CASE REPORT

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Full Mouth Rehabilitation of Failed Implants Prosthesis: A Case Report

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ABSTRACT

Management of implant failures is difficult, especially implant fixture fracture where it is complicated and requires multispecialty care. The aim of this report is to describe the challenges of treatment planning and management of implant fixture fracture with tooth wear on patient with financial constraints. A 67-year-old retired male patient came to the dental clinic with a complaint of a mobile implant-supported fixed prosthesis, fractured implant fixture and attrited lower dentition. Treatment plan was planned around low cost with the biggest benefit of the patient. Multispecialty care is involved such as root canal treatment, implant removal, restoration of remaining dentition and replacement of missing teeth with removable prosthesis. The patient was reviewed after a month of completing full treatment resulted in a good treatment outcome. Lack of maintenance regimen leads to failure and mobility of the implant prosthesis. Proper maintenance protocol, post-insertion instructions, and good patient compliance are the key factors in determining longevity of the restoration.

Keywords: *Composite build-up; fractured implant; full mouth rehabilitation; overdenture; tooth attrition*

INTRODUCTION

Dental implants are one of the common treatment options for the fully or partially edentulous area of the jaw. Dental implants provide prosthetic options such as implant-retained crown, bridge, dentures, implant-supported fixed and removable dentures. Survival and success rates of implant prostheses are dependent on the proper execution of protocols and adequate maintenance by the patient. The correct protocol and maintenance regime that involves loading of the prosthesis after achieving primary stability with a six-month recall period is known to provide a better outcome for the implant (Gulati *et al.*, 2014; Montero, 2021).

Success of dental implants is normally determined by their survival. The criteria of implant success as defined by The American Academy of Periodontology (AAP) in 2000 includes the absence of implant mobility and persistent signs or symptoms, no continuous peri-implant radiolucency, negligible progressive bone loss, and patient or dentist satisfaction with the implant-supported restoration (Iacono, 2000). Implant failures are commonly identified through clinical examination and radiographic assessment and are classified into two categories, namely, the biological and the prosthetic failures (Montero, 2021). The biological aspect involves the peri-implant health and the surrounding structures such as periodontal tissues and bone structures, while the prosthetic aspect involves components of the implant which include implant fixture, abutment, and prosthetic restoration. Both aspects are bidirectional: prosthetic problems would lead to biological problems and vice versa (Montero, 2021). One of the biological and prosthetic complications is peri-implantitis and implant fracture. Peri-implant vertical bone loss concurs with the apical limit of implant fixture, which increases the risk of implant fracture (Gupta *et al.*, 2015).

Peri-implantitis commonly manifests as visual inflammatory changes on peri-implant soft tissue, bleeding on probing and/or suppuration, increased probing pocket depth, and progressive bone loss seen on a radiograph. In contrast to peri-implant mucositis, there is an absence of radiographic bone loss after initial remodelling (Renvert *et al.*, 2018). However, peri-implant mucositis is reversible with the control of optimal biofilm removal (Salvi *et* al., 2012). Peri-implantitis can be managed with complex procedures such as surgical procedures (Prathapachandran & Suresh, 2012), but most cases are challenging to treat, and restoring again with implant supported prosthesis may not be possible owing to the progressive bone loss and financial constraint faced by the patients. The choice for prosthetic replacement in such complex situations may be the conventional acrylic dentures. Hence, this case report is intended to describe the management of peri-implantitis and implant fixture fracture, along with full-mouth prosthodontic rehabilitation on an elderly patient with the conventional acrylic dentures.

CASE REPORT

A 67-year-old retired male patient came to SEGi Dental Clinic complaining of mobile implant-supported fixed denture and discomfort on mastication in relation to the maxillary anterior region. Patient was medically fit and healthy with no prior history of smoking or drinking alcohol habits. Past dental history revealed that the patient underwent implant treatment eight years ago at a private dental clinic.

Basic clinical examination was done for the patient. A clinical (Fig. 1), radiographic examination (Fig. 2) and diagnostic cast of the lower arch (Fig. 3) revealed generalised mild tooth wear (combination of attrition and abrasion), a mobile implant-supported fixed denture on teeth 11 to 25, a complicated fractured crown on teeth 12 and 13, generalised attrition, abrasion on teeth 34, 44, and 45, Glickman furcation grade II on teeth 16 and 37, mandibular Miller grade II gingival recession, peri-implantitis on teeth 11 to 25 and generalised periodontitis stage III grade A. Oral hygiene of the patient was fair. Further periodontal examination was carried out to measure the pocket depth, clinical attachment loss, recession, furcation, and mobility of the remaining teeth.

Orthopantomogram (OPG) was taken to determine the level of bone loss around the dental implants and crown-to-root ratio of the remaining natural dentition. OPG revealed the patient had radiolucency on the coronal part of tooth 13 involving pulp, radiographic vertical bone loss at implant fixture 25 with radiographic horizontal bone loss at both implant fixtures 11 and 23, furcation involvement of both teeth 16 and 37 and generalised bone loss at the middle third level of the lower dentition (Fig. 2).

Fig. 1 The oral condition of the patient during the first visit.

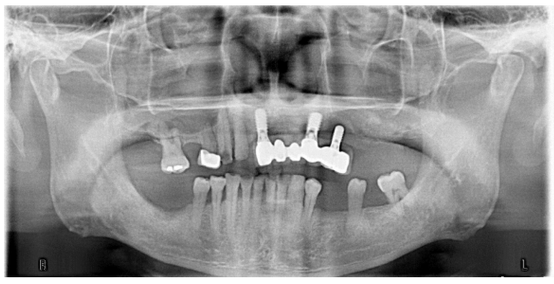

Fig. 2 Orthopantomogram (OPG) of the patient.

Fig. 3 Lower diagnostic cast of the patient.

The clinical treatment objectives of this case were to fabricate a maxillary complete overdenture, a lower partial denture with composite build-up on lower dentition to restore the functionality of the dentition, establish vertical dimension, remove the mobile implant and initiate full mouth rehabilitation. Hence, a treatment plan comprised of several phases (Table 1) was formulated and discussed with the patient with informed consent obtained. Treatment was initiated with Phase I followed up with Phase II, Parts 1 and 2. During Phase 1 therapy, the implant-supported fixed denture fractured in the patient's mouth together with implant fixture on 25, leaving both implant fixtures on 11 and 23 with broken implant collars. Teeth 16 and 37 were extracted after further periodontal assessment and the patient was on periodontal maintenance for a month.

One month later, the patient came back for Phase II Part 1 therapy in which root canal treatment for teeth 12, 13, and 14 was initiated and completed (Fig. 4). The reason for root canal treatment on teeth 12, 13 and 14 is to allow them to be used as overdenture abutments and prepare them into a dome shape. Pulpal diagnosis for teeth 12 and 13 is pulpal necrosis, while tooth 14 had normal pulpal health; the periapical diagnosis for these teeth was normal periapical health. Teeth 12, 13 and 14 do not have any tooth mobility, with an average pocket depth of 1 mm.

Composite (SDI Luna Composite, SDI, Australia) was used to restore the teeth 12, 13 and 14 after endodontic treatment. Next, a trapezoidal flap was raised and surgical removal of implant fixture on teeth 11 and 23, together with extraction of 35 was carried out using a trephine kit (Dentium, Implantium Malaysia Sdn Bhd) and extraction forceps (Fig. 5). Tooth 35 was extracted due to poor crown-to-root ratio and mesially rotated with a lingual undercut, therefore cannot be used as a denture abutment as guiding plane preparation on the lingual of tooth 35 needed to be done to ease the path of insertion of the lower Partial denture. Absorbable collagen hemostat (Collacone®, Botiss Biomaterials, Neodent, Germany) was mixed with the patient's blood and placed in tooth sockets 11 and 23. The flap was repositioned back and sutures were applied. After 10 days, the patient returned for suture removal and uneventful healing of the surgical site was observed. The patient was scheduled to be recalled after one month for stable bone and tissue healing before proceeding to Phase II Part 2.

Table 1 The treatment phases formulated for the present case

Phase	Treatment
Phase I (Initial phase)	• Ultrasonic scaling and polishing • Oral hygiene instructions • Extraction of hopeless tooth 16 and 37 • Removal of implant-supported fixed dentures
Phase II Part 1 (Collaboration for improving, and initial prosthodontic therapy)	• Root canal treatment on tooth 12, 13, and 14 • Non-precious metal coping for tooth 12, 13, and 14 • Extraction of tooth 35 • Surgical removal of implant fixture at 11 and 23 region • Socket preservation with collagen
Phase II Part 2 (Restorative and prosthodontic therapy)	• Permanent composite build up on occlusal lower teeth 34 to 45 (attrited) • Composite and glass ionomer cement restoration on tooth 34, 44, and 45 (abrasion) • Maxillary overdenture • Mandibular acrylic Partial denture
Phase III (Post-treatment care and maintenance)	• Post-treatment denture care and maintenance • Follow up • Evaluation of pocket depth, clinical attachment loss, and plaque index

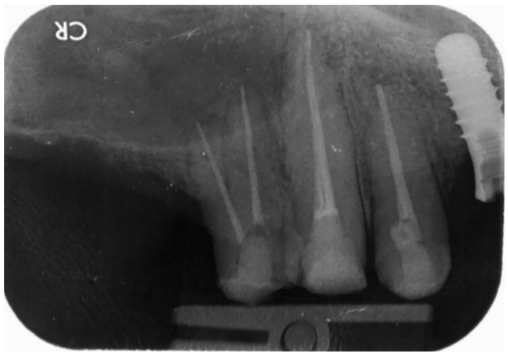

Fig. 4 Teeth 12, 13, and 14 were obturated and restored with resin composite

After one month, the patient was recalled for further treatment. Teeth 12, 13, and 14 were prepared as a dome shape for metal coping using crown preparation burs (Fig. 6). An impression of the prepared teeth was taken using putty and light body addition silicone (Elite HD+ Putty Soft and Light Body, Zhermack). A diagnostic wax-up was done on the lower cast (Fig. 7). The vertical amount of coronal reconstruction in the diagnostic wax up was 1 mm which was decided based on the preoperative vertical dimension at occlusion (VDO) measurements that indicated an increase of freeway space due to generalised attrition.

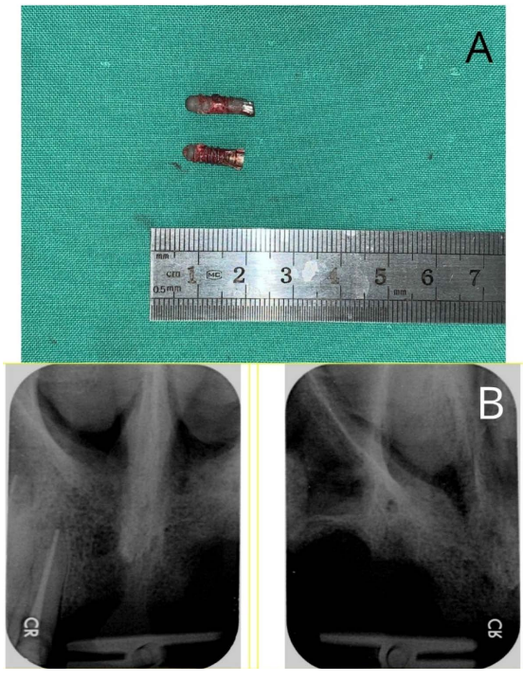

Fig. 5 (A) Both fractured implant fixture was removed surgically while (B) revealed the radiograph of post explantation of both implants.

The patient came for lower anterior composite build-up to replace missing tooth structure and diastema closure on teeth 34 to 45 using medium and dark shade composite (SimpliShade™ Composite, KaVo Kerr, Germany) (Fig. 8). Teeth 34 to 45 were beveled, and sharp edges were removed prior to composite restoration (Figs. 9A and 9B). Medium and dark shades were chosen to match the future denture acrylic tooth shade which is A3, as the original tooth shade was C3 (Figs. 9C to 9H). Glass ionomer cement (GIC) (GC Fuji 2, GC) was used to restore the abrasion of teeth 44 and 45, while medium-shade composite was used for tooth 34. Metal coping was cemented with self-adhesive resin cement (RelyX™ U200, 3M) (Fig. 10).

Afterward, fabrication of dentures was initiated. Jaw relation was recorded by orienting the maxillary occlusal rim to the ala tragus line followed by recording the vertical dimension using the physiological rest position of the mandible (measuring vertical dimension at rest [VDR] and vertical dimension at occlusion [VDO] with 4 mm difference as the freeway space). After achieving the desired VDR and VDO, landmarks such as midline, canine line and smile line of the patient were marked on the occlusal rim. Next, zinc oxide eugenol paste was used as bite registration material. During jaw relation appointment, we also used the physiological rest position of the mandible (VDO and VDR) to determine the vertical dimension needed for maxillary restorative space for the denture. The cast and the occlusal rims were mounted and teeth arrangement was done. The trial dentures were verified and dentures were processed. Gold wire mesh and permanent soft-liner material (Molloplast® B, DETAX) were incorporated onto the maxillary overdenture at the abutment area while a mandibular acrylic Partial denture was incorporated with gold wire mesh only. Dentures were issued afterward followed up with a one-month review (Fig. 11). Any pain and discomfort associated with the denture were rectified during the review; the prosthesis and restorations remained intact.

Fig. 6 Teeth 12, 13, and 14 were prepared to receive coping.

Fig. 7 Diagnostic wax-up of the lower cast.

Fig. 8 Medium and Dark shade SimpliShade™ universal composite used for the anterior build-up.

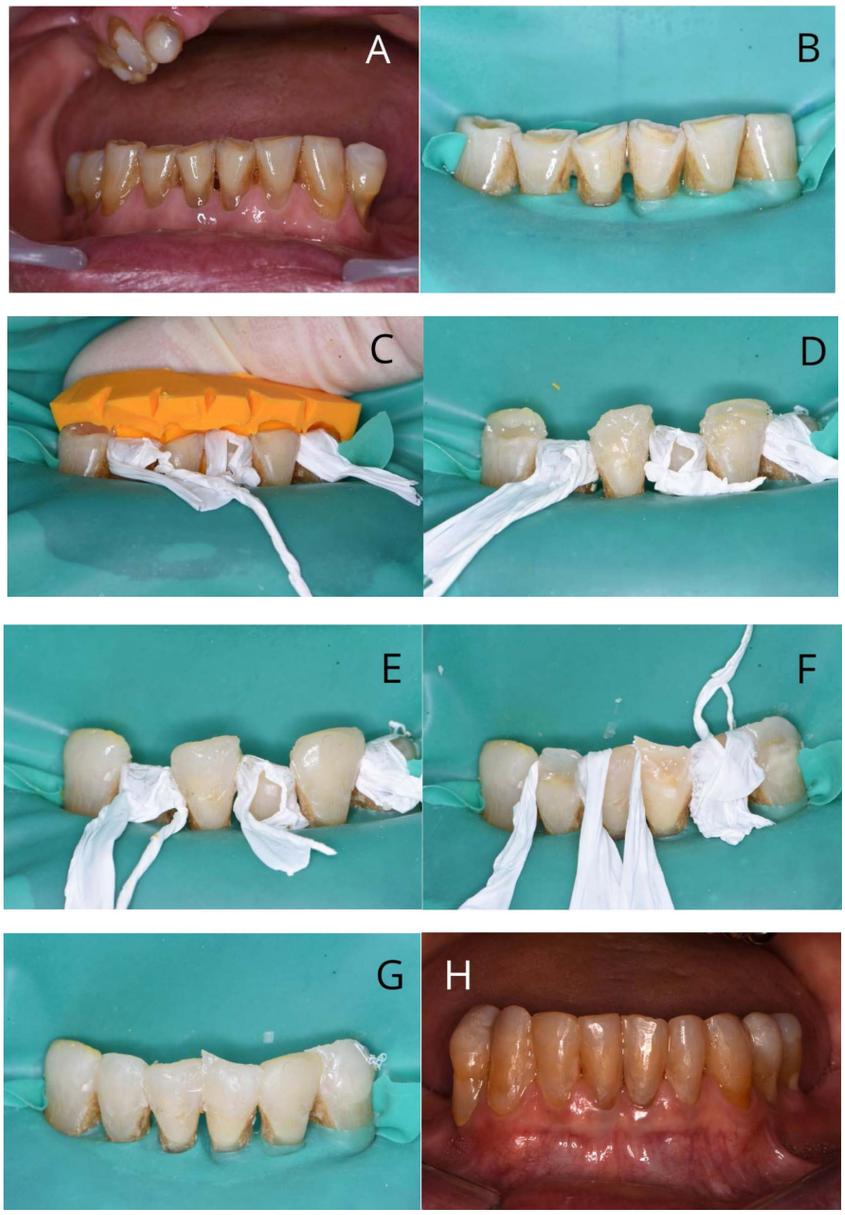

Fig. 9 (A) Clinical view of the lower attrited teeth; (B) After removal of sharp edges and bevelling with quadrant rubber dam isolation; (C) Adaptation of putty index onto the teeth; (D) Palatal wall build-up of teeth 32, 41, and 43 using putty index with Dark shade SimpliShade™; (E) Remaining restoration of teeth using Medium shade SimpliShade™; (F) and (G) used the same procedure as (D) and (E) without using the putty index; and (H) Immediate post-op after gross polishing of composite restoration.

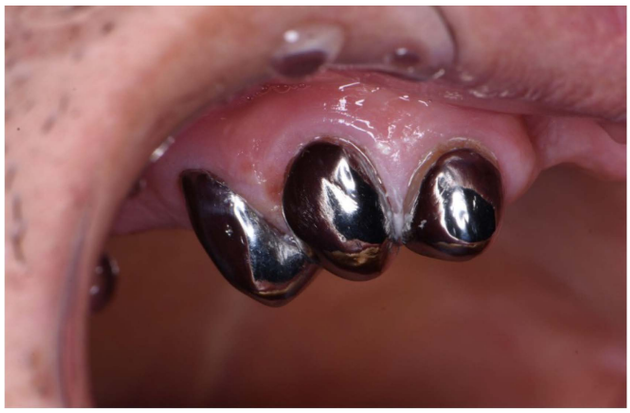

Fig. 10 Post cementation of metal copings onto teeth 12, 13, and 14.

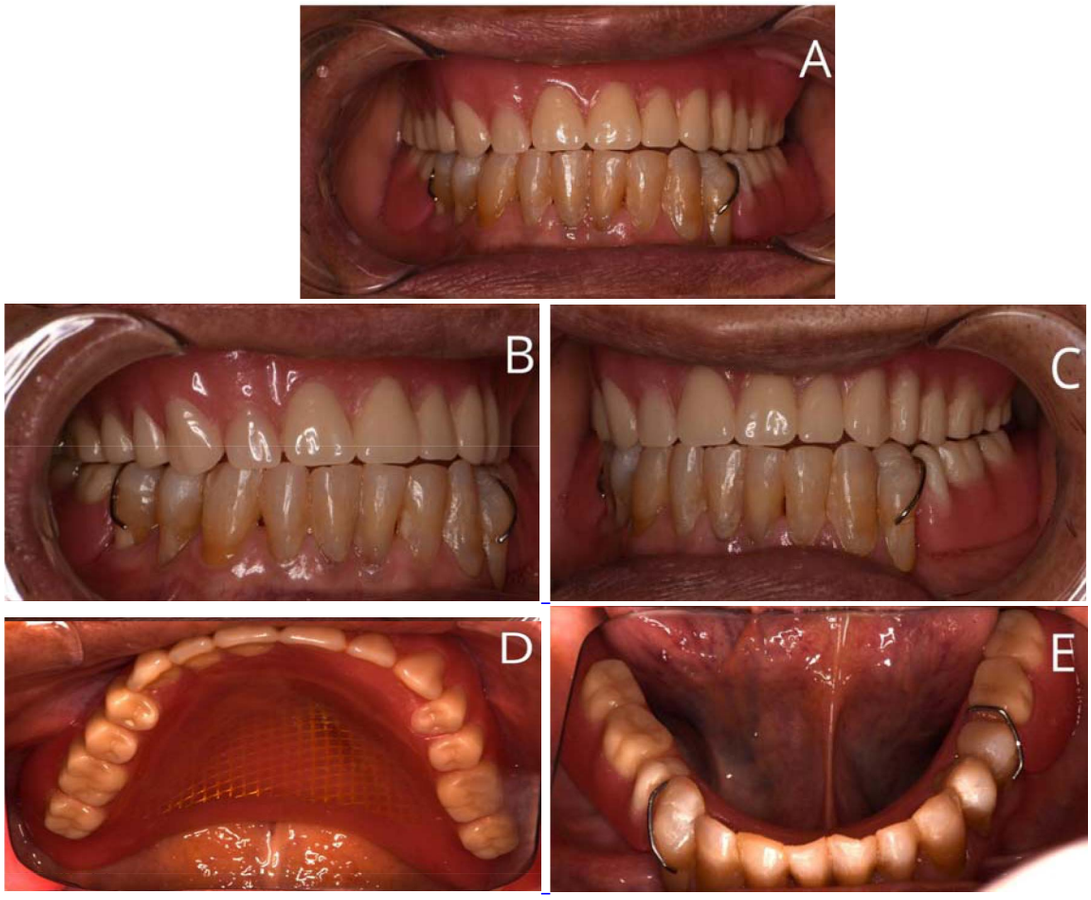

Fig. 11 (A) Frontal view with both dentures and final restoration in maximum intercuspation; (B) and (C) Left and right lateral view of both inserted dentures; (D) and (E) Occlusal view of both denture and final restoration at one month review visit.

DISCUSSION

In this case, patient presented with multiple dental problems including peri-implantitis, implant fixture fracture, generalised tooth wear, crown fracture and generalised periodontitis. Dental implant-related problems such as peri-implantitis and implant fixture fracture could be tricky for an undergraduate dental student to handle despite being supervised by a specialist. Hence, making a list of dental problems that the patient had and tackling them one by one could help in formulating a treatment option and plan from an undergraduate perspective.

Peri-implantitis, depending on its severity, can be treated with periodontal modalities such as non-surgical therapy, surface decontamination, surgical therapy, or combination therapy (Prathapachandran & Suresh, 2012; Mahato *et al.*, 2016; Rokaya *et al.*, 2020). In this case, an implant on the tooth 25 region had more than 50% bone loss while implants on the 11 and 23 region had less than 50% bone loss. Hence, moderate peri-implantitis was diagnosed on the implant on 11 and 23 while implant 25 was classified as severe peri-implantitis based on the classification of peri-implantitis by Froum & Rosen (2012). Studies found that a combination of resective and regenerative therapy was effective on advanced peri-implantitis in terms of clinical attachment loss gain, pocket depth, and bleeding on probing (Schwarz *et al.*, 2017). Peri-implant maintenance therapy (PIMT) helped in preventing further progression of peri-implantitis and failures (Monje *et al.*, 2016). Once the periodontal condition is stable, further treatment plans can progress.

The degree of implant fracture is the key factor in deciding the treatment option. Various options are available such as removal of the fracture fragment and reinserting screw abutments with a prosthesis in the case of screw abutment fracture, or implant removal due to fixture fracture (Marcelo *et al.*, 2014; Sanivarapu *et al.*, 2016; Wee & Lee, 2019). Previous studies revealed that screw loosening can be a warning sign prior to implant fracture (Sanivarapu *et al.*, 2016; Wee & Lee, 2019). In this case, it was first presented with loosening of the implant along with bone loss on a distal implant followed by the fracture of fixtures, which is unsalvageable. The literature describes several techniques for implant removal depending on the degree of osseo-integrated implant with few conservative implant removal approach such as the trephine drill technique, piezosurgery, the counter torque ratchet technique and the reverse screw technique (Bowkett *et al.*, 2016; Stajčić *et al.*, 2016). The trephine drill technique was chosen for its simplicity and no new implants were planned for replacement due to the financial constraints of the patient (Stajčić *et al.*, 2016). In situations where a new implant was planned for future placement, the counter torque ratchet technique and reverse screw technique should be the first choice as conservative approaches (Bowkett *et al.*, 2016; Roy *et al.*, 2020).

Treatment planning is crucial in determining the sequence of procedures to be carried out to achieve a predictable outcome. It is important to have correct clinical priorities and "initial phase" where the determination of chief complaint and correct diagnosis can be made (Calvani, 2020). Our treatment plan must cater to the needs of the patient: the treatment objective is to restore and improve the patient's dentition functionality. Prosthodontic treatment is classified into three categories: full reconstructive rehabilitations (FRR), interdisciplinary improving rehabilitations (IIR), and interdisciplinary healing rehabilitations (IHR) (Calvani, 2020). FRR is done on cases with no disease and no need for an interdisciplinary approach, while IIR and IHR involve an interdisciplinary approach but only the latter are cases with disease. In our case, the patient does not have any pathological disease in the oral cavity. Hence, we use an IIR approach to treat this case as periodontal; oral surgery and endodontic interventions were needed.

Worn dentition could be a difficult task to manage; it requires multiple approaches to treatment with available materials. It is important to identify the aetiology of tooth wear and evaluate the vertical dimension of the patient's occlusion. It determines the choice of treatment depending on space availability for restoration. In this case, the aetiology of this patient's tooth wear is due to ceramic antagonist restoration on maxillary and physiological attrition (Mundhe *et al.*, 2015). This patient presented with grade 2 tooth wear based on classification by Smith & Knight (1984). Direct composite restoration is a good treatment option as it is conservative, reliable, and has acceptable longevity compared to indirect restoration (Demarco *et al.*, 2017; Hemmings *et al.*, 2018). When composite restoration is fractured, it can be rebuilt back at a lower cost compared to that of indirect restorations.

Overdenture is a good treatment option, as few teeth remain on the maxillary arch to act as an abutment to prevent combination syndrome in the near future. Overdenture provides greater masticatory performance, conservation of alveolar ridge, and persistence of proprioception as compared to complete denture (Rissin *et al.*, 1978; Devi *et al.*, 2019). Overdentures with metal coping resulted with satisfactory of 100% survival results on the abutment teeth (Chhabra *et al.*, 2019). Gold wire mesh was incorporated in the denture to increase its fracture resistance and to withstand heavy masticatory forces. It has been previously reported that any reinforcement added to a denture could improve its fracture toughness (Pachore *et al.*, 2013). It also functions to retain the denture in one piece, even when it has fractured in half. Hence, maxillary overdenture incorporated with wire mesh could provide improved fracture resistance and withstand heavy occlusal forces against natural anterior mandibular teeth. Fabrication of acrylic denture instead of cobalt chrome denture is due to financial constraints of the patient as cobalt chrome is triple the price of acrylic denture, and the patient has no previous denture experience. Hence, provision of acrylic denture in the medium-to-long term is to observe patient's adaptability of wearing dentures.

Molloplast B is a type of heat-cured, silicon, long-term, soft, denture-lining material which is commonly incorporated into the tissue surface of dentures. Its main function is to improve the retention and stability of dentures, increase the psychological comfort of the patient, decrease any feeling of discomfort, pain and soreness of oral mucosa, and distribute masticatory forces evenly (Chladek *et al.*, 2014). In this case, the purpose of incorporating Molloplast B on the maxillary overdenture, especially at the overdenture abutment area, is to distribute forces that act on the overdenture abutments during mastication equally. However, soft denture lining materials will become discoloured from coffee, smoking and colonisation of fungus on the surface (Chladek *et al.*, 2014). Hence, meticulous oral hygiene practice is required for patients with Molloplast B incorporated dentures to avoid any discoloration and fungal colonisation.

The outcome of the treatment was that the patient was able to chew and eat his food normally with his dentures. The patient was able to maintain good oral hygiene with the dentures and restoration provided during the review visit. The prognosis of the denture is good, while the prognosis of the lower dentition is fair, as the patient was instructed not to chew on solid hard food due to the risk of occlusal composite build-up fracture (Ahmed & Murbay, 2016; Chhabra *et al.*, 2019). The maintenance plan for this patient was based on semi-solid food intake for teeth with composite restoration, with a normal diet at denture mastication areas. The patient was advised to initiate usage of floss, improve oral hygiene and to undertake recall visits every 1, 3, 6 and 12 months. Recall appointments will involve any required periodontal re-evaluation of pocket depths, clinical attachment loss and tooth mobility of abutment teeth, evaluation and restoration of any fractured composite

restoration, adjustment of denture due to discomfort or pain, or ultrasonic scaling. This is to maintain a good oral hygiene level and resolve any problems arising from the restorations and dentures.

CONCLUSION

Lack of a maintenance regimen leads to failure and mobility of the implant prosthesis. Failed implant restorations can be easily managed with precision diagnosis and treatment planning. The type of restoration planned and provided to the patient is crucial in restoring the patient's functional occlusion. A proper maintenance protocol, with post-insertion instructions and a recall review regime are key factors in determining the longevity of the treatment provided.

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