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Editorial Office

Dr. (Mrs) S. J. Nagda
Prof. & Head,
Dept. of Prosthodontics,
Nair Hospital Dental College,
Mumbai - 400 008, India.
E-mail: jipseditor@yahoo.co.in

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Case Report

The removable occlusal overlay splint in the management of tooth wear

Bilquis J. Ghadiali, S. A. Gangadhar, Kamal Shigli

Department of Prosthodontics, K.L.E.S's Institute of Dental Sciences, Belgaum, Karnataka, India

For correspondence

Dr. Bilquis J. Ghadiali, GN-7, 3rd Floor, Akkamahadevi International Girls Hostel, J.N.M.C Campus, Nehru Nagar, Belgaum - 590 010, Karnataka, India. E-mail: bilquis82@hotmail.com

The reconstruction of an extremely worn dentition is difficult and represents a challenge due to the minimal tooth structure that remains. These patients often exhibit the loss of the vertical dimension of occlusion and esthetic problems. Moreover, the problems associated with the maxillary complete denture opposing the natural teeth have to be taken into consideration. Occlusal problems and fracture of the denture bases account for most of these structural difficulties. These may result from the occlusal stresses on the denture and underlying tissues from the opposing teeth and musculature, the position of mandibular teeth and flexure of the denture bases. The current article describes the prosthodontic rehabilitation of a patient who reported with a completely edentulous maxillary arch and mandibular teeth with an uneven occlusal plane. Following a thorough examination, a glass-fiber-reinforced maxillary complete denture and a mandibular removable overlay occlusal splint was planned.

Key words: Maxillary single complete denture, occlusal overlay splint, tooth wear

INTRODUCTION

The extremely worn dentition is a difficult condition to treat due to the limited tooth structure that remains. These patients often exhibit the loss of the vertical dimension of occlusion and esthetic problems. When ideally treated, the remaining teeth may require crown lengthening, endodontic therapy, post cores and full crown coverage. Financial constraints or other priorities often restrict one from choosing the most desirable treatment.^[1]

The overlay removable partial denture is a prosthesis that covers and is partially supported by natural teeth, tooth roots or dental implants; further it is an effective method for treating a patient with a severely worn dentition.^[2]

Another challenge faced is to provide comfort, function, proper esthetics and retention for the maxillary complete denture of the patient with the natural opposing dentition. Sharry summarized the problem when he stated that, "Single dentures represent a vigorous challenge to the practicing dentist. In no other complete denture treatment are there so many factors that tend to negate the forces of retention and stability."^[3]

Occlusal problems and fracture of the denture bases account for most of these structural difficulties and these may result from one or all of the following:

1. occlusal stresses on the maxillary denture and the

underlying edentulous tissues from the teeth and musculature accustomed to the opposing natural dentition,

2. the position of the mandibular teeth, which may not be properly aligned for the achievement of bilateral balance for stability,
3. the change in the occlusal plane due to extrusion, rotation and migration and
4. the flexure of the denture bases.^[4]

CASE REPORT

A 52-year-old male patient reported to the Department of Prosthodontics, K.L.E.S's Institute of Dental Sciences, Belgaum, for prosthodontic rehabilitation.

The chief complaint of the patient was the inability to chew food and improper speech. His main concern was to improve these functions.

No significant systemic findings were elucidated. Clinical examination revealed an edentulous maxillary ridge and a full complement of mandibular teeth. The mandibular teeth showed excessive occlusal wear, questionable pulpal involvement and cervical erosions and/or abrasion. Further, the mandibular posterior teeth demonstrated an uneven occlusal plane [Figure 1].

Radiographic evaluation displayed no periapical involvement and no caries was evident.

Periodontal examination revealed tissues to be healthy

around the remaining natural teeth except for the right mandibular first molar that showed gingival recession and the loss of attached gingiva. Pocket depths were within the normal limits and no incidence of mobility was observed.

Prosthodontic evaluation

The maxillary ridge was adequate to retain a complete denture and also the bone quality was found to be good. The maxillary tuberosities displayed adequate space for the denture base and did not necessitate any preprosthetic surgery. No loss was observed in the vertical dimension of occlusion; this would have otherwise necessitated splint therapy to increase the vertical dimension.

Evaluation of temporomandibular joint: This demonstrated no evidences of clicking, joint pain, limitation on the range of motion or tenderness of the muscles of mastication.

After complete evaluation, the treatment planned was a maxillary complete denture and a mandibular removable occlusal overlay splint with the elimination of periodontal surgery and root canal therapy. An informed consent was obtained from the patient.

This option met the stated objectives with regard to the patient; it was financially affordable, required less chair side time and provided the patient the opportunity to later select other options when he was more financially and emotionally ready.

Procedure

1. The maxillary primary impression was made using impression compound (Pyrex; Pyrex Polykem, Roorkee, India) and the mandibular impression was made using an irreversible hydrocolloid (Alginoplast; Heraeus Kulzer, South Bend, India) and diagnostic casts (Type III Dental stone; Goldstone, Asian Chemicals, Gujarat, India) were fabricated.
2. Bite was recorded for diagnostic mounting.
3. The mandibular teeth displayed uneven and sharp cusps, few of which were traumatizing the tongue. Thus, tooth alteration was planned for these sharp cusps on the diagnostic casts.

A preparation guide was created that allowed the planned amount of odontoplasty to be transferred accurately and conveniently from the cast to the mouth.^[5] A uniform, clear, self-cure acrylic template was fabricated over the occlusal surface of the mandibular teeth on the cast. The cusps to be modified were marked on the cast with a contrasting colored pencil.

This clear acrylic template was then placed over the unmodified cast. The colored contrasting marks can be observed through the template. An acrylic trimming bur was then used to simultaneously trim both the template as well as the sharp cusps up

to the desired level of modification. This created openings on the occlusal and incisal surfaces of the template to indicate the position of the tooth structure before they were modified. The margins of the openings indicated the extent of tooth reduction, i.e., when the template was seated in the mouth, the natural teeth would protrude through these openings [Figure 2].

This template was then placed in the mouth and the mandibular teeth were reduced till the margins of the openings on the template.

4. After the planned amount of odontoplasty was performed, sharp margins were rounded and polished and final impressions were made. Maxillary arch with zinc oxide eugenol (DPI Impression paste; Bombay Burma trading Corp, Ltd., Mumbai, India) and mandibular arch with irreversible hydrocolloid impression material (Alginoplast; Heraeus Kulzer, South Bend, India). Wax occlusal rims were then fabricated on the master cast.
5. The vertical dimension was determined. Then the maxillary and mandibular casts were mounted on a semiadjustable articulator (Hanau series H2; Water Pik, Fort Collins, USA), by using a face-bow record and a centric relation record was established.
6. Then, the maxillary teeth arrangement was first carried out based on a normal compensating curve and not according to the uneven occlusal plane.
7. Subsequently, the wax-up of mandibular anterior teeth was carried out. The incisal guidance was adjusted accordingly and the protrusive contacts were established.
8. The mandibular posterior teeth were then waxed-up in occlusion with the maxillary posterior teeth [Figure 3]. This arrangement ensured a uniform and harmonious occlusal plane. Balancing contacts were achieved bilaterally [Figure 4].
9. For wax try-in purpose, a putty index (Aquisil; Soft putty, Dentsply, Germany) was made of the mandibular diagnostic wax-up. A duplicate cast with block out was fabricated. Self-cure clear acrylic resin (DPI RR Cold cure; Bombay Burma Trading Corp, Ltd., Mumbai, India) was then placed in this index and placed over the cast. The temporary removable occlusal overlay splint was obtained, which was used for try-in.
10. After the try-in stage, the maxillary and mandibular casts with wax-up were flaked.
11. The midpalatal region and the region palatal to the incisors in the maxillary denture were reinforced with E-glass fibers (Fiberglass Corporation, USA), using the split cast technique and the denture was packed with fiber-reinforced heat-cured acrylic resin (Lucitone 199; Dentsply, York Division).
12. The mandibular splint was packed with heat-cured clear acrylic resin (DPI Heat cure; Bombay Burma



Figure 1: Preoperative view showing excessive occlusal wear and an uneven occlusal plane of the mandibular teeth



Figure 4: Final wax-up in occlusion with maxillary teeth



Figure 2: Preparation guide placed in the mouth



Figure 5: Finished dentures



Figure 3: Mandibular teeth wax-up



Figure 6: Postoperative view with the splint in place

laboratory remount.

14. The dentures were then finished, polished [Figure 5] and inserted in the mouth with minor occlusal adjustments with the help of a clinical remount [Figure 6].

15. Oral hygiene and care instructions were administered.

16. Post insertion adjustments were minor, which

Trading Corp, Ltd., Mumbai, India).

13. After processing, the dentures were retrieved and necessary corrections were made during the

were completed.

Follow up: On a recall visit, the patient expressed his satisfaction with the prosthesis.

DISCUSSION

The reconstruction of a severely worn dentition is a very complex and difficult problem, which poses a real challenge to the dentist. The best treatment for any wear depends on its early recognition, but this is an ideal condition that is difficult to achieve.^[6]

It is important to perform a comprehensive examination to determine the cause of the problem, evaluate the diagnostic data that includes a temporomandibular screening and determine the vertical dimension of occlusion so that the patient can be categorized into one of the following categories:

1. Excessive wear with loss of VDO.
2. Excessive wear without loss of VDO.
3. Excessive wear without loss of VDO, but with limited space.^[7]

Different treatment options should be presented to the patient with the time commitments, costs and the advantages and disadvantages of each option.

Various treatment options include:

1. Bite guard to determine desired VDO.
2. Free gingival grafts and periodontal surgery in cases of recession and lack of attached gingiva.
3. Endodontic treatment of all the teeth with questionable pulpal involvement or insufficient crown length.
4. Cast post and core on endodontically treated teeth.
5. Porcelain fused to metal crowns on all the teeth restoring them to a height in harmony with the newly established VDO.
6. Maxillary complete denture with porcelain teeth or hardened acrylic resin teeth.^[1]

Another factor to be considered, are the problems associated with the maxillary complete denture opposing the natural teeth. One of the most common prosthodontic failures encountered is the fracture at the midline and the failure of a single maxillary denture.

Maxillary denture midline fracture has been related to the deformation of the denture base while functioning, thereby resulting in a flexural fatigue failure. Clinical factors related to single denture failure include:

1. Improperly contoured mandibular occlusal plane.
2. High frenal attachments.
3. Occlusal scheme.
4. Occlusal forces
5. Denture foundation.
6. Denture base thickness.

Various approaches can assist in reducing the

incidence of the midline fracture of denture bases:

1. Recontouring/crowning the natural teeth to obtain an occlusal plane favorable to maxillary denture with a balanced occlusal scheme.
2. In patients with high frenal attachments, frenectomy is recommended as high attachment results in a weak point and/or potential fracture line.
3. A bilateral balanced occlusal scheme is ideal for maxillary denture stability.
4. A shallow incisal guidance, which is esthetically and phonetically acceptable, should be obtained.
5. An ideal posterior occlusal form should be buccolingually narrow with the shallow cusp height.
6. Maximum physiologic extension of the denture base for increased tissue coverage through proper border molding and impression technique is recommended.^[8]
7. Use of high-strength polymers, i.e., impact resistant materials, reduces the tendency to fracture.
8. Also fiber reinforcement of the palate that is particularly palatal to the incisors in the anterior part of the palate, as performed in this case with E-glass fibers, decreases the tendency to fracture.
9. Maintaining the denture base thickness at a minimum of 2 mm and the use of metal bases provides rigidity.^[9]
10. Cast gold occlusal surfaces will not wear excessively and minimize abrasion.^[10]
11. Finally, a good processing technique reduces or eliminates residual stresses within the denture.

SUMMARY

Situations in which there is excessive wearing of teeth require a comprehensive examination and screening. Different treatment options should be presented to the patient with the time commitments, costs along with the corresponding advantages and disadvantages. In an occlusal wear situation for a patient with limited finances, the use of a removable occlusal overlay splint with a single maxillary complete denture reinforced with glass fibers was suggested as an alternative treatment.

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