurally robust than their standard counterparts[7,8]. In addition, it has been observed that two-piece narrow-diameter implants have a high incidence of mechanical failures, such as prosthetic abutment fractures and screw loosening. The typical torque value for screw tightening has been reported to be 15 Ncm[9].The problem of loosening and fracture of abutment screws is a common issue in dental implant restorations.Fractures of the screws can lead to complications and pose a risk to the implant and prosthesis. To manage a fractured abutment screw, various techniques can be used depending on the location of the fracture[10]. If the fragment is above the head of the implant, hemostats or artery forceps can be used to remove it successfully. However, if the screw fracture is below the implant's head, other procedures or technologies such as drilling a hole and using a removal wedge can be used to extract the broken portion. However, these methods may damage the implant's internal threads and render it unusable.In such cases, a cast post and core-supported prosthesis can save the implant from being unusable[5]. The implant's internal threads can be eliminated, and a custom titanium post and core can be created to fit into the screw hole. The post is then used as a channel to fabricate a metal-free crown and splint it with the adjacent tooth, thus providing a functional and esthetic restoration. In this case, splinting with natural tooth was done because there was no ferrule on the implant crown. In a case report, authors describe a new technique to salvage an implant with a fractured abutment screw. The technique involves using a titanium post and core-supported prosthesis to replace the fractured abutment screw[5].It is important to note that the prevention of screw loosening is crucial in implant restorations. Proper biomechanical design and occlusal management should be considered during the implant placement and restoration process. Regular follow-up appointments and maintenance can also help identify and manage any issues with the implant and prosthesis.

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