

# Impressions

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Attingal Branch



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# Impressions

December 2018  
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# President's Message



Dear members,

Seasons greetings from IDA Attingal branch.

Our prestigious, award winning journal, IMPRESSIONS is getting released. This is the fourth issue of the journal. We are nearing an years completion at this time. Like last year we could release four issues of the journal.

I sincerely appreciate the efforts rendered by our Editor Journal, Dr Pradeep C. Dathan to make this happen. Also I congratulate each and everyone who have contributed.

As I mentioned earlier, we are nearing the end of the year. Looking back, it was a fruitful tenure with lots of good memories. Our candidate Dr Abhilash could win the State President elect post, also we went on to win to host the IDA State conference for the year 2021.

Our CDH Convenor, Dr Roshith has done exemplary work to conduct various activities. We could conduct some good CDE's with eminent faculties this year. I congratulate Dr Biju A. Nair, CDE convenor for his efforts. All these programs wouldn't have been possible without the untiring efforts of the Hon Secretary and executive members. I sincerely thank everyone for the same.

Once again I congratulate Dr Pradeep C. Dathan for his tremendous efforts and wish that we could win yet another State and National best Journal award this year also.

JAI IDA

Thanking you all,

**Dr Ramesh S**  
President  
IDA Attingal Branch.



## Secretary's Message

Dear member,

Another association year and my term as secretary of IDA Attingal branch is just nearing completion, when I took charge I was worried how to run the office but the advice and guidance of my predecessors led me through the term. Dear friends whole heartedly I would like to say that I have put my sincere effort to uphold the principles of IDA and was able to serve the members of IDA Attingal branch. I take this opportunity to thank all the dear members for their trust and the support given to me for the past two years. I also thank the IPP Dr Deepak Das and the president Dr Ramesh S for the cooperation and support. There may be certain flaws in functioning anything of that sought may be pardoned.

We were able to conduct many programs like previous years and the highlight was training programs conducted for dental assistants. The CDE convener Dr Biju A Nair and CDH convener Dr Rohith did a tremendous work to make this association year fruitful. Amidst the lose in the semi final, our cricket team did a great and energetic performance, congratulations to the team.

The Government is planning to implement clinical establishment bill in near future and IDA state office intervened in every clause of the bill and suggested modifications favourable for dental practitioners. Dear friends, members are the strength of any association; so my humble request to all the upcoming graduates is to join IDA and make it more strong..

Let us welcome this new year with new hopes. I am happy to say that one of our founder member Dr Abhilash GS is taking charge as the New President of IDA KSB. The induction ceremony is on 6th January 2019 during the state conference. I hope all the branch members will support him during his term. I am also happy and proud to say that the 4<sup>th</sup> issue of our journal is getting published thanks to the editor for his untiring efforts. Once again I take this opportunity to thank all the members for supporting me to serve you for the past two years. I wish you all Merry Christmas and Happy New year.

Thanking you,

**Dr Anil Kumar D.**  
Honorary Secretary  
IDA Attingal Branch.



## ABOUT IDA ATTINGAL

IDA Attingal, symbolizes & represents, updates & educates, promotes & supports the local dental community of erstwhile Attingal, in delivering, quality dental health care to the general public. Maintenance of proper standards & ethical manner in practice, better interpersonal relations, as well as willingness to share knowledge among members has provided a high degree of respectability to the organization. Effective follow up of organizational proceedings at the state & national level by the branch executive, ensures that the members are kept abreast of all IDA activities. Regular representation at IDA events & healthy interaction with other branch members has made IDA Attingal quite popular & a force to reckon. Adding to this would be a plethora of eminent leaders from the branch, who have raised to higher echelons in IDA. Through various Scientific programmes, presentations, journals & newsletters, the branch creates awareness of the latest advancements in dentistry, among members.

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## Let us dream together

Nearly two years ago, when my association has entrusted me with the job of the editor of 'Impressions', I did not realize fully well the responsibilities, the editor of a scientific journal has. Towards the end of two years, I realized that editor's primary responsibility is towards the authors who provide the content of the journal. Editor is also responsible to the peer reviewers who comment on the suitability of manuscripts for publication, to the journal's readers and the scientific community, to the publishers of the journal and to the public as a whole. During the two year period, eight issues were published and which contained 64 articles spread in 288 pages. Authors belonged to different strata – very seniors and juniors who have just entered the profession. Authors belonged to different institutions situated in different parts of the country. Impressions received both state and nation wide attention. During the year 2017, 'Impressions' received best journal award at the state and national level. I had the opportunity to receive the awards representing my branch – IDA Attingal. At that proud moment I was reminded of the solid support and constructive criticism 'Impressions' received from the members of Attingal branch without which I would have been at a loss in maintaining the quality and regularity.

My editorial board stood solidly behind me in maintaining quality of the content.

It will be ungrateful if I won't mention the names of a few who helped me in this endeavor of publishing the journal. Dr. Ashok Gopan distinguished himself with timely interventions and encouragement in getting sponsors. I thank Dr. Arun Roy, former Vice President, IDA KSB for his constant support. I gratefully acknowledge the services rendered by Dr. Anil Kumar D, Secretary, Dr. Arun S., Treasurer, Dr. Deepak S Das, IPP and Dr. Ramesh, President for the timely release of resources . Special mention to Dr. Abhilash GS, Dr. Biju A Nair, Dr Prakash P., Dr Premjith, Dr Sudeep and Dr Rudy A George for guiding the editorial team ensuring the timely release. I take this opportunity to thank all the executive members of IDA Attingal for serving as the back bone of the journal.

The Journal has dreams to achieve and I am reminded of the words of Dale Carnegie "Most of the important things in the world have been accomplished by people who have kept on trying when there seemed to be no hope at all." Let us try.

**Dr. Pradeep C. Dathan**  
Editor, Impressions

# Characterisation of FPD Provisional - A technique

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Provisional restoration in fixed prosthodontic rehabilitation is important particularly if the restoration is expected to function for extended periods of time or when additional therapy is required before completion of the rehabilitation. Provisional restorations must satisfy the requirements of pulpal protection, positional stability, occlusal function, ability to be cleansed, marginal wear resistance, strength, and esthetics.<sup>1</sup>

An increasing patient and clinician awareness of the importance of macro aesthetics involving teeth and gingiva has resulted in the development of prosthetic techniques aimed at improving the same. It can be challenging to achieve aesthetic harmony matching the gingival shade in FPDs with excessive gingival display.

Characterization of tooth in provisional restoration can be accomplished with the use of surface stain kits by Cleveland et al<sup>2</sup>, custom shading by Cleveland et al<sup>3</sup>, with a layering technique Cho et al<sup>4</sup>, use of volatile solvents frequently found in commercial characterizing kit by Aloul et al<sup>5</sup>, photopolymerising methacrylate laquer with porcelain powder stain of different shades applied over restoration by Mishra et al<sup>6</sup> and few too.

The technique elaborates an easy, efficient and predictable chairside procedure for gingival shading in characterizing provisional restorations with a gingival extension.

- step 1- Provisional FPD (Protemp™ Plus, 3M ESPE, United States) is fabricated using the putty index technique after tooth preparation. (fig 1)
- step 2 - The gingival margins are delineated in the provisional using a pencil. (fig 2)
- step 3 - A suitable stain matching the gingival shade of the patient is selected (Burnt umber, Camelin acrylic colour, Hindustan trading company, India) and mixed with flow-able composite (A1 shade, 3 M ESPE filtek United States) in a mixing pad and matched with the patient's gingiva.(fig 3)
- step 4; This is syringed on to the marked area, excess removed, and light cured (fig 4)
- step 5 - Following polymerisation finishing and polishing are done (SHOFU Composite Finishing Kit, Mulholland Ltd UK). (fig 5)
- step 6 - The luted provisional shows superior esthesis and can act as a guide for gingival porcelain shade selection of the permanent FPD. (fig 6,7,8)

## Conclusion

The fabrication of a custom provisional restoration providing optimum esthetics and function using a simple chair side technique is described here. High quality provisionals provide a smooth transition from interim to permanent prosthesis without any compromise.





Figure 1 –Prepared provisional FPD



Figure 2- Gingival margins delineated



Figure 3- Stain matching gingival shade prepared

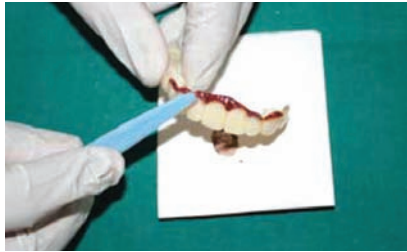


Figure 4- Mixed composite applied and light cured



Figure 5- Applied on the area trimmed and polished



Figure 6- Luted provisional FPD



Figure 7- Before characterization of provisionals



Figure 8 - After characterization of provisionals

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# Photography in Dental practice

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## Abstract

Intraoral photography is an essential part of clinical dental practice. During the course of dental treatment, the state of teeth and conditions in the oral cavity are likely to change. These can be recorded in detail by means of photographs. These provide an excellent option for documentation and the monitoring of treatment outcome over longer periods of time. With the right kind of skills and photographic techniques, the clinician establishes better communication with the patient regarding implementation of treatment plan. The various types of cameras and the accessories for intraoral photography are discussed, which will enable the dentist to make proper photographic documentation of cases.

**Key Words:** Intraoral Photography; Single Lens Reflex Camera; Digital Camera; Dental Photography

## Introduction

Photography finds wide application in various realms of dentistry, viz, in teaching, research and clinical documentation.<sup>1</sup> Clinical photography has become an inevitable part of routine dental practice. General dental practitioners and specialists both have found the photographic representation of a patient's condition as an essential part of the patient's record.<sup>2</sup> With evidence-based dentistry catching up worldwide, dental photography is inevitable in providing the evidence. In addition to traditional patient records and radiographs, dental photography offers the dentist with a wonderful possibility of visual reconstruction of the various stages of treatment.

Photographs are necessary for a variety of reasons: 1) Forgetfulness : Over a period of time, both patients and the dentist tend to forget how severe the original condition was. Taking photos at every visit and storing them makes the dentist and the patient aware of the original condition and the

improvements that has taken place. 2) Treatment evaluations: A quick review of sequential frames with patients during treatment will save lengthy explanations of the executed treatment plan. 3) Teaching needs: Slides are probably the most important teaching aids in dentistry. If cases are to be presented in lectures, papers and posters, high standard photographs are required. 4) Medico legal Cases: It is crucial to have clinical photographs that indicate any preexisting pathology or trauma to the teeth. Proper records will help avoid post-treatment litigation.<sup>3</sup>

## Types of cameras

Cameras are broadly divided into three main types: a) Those based on the single lens reflex (SLR camera) design with interchangeable lenses. b) Those based on a compact design where the lenses are not interchangeable - Digital camera and intra-oral camera. c) Digital SLR camera (combination of Digital and SLR camera).

The camera system could include, a 35mm single lens reflex system (SLR) camera, a lens capable of close-up photography, an electronic flash, mirrors and retractors, the brand of the camera being not so important,. Most dental photography is done with 35mm SLR camera systems, and of course digital cameras.<sup>4</sup>

**Single Lens Reflex (SLR) camera system:** SLR camera used in dental photography has two main parts, its body and lens. Cameras that are manual will function perfectly adequate, however cameras with auto exposure allow for more concentration on the patient and not photography. It is compact and easy to use, but probably the most important is that they can utilize interchangeable lenses.

**Digital Camera system:** Digital photography has become very popular and its application to dentistry offers many advantages. This allows photographic freedom, immediate review of pictures and they are most cost effective. They have a LCD screen so that the pictures can be reviewed and poor quality pictures can be deleted.

Choosing the right digital camera is not an easy task. Digital cameras are more technologically advanced than conventional cameras. The heart of any digital camera is the CCD. The individual areas on the CCD, which register the light falling onto them, are photodiodes, otherwise known as pixels. Megapixels are therefore millions of such pixels. The higher the MP (MegaPixel) number, the smaller the pixels, the better their solution. A digital zoom is not a true zoom lens, it merely crops the image throwing away the information at the edges and increasing the apparent magnification of the lens. Optical zoom implies the actual change in focal length. It functions by using a system of lenses to refract light and magnify the image on the CCD. Optical zoom magnifies the image quality along with the resulting details and clarity unlike digital zoom.

**Digital SLR camera:** These cameras combine the features of the SLR system with the digital camera. These include: i) an interchangeable lens which gives the option of taking extreme telephoto images that would be difficult or impossible with a compact digital camera. ii) Digital SLRs with large sensors will have much less noise than compact cameras.

This will give better fine detail, better shadow detail, and more flexibility to recover from exposure errors. iii) Digital SLRs use the faster and more accurate phase detection autofocus method and generally have shorter shutter lag times, making it easier to capture the action.

**Camera Accessories:** In addition to the camera some accessories are also required for a good quality photograph: a) Ring Flash –The ring flash on the SLR type camera produces excellent images. b) Memory card – the digital camera usually comes with a small card, which will hold relatively few images. Memory cards are available in different formats such as Compact Flash, Smart Media, XD cards and Microdrives. They can reach upto 8 GB in size and can store thousands of images dependent on the image format (eg TIFF, JPEG) that is used at the time the picture is taken. Not all cameras take all cards, but some will accept more than one type. c) Filter - If there is an internal thread on the lens it is worth buying a screw-on filter in order to protect it. This serves the dual purpose of lens protection and reducing the brightness of the image. d) Batteries – majority of digital cameras are power hungry and therefore it is worth buying an additional set, of the correct size, NiMH or Lithium ion rechargeable batteries and a quick charger, so that you always have a fresh set of charged batteries. e) Camera pouch this is useful to protect the camera when not in use.

**Photographic Accessories:** a) Cheek Retractors: They are used to retract the lips, labial and buccal mucosa out of the area to be photographed so that the maximum amount of light enters oral cavity which improves the visibility. Cheek retractors are available in clear plastic or metal. Metal retractors are less attractive but can be autoclaved. The transparent plastic retractors are aesthetically more acceptable and natural tissue colour shows through them, limiting the potential for distraction. Retractors are either single or double-ended. Double-ended retractors provide both a small and large curvature. This allows adaptability to a variety of mouth sizes. The end of the retractors acts as a handle to aid retraction. Strict aseptic measures are important during intraoral photography as in any other dental procedures in which infectious patho-

gens can be transmitted to the dental personnel or between patients. Because plastic retractors cannot be autoclaved, chemical sterilization is necessary.

**Technique for inserting retractors:** a) Moisten the retractors in water. b) Ask the patient to relax the lips and open the mouth slightly. c) Place the rim of the retractor onto the edge of the lower lip. d) Rotate the handle of the retractor until it is parallel to the corner of the mouth. e) Repeat this for the other side of the mouth if necessary. f) Instruct the patient to bite down on the posterior teeth. Pull out the retractors laterally and slightly forward.

**Intraoral mirrors:** Intraoral mirrors are used to provide a reflected image when areas of difficult access are photographed. Glass mirrors that have been rhodium plated on both sides create an excellent reflective surface. Intraoral mirrors are available in several sizes. The mirrors allow flexibility with minimal equipment for general adult photography. For photography of the pediatric patient smaller mirrors are recommended especially a child-size occlusal mirror. The large end of the mirror provides an excellent surface for capturing occlusal views, and the smaller end can be placed for palatal and lingual views. The mirror is easy to hold and keeps fingers from being too close to the scene. Mirrors can be washed with detergent and water.

**Technique for inserting mirrors:** a) Place the mirror in warm water before use to prevent fogging. A small heating pad could also be used to keep mirrors warm. b) Insert the appropriate cheek retractors. c) Select the mirror and the appropriate end for the desired view. d) Place the mirror flat into the mouth. As you retract with your fingers,

rotate the mirror into position. Take care not to hit the teeth or press into the alveolar process, as this is annoying and uncomfortable for the patient. e) Hold the mirror securely at the opposite end while maintaining retraction. f) If fogging occurs, blow a gentle stream of compressed air onto the mirror.

## Conclusion

Technological developments in the photographic process have continued to change and improve the practice of dentistry. Clinicians must now integrate existing photographic principles with today's contemporary camera systems and computer software technology. This evolution to a contemporary photographic process is revolutionizing the way clinicians diagnose, treat, and communicate with patients and colleagues. In this technologically advancing profession, the clinician should consider using an objective strategy for the selection and application of any camera system.

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# Virtual articulators

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## Abstract

The purpose of an articulator is to simulate centric, protrusive and lateral excursive movements of the mandible once the THA is transferred using a facebow to obtain the arc of closure as in that of the patient. It thereby helps in fabricating restorations which are biologically as well as functionally in accord with the masticatory system.<sup>1</sup> Technological advancements in the field of prosthodontics accounted for numerous design concepts of the articulators in the past decades reaching upto the virtual reality technology.

This review article discusses about the role of virtual reality technology in dentistry by the 3D visualization of maxillomandibular relationships and its effects on clinical outcome.

**Key words:** Virtual articulator, Static and Dynamic occlusion, Direct and Indirect digitizing, Collision-free movements

## Introduction

Virtual reality technology is an advanced form of human-computer interface that allows the creation and control of dynamic 3 dimensional, ecologically valid stimulus environments with which user can interact. This technology which began in domain of architecture and engineering established its significance in medical field through its applications-training of surgical procedures, education of patients and medical students, pain management methods, treatment of psychological dysfunction including phobias, post traumatic stress disorder and eating and body image disorders etc.<sup>2</sup>

Advent of virtual articulator, an application of this immersive technology in dentistry significantly reduced the limitations of the mechanical articulator, and by simulation of real patient data, allows analysis with respect to static and dynamic occlusion as well as to jaw relation.

Innovative research and development overcome limitations in design of mechanical articulators such as:

Mechanical articulators cannot evaluate the mobility of the teeth when using plaster casts in it, distortion and deformation of the mandible under loading conditions and the complexity of movement patterns. Mounted or articulated casts fails to represent the real dynamic conditions of the occlusion.

The accuracy of reproduction gets hampered by many other problems regarding the technical procedure and dental materials as:

- ☉ Susceptibility to deformation of bite registration material
- ☉ Accurate repositioning the cast into the bite impressions
- ☉ The stability of the articulator
- ☉ The correct orientation of the cast
- ☉ The use of rigid and expanded plaster material
- ☉ Maintenance of the mechanical articulator.<sup>3</sup>

## Virtual articulators

Virtual Articulators or “software articulators” comprise of virtual condylar and incisal guide planes. Guide planes can be measured precisely using jaw motion analyser or preset average values in

the software. The Virtual Articulators can be used to design prostheses kinematically. It simulates human mandibular movements by its feature of moving digitalized occlusal surfaces against each other and enabling correction of digitalized occlusal surfaces results in smooth, collision-free movements.

#### **Advantages over mechanical articulators**

1. Full analysis can be made of static and dynamic occlusion, of the intermaxillary relationships, and of the joint conditions
2. The possibility of selecting section planes allows detailed observation of regions of interest such as the temporomandibular joint.
3. Implant planning
4. Fabricate the best fitted occlusal restoration possible
5. To help students to understand the function of dental articulator, different excursive movement and their influence on the occlusal surface
6. To improve the quality of communication between the dentist and dental technician.
7. Allows modification or introduction of new setting according to the patient and helpful for patient's education

#### **Pre requisites**

- ⊙ 3D INTRA ORAL SCANNER(Direct digitizing) or CLOSED FRAME or OPEN FRAME DESK-TOP 3 D SCANNERS(Indirect digitizing) is a prerequisite for an automated and timesaving digitalization of a single tooth, complete denture models and the referred centric relation
- ⊙ a special orthodontical CAD-module to improve the functional occlusion and designing of occlusal profile of the teeth<sup>4</sup>

Based on the method of transfer of hinge axis, there are two techniques

1. With conventional articulator and cast
  - scanning whole articulator
  - scanning facebow
2. Without conventional articulator and cast

#### **With conventional articulator and cast**

##### **A) Scanning the whole Articulator**

Facebow transfer and interocclusal bite registration is made and cast is mounted onto articulator.

After mounting onto the conventional articulator, 3D scanner will scan the relationship of maxilla and mandible.

##### **b) Scanning the facebow**

Conventional face bow is used for recording the jaw relation from patient, and reference point are attached on cast and bite fork and scanned. The reference point is taken as guide for positioning virtual cast onto virtual articulator. Later the maximum intercuspation is scanned to locate mandibular relationship with maxilla

#### **Without conventional articulator**

Step 1: reverse engineering process: plaster models of upper and lower parts of the jaw are scanned to obtain a digitalized set of data of the patient. In this phase, the real geometry of the mouth and its relative location are reconstructed in a CAD system using the face bow.

Step 2: the type of articulator is selected depending on the required accuracy and/or on the patient's setting data available in each case.

#### **Selection of the articulator**

Virtual articulator design process requires operator skill and care because occlusal irregularities has potential to produce TMJ pathologies. Hence, it must be ensured that Occlusal restoration should allow free passage of the antagonist teeth without interfering with the movement of the mandible. Use of fully adjustable articulators facilitates high degree of precision.

Structures and shapes of articulators are analyzed using Reverse Engineering and measuring tools. Once the whole Virtual Articulator is constructed combining both measured and scanned parts, all the measures are verified. The final step deals with locating the models on the articulator. For this purpose, the relative position of the upper model is scanned using the face bow. Afterwards, the location in the virtual articulator is direct, and the location of the lower model is made using an electronic bite in Centric Relation. Modelling and parameterization makes it possible to introduce new settings which do not exist on a particular physical articulator, using intercondylar distance as a new parameter with regard to Hanau H2

The difficulty with previous technique is the transfer of digitized casts onto the virtual articulator. This was overcome with the introduction of virtual facebow.

Virtual cast which is already taken by extraoral and intraoral dental scanners is required for consisting the virtual articulator.

3 reference points are attached on patient's head, 2 are on temporomandibular joints and the 3rd one on infraorbital point

Scanning with optical scanner the pointer part placed on 3 reference points (1infraorbital, 2TMJ) to obtain the relationship between fixed part of head and the pointers (each devices have the their own reference point for determining the position of the device), and this information is transferred to scanner's software. Then determine 3 most prominent cusp of upper jaw by pushing the articulating paper on the metal facebow fork to upper jaw. Pointer tip is located on a prominent point and pointer is scanned. Repeat this twice on the 3 cusps. Transfer 6 positions of pointer (3 intraoral, 2 TMJ, 1 infraorbital) are transferred into scanner's software coincidentally

This image is transferred to virtual articulator software for indicating the position of the upper jaw between virtual articulator and virtual cast. By taking 3 surfaces (left, right, frontal) of the patient's jaw in centric relationship, mandibular virtual cast will be located in correct position.<sup>7</sup>

### Types of virtual articulators

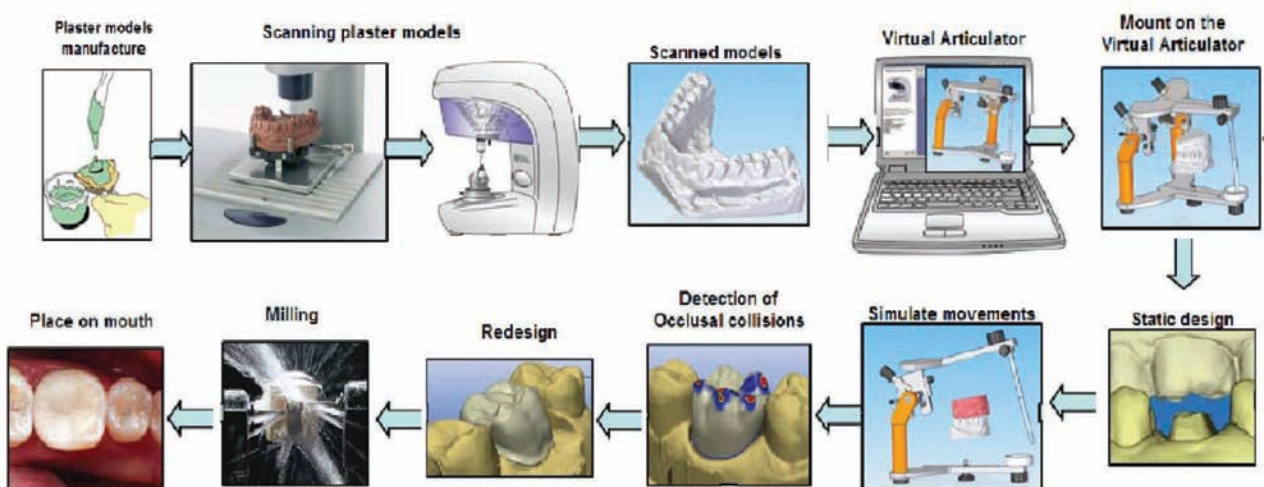
There are two types of virtual articulators namely:

- Completely adjustable
- Mathematically simulated

### Completely adjustable virtual articulator:

It reproduces exact movement paths of the mandible using an electronic jaw registration system called Jaw Motion Analyser (JMA). It is comprised of an ultrasound emitter array that is bonded to the labial surfaces of the mandibular teeth using a customized jig and four receivers attached to a face bow opposite to them for detecting all rotative and translative components in all degrees of freedom.

A special digitizing sensor is used to determine the reference plane, composed of the hinge axis infraorbital plane and special points of interest (eg: on the occlusal surface).



(figure1) dental laboratory process

adapted from [Design of a Virtual Articulator for the Simulation and Analysis of Mandibular Movements in Dental CAD/CAM E. Solaberrieta, O. Etzaniz, R. Mínguez, J. Muniozguren, A. Arias]

The digitised dental arches then move along these movement paths that can be viewed in the computer screen consisting of three main windows showing the same movement of the arches from different planes.

The software calculates and visualises both static and kinematic occlusal collisions and is used in designing and correction of occlusal surfaces in computer aided designing (CAD) systems. Eg: Kordass and Gartner virtual articulators.

The software of the DentCAM virtual articulator developed at the University of Griefswald consists of three main windows and a slice window, which show the same movement of teeth from different aspects:

*Rendering window:* Shows both jaws during dynamic occlusion and can visualise unusual views throughout dynamic patterns of occlusion i.e.: the view from the occlusal cusps while watching the antagonistic teeth coming close to the intercuspation position during chewing movements.

*Occlusion window:* Shows the static and dynamic occlusal contacts sliding over the surfaces of the upper and lower jaw as a function of time.

*Smaller window:* The movements of the temporomandibular joint are represented in a sagittal and transvers view which allows the analysis and diagnosis of interdependencies between tooth contacts and movements of the temporomandibular joint.

*Slice window:* Shows any frontal slice throughout the dental arch. This tool helps to analyse the degree of intercuspation, and the height and functional angles of the cusps. With this window, the analysis of guidance and balancing becomes easy.

The recent software versions incorporate an orthodontic module allowing the creation of a virtual setup. The program has also been equipped with the representation of the condylar trajectories in the sagittal and horizontal planes. This software tool allows us to observe the inter relationship between the incisal guide and the condylar guide, and the effects of joint mobility upon occlusion.<sup>3</sup>

### **Mathematically Simulated Virtual Articulator:**

It is a fully adjustable three dimensional virtual articulator capable of reproducing the movements

of a mechanical articulator by mathematical simulation. In addition, it contributes to offering possibilities not offered by some mechanical dental articulators, such as curved Bennett movement or different movements in identical settings. This makes it more versatile than a mechanical dental articulator. On the other hand, since it is a mathematical approach, it behaves as an average value articulator, and therefore, is not possible to obtain easily the individualized movement paths of each patient. Eg: Stratos 200, Szentpetery's virtual articulator

### **Conclusion**

The future of the dentistry is directed towards advancements in diagnosis of dysfunction and dysmorphology, optimizing networking communication and Improved clinical outcome through collision free restorations with computer-aided tools, thereby reducing time and labour.

### **Discussion**

Digital Articulators helps the clinician to visualize and deal with functional aspects of occlusion to design prostheses kinematically. It helps in minimizing the chair side time for occlusal corrections.

They are capable of:

- Simulating human mandibular movements,
- Moving digitalized occlusal surfaces against each other according to these movements, and
- Eliminating the occlusal interferences to enable smooth and collision-free movements.

Another remarkable conclusion is the flexibility and versatility offered by Virtual Articulator.

Limitations of virtual articulator:

- Expensive as it requires the digital scanners, digital sensors, software's, and different types of virtual articulator models mimicking the mechanical ones according to the patient need.
- One should have thorough knowledge about the CAD/CAM technology, mechanical articulators, designing and modeling of virtual articulators etc and technical skills regarding the interpretation of data recorded scanners, sensors, minor adjustments, incorporating motion parameters etc<sup>10</sup>



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# Provisionalisation– a much neglected step: its significance and recent advances

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## Abstract

Provisional restorations in fixed prosthodontic rehabilitation are important treatment procedures and a reasonable amount of time and effort spent on this phase of our work is a very good investment<sup>18</sup>. These materials should not only satisfy the mechanical requirements such as strength and resistance to wear but also meet the biologic and esthetic demands. The prognosis of a fixed restoration greatly depends on this interim restoration. This article describes the significance of provisionalisation, the various materials used and recent advances.

**Keywords:** Auto polymerized resin, bis-acryl composite, light cure resin, poly-ethyl methacrylate, provisional restoration

## Introduction

Interim fixed prostheses have a significant role in the fixed prosthodontic treatment from the time a tooth preparation is done till the definitive prosthesis is fixed<sup>1</sup>. The inaccurate assignment of the term “temporary” to the interim restoration has generated the misconception that eventual placement of the permanent restoration will immediately and miraculously remedy the detrimental effects of a poorly conceived and fabricated transitional restoration. A properly fabricated provisional fixed partial denture will provide a preview of the future prosthesis and enhance the health of the abutments and periodontium<sup>9</sup>. Provisionalization is done to establish esthetics, occlusal stability, function and also to verify therapeutic outcome and patient acceptance before the definitive prostheses. The requirements of an interim restoration are essentially the same as for the definitive restoration, with the exception of longevity and possibly the sophistication of color.

## Requirements for Ideal Interim Fixed Prosthesis Material<sup>2</sup>

- 1) Good marginal adaptation; adapts well to a tooth and matrix surface
- 2) Adequate retention and resistance to dislodgement throughout the normal masticatory process.
- 3) Strong, durable and hard
- 4) Nonirritating to pulp and other tissues; low exothermicity
- 5) Nonporous and dimensionally stable
- 6) Comfortable
- 7) Esthetically acceptable shade selection; translucent tooth-like appearance
- 8) Color stability
- 9) Physiologic contours and embrasures
- 10) Easy to mix and load in the matrix, fabricate, relin, and repair; relatively short setting time
- 11) Physiologic occlusion
- 12) Conducive to routine oral home-care cleaning procedures
- 13) Finishes to an extremely polished, plaque- and stain-resistant surface

- 14) Easy to remove and re-cement by the dentist
- 15) Relatively inexpensive
- 16) Low incidence of localized allergic reactions

#### Importance of interim restorations<sup>1</sup>

The interim restoration helps to determine if the proposed prosthodontic solution for the presenting condition satisfies the patient's functional requirements and esthetic expectations. A properly adapted and contoured interim restoration can serve as a guide to determine if there is adequate retention and resistance form for the functional requirements of the prosthesis and if optimal tooth reduction has been provided to satisfy the biomechanical, physiologic, and esthetic requirements of the planned restoration. Changes in vertical dimension of occlusion, centric occlusal contact relationships, and anterior guidance can most readily be evaluated with properly designed interim restorations. Changes in tooth length, contour, incisal edge position, lip support, occlusal or incisal plane, and tooth color can also be best evaluated with the interim restoration<sup>1</sup>.

Properly designed interim restorations serve as excellent guides to periodontal surgical procedures, such as crown lengthening, ridge augmentation, and pontic site development procedures. Interim restorations may also aid in pre-prosthetic endodontic and orthodontic therapies<sup>1</sup>.

A duplicate of the interim restoration serves as a guide for the laboratory technician in the fabrication of the definitive prosthesis<sup>1</sup>.

Provisionalisation are used during other treatment modalities like different stages of implant supported prosthesis which include provisionalisation before implant loading, transitional implant provisional restoration, cement or screw retained provisional prosthesis<sup>20</sup>.

Provisional restorations are also a part of maxillofacial rehabilitation which includes use of interim obturators or feeding plates and interim dentures. It also has a role to play during transformation of an immediate denture to conventional denture prosthesis<sup>20</sup>.

#### Materials used in the fabrication of provisional restoration

Interim prostheses are fabricated using two methods:

- 1) Preformed materials
- 2) Custom-fabricated materials.

Both methods have been shown to provide a clinically acceptable interim prosthesis<sup>4</sup>.

#### Preformed Materials

Preformed provisionals are crowns or matrices that are preformed by a manufacturer in the shape of a tooth. These shells are made of plastic, cellulose acetate or metal. They are then customized by relining with some form of acrylic resin before cementation (Liu et al 1986, Shavell 1979).

#### Custom-Fabricated Materials

Custom-fabricated materials are used for fabrication of interim fixed prostheses utilizing direct clinical, indirect laboratory or indirect/direct techniques (Christensen 1996).

These materials are categorized according to various criteria. The most general method is the chemical composition of the material, which divided these materials into acrylics or composites. The most common methods in the material science literature are categorization by polymerization method and chemical composition.

#### Acrylics<sup>3</sup>

The three types of acrylics are polymethyl methacrylates, poly-R' methacrylates and epimines

**Polymethyl methacrylates** are commercially available as Jet (Lang), Alike (GC America), Temporary Bridge Resin (Dentsply/Caulk), Neopar (SDS/Kerr), and Duralay (Reliance).

*Advantages:* low cost, good wear resistance, good esthetics, high polishability, good colour stability

*Disadvantages:* significant amount of heat given off by exothermic reaction, high degree of shrinkage (about 8%) objectionable odour, short working time, hard to repair and radiolucent.

**Poly-R' Methacrylates** (R' = ethyl, vinyl, isobutyl) are commercially available as Snap (a polyethyl methacrylate from Parkell), Splintline (a polyethyl methacrylate (PEMA) from Lang), Trim II (a polyvinyl methacrylate from Bosworth), Provisional C&B Resin (a polyvinyl methacrylate from Cadco), and Temp Plus (a polyisobutyl methacrylate from Ellman).

*Advantages:* low cost, less heat given off during reaction, less shrinkage than polymethyl methacrylates and extended working time.

*Disadvantages:* less esthetic than other currently marketed materials, eugenol deteriorates the resin, poor wear resistance, poor colour stability, objectionable odour, hard to repair and radiolucent.

Fracture of restoration is a common complaint and to overcome this problem research has proved that incorporating the following have found to increase the fracture resistance of the restoration such as metal strand, cast metal augmentation on

the lingual side, and infusion with various types of fibers (glass, carbon, polyethylene, etc.). The occlusal middle third region of the pontic from mesial to the distal end of the connector is found out to be the site for the placement of the fiber for fortifying the PMMA interim restorative resin<sup>12</sup>.

Epimines were the first two-paste acrylics, commercially introduced in 1968 as Scutan (ESPE). Although Scutan had relatively low shrinkage, heat production and lowest pulpal irritability, it was weak and could not be altered or repaired.

ACRYLICS	Advantages	Disadvantages
1) Polymethylmethacrylates	Low Cost	Heat production
	Wear Resistance	Odour
	Esthetics	Short working time
	Polishability	High degree of shrinkage
	Colour stability	Hard to repair
		Radiolucent
2) Poly-R' Methacrylates	Low cost	Poor wear resistance
	Less heat production during exothermic reaction	Less esthetic, Radiolucent
	Less shrinkage than PMMA	Poor colour stability
	Extended working time	Odour
3) Epimines	Low shrinkage	Weak
	Low heat production	Cannot be repaired
	Lowest pulpal irritability	

### Composites<sup>3</sup>

Composites are available as auto-polymerized, dual polymerized and visible light polymerized.

**Bis-acryl** provisional materials are resin composites and represent an improvement over the acrylics because they shrink less, give off less heat during setting, excellent esthetics, minimal odor and can be polished at chair-side. These products are provided in cartridges for use in an automix dispenser gun.

Commercially available *bis-acryl auto polymerized composite* include Bis jet, Integrity Luxatemp, Protemp II, ProtempGarant, Protemp IV, Provitec, Smar Temp, Temphase, Turbotemp and Ultra Trim.

Commercially available *Bis-acryl composite (Dual-polymerized)* are Iso temp, Luxatemp solar, Luxa-flow and Provipont DC.

Urethane dimethacrylate composite, *Visible light polymerized* is available as Triad.

### CAD/CAM provisional blocks

CAD/CAM technology is also used to produce long term interim prostheses from high-density polymer materials. These materials are manufactured with controlled polymerization under optimum pressure and temperature.<sup>8</sup> Polymethylmethacrylate (PMMA)-based polymer (Vita CAD-Temp) was the first-introduced interim prosthesis material for CAD/CAM<sup>7</sup>

- Acrylate polymer material VITA CAD-Temp® (VITA Zahnfabrik, Germany),
- Polyetheretherketone PEEK (Invibio Biomaterial Company, UK), and
- Polymethyl methacrylate material Telio CAD-Temp (Ivoclar Vivadent, Liechtenstein, Germany).

CAD/CAM provisional crowns demonstrated superior marginal fit compared with the direct provisional crowns. The mean internal gap was lower for the CAD/CAM groups; however, the internal gap was more uniform for the direct provisional crowns<sup>6</sup>.

### Discussion

Provisional restorations must satisfy biologic and esthetic needs as well as mechanical requirements such as resistance to functional loads, resistance to removal forces, and maintenance of abutment alignment<sup>13</sup>.

Traditionally, the methacrylates and bis-GMA resins have offered higher strength than the bis-Acryl resins, but flexural strength has been greater with bis-Acryl resins than with methacrylates. One study found this to be product specific, not material specific. (Haselton et al)

Young et al<sup>14</sup> compared bis-acryl and polymethylmethacrylate materials in terms of occlusion, contour, marginal fidelity, and finish. For both anterior and posterior teeth, they found that the bis-acryl materials were superior to PMMA in all categories. Among the various bis-acryl materials, studies have concluded that Protemp IV is the most colour stable and with superior mechanical properties.



When comparing the marginal integrity of provisional materials fabricated using the same technique, in vitro results suggest that marginal fidelity is more dependent on the specific product than on the chemical classification of the material<sup>17</sup>.

After the final testing of the 4 provisional crown materials, following was the relative degree of insulation that a material could provide<sup>5</sup>:

UDMA > Bis-Acrylic > PMMA > PEMMA

The available evidence after conducting systematic review and meta-analysis indicates that dimethacrylate-based provisional restorations possess better mechanical behaviour than monomethacrylate-based ones in terms of flexural strength and hardness, but there are no significant differences in fracture toughness. Among the monomethacrylates, PMMA shows greater flexural strength than PEMA<sup>16</sup>.

CAD/CAM interim crowns showed improved color stability and physical and mechanical properties compared to conventionally fabricated crowns<sup>19</sup>. CAD/CAM fabrication is applicable for long-term clinical interim restorations.

Atay et al investigated the influence of six interim prosthesis materials (four conventional polymer-based and two high-density polymer materials for CAD/CAM on L929 cells. The results of the cytotoxicity assay revealed that PT (Protemp 4-bis-acryl composite resin) and TC (Telio CAD, PMMA-based CAD/CAM material) were noncytotoxic materials, whereas the others were slightly cytotoxic on the fibroblast cells. None of the interim prosthesis materials had moderate or severe cytotoxic effects<sup>8</sup>.

## Conclusion

This phase of restorative treatment should not be merely considered a temporary treatment but act as a functional and esthetic try-in and serve as a blueprint for the design of the definitive prosthesis<sup>1</sup>. The information that is obtained in this phase of treatment will reduce the problems that may be encountered in the definitive treatment<sup>10</sup>. In selecting a material for the fabrication of a single crown or multi-unit interim restoration, the clinician must consider multiple factors, such as physical properties, handling properties, patient acceptance and material cost. There is no one material that meets all requirements<sup>1</sup>. The clinician must be aware of all attributes of various materials and choose the provisional material appropriate for each patient<sup>15</sup>.

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# An Overview on Full Mouth Rehabilitation

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## Abstract

Restoration of occlusion in patients with severely deteriorated dentition is a challenging situation. There is great apprehension involved in reconstructing debilitated dentition for successful full mouth rehabilitation. This article is an overview on why and when of full mouth rehabilitation.

**Keywords :** Full mouth rehabilitation, overview

## Introduction

The goal of dentistry is to increase the life span of the functioning dentition. Dentistry has long been a skilled craft, but it is much more than that. It is primarily, a science. Thus, it is, or should be, concerned not only with how to do it, but also with why do it. A better understanding of the scientific principles underlying our techniques will inevitably improve those techniques, since it focuses attention on the goal and thus provides a criterion for evaluating our procedures.

Successfully treating patients requires a thoughtful combination of many aspects of dental treatment such as patient education, sound diagnosis, periodontal therapy, operative skills, occlusal considerations, endodontic treatment and achieving harmony between the TMJ and occlusion.

Traditionally full mouth rehabilitation refers to the involvement of all diagnostic, therapeutic, and restorative procedures available for the treatment and prevention of dental disease. In the narrower, more recently acquired sense, the term refers to the extensive and intensive restorative procedures in which the occlusal plane is modified in many aspects to accomplish equilibration.

Full mouth rehabilitation is defined as the restoration of the form and function of the masticatory apparatus to as nearly a normal condition as pos-

sible.<sup>1</sup> It should re-establish a state of functional as well as biological efficiency where teeth and their periodontal structures, the muscles of mastication, and the temporomandibular joint (TMJ) mechanisms all function together in synchronous harmony.<sup>2</sup> The aim is to restore the tooth to its natural form, function and esthetics while maintaining the physiologic integrity in harmonious relationship with the adjacent hard and soft tissues, all of which enhance the oral health and welfare of the patient.

## Normal v/s pathological occlusion

In only slightly more than 10% of the population, is there complete harmony between the teeth and the TMJ.<sup>3</sup> In a majority of the population, the mandible is deflected away from its optimum position during maximum intercuspation. In the absence of symptoms, this can be considered physiologic or normal. Therefore, in a normal occlusion, there will be mandibular movements as a product of reflex function of the neuromuscular system which help in avoiding premature contacts.<sup>4</sup> The result will be hypertonicity of muscles and trauma to TMJ. This will be well within most people's physiologic capacity to adapt and will not cause discomfort.<sup>5</sup> However, the patient's ability to adapt may be influenced by the effects of psychic stress and emotional tensions on the central nervous system. This may lower the threshold to adapt, parafunctional activity

may develop, these will make a normal occlusion pathologic. Simple muscle hypertonicity may give way to muscle fatigue and spasm, chronic head ache, muscle tenderness, and finally leads to TMJ dysfunction. Clinicians have to trace out these interferences and its consequences during examination. When a patient with acute symptoms is treated and when the pathologic occlusion is being relieved, the changes should be such that recurrence of pathological signs does not occur in the occlusion.<sup>5</sup> It is equally important that when we treat and place a bridge on a patient without symptoms, we should not produce iatrogenic pathologic occlusion.

### Objective of full mouth rehabilitation

All patients requiring full mouth rehabilitation have a common problem: stress and strain. Usually the stress is due to malfunction or to poorly related parts of the oral mechanism.<sup>6</sup> Our objective is to minimize these stresses so that they are not destructive. In order to prevent this stress from being destructive, the best thing to do is to distribute it evenly over an area as great as possible, over as many teeth and as much tissue as possible, with the teeth providing a means by which the forces are distributed. The most common reason for doing full mouth rehabilitation is to obtain and maintain the health of periodontal tissues.<sup>7</sup> Ever wondered why, severely worn teeth (Bruxers) have less pocket depth and theoretically no pocket depth? Temporomandibular joint disturbance is another reason. Need for extensive dentistry as in case of missing teeth, worn down teeth and old fillings that need replacement. Esthetics, as in case of multiple anterior worn-down teeth and missing teeth. That is a full mouth rehabilitation should

- Restore impaired occlusal function
- Preserve longevity of remaining teeth
- Maintain healthy periodontium
- Improve objectionable esthetics
- Eliminate pain and discomfort of teeth and surrounding structures.

Malfunctioning mouths that do not need extensive dentistry and have no joint symptoms should be best left alone. A full mouth rehabilitation should not be taken as a preventive measure unless there is a definite evidence of tissue breakdown. In short, it can be concluded that: No pathology- No treatment

### Diagnosis and treatment planning

Based on history, examination, mounted diagnostic casts, and radiographs, diagnosis and treatment planning will be done. Proper evaluation followed by definitive diagnosis is mandatory as the etiology of severe occlusal tooth wear is multifactorial and variable. Careful assessment of the patient's diet, eating habits and/or gastric disorders, along with the present state of occlusion is essential for appropriate treatment planning.<sup>8</sup>

Etiology of extremely worn dentition full mouth rehabilitation<sup>9</sup>

1. Occlusal wear is most often attributed to attrition.
2. Congenital abnormalities
  - o Amelogenesis imperfecta
  - o Dentinogenesis imperfecta
3. Parafunctional occlusal habit
  - o Abrasion
  - o Erosion
4. Loss of posterior support that is the posterior collapse that results from missing, tipped, rotated, broken down teeth, malpositioned teeth.
5. Occlusal interference exerts undue force on anterior teeth resulting in teeth mobility and excessive wear of clinical crown.

Comprehensive treatment plan must be established prior to start of the treatment.<sup>10</sup> Communication and patient education are essential in order to match the dentist's and patient's definition of success.

Treatment plan is divided into

- 1) Pre- prosthetic phase<sup>11</sup>

To develop proficiency in diagnosing the need of occlusal rehabilitation, Periodontist, Orthodontist, Endodontist, Oral Surgeon and Prosthodontist must all be integrated in establishing an environment conducive to oral health. (POEOP)

- 2) Prosthetic phase
- 3) Maintenance phase

In order to proceed with rehabilitation, clinician should choose one of the approaches described below.

### Confirmative Approach

The confirmative approach is defined as the provision of restorations in harmony with the existing jaw relationships.<sup>12</sup> In practice, this means that the occlusion of the new restoration is provided in such

a way that the occlusal contacts of the other teeth remain unaltered.<sup>13</sup> The confirmative approach is favored not because of its safety but it's less probability to create problems to teeth, periodontium, muscles, TMJs, patient, and the dentist. It could be because the centric relation and maximal intercuspal position are coinciding. Every now and then the centric relation and maximal intercuspal position may not be coinciding, and although we tend to remove the interferences, the new occlusion would still not end in an ideal occlusion. This generated less than ideal occlusion could also be less harmonious than the one that was existing and therefore the patient tolerance to this adjusted occlusion will be less.<sup>14</sup> In such situations rehabilitation is executed in harmony with existing occlusion.

### Reorganized Approach

To maintain the health of stomatognathic system and for the longevity of restoration, the clinician will realize that the confirmative approach is not appropriate at times. It could be in situations like,

- An increase in vertical height is mandatory.
- A tooth or teeth are out of occlusion.
- A significant change in appearance is wanted.
- History of occlusally related failure or fracture of existing restorations.
- Recurrence of temporomandibular disorder that has relapsed after a period of successful splint therapy.<sup>15</sup>

In such cases depending on existing occlusal condition of the patient certain guidelines should be followed so that the occlusion can be modified favorably. Reorganization of the occlusion can also be considered if the existing intercuspal position is unsatisfactory for various reasons –

- Repeated failure or fracture of teeth or restorations,
- Severe attritional wear,
- Lack of interocclusal space for restoration,
- Affected dentition,
- Unacceptable function,
- Unacceptable esthetics,
- Sensitive teeth,
- Painful musculature due to disharmony between occlusion and TMJs.

### Classification

Various classifications<sup>16,17</sup> have been proposed to

classify patients requiring full mouth rehabilitation, however, the classification most widely adopted is the one given by TURNER AND MISSIRLIAN<sup>18</sup>. According to them, patients with occlusal wear can be broadly classified as follows:

Category-1: Excessive wear with loss of vertical dimension of occlusion (VDO). The patient's closest speaking space is more than 1 mm and the interocclusal space is more than 4 mm and has some loss of facial contour and drooping of the corners of the mouth. All teeth of one arch must be prepared in a single sitting once the final decision is made. This makes the increase in VDO less abrupt and allows better control of esthetics.

Category-2: Excessive wear without loss of VDO but with space available. Patients typically have a long history of gradual wear caused by bruxism, oral habits or environmental factors but the occlusal vertical dimension (OVD) is maintained by continuous eruption. It might be difficult to achieve retention and resistance form because of shorter crown length and gingivoplasty may be needed. Enameloplasty of opposing posterior teeth may provide some space for the restorative material.

Category-3: Excessive wear without loss of VDO but with limited space. There is excessive wear of anterior teeth over a long period, and there is minimal wear of the posterior teeth. Centric relation and centric occlusion are coincidental with a closest speaking space of 1 mm and an interocclusal distance of 2–3 mm. In such cases vertical space must be obtained for restorative materials. This can be accomplished by orthodontic movement, restorative repositioning, surgical repositioning of segments, and programmed OVD modification.

### DAWSON'S CLASSIFICATION<sup>19</sup>

Type I: Maximal intercuspatation is in harmony with centric relation

- Centric relation is verifiable with the teeth separated.
- Jaw can close to maximal intercuspatation without premature tooth contacts

Type IA: Maximal intercuspatation occurs in harmony with adapted centric posture

- Adapted condition to – Intracapsular deformation
- TMJ's can accept loading with no discomfort

TYPE II: Condyles must displace from a verifiable



centric relation for maximum intercuspation to occur

TYPE IIA: Condyles must displace from an adapted centric posture for maximum intercuspation to occur

- The source of pain will be in muscle or in interfering tooth
- The occlusal therapy goal is to achieve Type I or IA

TYPE III: Centric relation cannot be verified

- TMJ's cannot accept loading without tenderness
- Focus should be on correcting the TMD before occlusal treatment can be finalized
- The occlusal therapy goal is to achieve Type I or IA

TYPE IV: The occlusal relationship is in an active stage of progressive disorder because of pathologically unstable TMJ's

- Actively progressive disorder of the TMJ's
- Signs:
  - o Progressive anterior open bite
  - o Progressive asymmetry
  - o Progressive mandibular retrusion
- The goal is to stop the progression of the TMJ's deformation

## Discussion

A variety of techniques are employed in reconstructions to obtain complete arch dies and mounted casts.<sup>18,20-26</sup> These techniques assist in collateral laboratory construction of the units. There is flexibility in developing the occlusal plane, occlusal scheme, embrasures, crown contour, and esthetics since all the prepared teeth are on a single articulator. The disadvantages include full arch anesthesia, full arch chairside treatment restorations, multiple occlusal records, possible loss of vertical dimension of occlusion, strenuous, unforeseeable patient visits, the need for accurate cross-arch multiple tooth impressions, and, transfer techniques to fabricate full arch working casts.

An alternative approach to the full mouth simultaneous reconstruction is to complete one quadrant before beginning another. The advantages of this approach are primarily chairside and include preparation and final impressions of select teeth, maintenance of vertical dimension, quadrant anesthesia, and shorter, predictable appointments. The disadvantages include existing opposing den-

tition restricting the reconstruction of an isolated quadrant, limitations for achieving ideal occlusion especially when modifying the vertical dimension, occlusal plane, and embrasure development. As the porcelain restorations are fabricated at various stages the esthetic consistency is also lost.

Before beginning the treatment procedure, one must decide whether there is need for full mouth simultaneous technique which advocates simultaneous restoration of both arches, or quadrant/segment technique, where completion of restorations of one quadrant in a programmed sequence is done before proceeding to the next.

The principles of treatment are universal, all the functional factors are interrelated, and all efforts should be made to construct an occlusal interface such that the periodontium of teeth, muscles of mastication, and TMJ's function in harmony with each other. This requires accurate diagnosis regarding the etiology of the deranged condition, intra-oral changes and other adverse effects on jaw relations. Optimal occlusion according to the needs of the patient should be attained in rehabilitation procedures. Chewing efficiency can exist over a wide range of occlusal forms and types of occlusal schemes, so no set rule can be applied to all the patients.

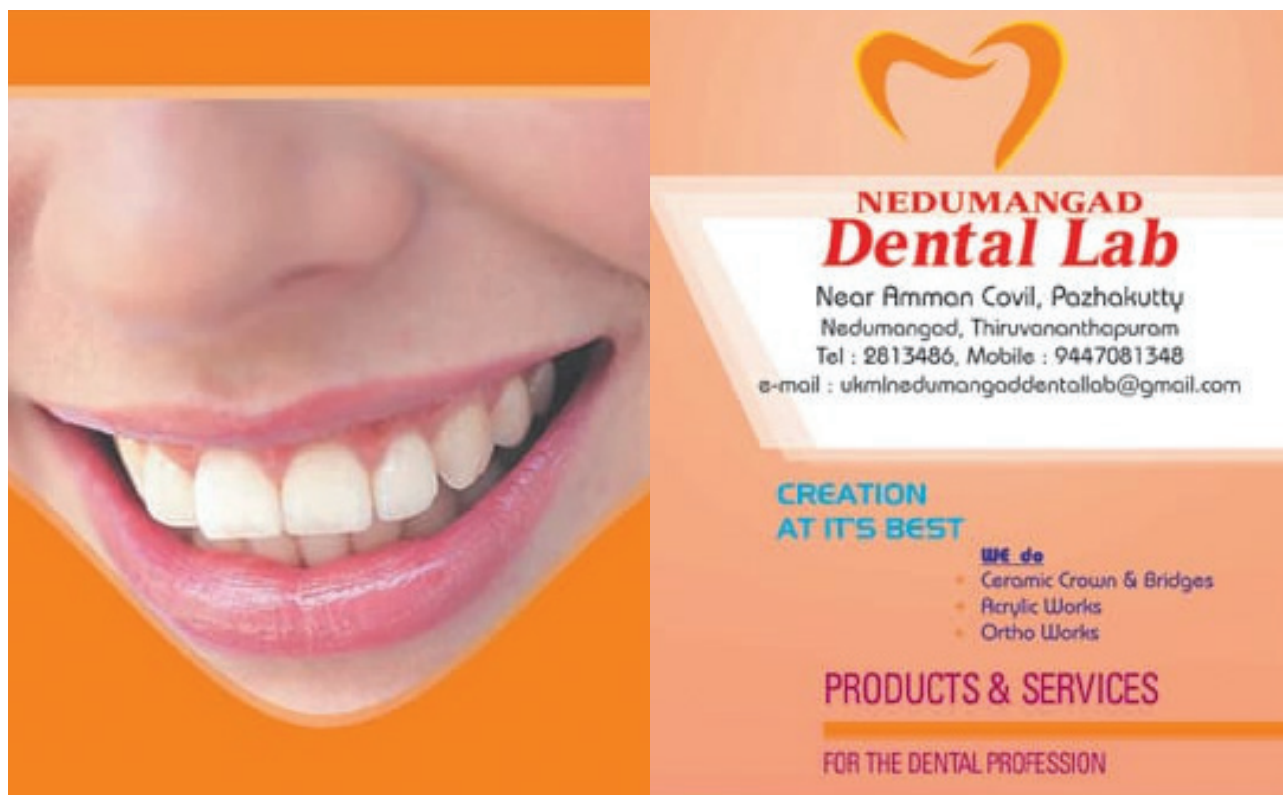
## Conclusion

Occlusal rehabilitation being an extensive and drastic procedure and should be carried out with utmost care and a thorough knowledge of various philosophies followed. A comprehensive study and practical approach must be directed towards reconstruction, restoration and maintenance of the health of the entire oral mechanism.

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# Piezography in fabrication of complete denture

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## Abstract

Mandibular denture stability can be attained using neutral zone concept. Since a person speaks much more than he involves in swallowing, we should follow phonation method more often to fabricate dentures for more stable denture prosthesis. The word "Piezography" means shapes formed by pressure. As speech is employed for recording the denture space it will be more easier for patients. The denture fabricated based on piezography is more stable than the other conventional and functional techniques like swallowing.

**KEY WORDS:** Piezography, neutral zone concept, stability

## Introduction

Attaining mandibular denture stability have always been an arduous procedure for the dentist. Increasing life expectancy, age-related reduction in adaptability and progressive severe mandibular resorption further worsens the condition.<sup>1</sup> The problem indeed need a definitive and qualitative solution to overcome these difficulties. One of the philosophies that was introduced to overcome the challenge of unstable denture was "neutral zone" concept<sup>2</sup>. It is based on neuromuscular control on the polished surface of denture and positioning the teeth in space where the oral musculature and tongue forces are nullified by each other.

However, the conventional as well as functional techniques have certain demerits. Therefore, Klein in 1974 introduced a method named "piezography", which recorded the prosthodontic space for teeth placement using speech.<sup>1</sup>

## Piezography

In Piezography shapes are been recorded by means of pressure. The term "Piezography" was coined by Klein in 1974 from the Greek term meaning 'a shape formed by pressure'.<sup>3</sup> In complete denture treatment, several methods that take physi-

ological functions into account have been developed since 1930s. These studies explained the significance of buccolingual tooth position and contour of the polished surface which aids in denture retention and stability.

Fahamy and Kharat reported that artificial teeth were arranged over the center of the alveolar ridges in conventional dentures which was found to be better in mastication<sup>5</sup>. However all the participants in their study experienced a superior sense of comfort and speech ability with the neutral zone denture and selected the latter over the conventional one.

The idea behind positioning artificial teeth in the neutral zone has two objectives. First, the teeth will not interfere with normal muscle function and secondly the forces exerted by the musculature against the dentures will be more favorable for stability and retention.

Piezography helps to record the neutral zone in a better way. The denture fabricated based on piezography is more stable than the other conventional and functional techniques like swallowing.

Because a person swallows up to 2,400 times per day and that during the entire swallowing sequence teeth come into contact for less than a second. So it

may be concluded that less than 40 minutes of tooth-to-tooth contact occurring per day during function. Since a person speaks much more than he involves in swallowing, we should follow phonation method more often to fabricate dentures for more stable denture prosthesis.

The buccolingual center of the occlusal table obtained by piezographic technique for fabrication of complete dentures is generally located slightly to the buccal of the residual alveolar ridge crest. Morikawa et al (1983) reported that the centerline of the neutral zone was located 1.9 mm to the buccal side of the alveolar crest<sup>6</sup>. Longer the period of edentulousness, the more buccally located the neutral zone from the crest of the alveolar ridge.

In 2006, Ikebe et al reported the effect of the piezography technique on changes in the man-

dibular tooth positions of 10 patients with edentulism. Premolar and molar denture spaces were significantly widespread buccolingually at repeated increments of the laminating tissue-conditioning materials (1.9 mm in premolar regions and 1.5 mm in molar regions from the top of the alveolar crest).<sup>8</sup>

The piezographic technique employs silicon-based soft liners. The advantages include its viscoelastic property, ample working and setting time, ability to be injected gradually over several applications and easy to handle and work over patient.

Patients with long period of edentulousness, having a severely resorbed lower ridge are most benefited by this technique.

As speech is employed for recording the denture space it will be more easier for patients and they

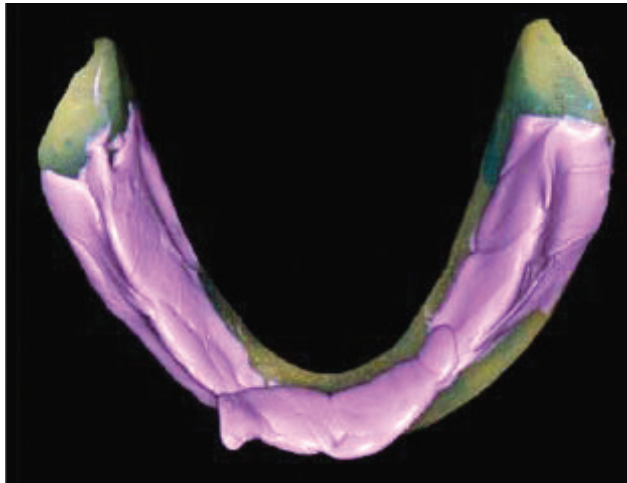


Fig. 1 Recorded piezography



Fig. 2 Indexed piezography pored with molten wax



Fig 3 Piezography of a mandibular arch

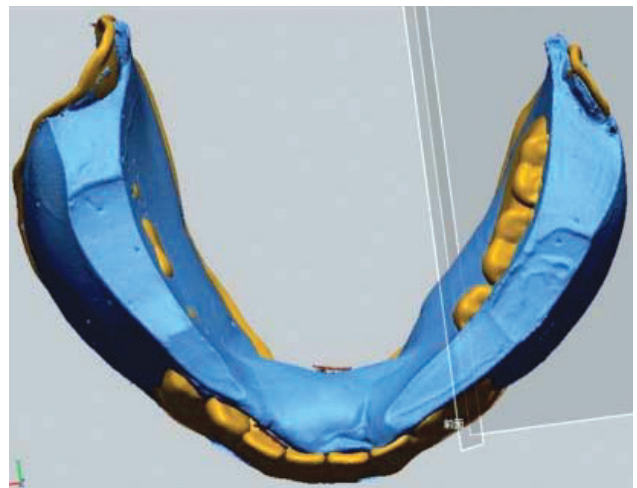


Fig 4 Piezography superimposed over previous denture



can practice it before the technique. It is also easy to understand especially for the elderly.

### Applications of piezography

To obtain the retention and stability of complete dentures, the potential space between the lips or cheeks and tongue were recorded using a flange technique, neutral zone procedure, Piezographic technique, and so on, based on a neutral zone philosophy. By arranging the artificial teeth and molding the denture flange within the denture space, the wax denture would be physiologically fitted to the muscles surrounding the oral cavity during functional movement of lips, tongue, and cheeks.

The relationship of the cameo surface of dentures to the surrounding tissues is of great importance. Piezography can record muscle pressure during speaking using high-fluidity silicone impression materials or tissue-conditioning materials. To improve the stability of mandibular complete denture, denture teeth are physiologically arranged within the piezographic space, which is determined by repeating phonetic sounds. Like repeated "SIS" followed by a strong "TO" for recording posterior and "TDMP" for recording anterior regions. With piezography, the lingual aspect with oblique sublingual cameo surfaces and customized contours could improve the retention and stability of the denture.

### Recent advances

Piezography which we have moulded can be digitalized using CAD CAM technology. 3 D printed piezography tray can be designed by scanning definitive impression of mandibular arch. This piezographic tray along with heavy, medium and light body silicone material can be used for moulding the speaking space, with heavy body as core and medium and light body layered over it. Repeated phonetic sounds, namely, "sis," "se," "so," "te," "de," "moo," and "sees," will mould the space.

The scanned piezographic space can be used to arrange the virtual teeth and then to print the prototypes. The scanned image can also be superimposed over the previous denture, thus detecting the defects in conventional arrangements.<sup>7</sup>

### Conclusion

Piezography gives us a physiologically appropriate complete denture based on neutral zone concept.<sup>7</sup> Thus, it can be concluded that providing a lower denture with piezographically produced lingual surface enhances its retentive ability over

a conventional design. Piezography customizes the contours, precludes over extensions and helps in arranging teeth for maximum comfort, function and aesthetics.<sup>1</sup>

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## OBITUARY



### Dr Dilip Stewart

Dr Dilip Stewart Chief Dental Surgeon and MD of Joy Dental Clinic Muttathara left us on 1/10/2018 as an active member if IDA Attingal branch his untimely demise is a great loss to all of us. Our collective hearts are heavy with sorrow and our hearts goes to his bereaved family. He is survived by his wife Dr Bindu Dilip Associate professor in Radio therapy Government Medical College Allapuzha and two Daughters Miss Aparna B Dilip and Miss Apsara B Dilip doing graduation at Bangalore. We pray for his Departed soul.

# Anterior tooth fragment reattachment – A case report

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## Abstract

Anterior crown fractures are estimated to be prevalent mostly in the population under the age of 18 years. It can lead to huge esthetic concerns in the affected child as well as their parents. The aim of this article is to present a case report which involves tooth fragment reattachment and endodontic treatment which was done prior to reattachment for pulpally involved tooth. Successful esthetics and functional results was achieved by bonding the crown fragment without the utilization of any intracanal post. The retention was achieved from enamel bevel as this increased the bonding area. The advancements of adhesive dentistry has allowed us to try out a treatment modality involving biological approach for the management of anterior tooth trauma.

## Introduction

Trauma involving anterior teeth is a common dental injury experienced by children and teenagers. Involvement in contact sports, falls, accidents, domestic fights are causes of these injuries. Due to the position in the arch, maxillary incisors are commonly affected.<sup>1</sup> The dental injuries require immediate attention owing to damage to the dentition as well as psychological effect of patient and parents.<sup>2</sup> Most injuries merely involve enamel and dentin without pulpal exposure. The ideal treatment option should be based on age of the patient, extent of fracture, time elapsed since trauma, endodontic involvement, presence and condition of tooth fragment, occlusion, esthetic considerations and patient expectations.<sup>3</sup>

The various treatment options for restoring the fractured tooth include selective grinding, composite resin restoration, fragment reattachment, ceramic restorations, laminates.<sup>3</sup> When the tooth fragment is retained in good condition, the reattachment of fractured fragment is considered to be the most conservative, esthetic and biologic approach.<sup>1</sup>

The first case report on reattachment was

published in 1964 by Chosack and Eildeman in which complicated tooth fracture was managed by endodontic treatment and the post and core were fitted to prepared tooth fragment which was then cemented to remaining tooth structure.<sup>4</sup> The advantages of reattachment over the other techniques are – it is less time consuming, cost effective, has better and long lasting esthetics, the patient has positive social and emotional effects after tooth restoration.<sup>5</sup>

The prognosis depends on the storage and preparation of fragment prior to reattachment, firm attachment of fragment to tooth, material used and design of tooth preparation used for reattachment procedure.<sup>2,5</sup>

This article discusses a conservative approach for the treatment of coronal tooth fracture in anterior maxillary region by fragment reattachment technique.

## Case report

A 14 year old female patient reported to the Department of Pedodontics, Sri Sankara Dental College, Varkala, with a complaint of fractured tooth in upper front tooth region following a fall 2 hours back. No significant findings were observed while

recording the history of trauma. The medical history was also non contributing.

The oral examination revealed a horizontal fracture involving enamel, dentin and pulp of maxillary left central incisor (Ellis class 3 fracture). The maxillary right central incisor had an oblique fracture involving enamel and dentine only (Ellis class 2 fracture) (figure 1). The periapical radiograph showed no root fracture. The fractured tooth fragment of 21 was recovered and brought in dry condition (figure 2).

The treatment planned for 21 was single visit endodontic therapy and fragment reattachment, composite restoration for 11.

The fractured fragment of 21 was disinfected using 0.09% chlorhexidine (Clohex Plus, Dr. Reddy's Laboratories Ltd.) and then stored in normal saline (0.9% w/v, Fresenius Kabi India Pvt. Ltd.). Single visit root canal treatment was done and obturated using gutta percha. An enamel bevel was prepared all around the remaining tooth structure as well as fractured margin of the segment. Acid etching using 37% phosphoric acid (D tech etching gel) of access cavity and the approximating surfaces of the two segments was carried out. The bonding agent (Adper single bond, 3M India) was subsequently applied and light cured. The access cavity was filled with conventional nano composite resin (3M Filtek Z350XT, 3M India) in small increments and light cured for each increment without interfering with the repositioning of the fragment. Then the fragment was repositioned correctly on 21 with a small amount of flowable nano composite (3M Filtek Z350XT, 3M India) over the whole surface of the tooth fragment. After the excess were removed, it was light cured from facial and palatal surface. Finishing and polishing were carried out (figure 3). Occlusion was checked and post operative instruc-

tions were given. The patient was kept for recall of 1 month, 3 months, 6 months and 1 year. The fractured 11 was restored with composite resin after etching and bonding agent application.

## Discussion

The coronal fractures needs to be treated in a systematic way in order to achieve a successful restoration.<sup>6</sup> Depending upon the clinical circumstances, treatment options like immediate reattachment; surgical exposure, crown and root recontouring and fragment reattachment; using splints; and without radicular anchorage have been proposed. Each treatment modality has its own advantages and disadvantages.<sup>7</sup> In younger patients due to large pulp, progressive eruption and gingival margin instability, the prosthodontic restorations are not suitable.<sup>1</sup> When the tooth is completely unrestorable, extraction is the only option available, which can lead to bone loss, subsequently making the future treatment with implants difficult.<sup>8</sup>

The reattachment of the dental fragment, if it is available and when there is no or minimal violation of the biological width is the best treatment option for coronal fractures.<sup>6</sup> Excellent results can be achieved with the reattachment of dislocated tooth fragment if biological factors, materials and techniques are logically assessed and managed. This is made possible with the development of newer adhesive materials.<sup>7</sup>

Conventional composite restorations has disadvantages like poor abrasion resistance in comparison to enamel,<sup>9</sup> it may result in less than ideal contours, color match and incisal translucency.<sup>1</sup> Cavalleri and Zerman reported that when compared to composite resin restorations, reattached crown fragments appears to have better long-term prognosis.<sup>10</sup>

The advantages of fragment reattachment are - it eliminates the problem of differential wear of re-



Fig 1 Ellis class III fracture of maxillary right central incisor

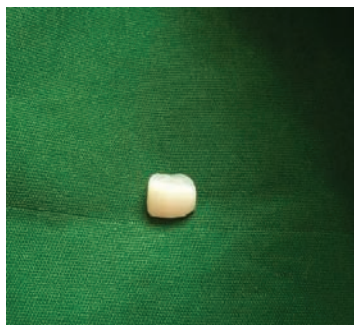


Fig 2 Fractured tooth part



Fig 3 Finished restoration



storative material, shade selection, and it maintains original contour and texture. This technique helps to restore function, is simple and conservative, provides long lasting esthetics and has a positive psychological response.<sup>11</sup>

The prognosis of reattachment depends on the time elapsed since trauma and storage condition of the fragment as this can result in loss of moisture from the fragment which affects the bond strength of composite resins with dentin.<sup>12</sup> Farik et al, has reported that loss of moisture from the fractured part affects the bond strengths and by improving the moistening, the bond strength can be improved.<sup>13</sup>

To improve the adhesion between the tooth fragment and the remaining tooth various methods are employed like using a circumferential bevel before reattaching, placing a chamfer at the fracture line after bonding, using a V-shaped enamel notch, placing an internal groove or a superficial overcontour over the fracture line.<sup>14</sup> According to Reis et al, the internal dentinal groove and over contour can provide better fracture resistance.<sup>15</sup>

The adhesive systems used for reattachment are flowable composites<sup>16</sup>, hybrid and microfilled light-cured and dual-cured composites<sup>17</sup>, chemically cured composites<sup>18</sup> and dual-cured<sup>15</sup>, chemically cured<sup>15</sup> and light-cured resin cements<sup>18</sup>.

In the present case report, tooth fracture reattachment procedure was done by means of acid etching and adhesive material. The tooth fragment was disinfected and endodontic treatment was done prior to reattachment for pulpally involved tooth. The retention was achieved from enamel bevel as this can increase the bonding area. Pulp chamber can also be used to give greater retention to the fragment. But the only concern with the enamel bevel is the chance of discoloration that may occur over a period of time.

## Conclusion

Tooth fragment reattachment is considered as conservative approach which is biological and esthetically acceptable method in managing traumatic injuries to teeth. It is essential to have a follow up to determine the success in terms of functional and esthetic longevity. It is important to advise and educate the patients to preserve the tooth fragments following trauma and seek dental treatment immediately.

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# Obturator prosthesis for hemimaxillectomy patient: A case report

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## Abstract

Malignancies in the oral cavity are frequently treated through surgical intervention, which often creates communication between oral cavity, nasal cavity and maxillary sinus. But the prosthetic rehabilitation of hemi maxillectomy patients can be challenging as getting adequate retention, stability and support is a common problem. Obturator prosthesis is an effective means to re- establish the form and function in such patients. It also acts as a barrier between the communicating cavities.

**Key words:** maxillary defect, support, retention, stability, obturator prosthesis, oroantral communication, hemimaxillectomy

## Introduction

Cancers of the mouth, tongue, oropharynx, nasopharynx, and larynx account for approximately 5% of all cancers. Patients are often left with severe functional impairment after resection of maxillofacial tumors because the affected structures are required for mastication, deglutition, and speech; resulting in hypernasal speech, and foods and liquids escaping through the nasal cavity. In addition, changes in appearance and psychosocial functioning may also result after surgery. These speech and swallowing deficits resulting from a maxillectomy are greatly rectified by placement of an obturator prosthesis. An obturator (Latin: obturare, to stop up) is a disc or plate, natural or artificial, which closes an opening or defect of the maxilla as a result of a cleft palate or partial or total removal of the maxilla for a tumor mass. The goals of prosthetic rehabilitation for total

and partial maxillectomy patients include separation of oral and nasal cavities to permit adequate deglutition and articulation, possible support of the orbital contents to prevent enophthalmos and diplopia, support of the soft tissue to restore the midfacial contour, and obtain acceptable aesthetic results.

## Case report

A 82 year old male patient reported to Department of Prosthodontics for the fabrication of a new obturator prosthesis. His chief complaint was nasal regurgitation of food and difficulty in mastication. He underwent surgical excision of left maxilla, left maxillary sinus, lateral wall of nasal cavity, part of orbital floor for the treatment of carcinoma. There was open communication between the nasal cavity, maxillary sinus and the oral cavity. It was difficult to obtain an exact medical history as the patient lost his old medical records. He has been

using prosthesis for the past 25 years which he lost a few days before reporting to the department. On examination he was found to have limited mouth opening of only 20 mm. The remaining teeth had cervical abrasions and severe attrition. The cervical abrasions were restored with Glass Ionomer cement. The preliminary impressions of the maxillary and

mandibular arches were made with alginate and the cast was poured in plaster of Paris.

The primary maxillary cast was surveyed, undercut areas were blocked and the final impression was recorded using light-body addition silicone material. The cast was poured in Type II Dental Stone. The maxillary defect was closed without blocking



Fig 1: Intra oral defect closed with wet gauze before impression procedure

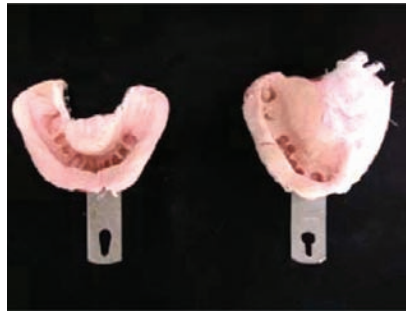


Fig 2: Primary alginate impression

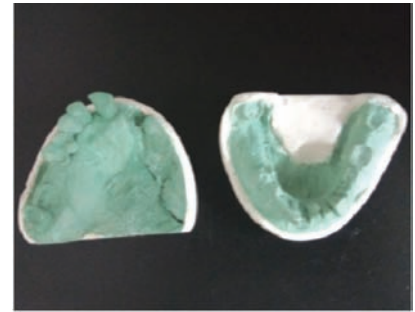


Fig 3: Master cast



Fig 4: Mouth opening



Fig 5: Jaw relation



Fig 6: Trial insertion



Fig 7: Post operative view

the airway using single piece wet gauze before impression procedures. Jaw relation was recorded with modeling wax and after teeth arrangement, try-in was done. The posterior border of the prosthesis was molded once again with Poly Vinyl Siloxane Putty material to ensure posterior seal during function and phonetics. C clasps and Ball end clasps were given to improve the retention of the prosthesis. The prosthesis was cured with heat-cured acrylic resin and properly finished and polished. The prosthesis was finally inserted and the patient was educated regarding oral hygiene and future maintenance of the prosthesis.

### Discussion

An obturator may be used

- to act as a framework over which tissues could be shaped by the surgeon;
- to function as a temporary prosthesis during the period of surgical correction;
- to restore cosmetic appearance of patients rapidly;
- when surgical primary closure is a contraindication;
- when the patient's age contraindicates surgery;
- when the size and extent of the defect contraindicates surgery;
- when the local avascular condition of the tissues contraindicates surgery;
- when the patient is at risk of recurrence of the original lesion that created the deformity.

The obturator fulfills many functions:

- for feeding purposes
- it could also be used to keep the wound or defective space clean, and may enhance the healing of traumatic or post-surgical defects;
- it could facilitate to reshape and reconstruct the palatal contour and/or soft palate
- it improves speech or, in some instances makes speech possible
- in areas of esthetic concern it can be used to correct lip and cheek contour. It can benefit the morale of patients with maxillary defects
- when there is impairment of deglutition and

mastication, it can be used to improve function

- it reduces the flow of exudates into the mouth
- it can also act as a stent to hold dressings or packs post-surgically in maxillary resections.
- It reduces the likelihood of post-operative haemorrhage, and maintains pressure either directly or indirectly on split-thickness skin grafts, thus maintaining close adaptation of the graft to the wound which prevents the formation of a hematoma and ultimate failure of the graft

The hollow bulb obturator design was not opted for this particular case because of the following reasons

- Reduced mouth opening
- The exposed mucosa in the nasal and orbital regions were sensitive
- Patient had reduction in dexterity

The construction of the definitive obturator will vary with the type of surgical resection and the presence or absence of teeth. If the design and construction of the obturator is improper, the stress on the remaining hard and soft tissues may be pathological and may lead to premature loss of abutment teeth and chronic irritation of soft tissues. Lack of retention, stability and support are common prosthodontic treatment problems for patients who underwent maxillectomy. The obturator can also get displaced superiorly with the stress of mastication and will tend to drop without occlusal contact. The degree of movement can vary with the number and position of teeth that are available for retention, the size and configuration of the defect, the amount and contour of the remaining palatal shelf, height of the residual alveolar ridge, the size, contour, and lining mucosa of the defect and the availability of undercuts. Though it is difficult to enhance the quality of life for hemimaxillectomy patients compared with patients with conventional prostheses, this can be achieved with skill, knowledge and experience of specialists. The problem experienced by hemimaxillectomy patients are reduced if a team approach is adopted and specialists are careful to apply skill

and experience at all stages and keep the patient under regular review.

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# IDA Attingal Branch Reports & Activities

## CDH:

International Day for Elderly was observed on 1<sup>st</sup> October 2018 at Chakkulathamma Sanjeevani Ashram Charitable Trust Old Age Home, Kilimanoor. Few of Our members along with branch CDH convenor Dr Roshith S Nath conducted an oral screening programme, they examined all the inmates, give awareness talk, distributed tooth brushes and pastes to them.

On November 8<sup>th</sup> IDA Attingal Branch members along with staffs and PG students of Department of Prosthodontics PMS Dental College and Research Centre, Vattappara conducted a Free Denture Programme. Complete denture fabrication were done from primary impression to denture delivery. A total of 15 patients were attended and the dentures were given free of cost to all of them in a single day.

On October 9<sup>th</sup> and 12<sup>th</sup> Dr Premjith and Dr Biju A Nair conducted 'Doctors on line' TV programme in Mangalam channel which is a popular health programme.

On November 9<sup>th</sup> attended 'Doctors on line' programme in Mangalam channel.

Children's Day was celebrated on November 14<sup>th</sup> at Time kids School, Attingal. Dental camp was Conducted

for the students and teachers, a dental awareness class was conducted for the teachers and parents, Pamphlets which carry oral hygiene instructions were distributed along with tooth brushes and pastes. On the same day we observed World Diabetes Day. Pamphlets stressing the need for oral health in diabetes and the common oral infections associated were distributed, an interactive speech was also delivered to the public. Public gathering was conducted at Kilimanoor junction and Pallickal junction.

## CDE:

The fifth CDE programme was conducted on November 4<sup>th</sup> "Changing Conventional Concepts for Predictable Restorations" at Hotel Karthika Park, Kazhakkutom by the eminent Faculty Dr Yohan Chacko. 53 members from Attingal branch and few members from neighboring branches attended the programme.

## Executive committee meetings:

We conducted three Executive Committee Meetings so far.



Health Talk in Mangalam TV Dr Biju A Nair



World Diabetes Day Message



Dr Premjith in Health Talk



Children's day celebration



Free Denture Programme



Dr Roshith Distributing the booklet for oral hygiene instructions