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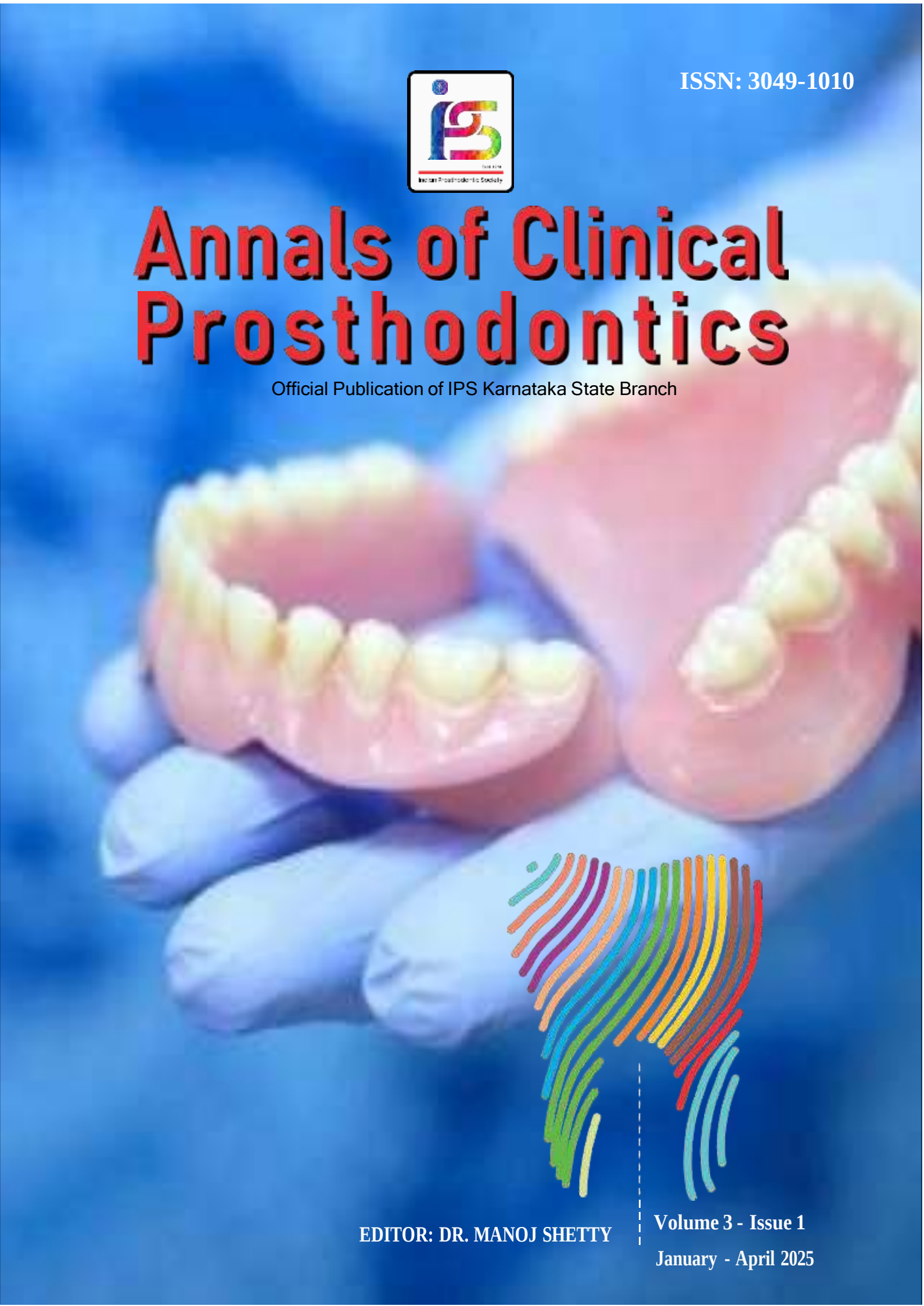

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THE AESTHETIC TRIANGLE IN COMPLETE DENTURE: ROLE OF ARTIFICIAL INTELLIGENCE

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ABSTRACT

Edentulousness, a prevalent condition among the aging population, severely impacts both the functional and aesthetic quality of life. Replacing lost teeth not only restores oral function but also plays a vital role in reestablishing a patient's facial aesthetics and smile, boosting their confidence. Complete dentures are especially crucial for geriatric patients, providing a solution to tooth loss due to various causes. The success of complete dentures is determined by their ability to offer comfort and satisfaction to the patient. The aesthetic outcome of dentures is shaped by the "Aesthetic Triangle," consisting of three key factors: teeth selection, shade selection, and gingival color. Each factor must be tailored to the patient's unique features and preferences to achieve a natural and harmonious result. With the advent of artificial intelligence (AI), the field of dentistry has seen significant improvements in treatment outcomes. AI tools streamline the design and fabrication processes, allowing for more accurate and personalized denture arrangements. These advancements not only reduce treatment time but also enhance patient satisfaction by optimizing the overall aesthetic and functional aspects of dentures. This paper discusses the role of AI in refining the creation of complete dentures and its positive impact on enhancing patient outcomes.

Keywords: Complete Dentures, Aesthetic Triangle, Artificial Intelligence, Patient Satisfaction.

INTRODUCTION

Edentulousness is one of the most common problem faced among the ageing population.it is considered has an major problem affecting the quality of the patients life[1].

Replacing teeth are not merely just about restoring the function of the absent tooth but it also plays a major role in establishing the natural aesthetic appearance of the patients facial appearance and smile.it helps

the patient gain back the confidence which they would have lost because of the loss of teeth. Complete dentures play a major role in the life of patients especially the geriatric patients who have lost their teeth due to various reasons.these complete dentures which are fabricated must be of atmost comfortability to the patient and should provide the patient with satisfaction[2].With the advancements of technology and invent of artificial intelligence the outcome of dental treatments can be improved.

The teeth arrangement has 3 basic factors which are to be taken into considerations – namely the teeth selection, shade selection and ginigival colour forming the aesthetic triangle. These components must be meticulously tailored to each patient's unique facial features, skin tone, and personal preferences to achieve a visually pleasing and harmonious result.

With the advancement in technology there are various artificial intelligence tools in the field of dentistry which help in easing our work flow and as well improves the patient satisfaction after the insertion of the complete dentures.

History on traditional complete dentures

Teeth selection can be done on basis of three major factors the shape, size and colour of the patient. Generally the usage of various guides such as pre-extraction records and photographs can be used as a tool[3]. Other methods such as using ratios of the facial structures help us in determining the shape and size of the tooth anthropometric measurements can also be useful in determining the tooth form[4].The most commonly used method of selecting teeth are the dentogenic factors which are taken into account.

Although these factors are precise and help us in proper selection of teeth there seems to be some unsatisfaction with the complete denture patients regarding esthesics. These traditional method of teeth selection does not help the patients visualize the dentures before they receive the dentures.

With the advent of facial scan and artificial intelligence we are able to show the patients the various types of tooth shape, size and colour which are available and provide them with a better explanation regarding the best suitabke denture for them .this provides the patient with better visualization the detures which they will be receiving in the future.as a result the satisfaction of the patient can be improved.

The role of artificial intelligence in complete dentures

AI can assist in selecting the ideal teeth by analysing multiple factors that affect the aesthetics and functionality of dentures, creating a more personalized and natural result[5]. Revilla leon et al did a study on assessing the performance of ai in prosthodontics . He found out that there is better shade selection when using than conventional shade selection[6].

Various methods have been formulated by various dentists in fabrication of complete dentures using the digital method.

After scanning the entire denture surface, Kawahata et al. created a prosthodontic wax type using a CNC machine and conducted research on the duplication process [15]. After defining the anatomic landmark for fake teeth and edentulous tissue, Sun et al. created a denture using 3D data of the edentulous area and artificial teeth. Following that, a tooth arrangement method was developed, and using a 3D printer, individual physical flasks were produced. However, they haven't developed a

comprehensive approach in their study, and choosing artificial teeth based on the age and sex of edentulous individuals is challenging.[16]. The base and artificial teeth of a single complete denture were scanned independently using a three-dimensional (3D) cone-beam computed tomography (CBCT) by Kanzawa and Inokosh, who then used the scanning data to design a new one. RP and fast milling were combined to provide an entirely wax-free manufacturing process for an acrylic resin denture base. Ultimately, the teeth were modified and cemented into the machined base's sockets. The logical formulation of automatic tooth selection for complete dentures by CAD was explored by Wang Y et al., although the various models that are accessible were not discussed. A traditional way of choosing artificial teeth and arranging the entire denture was detailed by Wu et al.; this method can serve as a guide for digital denture manufacture. When compared to traditional tooth arrangement, digital teeth arrangement and selection offer several benefits, including steady tooth arrangement accuracy, no human error, reduced chair time, and low cycle times.

Role of Artificial intelligence in teeth selection:

The customization of dentures to meet patient-specific needs and design preferences is a critical aspect of creating complete dentures. Artificial intelligence plays a valuable role in designing CDs and can independently recommend optimal designs tailored to the individual patient[7].these AI models and conventional neurak networks(CNN) help in classifying the various types of arches and help in fabrication of complete detnures*[8]*

AI-powered software significantly enhances the process of selecting teeth by advanced technologies to analyze a patient's unique facial features and anatomical data. By integrating sophisticated 3D facial recognition systems with powerful machine learning algorithms, the software can accurately propose ideal tooth shapes, sizes, and arrangements that complement the individual's natural appearance. Additionally, these systems allow for real-time simulation of various tooth arrangements, enabling patients to visualize different outcomes before committing to a final decision[9]. This interactive and data-driven approach not only empowers patients to make more informed choices but also minimizes the likelihood of human error. Ultimately, these innovations lead to highly personalized and precise results, improving the overall quality of care and ensuring greater patient satisfaction with the end result[10].

Role in shade selection

Artificial intelligence has the potential to improve the process of shade selection by employing cutting-edge digital shade-matching tools. These tools are designed to precisely measure and capture the exact color of a patient's natural teeth (if they are present) or the surrounding soft tissues. By leveraging this highly detailed data, AI algorithms can analyze and identify the most suitable tooth shade that not only complements the patient's natural coloration but also harmonizes seamlessly with their overall complexion. This ensures an end result that is both visually appealing and natural-looking.

Digital tools like cameras, colorimeters, spectrophotometers, and intraoral scanners are used to accurately record dental shades, reducing errors common in traditional visual methods.Software options such as ClearMatch, ShadeWave, Color Scanner

2006, Adobe Photoshop, MATLAB, EasyMatch QC, CT&A, PatchTool, SpectraMagic NX/DX, and Color iMatch further enhance shade matching by analyzing digital images. These tools are especially helpful when existing teeth are to be extracted before creating dentures.

Beyond technical precision, AI systems introduce a more personalized dimension to the shade selection process. These advanced systems consider individual preferences, even broader factors like cultural aesthetics to offer shade options tailored to the patient's unique characteristics. Furthermore, some of the most sophisticated AI-driven systems utilize machine learning capabilities to examine the patient's historical preferences or past dental choices. By doing so, they can predict and recommend an ideal shade that aligns with the patient's expectations. This integration of data-driven accuracy and personalized customization not only simplifies the decision-making process for dental professionals and patients but also enhances the overall experience by delivering results that are both precise and deeply satisfying.

Gingival colour selection

AI has opened up new possibilities for creating lifelike gingival colours by using advanced imaging and scanning technologies. AI-based systems can analyze the patient's mouth and gums, mapping the subtle variations in natural gum tissue. This data can then be used to create a gingival colour that closely matches the natural tissue, complete with texture and gradation in hue.Machine learning algorithms can also simulate the effects of aging and gum recession, adjusting the colour and texture to reflect these changes, enhancing realism and ensuring the final result looks natural.

The Future of AI in Denture Aesthetics

While AI is already playing a critical role in the denture design process, the technology is continually evolving. In the near future, we can expect even more sophisticated AI applications that will further streamline the aesthetic customization of complete dentures. Some possibilities include:

Patients could use augmented reality (AR) or virtual reality (VR) to try on digital renditions of their dentures before the physical creation process begins. This would allow them to see how different teeth shapes, shades, and gingival colours will look on their face, enhancing patient satisfaction and reducing the number of adjustments needed (pic 3).[13]

: AI could analyze a patient's facial expressions, emotions, and voice to help design dentures that not only look natural but also align with their personality. This data could be used to create dentures that better reflect the patient's emotional and social needs.

It could also automate much of the design and fabrication process, using 3D printing and robotic manufacturing to create dentures with unparalleled precision. This will also help in speeding up the production while maintaining a high level of aesthetic and functional quality.

Different AI softwares which can be used for fabrication of complete dentures:-

1. Denture Design Software (e.g., Exocad): This software includes modules for designing dentures and selecting teeth, using AI to optimize aesthetics and fit based on patient scans.
2. 3Shape Dental System: This software integrates AI to assist in the design and customization of dental prosthetics, including teeth selection based on facial morphology.

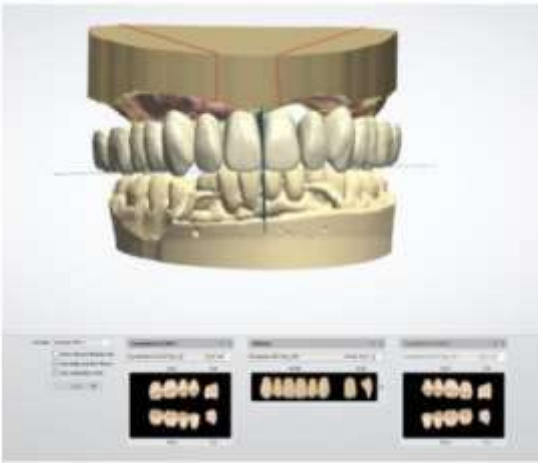
3. BlueSky Bio: Offers software that utilizes AI to facilitate treatment planning and tooth selection, enhancing the design process for dentures and implants.
4. Dental Monitoring: This platform uses AI to analyze oral conditions and can help in selecting appropriate teeth based on patient-specific data and preferences.
5. Carestream Dental: Their imaging and CAD software incorporate AI for enhancing the design of dentures, including teeth selection tailored to individual patient anatomy.
6. Zirconzahn: This software includes tools for aesthetic planning and teeth selection, leveraging AI to ensure a natural look and fit.

These tools streamline the process, allowing for better customization and improved outcomes in denture fabrication.

CONCLUSION

The most important factor has a dentist which has to be taken into consideration is the patient satisfaction after the delivery of the denture.

When a patient comes to our clinic it is our responsibility to give the patient possible treatment outcome which satisfies the patient. This can be possible with the usage of artificially driven softwares which provides us with various of options of tooth models from their libraries which can be further be shown to the patient and helps in better visualization of the dentures thereby increasing the potential outcome of the denture.



Digital teeth selection and arrangement from the library of the teeth available [13]

Customised teeth arrangement with corrections made according to the patients requirement [13]

Showing the patient- the denture before the fabrication of the final prosthesis.

Right:-final prosthesis after fabrication of the denture[14]

REFERENCES:

1. Soboleva U, Rogovska I. Edentulous Patient Satisfaction with Conventional Complete Dentures. Medicina (Kaunas). 2022 Feb 24;58(3):344. doi: 10.3390/medicina58030344. PMID: 35334520; PMCID: PMC8953744
2. Zou Y., Zhan D. Patients' expectation and satisfaction with complete denture before and after the therapy. Vojn. Pregl. 2015;72:495–498. doi: 10.2298/VSP140229002Z
3. Zarb, G.A., Bolender, C.L., Hickey, J.C. and Carlsson, G.E. (1990) Boucher's prosthodontics treatment for edentulous patients. 10th Edition, CV Mosby, St. Louis
4. Winkler, S. (1979) Essentials of Complete Denture Prosthodontics. W.B. Saunders Company, Philadelphia, 322.
5. Alshadidi AA, Alshahrani AA, Aldosari LI, Chaturvedi S, Saini RS, Hassan SA, Cicciù M, Minervini G. Investigation on the application of artificial intelligence in prosthodontics. Applied Sciences. 2023 Apr 16;13(8):5004.
6. Revilla-León M, Gómez-Polo M, Vyas S, Barmak AB, Gallucci GO, Att W, Özcan M, Krishnamurthy VR. Artificial intelligence models for tooth-supported fixed and removable prosthodontics: A systematic review. The Journal of prosthetic dentistry. 2023 Feb 1;129(2):276-92
7. Chen YW, et al. Quintessence Int. . 2020;3:248. doi: 10.3290/j.qi.a43952]
8. Takahashi T, Nozaki K, Gonda T, Ikebe K. A system for designing removable partial dentures using artificial intelligence. Part 1. Classification of partially edentulous arches using a convolutional neural network. J Prosthodont Res. 2021 Feb 24;65(1):115-118. doi: 10.2186/jpr.JPOR_2019_354. Epub 2020 Sep 9. PMID: 32938860
9. Bernauer, S. A., Zitzmann, N. U., & Joda, T. (2021). The Use and Performance of Artificial Intelligence in Prosthodontics: A Systematic Review. Sensors, 21(19), 6628. https://doi.org/10.3390/s21196628
10. Marinello, C.P., Brugger, R. Digital Removable Complete Denture—an Overview. Curr Oral Health Rep **8**, 117–131 (2021). https://doi.org/10.1007/s40496-021-00299-1
11. Tabatabaian F, Beyabanaki E, Alirezaei P, Epakchi S. Visual and digital tooth shade selection methods, related effective factors and conditions, and their accuracy and precision: A literature review. Journal of Esthetic and Restorative Dentistry. 2021 Dec;33(8):1084-104
12. Jarad FD, Russell MD, Moss BW. The use of digital imaging for colour matching and communication in restorative dentistry. Br Dent J. 2005;199:43-49.
13. Villias A, Karkazis H, Yannikakis S, Theocharopoulos A, Sykaras N, Polyzois G. Current status of digital complete dentures technology. Prosthesis. 2021 Sep 7;3(3):229-44.]
14. Hassan B, Greven M, Wismeijer D. Integrating 3D facial scanning in a digital workflow to CAD/CAM design and fabricate complete dentures for immediate total mouth rehabilitation. J Adv Prosthodont. 2017 Oct;9(5):381-386. doi: 10.4047/jap.2017.9.5.381. Epub 2017 Oct 16. PMID: 29142646; PMCID: PMC5673615.

15. Kanazawa M, Inokoshi M, Minakuchi S, Ohbayashi N. Trial of a CAD/CAM system for fabricating complete dentures. Dental materials journal. 2011;30(1):93-6.
16. Sun Y, Lü P, Wang Y. Study on CAD&RP for removable complete denture. computer methods and programs in biomedicine. 2009 Mar 1;93(3):266-72.

RESTORING SMILE THE CONVENTIONAL WAY WITH CAD-CAM DESIGNING - A CASE REPORT ON CAST PARTIAL DENTURE

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INTRODUCTION

A cast partial denture is a removable plate or frame used to fill in the spaces left by lost teeth in the mouth. It supports one or more artificial teeth. It has prosthetic teeth manufactured of acrylic resin affixed to a cast metal framework. When the remaining teeth are still present, these dentures are typically utilized.

They improve dental health, appearance, and performance. By supporting and stabilizing the remaining teeth, cast partial dentures restore proper speech and chewing while preventing neighbouring teeth from slipping.

As an alternative to fixed bridges or dental implants, they offer a comfortable and secure fit tailored to the unique oral structure of each patient.

Patients with partial tooth loss can improve their general dental health and self-confidence with cast partial dentures, which are affordable and dependable.

Key words: Cast partial denture (CPD), Partially edentulous patients, Removable partial denture

CASE REPORT-

A 52 year old female patient reported to the department with the chief complaint of missing teeth in the upper back and lower

front region of the jaw since 2 years. On examination, missing teeth with 16,17,25,26,27 of upper arch and 31,32,33,36,41,42,43,44,45,46 with respect to lower arch respectively. Fixed metal ceramic prosthesis with respect to 11,12,21,22 and 23 were present (FIGURE-1A,1B) .

Various treatment plan was discussed with the patient but as per the financial constraints of the patient cast partial denture replacing 16,17,25,26,27,31,32,33,36,41,42,43,44,45 ,46 was planned. Diagnostic impression and diagnostic mounting was done. Surveying was done (FIGURE-2) and cast partial denture was designed using CAD-CAM (FIGURE-3A,3B). Occlusal rest seat preparation with 15,24,34,35,37,47 and cingulum rest preparation with 13 and 23 and guiding plane with 15,24,35,37 and 47

were planned and the necessary mouth preparations were done in the patient's mouth followed by impression with elastomeric impression material (FIGURE-4). Wax up was done and casted. The metal framework for cast partial denture was then checked in the patient's mouth for stability and fit (FIGURE-5A,5B,5C). The jaw relations were done and try in was checked. The trial denture was then sent for acrylisation and finished denture was then delivered to the patient (FIGURE-6A,6B,6C,6D).

FIGURE-1A

FIGURE-1B

FIGURE-2

FIGURE-3A

FIGURE-3B

FIGURE-4

FIGURE-5A

FIGURE-5B

FIGURE-5C

FIGURE-6A

FIGURE-6B

FIGURE-6C

FIGURE-6D

DISCUSSION-

Patients who are partially edentulous might receive a variety of treatments. The optimum course of treatment is designed for the patients based on their circumstances and a number of diagnostic parameters.

Nowadays, because of the introduction of various techniques like CAD-CAM,

precision milled and semi-precision attachments, improved impression materials, improved techniques and designs, the best treatment can be given to the patients [1]. In removable partial denture, primary retention is mainly accomplished mechanically by placing retaining element on the abutment teeth whereas Secondary retention is provided by the intimate relationship of the denture bases and major connector with the underlying tissue [2]. Lack of stability is a major problem faced by most of the patients leading to poor chewing ability [3]. CPD are strong, rigid have good stability and hence it is preferred.

CONCLUSION-

Based on this case study, it was determined that if proper oral and denture care is maintained on a regular basis, a cast partial denture can function as a better prosthesis in terms of retention, stability, masticatory efficiency, comfort, and periodontal health of the abutment.

REFERENCES-

1. Williams RJ, Bibb R, Eggbeer D, et al. Use of CAD/CAM technology to fabricate a removable partial denture framework. J Prosthetic Dent 2006; 96:96–99.
2. Neha Alone, Ulhas Dudhekar, Karan Jaiswal, Pratik Pal, Ravina Khairkar, Praktan Gire, Rehabilitation of Partially Edentulous Patients with Cast Partial Denture: A Case Report, J Res Med Dent Sci, 2022, 10 (12): 163-166.
3. Chrystie JA. Principles of clasp retention: A review. Aus Dent J 1988; 33:96-100.

A SIMPLE TECHNIQUE TO LOCATE ABUTMENT ACCESS HOLE IN CEMENT RETAINED IMPLANT CROWNS: A CLINICAL TIP

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ABSTRACT

This article highlights a simple technique to gain access to abutment screw through the cement retained crown with a high degree of predictability.

Keywords: Access hole, cement retained implant crown, Putty index Keywords: Access hole, cement retained implant crown, Putty index

INTRODUCTION

The prosthetic phase of implant therapy involves fabrication of either cement retained or a screw retained prosthesis. Abutment screw loosening is one of the most common technical complications encountered[1], which necessitates the operator to access the abutment screw through the prosthesis for either removal or replacement. Several authors have mentioned different methods of gaining access to the abutment screw hole. **Doerr[2]** and **Tarlow[3]** described a method to gain access by using a vacuum formed matrix with access holes corresponding to abutment positions. **Hill[4]** described the fabrication of a putty index for the same purpose. **Schwedhelm and Raigrodski[5]** described a procedure which involves staining of the occlusal surface of the ceramic crown at the area corresponding to access hole location. **Lautensack J et al[6]** described a method of using a vacuform template that provides information regarding the screw location and angulation of the screw channel and enables guided drilling through the template.**Figueras-Alvarez et al[7]** and **Daher et al[8]** advocated the use of photograph as a record to ensure correct position of access hole location.**Wadhwani et al** [9] described a procedure for fabricating a custom-made and precision implant-locating device to record the access position of the abutment screw. **Patil and Patil[10]** suggests

preservation of the occlusal photograph of the restorations (indicating the access-points) placed on a definitive cast in the form of a computer file and transferring this to the patient's e-mail or social networking account. Most of the above mentioned methods are either cumbersome to fabricate, technique sensitive or require additional armamentarium and instrumentation.

The current technique involves the use of an orthodontic wire along with a PVSputty matrix which enables the operator to easily and accurately locate the screw access hole intraorally.

Procedure:

Record the impression using a suitable technique (open tray or closed tray) and material and attach the laboratory analogue to the impression coping. Pour the impression after application of gingival mask.

Retreive the cast, attach the abutment to the analogue and perform the necessary modifications, following which a crown is fabricated on the abutment.Once the crown is ready, unseatthe crown from the abutment on cast and a 21 gauge wire is used to create a small loop of 2 mm diameter with wires extending about 10mm from both arms of the loop.

The loop is then adjusted such that it corresponds with the occlusal aspect of abutment screw access hole with the wire positioned above the level of the prosthetic crown. (figure 1)

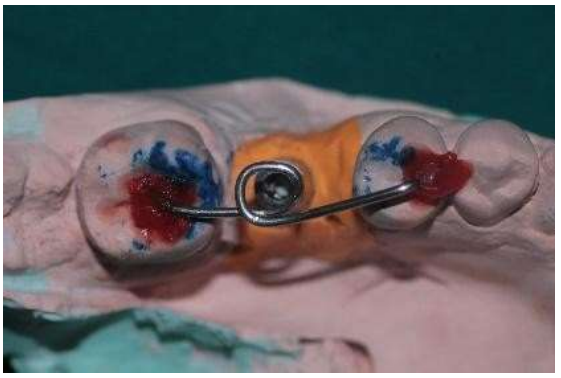

Fig.1 A loop of orthodontic wire corresponding to the access hole on abutment.

Once this position is fixed and stabilized using pattern resin on the arms of the loop extending on adjacent teeth, the crown is replaced back on the abutment and the putty index is fabricated on the crown and the adjacent teeth covering both buccal and lingual sides.

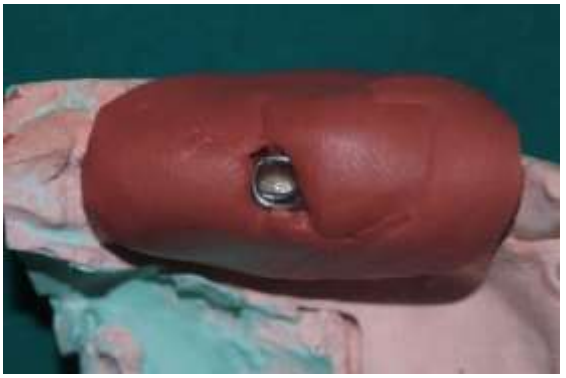

Fig.2 silicone putty embedding the orthodontic wire with the final crown seated in position.

Any excess putty covering the wire and the occlusal surface is cleared over the loop.

This putty index is then preserved for future reference.

The technique presents advantages in terms of ease of fabrication, use of materials and accuracy of location of the access hole. Poor relocation of the access hole may lead to non-usage of the crown or rather damage

to the underlying abutment itself which may necessitate usage of a new abutment and crown. This is especially true with regard to abutment screw retightening or replacement which does not involve any physical damage to the crown or abutment thereby not warranting their replacement. Operator does need to preserve the index which necessitates a certain amount of care in terms of record maintenance.

REFERENCES

1) Nissan J, Narobai D, Gross O, Ghelfan O, Chaushu G. Long-term outcome of cemented versus screw-retained implant-supported partial restorations. *Int J Oral Maxillofac Implants.* 2011;26(5):1102-07.

2) Doerr J. Simplified technique for retrieving cemented implant restorations. J Prosthet

Dent 2002; 88:352-3.

3) Tarlow JL. A modified technique to locate the abutment screw access opening of a cemented implant-supported restoration. *J Prosthet Dent.* 2012; 108:58-59.

4) Hill EE. A simple, permanent index for abutment screw access for cemented implant-supported crowns. J Prosthet Dent 2007; 97:313-4.

5) Schwedhelm ER, Raigrodski AJ. A technique for locating implant abutment screws of

posterior cement-retained metal-ceramic restorations with ceramic occlusal surfaces.JProsthet Dent 2006; 95:165-7.

6) Lautensack J, Weber V, Wolfart S. Template to determine the position and angulation of the abutment screw channel for implant supported, cement-retained restorations. *J Prosthet Dent* 2012;107:134-36

7) Figueras-Alvarez O, Cedeño R, Cano-Batalla J, Cabratosa-Termes J. A method for registering the abutment screw position of cement-retained implant restorations. JProsthet Dent 2010; 104:60-2.

8) Daher T, Morgano SM. The use of digital photographs to locate implant

abutment screws for implant-supported cement retained restorations. J Prosthet Dent 2008; 100:238-9.

9) Wadhwani C, Kwok-Hung Chung. Simple device to locate the abutment screw position of a cement retained implant restoration. J Prosthet Dent 2013; 109:272-274

10) Patil PG, Patil SP. Occlusal-view photograph of cement-retained implant prosthesis as a permanent guide for access-hole preparation. *J Prosthet Dent.* 2013;109(5):343-44.

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PROSTHODONTIC CONSIDERATIONS IN IMPLANT LOADING

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ABSTRACT

The success of dental implant therapy hinges on the preservation of peri-implant bone, particularly the bone crest, which is vulnerable to physiological bone loss due to occlusal forces or implant overloading. The density of the available bone plays a pivotal role in determining the surgical approach, healing period, and timing for implant loading. Research indicates that the risk of implant failure increases when the implant is prematurely loaded. As a result, various loading protocols have been developed and studied to mitigate these risks. Implant loading is a critical step, as the implant becomes functional once connected to a prosthesis. Proper selection of the loading protocol is crucial for treatment planning, and it directly influences the implant's long-term success. The timing of implant placement is an essential factor in this decision, with three primary approaches: late implant placement (more than six months after extraction), early implant placement (4–8 weeks post-extraction), and immediate implant placement (on the same day as tooth removal). Each approach has specific advantages and challenges, which must be considered based on the patient's clinical situation. Understanding the optimal loading protocol and placement timing is fundamental in ensuring the stability and longevity of implants.

Keywords: Implant Loading, Peri-Implant Bone, Loading Protocols, Implant Placement Timing, Prosthodontic Considerations.

INTRODUCTION

A key aspect of evaluating the success of implant therapy lies in preserving peri-implant bone, especially the bone crest. This area is vital as it is prone to physiological bone loss during adaptation to occlusal forces or overloading.

The density of the available bone is a crucial factor influencing the surgical approach, healing period, and timing for loading. Studies have shown that the risk of implant failure rises when the implant is loaded and begins functioning. This has led to the development and exploration of various loading protocols.
An implant becomes functional once it is connected to a prosthesis. Therefore, selecting an appropriate loading protocol is an essential part of treatment planning. Additionally, the timing of implant placement impacts the chosen protocol.

Timing of Implant Placement[1]

- **Late Implant Placement**: Implants are placed after complete bone healing, typically more than six months post-extraction.
- **Early Implant Placement**: Implants are placed following soft tissue healing or partial bone healing, usually 4–8 weeks post-extraction.
- **Immediate Implant Placement**: Implants are inserted into the fresh extraction socket on the same day as the tooth removal.

Loading Protocols[2]

A loading protocol is defined by the time interval between implant placement and the attachment of the prosthesis. After placing an implant, clinicians decide on the optimal timing for loading. This often involves using a provisional prosthesis before final rehabilitation.

Types of Loading Protocols[3]

- **Conventional/Delayed Loading**: Implants undergo a healing period of more than two months before being connected to a prosthesis.
- **Immediate Loading**: Implants are connected to a prosthesis within one week of placement. This is further classified into:
    - *Immediate Functional Loading*: The prosthesis is in occlusal contact.
    - *Immediate Non-Functional Loading*: The prosthesis is not in occlusal contact.
- **Early Loading**: Implants are connected to a prosthesis between one week and two months post-placement. It is further divided into:
    - *Functional Early Loading*: The provisional prosthesis is in occlusal contact.
    - *Non-Functional Early Loading*: The prosthesis is kept out of occlusion.
- **Progressive Loading**: Introduced by Misch in 1983, this protocol involves gradually increasing tension during the prosthetic phase without overloading the implant. This gradual process, spanning 6–8 months, promotes bone maturation and enhances density and quality.

Treatment Modifiers Influencing Loading Protocol[2]

Certain clinical factors influence the choice of a loading protocol during the diagnostic, surgical, and maintenance phases. These include:

- The patient's medical condition and local risk factors, negate immediate loading protocol.

- Implant primary stability with insertion torque >25 Ncm and ISQ >60, allows you to load immediately.
- Implant dimensions and surface characteristics, has an effect on the loading protocol.
- Ample quality and optimal quantity of soft and hard tissues, can positively influence in immediate loading.
- Significant bone augmentation at placement, would desire a delayed loading protocol.
- Treatment plans tailored to patient-specific esthetic requirements, would necessitate an immediate loading protocol.

Key Considerations for Clinicians[4]

1. **Aesthetic Importance**: Immediate solutions may be prioritized for visible teeth.
2. **Oral Hygiene**: Poor hygiene can adversely affect osseointegration; immediate loading is not advisable for such patients.
3. **Occlusion and Wear Patterns**: Excessive forces can lead to implant failure. Rigid splinting is crucial for success.
4. **Bone Grafting Needs**: Extensive grafting may require delayed loading or larger implants.
5. **Implant Surface Treatment**: Modifications like SLA and SLActive implant surfaces, enhance osseointegration and primary stability.

Factors Affecting Immediate Loading[5]

1. **Cross-Arch Stability and Micromovement**: Adequate passive fit and controlled micromovements (<150 μm) ensure successful osseointegration.
2. **Interim Prosthesis**: Typically made from softer materials, they reduce load during healing but may risk fractures in full-arch cases.
3. **Definitive Restorations**: Immediate definitive prostheses provide better soft tissue outcomes but may need replacement if failures occur.
4. **Screw vs. Cement Retention**: Screw-retained prostheses are preferred for their ease of retrieval and maintenance during healing. Residual cement from cement-retained prostheses can compromise results.
5. **Occlusion**: Functional or non-functional loading is chosen based on the patient's dentition and biomechanical needs.

Cross-Arch Stability and Micromovements

Achieving cross-arch stability is essential for a rigid, bilaterally splinted interim prosthesis. Splinting mitigates the bending effects of lateral forces, reducing harmful stresses and evenly distributing masticatory forces across a broader surface area. Additionally, a cross-arch restoration with a proper passive fit minimizes excessive micromovement and ensures the stability necessary for successful osseointegration.

Excessive micromotion can lead to the formation of scar tissue by stem cells at the implant site, hindering osseointegration. However, controlled micromotion under 150 μm is generally well-tolerated, as it provides mechanical stimulation that promotes bone growth and bone-to-implant

contact (BIC). Immediate loading techniques have demonstrated higher BIC percentages (71.1 ± 11.8%) compared to conventional loading (45.1 ± 16.1%), suggesting that low-amplitude mechanical strain may accelerate bone formation.

Immediate Loading and Prosthetic Fit[5]

In immediate loading, non-passive fit issues are less common. Static stresses from prosthetic misfit typically dissipate during the early stages of osseointegration, with bone resorption occurring within the first two weeks of healing. This process often leads to passive fit by the time the final restoration is completed. Conversely, in conventional loading, prosthetic misfit can introduce stress into the implant system, leading to uneven force distribution and potential prosthetic complications, such as loosening or implant failure, even years after placement. This is largely due to the ankylotic nature of osseointegration.

Interim Prosthesis[5]

Immediate loading often involves placing an interim prosthesis, which is replaced with a definitive prosthesis once the soft and hard tissues have healed. Interim prostheses are usually made from softer materials to minimize loads on the bone during healing but may be prone to fractures, especially in full-arch rehabilitations. This issue can be addressed by using an immediate definitive prosthesis that is fully functional.

For full-mouth rehabilitations, an interim prosthesis is typically recommended until osseointegration is complete. However, achieving a passive fit with interim prostheses can be challenging due to anatomical variations and the limited control over soft tissue healing. If an implant fails during osseointegration, any definitive prosthesis placed at the time of surgery would need replacement.

Screw-Retained vs. Cement-Retained Prostheses[5]

Interim prostheses are retrieved periodically (e.g., every two weeks) for procedures such as suture removal, implant stability checks, and soft tissue evaluations. A screw-retained interim prosthesis is generally preferred due to its ease of retrieval and reduced risk of complications. In contrast, cement-retained prostheses are harder to retrieve and may compromise tissue healing if residual cement remains. Additionally, screw-retained prostheses offer greater flexibility for angle corrections (40°–90°) compared to cement-retained options (10°–30°).

Occlusion in Immediate Loading[5]

There are two types of occlusion in immediate implants:

1. **Immediate Functional Loading**: Interim prostheses are in full occlusion, typically used in fully edentulous patients.
2. **Immediate Non-Functional Loading**: Temporary restorations are out of occlusion, serving primarily for aesthetics and soft tissue guidance during healing. This approach reduces biomechanical overloading and is often used for partially edentulous patients.

Regardless of the occlusal concept chosen,

the following guidelines should be followed in immediate loading:

- **Implant Restoration Design**:
    - Reduce the size of the occlusal table.
    - Posterior teeth should have narrower occlusal platforms compared to natural teeth to avoid cantilevered contacts.
    - Flat cusps minimize lateral forces, while a horizontal fossa design distributes forces evenly.
- **Occlusal Contacts**: [6]
    - Limit occlusal contacts to no more than two per implant.
    - Primary contact should be centered over the implant head, with secondary contact within 1 mm of the periphery.
    - Avoid cantilever extensions to prevent non-axial forces.
    - Patients should adopt a soft diet during the initial healing period to minimize stress on the implants.

Implant Design, Surface, and Number

- **Design**: Screw-type implants with active threads enhance primary stability and load distribution.
- **Length**: Longer implants improve stability, especially in poor-quality bone.
- **Surface Roughness**: Increased roughness enhances bone-implant contact.
- **Number and Distribution**: Full-arch restorations in the maxilla require more implants compared to the mandible, with proper anteroposterior spread being critical.

STRESSES EXERTED ON THE IMPLANT BY DIFFERENT PROSTHETIC MATERIALS[7]

Materials for Conventional Implant Prosthesis

Framework Materials:

- **Casted**
- **Milled:** Titanium, PEEK, Zirconia, Cobalt Chromium

Layering Materials:

- Acrylic
- Composite resin
- Ceramic

Postoperative Prosthetic Complications in Immediate Loading Across Different Treatment Phases[9]

1. Diagnostic and Surgical Phases

Occlusal Vertical Dimension: Acrylic or resin is commonly used for fixed implant-supported prostheses. However, these materials lack strength and require a bulkier design, necessitating a minimum restorative space of 12–15 mm per arch. Insufficient space can lead to higher fracture rates of the prosthesis.

Smile Line and Transition Zone: The transition zone, or the prosthesis-gingival junction, may become visible. In

such cases, additional alveolar ridge reduction might be required during surgery to address aesthetic concerns.

Planning-Related Complications:
Implant placement must follow a prosthetically driven plan to accommodate the structure of the future prosthetic framework.

Lip Support:
Patients with long-term use of removable prostheses may require a buccal flange for adequate lip support to achieve aesthetically pleasing results.

Soft Tissue Issues and Graft Failure:

- Lack of keratinized tissue can lead to peri-implant pain, compromising oral hygiene and increasing the risk of soft and hard tissue damage.
- The treatment plan must ensure that keratinized tissue surrounds the implants, either through proper implant placement or grafting procedures.

2. **Transitional Prosthodontic Phase**

This phase begins immediately after implant loading with an interim prosthesis, typically made from acrylic material. It overlaps with the definitive prosthetic phase.

Managing Parafunctional Habits:
Patients with bruxism or a history of fractured restorations require extra precautions to prevent overloading and subsequent fractures, which can weaken the prosthesis at repair sites.

Implant Fractures:
Implant fractures can occur due to:

- Overloading
- Poor implant design
- Use of narrow implants in high occlusal load areas
- Improper occlusal concepts
- Bruxism
- Lack of passive fit

Bone Loss:
Excessive load or an absence of passive fit can result in bone loss around the implant.

3. Definitive Prosthodontic Phase

Occlusal Adjustments:

- Occlusal contacts should be evenly distributed bilaterally to reduce wear on the prosthetic teeth.
- Tools like T-scan can assist in identifying and correcting uneven occlusal forces, ensuring smooth transitions in and out of centric relation.

Prosthesis Contours:

- The intaglio surface should be flat to convex rather than festooned, ensuring it fits closely against the tissue.
- Buccolingual profiles must be smooth to facilitate phonation and avoid speech difficulties.

Phonetic Considerations:
Improperly contoured prostheses may lead to phonetic challenges, emphasizing the need for precise design.

4. Maintenance Phase and Related Issues

Soft-Tissue Hyperplasia:
This can occur beneath overdentures due to:

- Poor oral hygiene
- Insufficient space between the bar and tissue

Hygiene Considerations in Prosthesis Design:

- Superstructures must be designed to allow access for standard oral hygiene tools.
- Adequate interimplant distance and ovate pontic designs are essential.
- Avoid concave or ridge-lap designs that are difficult to clean and maintain.

Conclusion

The success of implant therapy hinges on careful planning, execution, and maintenance, with an emphasis on preserving peri-implant bone, particularly the bone crest. Key factors such as bone density, implant placement timing, and loading protocols play pivotal roles in achieving predictable outcomes. A thorough understanding of loading protocols, implant design, prosthetic materials, and patient-specific modifiers ensures a tailored approach that minimizes complications and enhances long-term success.

Attention to occlusal forces, prosthesis contours, and hygiene accessibility further supports implant longevity and patient satisfaction. With advancements in implant surface technology and innovative treatment protocols, clinicians can now provide more efficient and predictable solutions while addressing individual patient needs. This comprehensive approach fosters improved functional and aesthetic outcomes, setting the foundation for sustainable implant therapy success.

REFERENCES

1. Chen ST, Buser D. Esthetic outcomes following immediate and early implant placement in the anterior maxilla—a systematic review. Int J Oral Maxillofac Implants. 2014 Jan 1;29(Suppl):186-215.
2. ITI Treatment Guide Vol 4 :- Loading Protocols In Implant Dentstry – Edentulous Patients
3. Misch CE. Contemporary Implant Dentistry-E-Book: Contemporary Implant Dentistry-E-Book. Elsevier Health Sciences; 2007 Nov 26.
4. Porter JA, Von Fraunhofer JA. Success or failure of dental implants? A literature review with treatment considerations. General dentistry. 2005 Nov 1;53(6):423-32.
5. Ghoul WE, Chidiac JJ. Prosthetic requirements for immediate implant loading: a review. J Prosthodont. 2012 Feb;21(2):141-54.
6. Y Y Chen, C L Kuan, Y B Wang, Implant occlusion: biomechanical considerations for implant supported prostheses, J Dent Sci, 3(2), 2008, 65 - 74.
7. Lum LB, Beirne OR, Curtis DA. Histologic evaluation of Hydroxylapatite coated versus uncoated titanium blade implants in delayed and immediately loaded applications. Int J

Oral Maxillofac Implants. 1991;6:456-462.

8. Soliman TA, Tamam RA, Yousief SA, El-Anwar MI. Assessment of stress distribution around implant fixture with three different crown materials. Tanta Dental Journal. 2015 Dec 1;12(4):249-58.
9. Balwani TR, Godbole SD, Sathe S, et al. Prosthodontic complications associated with immediately loaded fixed implant-supported prostheses - a review. J Evolution Med Dent Sci 2020;9(45):3394-3398

AESTHETIC AND FUNCTIONAL REHABILITATION WITH ATTACHMENT-RETAINED CPD

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INTRODUCTION

Precision attachments are components, designed to enhance the retention, stability, and esthetics of removable partial dentures and overdentures. These attachments function as connectors between the prosthesis and abutment teeth or implants, allowing for controlled movement and improved distribution of masticatory forces, thereby minimizing trauma to abutments and soft tissues (1).

Precision attachments are primarily categorized based on their location relative to the abutment tooth into intracoronal and extracoronal types. Intracoronal attachments are housed entirely within the contours of the crown portion of a natural tooth. This design offers a non-resilient connection, providing a precise path of placement and enhanced esthetics due to the absence of visible clasps (2).

In contrast, extracoronal attachments are positioned outside the natural contours of the abutment tooth. They are often employed in scenarios where intracoronal attachments are not feasible, such as in cases with limited tooth structure or when additional retention is required. Extracoronal attachments can accommodate slight movements, offering a semi-resilient connection that aids in stress distribution and reduces the load on abutment teeth (3).

Among extracoronal attachments, the double ball attachment system has gained attention for its efficacy in enhancing prosthesis retention and stability. This system comprises two ball-shaped metal components on the denture that correspond to silicone or metal housings on the abutment teeth or implants, creating a secure and stable connection. The double ball design offers increased retention compared to single ball attachments, distributing occlusal forces more evenly and reducing stress on abutment teeth. This configuration is particularly beneficial for patients with limited residual dentition, as it provides improved masticatory efficiency and comfort (4).

The selection between attachments depends on factors such as the condition of abutment teeth, available inter-arch space, esthetic considerations, and patient-specific

functional requirements. A thorough understanding of these attachment systems enables clinicians to devise prosthetic solutions that are both functional and esthetically pleasing, thereby enhancing patient satisfaction and oral health-related quality of life (5).

The following article describes prosthetic management of partially edentulous patient using precision attachment and cast partial denture thereby enhancing the aesthetic and functional outcomes.

CASE REPORT

A 57-year-old male patient reported to the Department of Prosthodontics with a chief complaint of missing teeth(figure-1). The patient had no relevant medical history. Dental history revealed endodontic treatment with a bridge on 14, 15, 16 and crowns on 21, 35, 36, and 44.

Clinical examination showed missing teeth: 12, 24, 25, 26, 27, 31, 32, 33, 34, 41, 42, 43, 45, 46, and 47. Based on Kennedy's classification, the case was categorized as Class II, Modification 1 in both the maxilla and mandible, with insufficient vertical space for prosthetic rehabilitation. To correct this, the vertical dimension was increased by 2mm by adding composite (3M ESPE) to the articulating surface of tooth 44, and the patient was instructed to return after one week for evaluation.

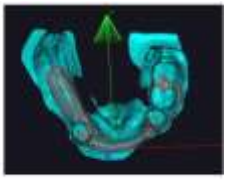
(Figure-1)

(Figure-2)

Diagnostic impressions were made, and casts were obtained and transferred to a semi-adjustable articulator using a facebow transfer and centric record at the predetermined vertical dimension. A diagnostic wax-up and removable partial denture (RPD) design were created using EXOCAD software, incorporating an anteroposterior (A-P) palatal strap connector for the maxilla and a lingual bar for the mandible.

Tooth preparations were performed for full-contour porcelain-fused-to-metal (PFM) crowns on maxillary teeth 12, 11, 21, 22, and 23 (figure-2) and mandibular teeth 37 and 44. A putty-light body impression (Reprosil, Densply) was made, and casts were obtained. Metal copings along with ball attachments(Patrix) was designed in ExoCad along with mandibular CPD framework(figure 3,4) A full-contour wax-up was fabricated with a double ball attachment (Patrix) on the distal surface of 23(figure-5). Following this, a metal trial was conducted, and a pickup impression of the metal coping along with the ball attachment was made using addition polysilicon impression material, Putty consistency (Aquasil soft putty, Densply) for fabrication of the matrix and CPD framework (figure-6,7).

(Figure-3)



(Figure-4)

(Figure-5)

(Figure-6)

(Figure-7)

After porcelain layering, the crowns were luted using GIC (Hy-bond, Shofu), and a

CPD framework trial was carried out for both the maxilla and mandible. A functional impression of the mandible was taken using the CPD framework, and an altered cast technique was used to obtain an accurate master cast. The bite registration was done, followed by an RPD trial, during which the patient was evaluated for aesthetics, phonetics, fit, and occlusion.

Upon the patient's approval, the final denture was inserted, and the patient was placed on a continuous follow-up and monitoring protocol to ensure long-term success and adaptation.(figure-8)

(Figure-8)

DISCUSSION

Extra-coronal precision attachments are widely used in removable partial dentures (RPDs) to enhance retention, stability, and stress distribution while preserving esthetics and reducing the need for visible clasps (6). In the present case of Kennedy Class II Modification 1 in both maxilla and mandible, a double ball attachment distal to 33 was incorporated to improve retention and aesthetics in the upper arch. This design offers enhanced stress distribution by allowing slight movement, reducing torque on the abutment teeth (7).

The double ball attachment provides increased mechanical retention by engaging corresponding metal housings within the denture base, ensuring a secure yet resilient connection (8).

One of the critical considerations in this case was the increase in vertical dimension by 2mm to restore prosthetic space. According to Study by Chikunov I et al, suggests that moderate vertical dimension increases can enhance esthetics and function without causing discomfort or temporomandibular joint complications when properly assessed (9). The double ball attachment, with its resilient nature, helps accommodate minor variations in occlusal forces, further enhancing patient adaptation.

Long-term success depends on proper case selection, precise attachment positioning, and patient compliance with maintenance protocols. Periodic evaluation of abutment health, retention inserts, and occlusal balance is necessary to ensure continued prosthesis function.

1. Figure 1- Intra-oral Pre-operative photograph at maximum intercuspation
2. Figure 2- Preparation of 11,21,22,23 for PFM crowns and Patrix ball attachment
3. Figure 3- Designing of Metal coping and ball attachment in EXOCAD
4. Figure 4- Designing of mandibular cast partial denture framework in EXOCAD
5. Figure 5- Crowns with Double ball attachment
6. Figure 6- Mandibular partial denture framework
7. Figure 7- Maxillary Partial denture framework along with "O" rings
8. Figure 8- Intra-oral Post-operative photograph at maximum intercuspation

REFERENCES

1. McCracken WL. *McCracken's Removable Partial Prosthodontics*. 13th ed. Elsevier; 2016.

2. Zarb GA, Hobkirk JA, Eckert SE, Jacob RF. *Prosthodontic Treatment for Edentulous Patients: Complete Dentures and Implant-Supported Prostheses*. 13th ed. Elsevier; 2013.
3. Stewart KL, Rudd KD, Kuebker WA. *Clinical Removable Partial Prosthodontics*. 2nd ed. Mosby; 2014.
4. Kim HY, Lee JY, Shin SW. Biomechanical behavior of different double ball attachment systems in implant overdentures: A finite element analysis. *Int J Oral Maxillofac Implants.* 2021;36(4):781-788.
5. Hobo S, Ichida E. CAD/CAM applications in precision attachment prostheses. *Int J Prosthodont.* 2020;33(1):45-52.
6. Burns DR, Ward JE. A review of attachments for removable partial dentures. *Int J Prosthodont.* 1990;3(1):98-102.
7. Abduo J, Lyons K. Clinical considerations for increasing occlusal vertical dimension: A review. *Aust Dent J.* 2012;57(1):2-10.
8. Misch CE. *Contemporary Implant Dentistry*. 3rd ed. Mosby; 2008.
9. Chikunov I, Jivraj S, Chee W. Treatment planning of the edentulous maxilla. *Br Dent J.* 2008;204(2):71-77.

RECONSTRUCTION OF MAXILLARY DEFECT WITH OBTURATOR PROSTHESIS IN MAXILLECTOMY USING LOST SALT TECHNIQUE: A CLINICAL REPORT

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ABSTRACT

Maxillectomy abnormalities can cause oro-antral communication issues, including difficulty in mastication, deglutition, diminished speech, and facial deformities. Prosthetic rehabilitation of such abnormalities is sometimes difficult due to the size of the defect area and the lack of proper retention induced by the prosthesis's size and weight. To create a lightweight prosthesis, an open hollow obturator or a closed hollow obturator is typically used. This case report demonstrates a one-step fabrication of a closed hollow bulb obturator utilizing the classic lost salt approach in a maxillectomy patient.

Keywords: hemi-maxillectomy, maxillofacial prosthesis, mucormycosis.

INTRODUCTION

Surgical therapy for maxillofacial malignancies can cause abnormalities both within and outside of the oral cavity. Reconstructive operations can repair minor errors, while severe deformities may need prosthetics. Prosthodontists have difficulty when restoring severe maxillofacial abnormalities due to limited retention options, high aesthetic expectations, and the necessity for optimal function.

Maxillectomy is the surgical excision of a portion or all of the maxillae, which is typically performed in acquired lesions such as squamous cell carcinoma and mucormycosis. It is frequently widespread because it preserves both hard and soft tissues in one's oral cavity. Successful rehabilitation can significantly improve the patient's quality of life.The maxilla is the most prevalent location for intraoral defects, which open into the antrum and nasopharynx. Defects in the maxilla can be congenital or acquired by surgery for oral neoplasms.

The aperture may be small or large, including the hard and soft palate, alveolar

ridges, and nasal cavity floor. Post-surgical maxillary abnormalities can lead to hyper nasal speech, fluid escaping to oral cavity, and poor masticatory function.

An obturator is defined as "a maxillofacial prosthesis used to close a congenital or acquired tissue opening, primarily of the hard palate and/or contiguous alveolar/soft tissue structures" in the glossary of prosthodontics.

An obturator is a disc or plate used to repair a defect or opening in the maxilla after partial or entire excision. Prosthetic rehabilitation for total and partial maxillectomy patients aims to separate the oral and nasal cavities for proper deglutition and articulation, support the orbital contents to prevent enophthalmos and diplopia, restore the midfacial contour, and achieve an acceptable aesthetic result. Obturators are categorized into three types according on their treatment phases: surgical, intermediate, and final. Obturators can be soft palate, pharyngeal, or hard palate, depending on the degree of the impairment. Definitive obturators are classified as either closed or open hollow bulb obturator

CASE REPORT

A 32-year-old male patient was referred to the Department of Prosthodontics by the Department of Ear, Nose, and Throat. With chief complaint of nasal regurgitation include difficulty swallowing, nasal tone in speech, breathing difficulties, excessive snoring, and food leaking during eating. The patient had previously been treated for mucormycosis of the palate, as evidenced by earlier reports. A 6 months ago, he underwent a partial palatectomy under general anesthesia and received a temporary obturator.

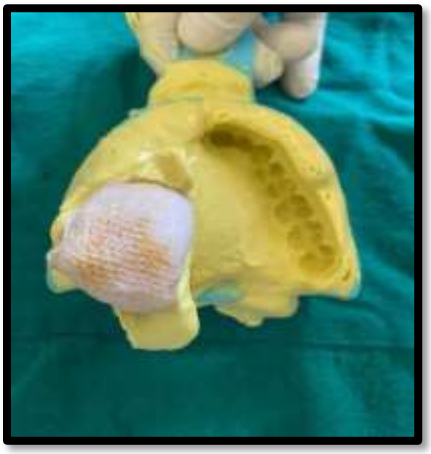
Following clinical examination, the patient had a large oro-antral communication of approximately 5 cm x 6 cm on the left side (fig. 1) extra oral image of the patient with recent ear surgery (fig.2)

Intra oral image showing the Oro antral defect (fig 1) extra oral image of the patient (fig.2)

Left maxillary alveolus was missing and teeth 21 to 26 were missing and callus seen on 27&28 respectively .Completely dentulous arch in the mandible.(fig3)

Image of the teeth present and missing intra orally (fig.3)

The patient was treated by creating an obturator. The main alginate impression was obtained by sealing the patient's nostrils with cotton rolled in gauge and dipped in betadine solution (fig.4). The impression was poured with Type III gypsum product and block out was done (fig.5). A customized tray was made with auto-polymerizing resin, bordered with green stick impression material, and the defect was recorded using an admixed compound in the ratio of 3:7sooften in a hot water bath (fig.6) followed by a secondary imprint with light-body impression material for dimensional stability (fig.7).wax bite was registered and Teeth arrangement and followed by try in was done (fig.8)

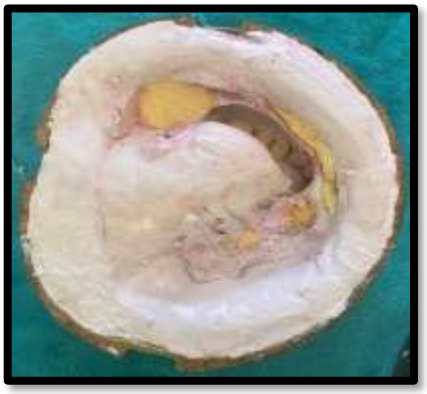


Alginate impression (fig.4) primary cast with wax block out (fig5)

Secondary impression (fig.6) master cast with dental stone (fig.7)

Wax bite registration, teeth arrangement and try in done (fig.8)

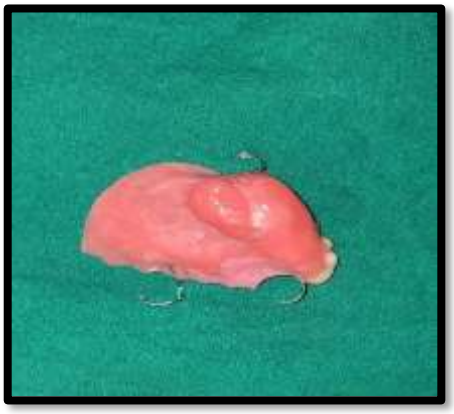
The next processes of maxilla mandibular attachment, articulation, and try-in were completed in the conventional manner.
Following de-waxing (fig.9), the following steps were taken to create a hollow bulb obturator. Undercuts were blocked out first, then separating media was applied to the depth of the defect, followed by auto-polymerizing heat cure acrylic to the depth of the master cast defect and the salt was packed in the cellophane sheet (fig 10,11), and packed completely using the same acrylic.
After processing, three small apertures were produced on the prosthesis's walls with an acrylic removing bur, and the salt inside the prosthesis was removed via the openings generated by injecting water into one hole and extracting dissolved salt from the other. The holes were subsequently sealed with an auto-polymerizing resin. Followed by floating test and weighing of the prosthesis was done to confirm the lightness of the obturator prosthesis (fig12). After setting, the material was carefully removed from the cast, trimmed to a thickness of 2 mm, and restored to the problem region (fig.13). The hollow part of the denture was made using the prosthesis's bulb. The final prosthesis was completed, polished, and presented to the patient (fig14). The patient received post-insertion maintenance instructions and was followed up on at 24 hours, 3 months, and 6 months later.



De-waxing done (fig.9)

Auto polymerising heat cure acrylic was packed using the lost salt technique (fig.10, 11)

Salt removal, Floating test and weighing of the prosthesis before delivery (fig 12)



Final maxillary obturator prosthesis (fig.13)

Final insertion of the orbital prosthesis (fig.14)

DISCUSSION

Hollowing down the bulb section of the maxillary obturator reduces its weight greatly. The bulb component of the obturator may be solid, open hollow, or

closed hollow. Both of open hollow and closed bulb obturators are lightweight, offering the benefits of decreased weight and enhanced speech. Open hollow bulb obturators gather mucous and fluid, resulting in a foul odour. Closed hollow bulb obturators, on the contrary, do not collect moisture or other accumulations while yet reaching sufficiently into the defect and giving better retention and support. A hollow maxillary obturator can decrease the weight of the prosthesis by, depending on the extent of the maxillary defect.

In this setup, we used salt, which is widely available and inexpensive. Separate lid manufacturing and subsequent luting of the lid to the prosthesis were omitted, resulting in reduced laboratory time. Thus, convenience, time, and cost savings are the benefits of the one-time processing approach used in this paper.

CONCLUSION

In order to prevent widespread surgical resection, post-operative complications, and the loss of physiological functions, prosthodontist should be vigilant and suspicious in cases of palatal perforation, particularly in elderly patients who are immune-compromised. Maxillary obturators are still regarded as a less intrusive and more cost-effective alternative to surgical reconstruction for the majority of patients. Prosthodontists play an important part in the effective rehabilitation of patients treated with maxillectomy. Effective rehabilitation in such circumstances requires a deep awareness of the patient's demands as well as substantial experience.

The obturator is the optimal treatment option due to its fast rebuilding, low risk of complications such osteoradionecrosis, patient acceptability, low cost, and ability to restore physiological functions.

REFERENCES

1. Deepika K, Gupta R, Gill S. Modified Extraoral Retentive Technique for Retaining Obturator in Bilateral Maxillecto my Defects Secondary to Mucormycosis in Healing Phase. Int J ProsthodontRestor Dent 2022;12(1):30–35.
2. Glossary of Prosthodontic Terms (2005) J Prosthet Dent 94: 10-92
3. Neville BW, Damm DD, Allen CM, Bouquet JE. Fungal and protozoal diseases. Oral and Maxillofacial Pathology, 3rd ed. Philadelphia: W.B Saunders Co.; 1995. p. 232-3.
4. Tirelli G, Rizzo R, Biasotto M, Di Lenarda R, Argenti B, Gatto A, et al. Obturator prostheses following palatal resection: Clinical cases. Acta Otorhinolaryngol Ital 2010;30(1):33-9.
5. Dhiman M, Shastry T, Bhandari S, et al. A custom made ex traoral aid for retaining interim obturator in edentulous pa tients with bilateral maxillectomy: a report of four patients. Spec Care Dentist 2019;39(4):429–434. DOI: 10.1111/ scd.12386
6. Rathee M, Divakar S, Jain P, Chahal S, Singh S. Magnet-Retained closed bulb hollow obturator and orbital prosthesis for patient with maxillectomy and orbital exenteration following COVID-Associated mucormycosis. Niger Postgrad Med J.
7. 2023;30(2):175-179. doi:10.4103/npmj.npmj_337_22
8. Farghal AE. Fabrication of a definitive obturator for a patient with a

maxillary defect: A case report. Cureus. 2023;15(12):e50578. doi:10.7759/cureus.50578
9. Ibrahim AS, Spellberg B, Walsh TJ, Kontoyiannis DP. Pathogenesis of mucormycosis. Clin Infect Dis 2012;54 Suppl 1:S16-22.
10. Francis G, Kariyatty P, Lijo J, Alani MM, Pramod PS, Varughese DP. Prosthetic rehabilitation by palatal hollow bulb obturator with cast metal denture base: A case report. Adv Hum Biol 2015;5(1):71-4.
11. Garg R, Gupta VV, Ashok L. Rhinomaxillary mucormycosis: A palatal ulcer. Contemp Clin Dent 2011;2(2):119-23.

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