

AN ALTERNATIVE REINFORCMENT METHOD FOR MANDIBULAR IMPLANT RETAINED OVERDENTURES WITH E-GLASS FIBERS: A CASE REPORT

Güliz Aktas, DDS, PhD

Asistant Professor, Department of Prosthodontics,
Faculty of Dentistry, Hacettepe University,
Ankara, Turkey

Duygu Karasan, DDS, PhD

Department of Prosthodontics,
Faculty of Dentistry, Hacettepe University,
Ankara, Turkey

Mehmet Muhtarogullari, DDS, PhD

Associate Professor, Department of Prosthodontics,
Faculty of Dentistry, Hacettepe, University,
Ankara, Turkey

Şenay Canay, DDS, PhD

Profesor, Department of Prosthodontics,
Faculty of Dentistry, Hacettepe University,
Ankara, Turkey

Correspondence**Güliz Aktaş, DDS, PhD**

Department of Prosthodontics,
Faculty of Dentistry,
Hacettepe University
Sıhhiye 06100, Ankara, Turkey
Phone: +90 312 3052240
Fax: +90 312 3113741
E-mail: g_emul@yahoo.com

ABSTRACT

Implant retained overdentures are the best treatment solutions for long time edentulism. However especially for un-reinforced mandibular overdentures with locator attachments, if the naturel dentition exists on the opposing arch, the most common failure is fracture of the acrylic denture base around the attachment clips. In this case report, acrylic base material of the fractured mandibular implant retained overdenture was reinforced with bidirectional e-glass fibers.

Key words: Feinforcement, Fiber, Overdenture

Submitted for Publication: 09.05.2013

Accepted for Publication : 04.03.2014

ALT ÇENE İMPLANT TUTUCULU OVERDENTURE PROTEZ İÇİN CAM-FİBER İLE ALTERNATİF GÜÇLENDİRME YÖNTEMİ: VAKA RAPORU

Güliz Aktaş

Yrd. Doç. Dr., Hacettepe Üniversitesi,
Dış Hekimliği Fakültesi,
Protetik Dış Tedavisi Anabilim Dalı
Ankara, Türkiye

Duygu Karasan

Dr. Hacettepe Üniversitesi,
Dış Hekimliği Fakültesi,
Protetik Dış Tedavisi Anabilim Dalı
Ankara, Türkiye

Mehmet Muhtarogulları

Doç. Dr., Hacettepe Üniversitesi,
Dış Hekimliği Fakültesi,
Protetik Dış Tedavisi Anabilim Dalı
Ankara, Türkiye

Şenay Canay

Prof. Dr., Hacettepe Üniversitesi,
Dış Hekimliği Fakültesi,
Protetik Dış Tedavisi Anabilim Dalı
Ankara, Türkiye

Sorumlu Yazar

Güliz Aktaş,

Hacettepe Üniversitesi,
Dış Hekimliği Fakültesi,
Protetik Dış Tedavisi Anabilim Dalı
Sıhhiye 06100 Ankara, Türkiye
Telefon: +90 312 3052240
Faks: +90 312 3113741
E-mail: g_emul@yahoo.com

ÖZET

Uzun süreli tam dişsizliklerde implant destekli hareketli protezler en iyi tedavi yöntemidir. Ancak karşıt arkın doğal dentisyon olduğu durumlarda özellikle locator tutuculu güçlendirilmemiş alt hareketli protezlerde, tutucu klips çevresinde akrilik kaide materyalinin kırılması en sık görülen başarısızlıktır. Bu vaka raporunda, akrilik kaide materyali kırılan implant destekli alt protez çift yönlü cam fiber ile güçlendirilmiştir.

Anahtar Kelimeler: Güçlendirme, Fiber, Overdenture

Yayın Başvuru Tarihi : 05.09.2013

Yayına Kabul Tarihi : 03.04.2014

INTRODUCTION

Conventional complete dentures pose some problems for edentulous patients with severely resorbed mandible or maxilla such as insufficient stability, retention, chewing ability and patient satisfaction.¹ Implant supported overdentures has become the viable standard treatment solution for the care of edentulous patients to overcome these problems.² However some technical complications such as acrylic resin denture base fracture³ might occur when the insufficient space exists between the denture teeth and attachment system or the implant retained overdenture opposes naturel teeth or the implant supported prosthesis.⁴ Many attempts have been made to enhance the strength of acrylic denture bases such as addition of the metal wire⁵ or various types of fibers.^{6,7} Cast metal wire is particularly helpful for reinforcement, but they might be unaesthetic, expensive and prone to corrosion.⁸ Several mechanical laboratory studies demonstrated that adding glass fibers are useful for reinforcing the acrylic denture base materials.⁹⁻¹² Reinforced acrylic denture base material can be achieved either adding the glass fibers to whole denture base or only to the weak region.¹³ In this case report acrylic base material of the fractured mandibular implant retained overdenture was reinforced with bidirectional glass fibers.

CASE REPORT

A 72 year-old man presented to the department of prosthodontics, Faculty of Dentistry, Hacettepe University, with a fractured mandibular implant retained overdenture (Figure 1). Intraoral examination showed that his opposing dentition was natural dentition and his mandibular implant retained overdenture was not reinforced with any material. The initial treatment plan was to repair of the fractured mandibular overdenture by rejoining pieces of a fractured denture base using an auto polymerizing resin. After this repair, 2 mm thickness of the denture base material was removed from the tissue side of the prosthesis to relining procedure and denture surface was roughened. Zinc oxide eugenol impression material (SS White Manufacturing, Gloucester, England) was placed directly on the tissue surface of denture base; afterwards the denture was inserted into the patient's mouth. Thus, the old base was used as an impression tray. The denture with eugenol impression material was invested in the drag of the denture processing flasks using type II dental plaster (Snow white plaster; Kerr, Romulus, Mich). The undercuts in the investment



Figure 1. Fractured mandibular implant retained overdenture

were removed and the investment was allowed to set. Housing part of the attachment with black processing patrxix was filled using condensation silicone material (Speedex, Coltane, Switzerland). A thin layer of separating medium (modern material separating Medium; Herauskulzer) was applied to the surfaces of the investment. The cope was positioned in place and a second mix of type II plaster was poured into the flask until the ring was filled completely and the top of the flask placed in position. The flask was placed in a boil tank for 10 min. to eliminate the impression material. The remaining impression material was rinsed with hot running water after separating the cope and drag. A layer of the separating medium was applied to the plaster of the investment in both portions. Bidirectional glass fibers were impregnated with powder-liquid mixture in an aluminum foil for about 10 min. until they became transparent (Figure 2A, 2B). Heat-polymerized polymathacrylate resin (Meliodent; Herauskulzer GmbH & Co. KG, Hanau, Germany) was mixed according to manufacturer's instructions and packed in doughy stage at 200 Psi for 3 trial packs using 10x10 clear separating sheets. At the third trial the transparent bidirectional glass fibers were placed on the tension side of the mandibular overdenture (Figure 3). The flask was clamped and polymerized at 100 °C for 1 hour from the time of initial placement into the boiling water. Following the cooling process, the two parts of the flask was separated (Figure 4); afterwards the overdenture was finished and polished. The black processing attachments were replaced with blue matrixes. The patient was followed up for 1-year period with recalls in every 4 month.



Figure 2A. Polymethacrylate resin powder-liquid mixture



Figure 2B. Impregnation of the e-glass fibers in an aluminum foil



Figure 3. Insertion of the e-glass fibers to the denture base

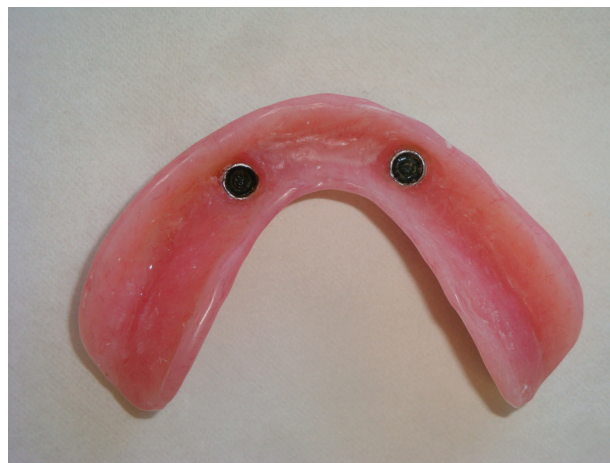


Figure 4. Reinforced overdenture before finishing and polishing procedures

DISCUSSION

The presence of bidirectional e-glass fibers would significantly increase the fracture strength of the implant retained overdenture during the one year follow up. Not only in-vitro studies^{14, 15} but also clinical studies^{16, 17} revealed that adding glass fibers are efficient in reinforcing acrylic denture base resin. In this case report the glass-fiber reinforcement was placed to the tension side of the overdenture, between and around the locator housings. The placement of the e-glass fibers in the most expected tension area was consistent with other studies.^{18, 19} The increased modulus of elasticity from the embedded fibers themselves may play an important role on the mechanism of improved fracture resistance.²⁰ The amount of fiber layers and the use of polymethylmethacrylate impregnation may also have impacted the reinforcement. However, type of fibers or distribution of them remains as a question to provide the highest increase on the fracture strength. These aspects should be investigated in future laboratory studies.

CONCLUSION

Fractured mandibular implant retained overdentures may be reinforced by adding bidirectional glass fibers to the weak regions of the acrylic resin base.

REFERENCES

1. van Waas MA. The influence of clinical variables on patients' satisfaction with complete dentures. *J Prosthet Dent* 1990; 63: 307-310.
2. Fein JS, Carlsson GE, Awad MA, Chehade A, Duncan WJ, Gizani S

et al. The McGill consensus statement on overdentures. Mandibular two-implant overdentures as first choice standard of care for edentulous patients. *Gerodontology* 2002; 19: 3-4.

3. Hemmings KW, Schmitt A, Zarb GA. Complications and maintenance requirements for fixed prostheses and overdentures in the edentulous mandible: a 5-year report. *Int J Oral Maxillofac Implants* 1994; 9: 191-196.

4. Zitzmann NU, Marinello CP. A review of clinical and technical considerations for fixed and removable implant prostheses in the edentulous mandible. *Int J Prosthodont* 2002; 15: 65-72.

5. Ruffino AR. Effect of steel strengtheners on fracture resistance of the acrylic resin complete denture base. *J Prosthet Dent* 1985; 54: 75-78.

6. Bowman AJ, Manley TR. The elimination of breakages in upper dentures by reinforcement with carbon fibre. *Br Dent J* 1984; 156: 87-89.

7. Chen SY, Liang WM, Yen PS. Reinforcement of acrylic denture base resin by incorporation of various fibers. *J Biomed Mater Res* 2001; 58: 203-208.

8. Carroll CE, von Fraunhofer JA. Wire reinforcement of acrylic resin prostheses. *J Prosthet Dent* 1984; 52: 639-641.

9. John J GS, Shah I. Flexural strength of heat- polymerized polymethyl methacrylate denture resin reinforced with glass, aramid, or nylon fibers. *J Prosthet Dent* 2001; 86: 424-427.

10. Nagai E, Otani K, Satho Y, Suzuki S. Repair of denture base resin using woven metal and glass fiber: effect of methylene chloride pre-treatment. *J Prosthet Dent* 2001; 85: 496-500.

11. PK V. A review of fiber-reinforced denture base resins. *J Prosthodont* 1996; 5: 270-276.

12. Vallittu PK, Ruyter IE, Ekstrand K. Effect of water storage on the flexural properties of E-glass and silica fiber acrylic resin composite. *Int J Prosthodont* 1998; 11: 340-350.

13. Vallittu PK. Glass fiber reinforcement in repaired acrylic resin removable dentures: preliminary results of a clinical study. *Quintessence Int* 1997; 28: 39-44.

14. Vallittu PK. Flexural properties of acrylic resin polymers reinforced with unidirectional and woven glass fibers. *J Prosthet Dent* 1999; 81 : 318-326.

15. Narva KK, Lassila LV, Vallittu PK. The static strength and modulus of fiber reinforced denture base polymer. *Dent Mater* 2005; 21: 421-428.

16. Narva KK, Vallittu PK, Helenius H, Yli-Urpo A. Clinical survey of acrylic resin removable denture repairs with glass-fiber

reinforcement. *Int J Prosthodont* 2001; 14: 219-224.

17. Goguta LM, Bratu D, Jivanescu A, Erimescu R, Marcauteanu C. Glass fibre reinforced acrylic resin complete dentures: a 5-year clinical study. *Gerodontology* 2012; 29: 64-69.

18. Dyer SR, Lassila LV, Jokinen M, Vallittu PK. Effect of cross-sectional design on the modulus of elasticity and toughness of fiber-reinforced composite materials. *J Prosthet Dent* 2005; 94: 219-226.

19. Kanie T, Fujii K, Arikawa H, Inoue K. Flexural properties and impact strength of denture base polymer reinforced with woven glass fibers. *Dent Mater* 2000; 16: 150-158.

20. John J, Gangadhar SA, Shah I. Flexural strength of heat-polymerized polymethyl methacrylate denture resin reinforced with glass, aramid, or nylon fibers. *J Prosthet Dent* 2001; 86: 424-427.