Rehabilitation of a Failed Implant-Supported Mandibular Complete Denture Using Cast Copings: A Case Report

*Oseremen **AKHIGBEMEN**, *Josephine **ATAT**, *,**Julie **OMO**, ***Matthew **SEDE**
[Department of Prosthetics, University of Benin Teaching Hospital, **Department of Prosthetics, University of Benin, ***Department of Restorative, University of Benin and University of Benin Teaching Hospital, Benin City.]*

Correspondence
Dr Oseremen Akhigbemen

Department of Prosthodontic, University of Benin Teaching Hospital
Email: osesteve@yahoo.com

ABSTRACT

Background: Managing a completely edentulous patient is a major challenge to both the patient and the clinician, as most patients experience difficulty in using the new prosthesis fabricated. The conventional course of treatment for these individuals has been removable complete maxillary and mandibular dentures. Nonetheless, they have been associated with problems such as discomfort, instability, retention and functional impairment.
An Implant-supported overdenture restores dental and alveolar tissues and provides improved facial support, better comfort, long-term patient acceptance and satisfaction. The design of implant-supported overdentures varies based on the attachment method and the desired level of implant and ridge mucosa support. These attachment designs include bar and ball attachment systems, studs, magnetic attachments and telescopic copings. Failure of attachments, wear, and fracture of the prosthesis or abutment screws results in mechanical complications.
Clinical Case: A Case of an 84-year-old female who presented to the Prosthetics clinic, University of Benin Teaching Hospital, Nigeria for rehabilitation of a failed implant-supported mandibular complete denture using bar cast coping. She had an all-on-four implant-retained mandibular overdenture with a resilient liner done outside the country. The prosthesis was replaced with a new acrylic mandibular overdenture retained with cast copings and a bar over the implant. She had one and four weeks of post-insertion review.
Conclusion: Fabricating a new prosthesis using a cast coping and bar attachment enhanced the patient's denture success criteria after the implant-supported overdenture failed. This illustrates the prosthetic options in difficult prosthodontic situations.

Keyword: Implant-supported, Overdenture, Edentulous patient

Oseremen Akhigbemen
https://orcid.org/0009-0005-9918-6291
Josephine Atat
https://orcid.org/0009-0007-7905-0279
Julie Omo
https://orcid.org/0000-0002-5680-6922
Matthew Sede
https://orcid.org/0000-0002-6737-8601

Received: 14-Aug, 2024
Revision: 9 Nov, 2024
Accepted: 14 Nov, 2024

Citation: Akhigbemen O, Atat J, Omo J, Sede M. Rehabilitation of a failed implant-supported mandibular complete denture using cast copings: a case report. Nig J Dent Res 2025; 10(1): 1-6. https://dx.doi.org/10.4314/njdr.v10i1.1

INTRODUCTION

The prosthetic management of a completely edentulous patient is a major challenge to both the patient and the clinician, as most patients experience difficulty in transitioning from a dentate to an edentulous state.[1] Complete maxillary and mandibular dentures have been the traditional standard of care for these patients. Still, they report problems adapting to their complete dentures due to a lack of comfort, retention, stability and inability to function. A crucial element to consider during rehabilitation is bone resorption, particularly in the mandible.[1–3]

An Implant-supported overdenture restores both dental and alveolar tissues thus providing facial support, better comfort, long-term patient acceptance and satisfaction. Implant support improves the biomechanical integration of the dentures by providing them with better retention and increased biting force because the gingiva-mucosal support is relieved of the occlusal loads. Implant-supported overdentures increase patients' satisfaction and quality of life when compared to conventional complete dentures.[4] It is also a cost-effective treatment option as compared to implant-supported fixed prostheses.

Placing implants in the edentulous arch and subsequent loading helps to limit bone resorption and changes in bone architecture, shape and volume.[3,5] The design of implant-supported overdentures varies based on the attachment method and the desired level of implant and ridge mucosa support. The connection between the implants and overdentures is by attachments consisting of matrices and patrices. The attachment designs include bar and ball attachment systems, studs, magnetic attachments and telescopic copings. The bar and ball attachment systems are most commonly used[6]. Among these systems, the bar attachment system which can be prefabricated or cast provides superior retention and stability compared to stud attachments. It also allows splinting of implants and better distribution of forces.[7] Resilient liner materials and more recently, matrices based on polyvinyl siloxane (PVS), which are made especially as retention materials, have been employed in addition to traditional matrices[8]. Resilient denture liner matrix materials have been reported to increase patients' comfort and satisfaction, enhance retention, ensure peri-implant soft tissue health, inexpensive and associated with fewer denture-related complications compared to bar clips[9,10].

Failure of attachments, wear and fracture of the prosthesis or different system components, as well as the loosening or breaking of prosthetic or abutment screws, might result in mechanical complications. These are the most serious and prevalent problems associated with the restorative aspect of dental implants.[11] This case report is about a zirconia implant-supported mandibular overdenture retained by a resilient liner presenting with insufficient retention. The appliance was replaced with a new acrylic implant retained overdenture with copings and bar.

CASE REPORT

A case of an 84-year-old female who presented to the Prosthetics Clinic, University of Benin Teaching Hospital, Nigeria on account of difficulty in mastication and speech due to loose fitting and non-retentive implant-supported mandibular overdenture. The patient has had multiple dental visits and is currently wearing an implant-supported overdenture on the upper and lower jaws which was done 3 years ago, outside the country. She complained of problems with the lower implant-supported overdenture which became loose; making it difficult to function with it. Also due to the bulkiness of the zirconia prosthesis, it wasn't easy to use her oral musculature to support and retain the prosthesis. Medical history revealed that she is a known hypertensive and diabetic patient, though well-controlled. On oral examination, it was observed that she had an upper implant-supported complete denture suspected to have been retained with screws. A similar view was held about the lower implant-supported denture. A careful examination of the mandibular overdenture revealed a smooth matrix outline into which the implant abutments fit without an indication that screws retain it, therefore it was concluded that it was retained by a resilient liner (fig 1).

The lower jaw had implant abutments around the canine and first molar regions. Implant abutments around the first molar regions were at the gingival margin and appear not to have contributed to the overdenture retention. The mandibular ridge was severely resorbed and the vestibular sulcus reduced. Periapical radiographs of the implants revealed adequate implant osteointegration (Fig 2). The

posterior mandibular implants had angled abutments.

Figure 1: Clinical photograph of the lower jaw

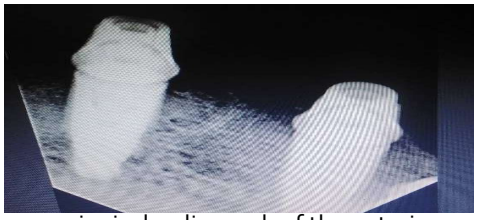

Fig. 2: periapical radiograph of the anterior implant

Fig. 3: Alginate impression of the lower jaw

Fig.4: Alginate impression of the upper jaw

The initial treatment plan was to use cold cure acrylic to secure the overdenture on the anterior implant abutment. At the end of the first visit, the plan to retain the lower overdenture with acrylic was not possible due to the lack of appropriate screws to anchor the denture. After a further examination, a decision was taken to fabricate a new complete lower acrylic overdenture, which the patient consented to.

Fig. 5: Cast of the mandible

Fig. 6: Acrylic Complete denture on the lower cast

Fig. 7: Wax denture Try - in

Upper and lower alginate impression was made (fig 3 and 4), and all stages for fabrication of complete denture followed (special tray fabrication of the lower arch, secondary impression, bite registration, try-in of wax denture, denture delivery) (fig. 5 -7). Special consideration was made for the implant abutment to fit into the overdenture as relief for the implant abutment was made on the fitting surface of the denture (fig. 8a, 8b and 8c). Glass ionomer cement was then used to cement the denture on the implant abutment (fig.9a and 9b). Post-insertion fitting was satisfactory and post-insertion instructions were given with follow-up appointments for review.

Fig. 8a: Acrylic Complete denture on the lower cast

Fig. 8b: Fitting surface of Acrylic Complete denture on the lower cast

Fig. 8c: Occlusal surface of Acrylic Complete denture on the lower cast

At the follow-up appointment, it was discovered that there was a cementation failure, with the patient still having problems with the retention and stability of the denture in her mouth. However, the patient felt better using it as it was lighter than the previous zirconia lower denture. A new treatment plan was considered to make cast metal copings joined together by a bar attachment, fitted to the intaglio surface of the acrylic denture using cold-cured acrylic with the implants as retainers. Impression of the lower jaw was made and poured into dental stone. The wax pattern of the copings joined with a bar was made and casting was done. The copings and bar were made of Chrome cobalt and the marginal fit was evaluated and found satisfactory (fig.10). Relief for the copings and bar attachment was made on the intaglio surface of the denture and tried in the patient's mouth. The copings and bar were attached to the intaglio surface of the denture with self-curing acrylic material in the mouth under habitual bite force and petroleum jelly application around the oral mucosal to protect it from irritation (Fig 11).

Fig. 9a: Intra-oral photograph

Fig. 9b: intraoral Photograph

Fig. 10: Try-in of bar attachment over the implant abutment

Fig.11: Bar attachment secure to the fitting surface with cold cure acrylic.

The complete acrylic denture was examined and trimming of excess acrylic was done with acrylic burs and the denture was polished with an acrylic polishing machine using pumice and water (Fig.12). The denture was delivered with a satisfactory fit (Fig. 13). Post-insertion instructions were given to the patient and a follow-up appointment was scheduled for the next day (24 hours), one (1) week, one (1) month, six (6) months and one (1) year respectively, pending her return back to where the initial implant-supported denture was fabricated.

Fig.12: Acrylic Denture on patient cast

Fig.13: Implant-retained bar attachment intraorally

DISCUSSION

Implant dentistry has been found to significantly improve rehabilitation of edentulous patients with mild to severe residual ridge resorption. Using Mandibular implant-supported overdentures with two or more implants is a treatment option for elderly edentulous patients who are dissatisfied with retention and stability of conventional complete dentures. The number of implants, type of implants as well as retention mechanisms varies for each patient. Management of reported cases of fractured screw abutment has been by fabrication and cementation of custom-made cast post and core.[12–14] This case report showed an implant-supported overdenture retained with a cast coping in a patient who had a failed implant supported lower overdenture. Good retention and stability are two important features that enable a successful complete denture that positively impacts the quality of life of patients. This case showed an improved retention and stability after the insertion of the new complete denture retained over cast metal coping, as similar outcome was seen in a study with a mandibular over-denture retained by two implants with bar attachment. [1]

Implant-supported prostheses constitute a safe and predictable treatment method with a high success rate, however, biological and mechanical complications can arise[1,15–17]. Mechanical complications associated with implant-supported prostheses include implant loss, screw fracture, screw loss, loss of resin covering the screw, fracture of the metal, resin, or porcelain structure and can lead to loss of overdenture retention and failure of the implant-supported prosthesis.[17] Abutment fracture and loss of abutment screw may be caused by bruxism, unfavourable superstructure, overloading, malfunction, premature occlusal contacts, metal fatigue after screw loosening and component misfit.[18] Screw fractures and loss though accounting for the least of the failures of implant-supported overdentures, their management poses a challenge for the prosthodontist in a resource limited setting .[17]

Depending on the fracture's level, removal of the fractured part without damage to the internal threads of the implant and screwing a new abutment is the solution of choice. For screw loss, replacement with a new one is the preferred solution, however, the major challenge encountered in the management of this patient was the inability to identify the implant system by both the dentist and the patient, thus the need to improvise with alternatives sort locally.

The patient presented with a severely resorbed mandibular ridge thus the two anteriorly placed implants (canine region) were important for retention in this patient. Anteriorly placing an implant reduces the rate of bone resorption, as a study has shown that the reduction in the anterior part of the mandible in patients wearing complete conventional dentures amounted to 5.2 mm compared to 0.6mm for implant-supported overdenture.[19]

In this case report, a new denture made with acrylic material was fabricated for the patient as the patient complained of the bulkiness of her previous all porcelain denture, which caused her discomfort.

Given the difficulty of restoring an edentulous mandible, careful considerations of the number of implants, overdenture design, and attachment system selection are required. When such treatment has challenges, we must look for ways to overcome the challenges that patients face, especially reduced retention and stability. Patients' need and satisfaction play a critical role thus Prosthodontists should plan cases according to patients' needs. Patients who had received implant overdenture compared to conventional mandibular dentures are more satisfied with the stability and retention of their dentures and thus have experienced less difficulty in their daily activities.

CONCLUSION:

This case report described the management of a completely edentulous patient with failed lower implant-supported zirconia overdentures. The fabrication of a new implant-supported acrylic overdenture retained with a cast bar attachment demonstrated a temporary transition of the patient with satisfactory retention and stability.

Financial support

Nil

Conflict of interest

None Declared

REFERENCE

1. Karabuda C, Yaltrk M, Bayraktar M. A clinical comparison of prosthetic complications of implant-supported overdentures with different attachment systems. *Implant Dent*.

2008;17(1):74-81. doi:10.1097/ID.0b013e318166d88b
2. Ülkü SZ, Kaya FA, Uysal E, Gulsun B. Clinical evaluation of complications in implant-supported dentures: A 4-year retrospective study. *Med Sci Monit*. 2017;23:6137-6143. doi:10.12659/MSM.907840
3. Mosnegutu A, Wismeijer D, Geraets W. Implant-Supported Mandibular Overdentures Can Minimize Mandibular Bone Resorption in Edentulous Patients: Results of a Long-Term Radiologic Evaluation. *Int J Oral Maxillofac Implants*. 2015;30(6):1378-1386. doi:10.11607/jomi.4009
4. Mishra SK, Chowdhary R. Patient's oral health-related quality of life and satisfaction with implant supported overdentures -a systematic review. *J Oral Biol Craniofac Res*. 2019;9(4):340-346. doi:10.1016/j.jobcr.2019.07.004
5. Assad AS, Hassan SA, Shawky YM, Badawy MM. Clinical and radiographic evaluation of implant-retained mandibular overdentures with immediate loading. *Implant Dent*. 2007;16(2):212-223. doi:10.1097/ID.0b013e318065a95f
6. Feine JS, Carlsson GE, Awad MA, et al. The McGill consensus statement on overdentures. Mandibular two-implant overdentures as first choice standard of care for edentulous patients. *Gerodontology*. 2002;19(1):3-4.
7. Luthra R, Sharma A, Kaur P. Implant Supported Overdenture: A Case Report. *Periodon Prosthodon.* 2016;02(02):1764-1768. doi:10.21767/2471-3082.100018
8. Yılmaz E, Gencel B, Geckili O, Sakar O. Comparison of the Retention of Conventional and Polyvinyl Siloxane Matrix Materials with Different Patrices for Implant-Retained Overdentures: An In Vitro Study. *Int J Prosthodont*. 2022;35(3):311–318. doi:10.11607/ijp.6882
9. Gibreel M, Fouad M, El-waseef F, Marzook H. Clips vs Resilient Liners Used With Bilateral Posterior Prefabricated Bars for Retaining Four Implant-Supported Mandibular Overdentures. *J Oral Implantol*. 2017;43(4):273-281. doi:10.1563/aaid-joi-D-16-00148
10. Elsyad MA, Mohamed SS, Shawky AF. Posterior Mandibular Ridge Resorption Associated with Different Retentive Systems for Overdentures: A 7-Year Retrospective Preliminary Study. *Int J Prosthodont*. 2017;30(3):260–265. doi:10.11607/ijp.5114
11. Gupta S, Gupta H, Tandan A. Technical complications of implant-causes and management: A comprehensive review. *Natl J Maxillofac Surg*. 2015;6(1):3-8. doi:10.4103/0975-5950.168233
12. Canpolat C, Özkurt-Kayahan Z, Kazazoğlu E. Management of a Fractured Implant Abutment Screw: A Clinical Report. *J Prosthodont*. 2014;23(5):402-405. doi:10.1111/jopr.12111
13. Geckili O, Gencel B, Idemen AC, Dayan SC. Technique for Converting A Fractured Implant Locator Abutment to A Custom Implant Cast Post and Core. *J Prosthodont*. 2021;30(4):363-366. doi:10.1111/jopr.13327
14. Shah K, Lee DJ. An alternative approach for the management of fractured implant abutment screws on a mandibular implant-retained overdenture: A clinical report. *J Prosthet Dent*. 2016;115(4):402-405. doi:10.1016/j.prosdent.2015.09.027
15. S. Calderon P, M. C. Dantas P, C. L. Montenegro S, et al. Technical complications with implant-supported dental prostheses. *J Oral Sci*. 2014;56(2):179-184. doi:10.2334/josnusd.56.179
16. Zanolla J, Amado F, da Silva W, Ayub B, de Almeida APF, Soares S. Success rate in implant-supported overdenture and implant-supported fixed denture in cleft lip and palate patients. *Ann Maxillofac Surg*. 2016;6(2):223-227. doi:10.4103/2231-0746.200338
17. Verma A, Singh SV, Arya D, Shivakumar S, Chand P. Mechanical failures of dental implants and supported prostheses: A systematic review. *J Oral Biol Craniofac Res*. 2023;13(2):306-314. doi:10.1016/j.jobcr.2023.02.009
18. Raju S, Nair V, Karunakaran H, Manjuran N. Management of perishing implants with abutment screw fracture – A systematic review. *J Indian Prosthodont Soc*. 2021;21(3):229-239 doi:10.4103/jips.jips_295_20
19. Takeshita S, Kanazawa M, Minakuchi S. Stress analysis of mandibular two-implant overdenture with different attachment systems. *Dent Mater J*. 2011;30(6):928-934. doi:10.4012/dmj.2011-13