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ABOUT THE JOURNAL

The Journal of Prosthetic rehabilitation is a peer reviewed open access e-journal published on behalf of Indian Prosthodontic Society, Nagpur Branch. Articles on Complete Denture Prosthodontics, Removable Partial Denture Prosthodontics, Fixed Partial Denture Prosthodontics, Implantology, Maxillofacial Prosthodontics, Occlusion, Aesthetics and Materials used in Prosthodontics will be published in this journal. Journal will be published in April, August and December of every year.

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CONTENTS

FROM THE EDITOR'S DESK

DR. RAJLAKSHMI BANERJEE

Greetings to all!! We are amidst the worst phases of the pandemic and bringing out the issue in such times was really challenging. Nevertheless, all the Prosthodontic teaching faculties, Practitioners and Postgraduate students extended their wholehearted cooperation in bringing out this publication. I wish to extend my heartfelt gratefulness for the same.

Also, an application to obtain an ISSN number for the IPS Nagpur branch journal has been submitted and thereby I solicit your support and cooperation in the coming days too to continue submitting quality articles to the journal. The Journal of Prosthetic Rehabilitation, the official publication of the Nagpur IPS branch, has been providing a platform to all IPS members of the Prosthodontic fraternity in the Vidarbha Region to showcase their work in the field of research and various fields of prosthodontic rehabilitation procedures. The Guest editorial focuses on the applications of Research in the field of Prosthodontics and also opens a plethora of newer avenues for the budding as well as the experienced Prosthodontists alike.

Jai Hind!

Minimally Invasive Esthetic Options & Procedures in Prosthodontics

DR. PRAGATI KAURANI

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Prosthodontics as a speciality caters to the varied restorative needs of the vast spectrum of population. With so many rapid advances in various fields of prosthodontics, it is imperative to have evidence based research to corroborate on the application of various materials and techniques in the treatment of patients. According to American Dental Association, Evidence based dentistry (EBD) is defined as " An approach to oral health care with judicious integration of systematic assessment of clinically relevant scientific evidence, relating to patients oral and medical conditions and history with the dentists clinical expertise and patients treatment needs and preferences". Evidence based research could be In-vitro or In-vivo. In-Vivo studies are one of the most challenging studies providing more accurate results than in-vitro. Be it in the field of Implant supported full mouth rehabilitation, implant-abutment interfaces, post implant loading, abutment designs, luting agents, type of prosthetic material for full mouth implant prosthesis, CAD CAM Prosthesis, accuracy of the various intra oral scanners which are fast replacing the traditional Impression materials, incorporations of substances into the acrylic teeth for better wear resistance, virtual bite registration materials, materials used for Maxillofacial Prosthodontics, to name a few, are the various aspects of Prosthodontics where EBR is required to provide a better standard of care to our patients. In-Vitro studies in Prosthodontics are done following robust research methodology. The use of digital methods of measuring the outcomes has increased the accuracy in the data collected. Randomised Control Trials are considered on the top of hierarchy of evidence. Today there is greater emphasis on patient reported outcome measures in patient-based studies.

Research is an essential tool that propels the subject of Prosthodontics to move ahead. As the subject of Prosthodontics is unique, it is imperative to have consensus on guidelines for reporting Prosthodontic outcomes. All reporting of Prosthodontic research should fall under the different reporting guidelines such as CONSORT, PRISMA, STOBE and many more. This shall ensure greater quality of evidence that shall make clinicians take decisions based on sound scientific grounds.

Short Implants for Rehabilitation of Atrophic Maxilla and Mandible: A Systematic Review

Dr. Kalyani Deshmukh, Dr. Usha Radke, Dr. Priyanka Tompe, Dr. Saee Deshpande, Dr. Twinkle Lokhande

Introduction: Dental implants have been used as a treatment modality for oral rehabilitation in partially or completely edentulous patients with high survival rates. Presence of adequate bone after the loss of teeth is of prime importance for the selection of implant size. In the absence of bone volume various bone augmentation procedures such and direct and indirect sinus lift procedures, vertical augmentation and guided bone regeneration. Not all patients have sufficient bone volumes to be rehabilitated with fixed implant-supported prostheses. Long implants have always been considered more desirable in this respect but in patients with advanced alveolar bone resorption their placement is problematic due to the anatomic boundaries.[1] Anatomical limitation in resorbed maxilla includes the maxillary sinus posteriorly and nasal floor and nasopalatine canal anteriorly whereas in resorbed mandible it is inferior alveolar canal.[1] Various surgical techniques as well as new implant surfaces have been developed in the attempts to solve these problems[2-6], but it is unclear whether any of the various sinus lift procedures currently used are advantageous or superior to the others.[3]

There have been a lot of clinical studies focused on the use of short implants as an alternative to long implants requiring additional augmentation procedure. There have been a variability in the lengths of short implants from 6mm - 10 mm.

The general population is already apprehensive regarding the cost of the implant procedures, short implants have an advantage over the long implants as they bypass the additional surgical step.

Therefore the aim of this systematic review was to analyse the randomised control trials and prospective studies available in the literature for finding out whether short implants can be an alternative to conventional implants in posterior resorbed alveolar ridges.

Materials and methods: The study protocol followed the PRISMA (Preferred Reporting Items for Systematic Review and Meta-Analyses) guidelines, and the project was registered at PROSPERO with CRD42020169719. The focused question of the search was in a PICO (Population, Intervention, Comparison, Outcomes) format as follows: Can rehabilitation of resorbed ridges be successfully done by placing short implants?

Search strategy: A medline (PUBMED) search was done for the clinical studies which included the articles published from January 1990 to November 2020. The search was limited to English language with the following word combinations-

(edentulous jaws[MeSH Terms]) OR (partially edentulous jaws[MeSH Terms])) OR (resorbed maxillary arch[MeSH Terms])) OR (resorbed maxilla[MeSH Terms])) OR (atrophic maxilla[MeSH Terms])) OR (resorbed mandible[MeSH Terms])) OR (atrophic mandible[MeSH Terms]))) AND (short dental implants[MeSH Terms])) AND (conventional long dental implants[MeSH Terms])) OR (sinus augmentation procedures[MeSH Terms])) OR (bone augmentation procedures[MeSH Terms])) AND (marginal bone loss[MeSH Terms])) OR (dental prosthesis failure[MeSH Terms])) OR (dental implant survival rate[MeSH Terms])

After the electronic search, selection of articles was done on the basis of title and abstract and then the full text articles selected and were hand searched.

Inclusion criteria: Randomised clinical trials and prospective studies.

Partially edentulous subjects with implant restorations in the posterior mandible or maxilla.

Implants with ≤6 mm in length with moderate rough surface compared to implants ≥7 mm.

The studies included were at least 10 patients with a follow-up of at least 1 year after loading.

The studies included implant rehabilitation on the posterior maxilla and/or mandible of partially edentulous patients.

Exclusion criteria: Randomised clinical trials and prospective studies.

Partially edentulous subjects with implant restorations in the posterior mandible or maxilla.

Implants with ≤6 mm in length with moderate rough surface compared to implants ≥7 mm.

The studies included were at least 10 patients with a follow-up of at least 1 year after loading.

The studies included implant rehabilitation on the posterior maxilla and/or mandible of partially edentulous patients.

Selection of studies: Based on the inclusion criteria, two authors (KD and UR) screened independently the titles derived from the initial search. Subsequently, abstracts were screened and in case they did not provide sufficient information regarding the inclusion criteria, the full text was obtained. Any disagreements at the above stages of the search were resolved by discussion including a third reviewer (PT). Finally, the selection based on inclusion/ exclusion criteria was made for the full-text articles. The finally selected studies were screened, and data were extracted.

Data extraction and method analysis: Based on the inclusion criteria, two authors (KD and UR) screened independently the titles derived from the initial search. Subsequently, abstracts were screened and, in case they did not provide sufficient information regarding the inclusion criteria, the full text was obtained. Any disagreements at the above stages of the search were resolved by discussion including a third reviewer (PT). Finally, the selection based on inclusion/exclusion criteria was made for the full-text articles. The finally selected studies were screened, and data were extracted. The following data was extracted; name of authors, study year, study design, number of patients, number of implants, location of implant placement, procedure followed, duration of followup, number of implants, number of prosthesis, marginal bone loss, prosthesis survival and implant survival.

The primary outcome was the survival of short implants as compared to conventional ones. Additional outcomes were marginal bone loss and prosthesis survival.

Quality assessment: The quality assessment was done by both the reviewers using the Cochrane's tool for risk of bias assessment for randomised controlled trials and cochrane tool for risk of bias assessment of non randomised studies.

Discussion: The strength of the proposed study in transparency of the procedure for literature search for the systematic review. The protocol describes he studies and their types, intervention if any and the outcomes, data sources, search strategy and data extraction method.

The results shall provide the information regarding the success of short implants and also the reasons of failures. It will also give us a clear idea on the comparison of conventional and short implants which is quiet controversial. The potential limitation include the heterogenicity of the measures of outcome.

Funding: Nil

Competing interests: None declared.

Patient consent for publication: Not required.

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A Spectrophotometric Evaluation Of Effects Of Disinfection And Aging Conditions On The Color Stability Of Maxillofacial Silicones Material

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VYWS Dental College And Hospital, Amravati-Maharashtra.

Abstract: *Background:* The replacement of intricate facial structures requires the use of man-made external prosthesis despite improvements in re-constructive and plastic surgery. Special effects artists began their career in prosthetics and makeup artists create their own prosthetics. Also considering the psychosocial pressures for facially disfigured patients, there is an increasing need to improve the prosthetic materials that are in use and to synthesize new elastomers, specially for use of a facial prosthetic material. *Materials:* Maxillofacial Silicone material (M511 and Z004) *Methods:* A total of 40 samples were made from Skin colored Maxillofacial silicone materials of light and dark specimens and divided into two main group: Group A and Group B (20each).The main groups were then subdivided into five subgroups (A1B1, A2B2, A3B3, A4B4, A5B5,)(Outdoor weathering, acidic perspiration, sebum, neutral soap and disinfectant). Subjects were subjected to extraoral aging conditions and analysed. *Equipments:* Spectrophotometer *Results:* There was no statistical significance between the two materials when subjected to extraoral aging conditions. *Conclusion:* The purpose of this poster is to focus on artificial intelligence regarding prosthetic materials used in the construction of extra oral Maxillofacial prosthesis that used to restore missing or defective ear, nose or eye.

Introduction: 'You can dress up in the most extravagant costume, and paint the most intense makeup over your entire body, but nothing screams different louder than physically altering your bodily structure. You're not a beast until you have an extended forehead. You're not a demon until you have horns. You're not a mutant unless you have those little spikey things in a pattern down your back. In the entertainment industry, these are accomplished with what is known as special effects prosthetics'.[4] Such radical changes should not be taken lightly. A good actor and director know how to make a successful monster without altering appearance. Rather, prosthetics are best used for impact or to represent deviation from the normal or a change that has taken place. Like any other prop, they should accentuate the character and help explain its personality, not stand in for it.[4]

Maxillofacial prosthetic treatment allows many patients with orofacial defects to return to an active role in public. The results of prosthetic treatment are influenced by the nature of the defect, the skill of the prosthodontist, and the properties of the materials used. The most critical properties are esthetics, durability, and accuracy of processing. Patients are concerned with the durability and esthetics of the prosthesis. A prosthesis must be durable, esthetic, and color stable[1] James Lemon et al studied color stability of facial prosthesis and concluded that changes occurred in the color of the samples, with artificial aging causing a greater change than outdoor aging[1]. Muhanad M. Hatamleh, et al[2] suggested that Accelerated aging of silicone specimens in simulated sebum under artificial daylight for 12 months of simulated clinical service greatly affected functional properties of silicone elastomer; however, in real practice, the effect is modest, since sebum concentration is lower, and daylight

is less concentrated. Marcelo Coelho Goiato, et al concluded that the factors of storage time and disinfection statistically influenced color stability; disinfection acts as a bleaching agent in silicone materials[3]. Tania sethi et al suggested that Silicone elastomers are materials that have properties suitable for making prostheses for replacing lost bodily organs. Their biocompatibility, flexibility, ability to be colored artistically render them ideal materials for this purpose. Some of their inherent drawbacks such as their hardening and loss of colour are topics of exciting current cutting edge research in this field[5] Aldie´ ris Alves Pesqueira et al concluded that the ceramic pigment presented greater color stability regardless of disinfection and period. On the other hand, the makeup pigment exhibited the highest values of chromatic alteration[6] Various material used for Maxillofacial prosthesis are Heat-vulcanized silicones, Maxillo-facial materials, Room temperature vulcanized Silicones, etc[7]

Silicones have many desirable properties including biocompatibility, ease of manipulation, low viscosity, and patient accommodation properties (i.e. nontoxic, easily cleansable, lightweight, compatible with adhesives). Moreover, they have high tensile strength, high elongation, and sufficient bonding to underlying substrates. But silicone based.

Maxillofacial prostheses require replacement every 6 to 18 months, as they suffer deterioration in physical and mechanical properties and discoloration upon service[2]. Thus, this in vitro study evaluated and compared the color stability of two commercially available Maxillofacial silicone elastomers after subjecting them to extraoral aging conditions like; outdoor weathering, skin secretions, and disinfectant solutions.

Subjects and method: M511 Maxillofacial rubber (Part A: Part B = 10:1) (Technovent series material, Principality Medical Ltd., South Wales, UK) and Z004 Platinum silicone rubber (Part A: Part B = 1:1) (Technovent Ltd., Newport, UK) were used for the study. Both the silicones are room temperature vulcanizing silicones. A precise stainless steel mold with a depression measuring 30 mm in diameter and 3 mm in thickness was customized.

M511 Maxillofacial rubber Fig.1

Z004 Platinum silicone rubber Fig .2

Customized stainless steel mold Fig 3

Ten Polyvinyl siloxane putty impressions were obtained using the mold and were invested in large Maxillofacial flask. After the stone was set, the VPS putty samples were peeled off the mold leaving behind accurate depressions measuring 30 mm in diameter and 3 mm in thickness [Figure 3].

A standardized procedure was followed for the staining procedure for the specimens. Intrinsic stains were extensively used to mimic the average Indian medium skin tone.[8] The Maxillofacial silicone was mixed and cured according to the manufacturer's instructions. Taking into consideration, the experimental errors that would occur during the study, the sample size was taken to be as 4 per

group. A total of 40 specimens were selected and divided into Group A (Technovent 10:1) and Group B (Technovent 1:1).

Further, each group was divided into five subgroups depending on the extraoral aging conditions, they were subjected to as follows: A1B1 (outdoor weathering), A2B2 (acidic perspiration), A3B3 (simulated sebum solution), A4B4 (neutral soap solution), and A5B5 (disinfection solution).

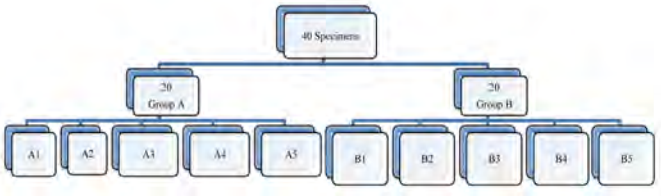


Fig .4

Abbreviations:

A1B1 : Outdoor weathering

A2B2 : Acidic perspiration

A3B3 : Simulated sebum Solution

A4B4 : Neutral soap solution

A5B5 : Disinfectant solution

For the subgroup A1B1, the specimens were subjected to maximize the amount of sunlight on the specimens.[9] The whole assembly was placed on the roof for 3 months.

For the subgroup A2B2, the specimens were immersed in simulated acidic perspiration for 3 months, which was prepared by adding L-Histidine monohydrochloride monohydrate-0.5 g, sodium chloride-5 g , and sodium dihydrogen orthophosphate dehydrate-2.2 g per liter of distilled water.[9]

For the subgroup A3B3, simulated sebum solution was by mixing palmitic acid-10%, glycerine tripalmitate-2% and linoleic acid-88% (all w/w)and the specimens were stored in it for 3 months.[2]

The specimens of subgroup A4B4 and A5B5 were immersed in neutral soap solution (Johnson and Johnson soap solution) and disinfectant solution (Clinsodent Effervescent denture cleansing tablets) respectively, for 30 h[9]

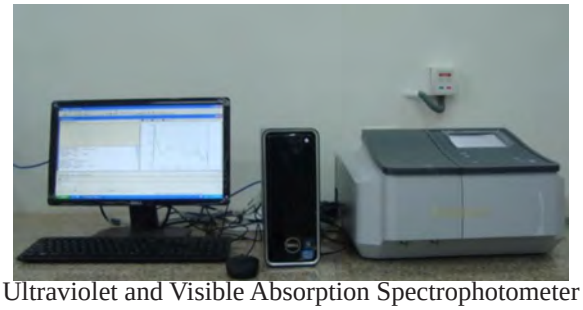
Color differences of each specimen were measured using Ultraviolet and Visible Absorption Spectrophotometer (UV-VIS) [Model no. UV -1800,Company name Shimadzu, Japan] using the system to measure the color alteration.

L*, a*, and b* values of each specimen after immersion at each specified time interval (T0, T30 h, and T3 m) was measured and the mean was calculated. Color difference ΔE was calculated from the mean ΔL*, Δa*, and Δb* values for each specimen with the formula.[9]

$\Delta E = (\Delta L^{*2} + \Delta a^{*2} + \Delta b^{*2})^{1/2}$

Where ΔL*, Δa*, and Δb* are the differences in L*, a*, and b* values before (T0) and after immersion at each time interval (T30 h and T3 m).

Ultraviolet and Visible Absorption Spectrophotometer (UV-VIS) Fig.5



Ultraviolet and Visible Absorption Spectrophotometer (UV-VIS) Fig.5

Results: Values of ΔE* ≤3 were considered clinically acceptable. Values more than 3 reflected unacceptable color change clinically as suggested by Fontes et al.[10] The values obtained did not follow a normal curve/Gaussian curve, and hence nonparametric tests were employed. The intergroup comparison was done by Kruskal–Wallis test, whereas the intragroup comparison was done by Mann– Whitney test Values of ΔE* ≤3 were considered clinically acceptable. Values more than 3 reflected unacceptable color change clinically as suggested by Fontes et al. Any ΔE value more than 3 was considered to be a visually perceptible color change from the baseline reading.[9]

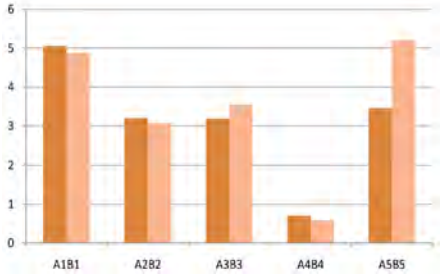
The results showing the mean difference of mean ΔE*, SD, and P value of Group A and B are presented in Table 1

Table 1: Mean difference of ΔE and Standard deviation of Group A and Group B at different time intervals (intergroup comparison using Kruskal-Wallis test)

Subgroups	Mean	Standard deviation
A1	5.05	1.39
A2	3.20	2.89
A3	3.19	1.65
A4	0.70	0.28
A5	3.45	1.74
B1	4.88	1.81
B2	3.07	0.92
B3	3.54	2.08
B4	0.58	0.30
B5	5.21	2.46

Table 2 : Comparison of mean ΔE values of Group A and Group B specimens at different time intervals

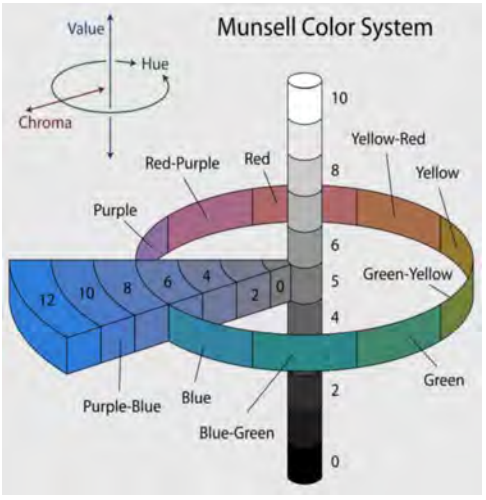
A1B1	A2B2	A3B3	A4B4	A5B5
5.05	3.20	3.19	0.70	3.45
4.88	3.07	3.54	0.58	5.21



Graph 1

Group A versus Group B mean difference
0.17
0.13
-0.35
0.12
-1.76

Discussion: Color stability is the property a material has, of retaining color for a period of time in a certain environment. Two of the color systems used to assess the chromatic differences are the Munsell color system and the CIE L*a*b* color system. Cantor et al.[11] reported methods for evaluating prosthetic facial materials. The authors investigated the esthetics of the materials and color matching of skin and facial materials using reflectance spectrophotometry. Since then, reflectance spectrophotometry and color and optical density have been used to evaluate the color stability.



Munsell color system Fig. 6

The deterioration of the color of the Maxillofacial silicone prosthesis is not by virtue of a single factor or aging condition. Infact, it is due to the combined effect of various factors such as environmental exposure, humidity, UV radiation, air pollutants, exposure to facial secretions, and the method of disinfection. Apart from these external factors, certain internal factors such as the composition of the silicone, degree of cross-linking, mode of curing, extrinsic and intrinsic stains used; all play an important role in maintaining or degrading the color of the silicone prosthesis.[9]

The ADA recommends the use of CIE L*a*b* system, which quantifies the color alterations using a mathematical equation expressed by ΔE* and obtained with the variation of three coefficients (L*a* and b*) where,

L* = Color luminosity (ranging from 0-black to 100-white)

a* = Ranges from 90 to 70 and represent the greenness on the positive axis and redness on the negative axis

b* = Rang es from 80 to 100 and represents yellowness (positive b*) and blueness (negative b*).

ΔE = (*ΔL+2 + *Δa+2 + *Δb+2)1/2

There was a highly statistically significant color change that was noted in the specimens before and after outdoor weathering irrespective of the material being used similar to the studies conducted by Lemon et al[1] This significant color change can be attributed to the presence of UV light irradiation present in the solar radiation which may have enhanced cross-linking, along with accelerated interaction of the fatty acids with silicone, breaking down the chain bonds, and decomposing the elastomer as suggested by Hatamleh et al.[2]

Within the limitations of this in vitro study and from the results obtained, the following can be inferred.

- All the specimens produced a statistically significant color change when subjected to extraoral aging conditions
- Immersion in neutral soap solution does not produce a statistically significant color change irrespective of the material used.
- There was no statistically significant difference in the color stability of M511 Maxillofacial Rubber (Part A: Part B = 10:1), Technovent series material and Z004 Platinum Silicone Rubber (Part A: Part B = 1:1), Technovent Ltd that were compared in the study.

The limitations of this study include:

- Evaluation of the color stability of the materials was done based on intrinsic staining only.
- The effect of outdoor weathering on color stability is limited to the areas with tropical climatic conditions.
- Manipulation of the Maxillofacial silicone elastomer was done by mechanical hand mixing.

Conclusion: Immersion of the specimens in neutral soap solution produced the least color change irrespective of the material used.The results of this study can give an insight into how different Maxillofacial silicone elastomers may behave when exposed to different extraoral aging conditions, thus affecting the clinician's choice of material and the patient's concern toward the prosthesis

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Color Stability of Ceramic Laminate Veneers Cemented with Light-Polymerzing and Dual-Polymerizing Luting Agent: A Systematic Review

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Abstract: *Background:* Ceramic laminate veneers (CLV) are among the most desired cosmetic treatments and the resin cements are the selective luting agents for cementation. Color change overtime of luting cements can be detected through translucent ceramic veneers. Therefore, the evaluation of Color stability cemented with resin luting agent is utmost important for aesthetic purpose. *Objective:* The objective of the present study is to evaluate the Color stability of ceramic laminate veneers cemented with light-polymerizing and dual-polymerizing luting agent. Material and *Method:* Systematic review of observational studies on color stability of CLV will be conducted. We will search the following electronic bibliographic databases: PubMed/MEDLINE, Cochrane Library, Science Direct, Willey Online Library, Google Scholar. Manual search will be carried out for similar topics in library of dental college. Only studies written in English will be included. Studies published till 1st October 2020 will be included. The searches will be re-run just before the final analyses and further studies retrieved for inclusion. The primary outcome is to evaluate the color stability of CLV luted by resin cements. Study selection will follow the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Guidelines (PRISMA).

Ethical issues: As it will be a systematic review, without human beings' involvement, there will be no requirement for ethical approval. Findings will be disseminated widely through peer-reviewed publication and in various media.

Prospero Trial Registration Number- CRD42020216150.

Keywords: color stability, ceramic laminate veneer, light polymerizing resin cement, dual polymerizing resin cement

Introduction: Ceramic laminate veneers (CLV) are among the most popular aesthetic dental restorations due to excellent esthetics appearance and optical properties. These are the indirect restorations performed by conservative techniques with the purpose of harmonizing the smile, restoring the adequate Color, shape and function of esthetically compromised teeth. In the long-term process, the discoloration of restoration is caused by extrinsic as well as intrinsic factors. The long-term exposure of extrinsic factors (smoking, beverage, food component) may have potential to stain restorative materials.[1]

Adherence to conservative approaches in recent years has led to the development of very thin laminate veneers with greater translucency. It also provides proper Color shade and maintaining it in the long-term challenging issues concerning these restorations.[2]

Resin cements like light polymerising and dual polymerising luting agents are indicated for bonding these restorations due to the low amount of retention of conservative preparations. However, the successful clinical treatment depends on the perfect combination of colors between the prosthesis and remaining teeth, and there are many variations involved, like the Color of the supporting tooth structure, thickness, shade and type of ceramic

and resin cement[3], in addition to these restorative material's translucency shown by the amount of reflection and scattering of light.

Now a days light polymerizing and dual polymerizing resin cements are used as luting agent for cementation of ceramic laminate veneer (CLV). The longevity of these restoration is related to the materials Color stability and partly depends on the used cementation technique.[4]

Therefore, the present systematic review is being carried out on the available literature to evaluate-the Color stability of ceramic laminate veneers cemented with light-polymerizing and dual-polymerizing luting agent

Materials and methods: Eligibility Criteria for the studies:

This systematic review will be carried out on Color stability of ceramic laminate veneers cemented with light-polymerizing and dual-polymerizing luting agent . Following will be inclusion criteria:

1. Studies regarding color stability of ceramic laminate veneer cemented with light-polymerizing and dual polymerizing luting agent
2. In-Vitro study,
3. Randomized controlled trials.

The studies that will be excluded from the present review:

1. studies which are unrelated to the present systematic review, studies not published in English
2. cross sectional study
3. retrospective studies.

Initial electronic and manual search for color stability of CLV luted by resin cements will be carried out. Search strategy consisting MeSH terms and key words will be used for extracting data by electronic and manual search in Dental Institute library, will be carried out. The current systematic review protocol is registered in Cochrane's International Prospective Register of Systematic Reviews (PROSPERO registration number is CRD42020216150) (https://www.crd.york.ac.uk/PROSPERO/#recordID=216150).

Identification of relevant studies: The present review of literature will be carried out both electronically as wells as manually. The present review will be carried out based on PRISMA guidelines. Relevant literature search will be carried out through computerized literature searches of PubMed/Medline, Cochrane Library, Science Direct, Willey Online Library, Google Scholar and manual search irrespective of the date of publication using Mesh terms. We will use following search strategy: ((((((((((((color stability[MeSH Terms]) OR (colour stability[MeSH Terms]) OR (discoloration[MeSH Terms]))) AND (ceramic veneers[MeSH Terms])OR (porcelain veneer[MeSH Terms]) OR (ceramic laminate veneer[MeSH Terms]))) AND (light polymerizing luting cement[MeSH Terms])) OR (light cure cement[MeSH Terms])) OR (light activated cement[MeSH Terms])) AND (dual polymerizing luting cement[MeSH Terms])) OR (dual cure cement[MeSH Terms])) OR (dual polymerizing cement[MeSH Terms])

Studies conducted on color stability of CLV will be filtered and abstract will be explored by two independent authors (TL and NP). Various key words that will be utilized in search strategy include-color stability, ceramic laminate veneer, light polymerizing cement, dual polymerizing cement. Various combinations of key words were made using 'and', 'or' as Boolean operators. Experts in the concerned field and authors of selected studies will also be contacted for obtaining missing or unclear data whenever deemed essential.

Selection of studies: Two authors [TL and NP] will independently identify studies that will be included in the present review. Initially, titles and abstracts of the records retrieved by the search will be assessed in order to exclude those studies that are inappropriate. Reviews will not be included though their reference lists will be searched in turn for any studies not retrieved by the electronic search. For the remaining studies, full text articles will be recovered that met the inclusion criteria. Selected studies will be

screened using STROBE checklist for observational studies.

Collection and extraction of data: This review will be done according to the guidelines set forth by Preferred Reporting Items for Systematic Reviews and Meta-Analyses [PRISMA].[5] Two of the authors [TL & NP] will be given the responsibility of extracting data from the studies. Pre-specified data will be extracted from each of the studies including the study design, sample size, biomedical waste management practices among the study subjects, awareness and knowledge regarding disposal of biomedical waste in their institution and other study characteristics. Any kind of disagreement regarding article screening and extraction will sorted out by discussion with other authors (UR and PT)

Quality assesment: The quality assessment was done by both the reviewers using the Cochrane's tool for risk of bias assessment for randomised controlled trials and Cochrane tool for risk of bias assessment of non randomised studies.

Discussion: One of the strengths of the proposed study is to apply a reproducible and transparent procedure for systematic review of the literature. In this protocol, we clearly describe the types of studies, participants, interventions and outcomes that will be included, as well as the data sources, search strategy, data extraction methods (including quality assessment) and methods of combining data. By publishing the research protocol, we reinforce the clarity of the strategy and minimize the risk of bias, namely selective outcome reporting.

The results shall provide high-level information regarding Color stability of ceramic laminate veneer cemented by light polymerizing and dual polymerizing resin cements. Potential limitations of this study include the heterogeneity of measures and outcomes evaluated which may negatively influence the statistical power in data synthesis. This review will evaluate the Color stability of CLV luted by resin cements essential for esthetic purpose.

Amendments: Any amendments to this protocol will be documented with reference to saved searches and analysis methods, which will be recorded in bibliographic databases and End Note.

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Competing Interests: None declared.

Patient consent for publication: Not required.

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Minimally Invasive Anterior Esthetic Restoration: A Literature Review

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Abstract: The importance of minimally invasive procedures in the anterior esthetic zone restoration has made the new paradigm in aesthetic dentistry. These dynamic new techniques has not only joined dentistry but made exciting revolution as well. This has adopted a philosophy that integrates prevention, remineralization and minimal intervention for the placement and replacement of restorations. This literature reviews in brief about the contents such as classification, indication, contra indication, steps of tooth preparation, different material used, and the technique of restoration used during practice of minmal invasive dentistry.

Key words: minimally invasive, laminate veneer, tooth preparation

Introduction: Esthetic has drawn attention of many since a decade or more. In today's world, where presentation and appearance are the need for the day, great emphasis is placed on a confident and captivating smile so many individuals are concerned about their esthetic while in public appearances .Inclusion of many minimally invasive surgery such as rhinoplasty, lip repositioning surgery as well involvement of botox, dermafills and trichology has gained pace in last few years. This entire processes has highlighted the procedure of restoring the anterior tooth using minimal invasive technique with definite restoration for more esthetic and pleasing appearance.[1] This has facilely brought into exercise with recent dental materials. The complete restoration is done more precisely in acceptable manner creating "SMILE" that considered is the most beautiful expressions of all. As the Modern dentistry offers various treatment modalities for smile correction. The most conservative and highly effective therapeutic options are the ceramic and composite laminate veneers.[2]

Classification of laminates and veneers:

I. Based on coverage of tooth

1 Partial veneers - partially covering the tooth structure.

2 Full veneers - complete coverage of tooth structure.

II. Based On the Fabrication Technique:[3]

I. Directly fabricated veneers: Composite resin materials applied to the tooth surface free hand by the clinician.

II. Indirectly fabricated veneers:

a) Processed Composite.

b) Etched porcelain/feldspathic porcelain

c) Heat pressed ceramic / Glass based Ceramics

d) Machineable (CAD/CAM) Ceramics

III. Depending On Preparation Depth :

Extra enamel - without preparation

Intra enamel - limited to enamel

Intra dentine - involving dentin.[4]

IV Based on the New Veneer Classification System [5

Dentin Exposed

Reduction	Facial	Dentin Exposed
CL-I No-Prep or Practically Prep-less	No-Prep or Practically prep-less Detectable with magnification	0*
CL-II Modified Prep-less or Minimally Invasive	up to 0.5 mm	10% to 20%*
CL-III Conservative Design	0.5 mm to 1 mm	20% to 50%*
CL-IV Conventional A ll-Ceramic Design	1+ mm	50%

*Enamel periphery of at least 70%.

Enamel Remaining

Reduction	Facial	Enamel Remaining
CL-I No-Prep or Practically Prep-less	Detectable with magnification with or without gingival finish line	95% to 100%
CL-II Modified Prep-less or Minimally Invasive	up to 0.5 mm	80% to 95%
CL-III Conservative Design	0.5 mm to 1 mm	50% to 80%
CL-IV Conventional All-Ceramic Design	1+ mm	<50%

Indications:

According to Magne & Belser[6]

Type I: Teeth resistant to bleaching

Type IA: Tetracycline discoloration

Type IB: Teeth that are unresponsive to bleaching

Type II: Major morphologic modifications

Type IIA: Conoid teeth

Type IIB: Diastema or interdental triangles to be closed

Type IIC: Augmentation of incisal length or facial prominence

Type III: Extensive restorations

Type IIIA: Extensive coronal fracture

Type IIIB: Extensive loss of enamel by erosion and wear

Type IIIC: Generalized congenital malformations

Contraindications:

Teeth exposed to heavy occlusal forces owing to bruxism.

Severely mal-positioned teeth

Presence of soft tissue disease

Highly fluoridated teeth

Teeth with extensive existing restorations

Anterior Crossbite

History of occlusal or joint dysfunction[7-9]

Materials used to fabrication and armamentarium: Mainly there are three broad category dental material are used in fabrication of dental laminates and veneers

Acrylic resin laminates

Porcelain laminates

Composite laminates

Laminate veneer system (Komet/Brasseler) includes four burs to prepare the tooth and four burs to finish the laminates.

Steps in tooth preparation:

1] **Labial preparation:** Should encompass the amount of preparation that facilitates the placement of an aesthetic restoration and remain within the enamel to ensure an adequate seal to enamel for most situations 0.5 mm reduction and 0.3 mm for small teeth such as mandibular incisors.

Three horizontal depth cuts are prepared on labial surface.

Bur is angled to complete the gingival depth cut and the incisal depth cut.[15]

2] **Inter proximal extension:** Extend this margin about half way into the interproximal contact area moving the margin into this embrasure just lingual to the buccal surface of the interproximal papillae.

3] **Proximal Finishing Lines:** A proximal chamfer finishing line is preferred.

When diastema are present - feather edge finishing line.

Proximal Contact Area:

- Proximal finishing line terminates 0.2 mm labial to the contact area.
- Extension of the laminate beyond the mesiobuccal and distobuccal line-ensures the wraparound effect.
- Preparation is essential and is particularly crucial when the final restoration significantly differs in shade from that of the unprepared tooth structure.
- Proximal representation of porcelain laminate veneer after proper reduction of the proximal sub contact area is known as Elbow Preparation.[10-12]

4] **Sulcular extension and marginal placement:** Supra-gingival placement has the following advantages:

- Finish line in enamel, ensures strongest bond strength.
- Isolation is easier.
- Easier access for the finishing and polishing regimes.
- Eliminates the possibility of impingement on biological width by an inadvertent overextension of the preparation.
- Maintenance of hygiene becomes easier.
- Minimizes the risk of undue exposure of dentin in the cervical region.
- The gingival finish line must be continuous well defined modified chamfer.[13-14]

Lingual preparation:

- Incisal edge should be flattened, leaving a butt finish line configuration on the lingual surface that should slope approximately 75 degree gingivally from the labial to a depth of 0.5 to 1.0mm.
- The preparation lines on the lingual should not be located on the palatial concavity.[14]

Technique of tooth preparation: In the approach of minimally invasive restoration of anterior tooth the preparation is perform considering over all outcome of the ultimate restoration and also of the adjacent tooth structure including periodontal condition, physiological consideration and mechanical consideration as summation of all will cause to longevity of the restoration. Mainly the subsequent technique are enumerated:

A] **Incisal edge preperation Technique:**

Window - preparation is taken close but not upto incisal edge.

Feather - preparation is taken upto height of incisal edge but edge isn't reduced

Bevel - Bucco palatal bevelled prepared, preparation of incisal length.

Incisal overlap - incisal edge is reduced so the veneer preparation extended onto platal aspect of the tooth ; preparation of a minimum 1 mm is there .[15-16]

B] **Gurel Technique:**

- Very efficient when 2 to 4 lingually tilted teeth are to be treated.
- Composite mockup is bonded after spot etching to correct the esthetic placement of tooth surface in dental arch.
- Use the depth cutter over the composite build up so that it preserve maximum enamel on tooth surface.
- If the composite mock-up thickness is over than the intended reduction, remove the remaining composite and slightly roughen the surface - improve bonding.[14]

C] **Asthetic pre-recontouring (APR) Technique:**

- Practiced when the individual tooth position or their alignment must be altered.
- The essential principle of APR is to place the partially protruding axially misaligned or rotated teeth into proper alignment on the arch.
- Understanding of that specific individual's tooth form and also the alignment of their teeth is required for APR technique.
- Within the actual material preparation (AMP) the specified amount of enamel, and sometimes dentin, must be removed to provide enough space for Porcelain Laminate Veneer build-up.
- An APR is supposed to be made in order to place these things into order and to get the satisfying pleasing symmetry and balance in the arch.
- Should definitely be decided quite early to the actual material preparation starts.
- Unfortunately, this field of pre-recontouring tends to induce far less attention than is importance.[14]

Conclusion: Perfect smile improves the self-confidence, personality, social life and have

psychological effect on improving self-image with enhanced self-esteem of the patient. New emerging concepts in aesthetic dentistry with regards to materials, technology and public awareness has made veneers on demand. No sooner the newer regime of lumineers and componeers are seen into practice seamlessly leaving least weightage to the conventional techniques. The objective of cosmetic odontology must be to produce the utmost improvement in aesthetic with minimum trauma to the dentition. Minimally invasive ceramic restoration when done using proper materials and techniques in an exceedingly conservative manner have proven to be a highly successful variety of treatment.

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Occlusal Forms and Philosophies in Full Mouth Rehabilitation: A Literature Review

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Abstract:

Full mouth rehabilitation encompasses the execution of all the steps necessary to produce healthy, esthetic, well-functioning, and self – maintaining masticatory mechanism. 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 improves the oral health and quality of life of the patient. It is a complex procedure which involves multiple steps and active participation between prosthodontist, patient and technician to achieve a satisfactory treatment outcome. The apprehension and doubt associated with such procedures are usually associated with an array of available techniques and philosophies. Careful and meticulous diagnosis and formulation of treatment plan holds the key. This article reviews the various occlusal forms, schemes and philosophies associated with Full Mouth Rehabilitation in the existing literature.

Keywords: Full mouth rehabilitation, Occlusal concepts/philosophies, Occlusion

Introduction: Full mouth rehabilitation entails the performance of all the procedures necessary to produce healthy, esthetic, well-functioning, and self – maintaining masticatory mechanism [1].

The target is to rehabilitate the tooth to its natural form, function and esthetics while maintaining the physiologic integrity in harmonious relationship with the adjacent tissues, all of which enhance the oral health and quality of life of the patient.

Goals (Schuyler)[2]:

- A static co-ordinated occlusal contact of the maximum number of teeth in centric relation.
- An anterior guidance that is in harmony with the lateral eccentric position on the working side
- Disclusion by the anterior guidance of all posterior teeth in protrusion
- Disclusion of all non-working inclines in lateral excursions.
- Group function of the working side inclines in lateral excursions

If these goals are to be achieved few guidelines have to be followed[3]. They are

- Requirement of reorganizing the occlusion
- Suitable occlusal scheme
- Change in occlusal vertical dimension
- Requirement of replacement of missing teeth

The effects of the type of restorative material used on occlusal stability of para-functional habits and Temporomandibular Joint Disorders (TMD).

There are mainly 2 approaches to achieve such rehabilitation[4].

Conformative approach: Construct the restoration to conform to patients existing inter cuspal position.

This can be done in two situations, such as:

- Occlusion is not altered prior to tooth preparation although minor changes can be made on restoration such as elimination of the non-working contacts.
- Occlusion is modified by localized occlusal adjustment before tooth preparation. E.g.:elimination of working side interferences and removal of a deflective contact on tooth restored.

Reorganized approach[5] : Entire occlusal scheme is modified and restoration provided in harmony with new jaw relation so as to:

- Provide a reproducible starting point i.e. centric relation position
- Provide an even, stable occlusion.
- Provide an occlusion that is in harmony with functional movements.
- Ensure that pathologic deflective contacts are not introduced.
- Provide posterior stability to prevent anterior drifting

Reorganization may be considered when the existing intercuspation is considered unsatisfactory for any of the following reasons

- Repeated fractures of existing teeth or old restoration
- Bruxism
- Lack of interocclusal space for restoration
- Trauma from occlusion due to excessive or abruptly directed forces.
- Compromised function – unstable tooth contacts with tilting and supraeruption of teeth hampers mastication.
- Compromised esthetics- change of clinical heights necessary to improve esthetics.
- TMD
- Developmental anomalies e.g. amelogenesis imperfecta.

There is no ideal technique to achieve this in every patient. There are 4 basic steps in harmonizing anterior guidance[4]:

1. Establish coordinated centric stops on all anterior teeth
2. Extend centric stops forward at the same vertical to include light closure from the postural rest position
3. Establish group function in straight protrusion
4. Establish ideal anterior stress distribution in lateral movements

Occlusal Schemes: There are various occlusal schemes which are used to rehabilitate such cases. Each type has its own indication and contraindication[6].

Mutually Protected Occlusion: The concept was developed from the work of D'Amico[7], Stuart, Stallard[8] and Lucia[9] and the members of Gnathological Society established by McCollum in mid 1920s. Stallard and Stuart (1961) changed the term mutually protected occlusion to organic occlusion in which centric relation and MIP coincided. Cusps of posterior teeth should contact in centric occlusion while, in lateral excursions only opposing canines should contact and in protrusion only the anterior teeth should contact.

The posterior teeth are in a cusp to fossa relation. The anterior teeth disocclude by 25microns.

Canine guided occlusion: In 1915, Gysi introduced the scheme of canine protected occlusion. D'Amico in 1958 studied the significance of cuspid teeth and presented the Concept of Canine Guidance (Canine disclusion) in which the maxillary canine teeth serve to guide the mandible during eccentric movements. When in functional contact with the lower teeth, it guides both lateral and protrusive movements of the mandible. Thus preventing any force other than the axial loading.

Group Function Occlusion: Schuyler (1929) introduced the principles of group function occlusion. It is defined as multiple contact relations between maxillary and mandibular teeth in lateral movements on the working side, whereby simultaneous contact of several teeth, act as a group to distribute occlusal forces. The group function of the teeth on working side evenly distributes the occlusal forces on all the teeth. The posterior teeth on the working side contact during excursive movements, but not those on the non-working side. The desired working contacts are only those between the upper and lower buccal cusps-lingual cusp working contacts are not wanted, nor are posterior protrusive contacts.

Philosophies in full mouth Rehabilitation

Pankey–Mann–Schuyler technique[10] **:** Their

philosophy was based on the spherical theory of occlusion, the ''wax chew-in'' method stated by Meyer and Brenner, and on the role of cuspid teeth as described by D'Amico.

Steps for Pankey–Mann–Schuyler technique[11]

Part I: Examination, Diagnosis, Treatment planning and Prognosis

Part II: Harmonization of the anterior guidance for best possible aesthetics, function & comfort

Part III: Selection of an acceptable occlusal plane and restoration of the lower posterior occlusion in harmony with the anterior guidance in a manner that will not interfere with condylar guidance.

Part IV: Restoration of the upper posterior occlusion in harmony with the anterior guidance and condylar guidance.

Hobo's twin table philosophy[12]**:** Dr. Sumiya Hobo introduced Twin table concept which developed anterior guidance to create a harmonious disclusion with the condylar guidance.

- The first incisal table is termed incisal table without disclusion.
- The second table is used to develop Incisal guidance with disclusion the articulator is made to simulate border movements by placing 3 mm plastic separators behind the condylar elements.

The first incisal guide table is used to develop restorations for posterior teeth.

The second guide table is used to develop incisal guidance with disclusion.

The Functionally Generated Path Technique[13,14]**:** The original technique was described by Meyer for obtaining the 'functional occlusal path' for complete dentures and fixed partial denture fabrication.

Other philosophies:

Restoring occlusion to long centric: The term 'Long Centric' could be defined as 'freedom to close the mandible either into centric relation or slightly anterior to it without changing the vertical dimension of occlusion'. It is also known as"Freedom in Centric". Area of freedom between CR,and IP is around 0.5 +/- 0.3 mm.

Concepts used in advanced periodontal situations:

Nyman and Lindhe concept

Youldelis concept

Treatment techniques:

- Simultaneous restoration of both arches (Bailey, Grubb, Linkow)
- Individual quadrants (Pankey, Mann, Dawson, Granger)
- Segmented simultaneous arch technique (Binkly & Binkly)

Discussion: Posterior disclusion refers to absence of contact on any posterior teeth in any position but centric relation. It can be accomplished easily with cusp tip-to-fossa morphology. It must also be achieved with tripod or surface-to-surface morphology to prevent lateral interferences in any conditions with centric contact on inclines that are steeper than the lateral border movements of the mandible. There are two techniques of accomplishing posterior disclusion:

1. The anterior guidance is harmonized to functional border movements first and then the lateral inclines of the posterior teeth are disoccluded by a correct anterior guidance.
2. The posterior teeth are built first and then disoccluded by developing the anterior guidance. This method is backward. Anterior guidance is an important guiding factor of posterior occlusal form and thus should be developed at the start. When posterior occlusal form determines the anterior guidance, the correctness of the anterior guidance is doubtful.

Posterior disclusion can be developed by two methods of anterior guidance:

Anterior group function and cuspid protected occlusion. Cuspid-protected occlusion is defined as dis-occlusion by the cuspids of all other teeth in lateral excursions. It usually serves as the cornerstone of what is called mutually protected occlusion[7]. Lucia (1961) described advantages of a mutually protected occlusion as the following:

1. A cusp to fossa relationship produces an interlocking of upper and lower components- giving a maximum support in centric relation in all directions.
2. The force is clearly closer to the long axis of each tooth.
3. The arrangement of the marginal, transverse and oblique ridges have a shearing action - make a more efficient chewing apparatus[9].

Mutually protected occlusion cannot be given to those patients whose periodontium is compromised. While group function occlusion has the following advantages:

1. Teeth on the working side distributes the occlusal stress evenly.
2. The absence of contact on the nonworking side prevents those from getting subjected to destructive, obliquely directed forces found in nonworking interferences.
3. Horizontal pressures during lateral movements are distributed to one half of the arch on the working side.
4. It also saves centric holding cusps that is; mandibular buccal cusps and maxillary palatal cusps from excessive wear.

Pankey Mann Schyuler's philosophy[15] advocates that condylar guidance does not dictate anterior guidance. Thus, it advises development of the anterior guidance for best possible aesthetics, function and comfort.

Advantages of this technique are that it is possible to diagnose and plan the treatment for entire rehabilitation before preparing a single tooth, it is a well-organized logical procedure that progresses smoothly, there is never a need for preparing or building more than 8 teeth at a time, there is no danger of losing patient's vertical dimension, all posterior occlusal forms are in harmony with both condylar movements and a developed anterior guidance. Hobo and Takayama stated that anterior guidance influenced the working condylar path and concluded that they were dependent factors[12]. According to them, posterior disclusion is depends on: the angle of hinge rotation created by the angular difference between anterior guidance and condylar path, and on inclination and shape of posterior cusps which helps in managing damaging non axial forces. They concluded that cusp angle be considered as the most reliable factor of occlusion as cusp angle does not deviate and is 4 times more reliable than the condylar and incisal path which shows variation. Though independent of condylar path as well as incisal path, a standard value for cusp angle was determined such that it may compensate for wear of natural dentition due to caries, abrasion and restorative works. By using the standard cusp angle, it was possible to establish the fixed amount of disclusion. Disclusion is required in Full Mouth Rehabilitation as molar disclusion during eccentric movements is effective in eliminating harmful lateral occlusal forces and the anterior teeth, being farthest from the fulcrum are minimally influenced by the varied amount of flexion caused by the closing musculature, and thus are in the best position to carry the load. And also posterior teeth contact should be avoided during incising especially in protrusive movements as interferences in protrusion are the most damaging. Youdelis in 1971 proposed an occlusal scheme for advanced periodontitis cases[16]. The goal was to achieve simultaneous interocclusal contact of posterior teeth in centric relation position with forces directed along the long axis. Anterior disclusion is developed for protrusive excursions and canine disclusion for lateral movements. Cuspal anatomy is so arranged that if the canine disclusion is lost through wear or tooth movement, the posterior teeth goes into group function. According to Nyman and Lindhe Scheme for extremely advanced periodontitis cases even contact should be provided in the intercuspal position, although no great emphasis is placed upon the type of contacts[17]. When distal intercuspation is available, anterior disclusion should be achieved. Before beginning the treatment procedure, one must plan whether there is a need for full mouth simultaneous technique which advocates the simultaneous restoration of both archesor

quadrant/segment technique, where completion of restorations of one quadrant in a planned sequence is done before proceeding to another[18]. In case of segmented simultaneous technique, a combination of the desired features of the full mouth simultaneous rehabilitation and the programmed quadrant approach into a single re-constructive technique is done. This technique simplifies the basic procedures for reconstructions while permitting the dentist to use a suitable occlusal scheme and philosophy for a particular patient.

Conclusion: Every occlusal form, occlusal scheme and philosophy has its own unique advantage over others that can be used to restore posterior teeth.

Whichever design is selected suiting the specific patient should be chosen because it :

1. Directs the forces to the long axis of each tooth as much as practically possible
2. Distributes the lateral stress to get a favorable outcome in varying situations of periodontal compromise
3. Provides maximum stability
4. Provides maximum wear-ability
5. Provides optimum masticatory function

The risk benefit ratio should also be weighed and the least cumbersome approach in terms of effort, time and finances achieving the most optimum result should be chosen.

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Titanium- A Boon in Prosthodontics

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Abstract:

Aim: The objective of this study was to describethe different uses of titanium in Dentistry, reviewing its historical development and discoursing about its state of art and future perspective of its utilization.[1]

Introduction: Titanium is a metallic element known by several attractive characteristics, such as biocompatibility, excellent corrosion resistance and high mechanical resistance. It is widely used in Dentistry, with high success rates, providing a favorable biological response when in contact with livetissues.[1]

Material and Methods: A search in the MEDLINE/PubMed database was performed using the terms 'titanium', 'Prosthodontics', 'implants', osseointegration'. The title and abstract of articles were read, and screening of articles was done and their full-texts were downloaded. Additional text books and manual search of reference lists within selected articles were included.

Results: Although there are wide applications of Titanium in Prosthodontics, its use for prostheses frameworks still needs technological improvements in order to surpass its limitations.

Conclusion: This article will highlight the following aspects of titanium like extraction from its ores, properties, uses in Prosthodontics including complete dentures, RPD's, FPD's and especially in Implantology.

Introduction: Titanium is the fourth most abundant metallic element in the earth's crust. It occurs chiefly as an oxide ore. The commercially important forms are rutile (titanium dioxide) and ilmeite(titanium-iron oxide), the former being richest in titanium content. Titanium was first discovered by William Gregor in 1791 who called it menachite. It was rediscovered by a German chemist M.G. Klaproth in 1795 who named it titanium, after the powerful mythological first sons of the earth – the titans.

The use of titanium and titanium alloys for medical and dental applications has increased dramatically in recent years. Over the past three decades, the development of new processing methods-such as lost-wax casting, computer-aided machining and electric discharge machining has expanded titanium's useful range of applications in biomedical devices. Today, titanium and titanium alloys are used for the fabrication of prosthetic joints, surgical splints, stents and fasteners, dental implants, dental crowns and partial denture frameworks.

History: Towards the end of 19th century in 1887, H. Moissan, Nilson and Petterson succeeded in producing 95% pure titanium. Hunter et al in 1910 in the USA produced the first moderately pure sample of titanium. In 1938 Wilhelm Kroll produced titanium, which involved the reduction of chloride. In the year 1940, he published the first acceptable process of producing titanium and named it Dr. Kroll's process. Dr. Kroll is considered as the father of titanium industry.

It was in the year 1950, Swedish scientist Peringvar Branemark observed that titanium could bond with bone and termed this as osseo-integration. In

1970's and 1980's American Dental Association accepted the commercially pure titanium implants. In 1980 Screw type Titanium-implants with external hexagonal heads were introduced.

Properties: Titanium is a unique material, as strong as steel with less than 60% of its density. In its unalloyed condition, titanium is as strong as steel, but 45% light in weight. The most noted chemical property of titanium is its excellent resistance to corrosion.

ASTM International (the American Society for Testing and Materials) recognizes four grades of commercially pure titanium, or Ti, and three titanium alloys (Ti-6Al-4V, Ti-6Al-4V Extra Low Interstitial [low components] and Ti-AlNb).[2]

Titanium is a highly reactive metal that readily passivates to form a protective oxide layer, which accounts for its high corrosion resistance. The low density of titanium provides for high-strength, lightweight prostheses. Additionally, dental porcelain can be fused and bonded to titanium to produce an aesthetic, life like restoration.

Titanium must be melted in a vacuum or under inert gas to prevent oxidation and the incorporation of oxygen that can lead to embrittlement of the cast metal.[6] Contamination with even low concentrations of atmospheric oxygen can lead to significant loss of ductility. The molten alloy also can react readily with refractory investment materials, requiring careful selection of compatible materials, removal of the surface-reacted layer of metal or both. This same reactivity is responsible for many of titanium's favorable properties. The metal oxidizes almost instantaneously in air to form a tenacious and stable oxide layer approximately 10 nanometres thick.[3,4]

The presence of Tio_2 on the implant surface which is responsible for Osseo-integration with the bone has made it comparatively popular than other implant materials. This oxide layer provides a highly biocompatible surface and a corrosion resistance similar to that of noble metals. In addition, the oxide layer allows for bonding of fused porcelains, adhesive polymers or in the case of endosseous implants, plasma-sprayed or surface-nucleated apatite coatings.

Reports on the allergy to nickel, has helped Titanium to enter into the field of removable partial dentures.

Discussion:

Titanium in complete denture- Ti and its alloy have been verified in complete denture construction and are used to make denture bases after superplastic forming of Ti. Superplastically formed material would only need to be heated to 0.6Tm (K), so that problems associated with thermal mismatch of the investment material, casting shrinkage and porosity would be avoided. The slow strain rates of between 5 x 10 -4 s-1 and 1 x 10-4s-1 used for forming the components would reduce the likelihood of internal stresses leading to dimensional changes on cooling.[7] The process typically conducted at high temperature and under controlled strain rate, giving ten-fold increase in elongation compared to conventional room temperature processes. The evolution of pressure must be closely controlled during the process since the alloys of interest only exhibit superplastic behavior for certain temperature dependent range of strain rate. Specific alloys of titanium, stainless steel and aluminium are commercially available with fine-grained microstructure and strain rate sensitivity of flow stress that are necessary for superelastic deformation. SPF can produce parts that are impossible to form using conventional techniques. During the SPF process, it is heated to the SPF temperature within a sealed die. Inert gas pressure is then applied, at a controlled rate forcing the material to take the shape of the die pattern. The flow stress of the material during deformation increases rapidly with increasing strain rate. Superplastic alloys can be stretched at higher temperatures by several times of their initial length without breaking. The superplastic forming of Ti-6Al-4V was made to apply to fabrication of partial denture major connector and denture base.

Titanium in removable partial denture prosthosis- Successful use of titanium in implants confirmed its biocompatibility beyond doubt. Its

favorable mechanical properties such as low density, strength and outstanding corrosion resistance encouraged researchers to employ it in removable partial denture prosthesis. Although conventional base metal partial denture alloys were serving the purpose hypersensitivity reactions had been reported to them[38]. Hence Ti was considered as an alternative to these alloys. While evaluating of Ti and its alloys for rpd[8] it showed several advantages over conventional alloys such as titanium has increased resiliency and makes it more like gold alloys. This property would allow for the retentive clasp arm of RPD to be placed in deeper undercuts on abutment. The hardness value of commercially pure Ti is almost identical to gold alloys and significantly lower than base metal alloys. Although the hardness value is not the sole determinant of abrasiveness, Ti is expected to be more compatible to opposing enamel surfaces. Lower density of Ti approximately one quarter that of gold alloys and half that of Cr-Co alloys is an advantage especially when removable partial denture is constructed of all metal components, reducing markedly the overall bulk of the prosthesis. Retentive forces of TÍ-6A1-4V and Co-Cr RPD clasps were measured on a standard model initially and after 500 reseatings.[9] It was found that clasps made from Ti alloy are able to maintain more of their retention than are Co-Cr clasps.

Titanium in fixed partial denture prosthesis- High noble and noble alloys were first to be used in this field. They have the longest record of successful clinical use demonstrating excellent castability and fit as well. However the allergic and carcinogenic potentials of nickel and beryllium were reported in patients. Possibility of adverse health reactions. Titanium with its excellent corrosion resistance, bio-inertness, and favorable mechanical properties such as low density, high elastic modulus, and adequate strength fulfill most of the criteria. The casting of titanium crowns was noted in early 1970's with works of Waterstratt of US National institute of standards and technology. Alternatives to casting were investigated in the form of machine duplication and spark erosion was introduced by Andersson et al and it is being used clinically with success[4]. An early two-year clinical study reported on restoration with dental cast crowns made of titanium[10]. Titanium was cast using a two-chamber vacuum pressure type casting machine and MgO type investment material. Since the expansion of the mold material was not sufficient, a spacer was used on the stone model. Based on the evaluation of 111 crowns for each metal, the fitness of titanium crowns was superior in 19%, equal in 43%, and inferior in 38% crowns compared to those made of the Ag–Pd–Au alloy. Compared to nickel–chromium alloy, the fitness was superior in 56%, equal in 33%, and inferior in 7%. Problems in occlusal adjustment occurred in 12% of titanium crowns, which was similar to those for the other two alloys. In a follow-up of two years after setting, 62 titanium crowns were examined. Discoloration and wear were found in one case for each, and the degree of plaque adhesion to the crowns was not different among the alloys[10].

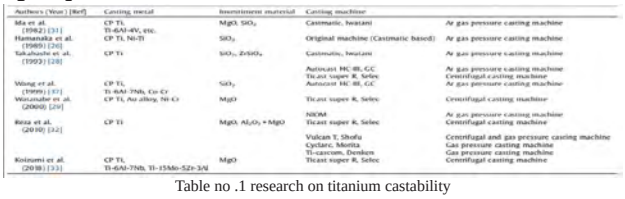

Table no .1 research on titanium castability

Koizumi H, Ishii T, Okazaki T, Kaketani M, Matsumura H, Yoneyama T. Castability and mechanical properties of Ti-15Mo-5Zr-3Al alloy in dental casting. J Oral Sci2018;60:285–92

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Titanium in implantology: Titanium is a material of choice largely because of its biocompatibility, it may be also that it's low modulus of elasticity, its machinability into strong hollow tubes and its potential to be plasma sprayed of heat sintered in powder form to create porous implant surface makes it a preferred metal.

In Implantology Titanium plays a major role as:

1. Titanium as an implant material: It is clear that the proven high biocompatibility of titanium as an implant material is connected with the properties of its surface oxide. TiO2 is very resistant against chemical attack, which makes titanium one of the most corrosion resistant metals, particularly

in the chemical environment with which we are concerned.

2. Concept of Osseointegration: Osseointegration is characterized by a number of clinical as well as ultra structural observations. It may broadly be defined as the dynamic interaction of living bone with that of a biocompatible implant in the absence of an interposing soft tissue layer Branemark et al. Several studies have analyzed this bone to titanium interface histologically and ultrastructurally, with often-inconsistent findings. The difficulty arises primarily with the need to prepare and section the specimens, without changing or damaging the interface.
3. Structural aspect of interface between tissue and titanium implants: Epithelial cells attach to titanium surfaces in much same manner as they attach to natural tooth surfaces. The literature published by Branemark's group was reviewed and it was proposed that deep within the gingival crevice, collagen fibers could be expected to form a light cuff around the implant abutment. Fibroblasts produced glycosaminoglycans during healing which may coat the implant surface additionally, fibroblasts and endothelial cells, present in the healing wound extracellular matrix, produce 'Fibronectin' a GP found in lamina densa, which binds to collagen and glycosaminoglycans representing the 'glue' between implant and type IV collagen of lamina densa. In contrast to the natural tooth, macroscopic evaluations suggest that implants display no periodontal ligament or gingival sulcus. The epithelium has been observed to have a tight adaptation to the collar of the implant with little inflammation, presumably in the absence of dental plaque. At a cellular level, the relationship of an implant with the surrounding tissue is highly dependent on the interaction between a passive titanium oxide (TiO2), which is formed on the surface of a titanium implant, and biological elements such as collagen, osteoblasts, fibroblasts and blood constituents.
4. Titanium implant surface treatments: Surface modification is one of the most common approaches as the surface properties can be selectively modified while retaining the desirable bulk attributes of the materials. The osseointegration process is influenced by a wide range of factors: anatomical location, implant size and design, surgical procedure, loading effects, biological fluids, age and sex, and, in particular, surface characteristics. For this reason, several attempts have been aimed at modifying implant surface composition and morphology to optimize implant-to-bone contact and improve integration. Preliminary interactions between implanted materials and biological environment are deemed to be governed by the surface properties; they control the amount and quality of cell adhesion on the surface and, consequently, cell/tissue growth. Surface modification can be done by- a) Mechanical methods- Sand blasting By Al_2O_3,By ZrO_2 b) Chemical methods- Acid etching c) Combination of mechanical and chemical d) Electrochemical e) Ion implantation.

Summery and conclusion: The main reason for employing titanium in dentistry was its excellent biocompatibility. Its successful osseointegration was a major achievement in the field of dental and cranio-facial Implantology. Improvements in design, surface characteristics and clinical implantation techniques have resulted in increased success rates over the years. Research regarding feasibility of use of titanium in fixed and removable prosthesis began subsequently at various institutions and laboratories across the world. Titanium had many enticing characteristics such as bio-inertness and favorable mechanical properties viz., low density, adequate strength, flexibility etc. However it had some technical problems due to its high reactivity and high melting point making it difficult to cast with conventional methods and further research needs to be made on the same.

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Immediate Placement and Loading of Single Implant in the Esthetic Zone: A Case Report

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Abstract: Single tooth replacement with a dental implant has become an increasingly favoured treatment option in the anterior maxilla. However, maxillary anterior tooth extraction results in bone resorption and often compromises gingival tissue for the implant restoration. An immediate implant insertion after tooth extraction may maintain the crest bone and the interdental papillae, thus achieving peri-implant esthetics and reducing the treatment time. Thus, the aim of this article is to describe a clinical case in which a fractured maxillary right central incisor was atraumatically extracted, followed by immediate placement of dental implant in prepared socket, the immediate temporization and transferring the emergence profile from the provisional to the final restoration. This permits a reduction of the number of implant components and consequently a lower cost of treatment, while at the same time maintaining acceptable aesthetic and functional outcomes and patient satisfaction.

Keywords: Dental implant, immediate placement, immediate loading, temporization, atraumatic extraction, emergence profile.

Introduction: Endosseous dental implant therapy is rapidly becoming the prosthetic standard of care for a vast array of clinical applications.[1] A good biological integration is an essential prerequisite for the success of a fixed implant supported restoration. Conventionally, 3–4 months of healing period is required for the maturation of extraction socket. Taking into account the prosthetic treatment, patients have to wait for >6 months for the replacement of a lost tooth.[2]

Loss of tooth in the esthetic zone is a traumatic experience with or without compromise in phonetics. As the aesthetic requirements of the patients have become increasingly important, patients require a treatment that should be fast, minimally invasive, and of low cost.[3] In order to meet the modern needs of patients, approaches such as early or immediate loading following immediate implant placement in fresh extraction site have been proposed and are gaining acceptance, which reduce the number of operating sessions.[4]

A favorable emergence profile is also very important for the health of peri-implant tissues as it affects the effectiveness of oral hygiene.[5,6] The gingival tissue at the interdental papillae can be formed into the desired shape if supported properly by a provisional restoration. Because the provisional prosthesis serves as an exact replica of the final restoration, it is crucial that the earlier mentioned outcome must be transferred with a simple, fast, and accurate technique.[7]

In this case report, the harmony of soft and hard tissue was preserved by immediate implant placement and immediate loading in the anterior maxilla in fresh extraction socket and the gingival profile of the patient developed by provisional prostheses on implants was transferred fixed prostheses involving anterior region.

Case report: A female patient aged 62 years reported to the Department of Prosthodontics and Crown & Bridge with fractured right maxillary central incisor and wide space between left central incisor and right lateral incisor for restorative opinion (Fig.1). The patient was conscious about her esthetics and

wanted the earliest possible solution. The patient was informed about various treatment options upon which she gave consent for implant supported prosthesis. The patient had a clear medical history, no active dental disease and no contraindications present for implant therapy.

Clinical and radiological evaluation with IOPA and CBCT scan revealed adequate alveolar bone and absence of periapical pathology (Fig. 2). It was decided to extract and place endosseous implant immediately and place provisional restoration.

Following administration of local anesthesia (2% lignocaine), the fractured tooth was atraumaticaly extracted using periotome (Fig. 3). The extraction socket was thoroughly cleaned. With the help of measurements of extracted tooth (Fig. 4) and radiographic evaluation, the ADIN implant with active threads measuring 4.2 x 13mm was selected. The implant site was prepared according to standard procedure (Fig. 5 & 6) and implant was placed palatally (Fig. 7), 1.5 mm from adjacent teeth (Fig. 8) and 3 mm apical to creastal bone (Fig. 9) with the insertion torque of 45Nm. Stability of implant was measured by Osstell implant stability quotient (ISQ) meter and multiple readings were obtained which state it to be highly stable (Fig. 10).

The preformed abutment was screwed to the implant (Fig. 11). A screw retained custom made composite crown was used for temporization (Fig. 12). It was checked for contacts in centric and eccentric occlusion. The left central incisor was restored with composite resin (Fig. 13) and post-operative instructions were given.

The provisional prosthesis was unscrewed after 4 months and the emergence profile could be appreciated (Fig. 14). The emergence profile was transferred from provisional to final restoration by extra-orally modifying the impression post. The temporary crown was attached to the implant analog and this assembly was fitted into the Dappen dish filled with putty impression material (Fig. 15). Thus the emergence profile was replicated in putty (Fig. 16). The impression post is then attached to implant analogue (Fig. 17) and the space around it was filled with flowable composite (Fig. 18). After curing the composite resin, the customized impression post was removed from the Dappen dish (Fig. 19) and was attached to the implant intraorally (Fig. 20).

Final impression was made using open tray with putty and light body impression material (Fig. 21).Thus the transfer moulding was done with customized impression post (Fig. 22). The final prosthesis was fabricated of porcelain fused to metal and was screw retained. Composite resin laminate was given on left central incisor (Fig. 23). Thus, the rehabilitation was completed (Fig. 24). The clinical and radiographic appearances after 6 months showed good esthetics, osseointegration and maintenance of bone around the implant (Fig. 25).

Conclusion: The present study achieved its early result with immediate implant placed in the extraction socket followed by immediate temporization[4]. Customised impression coping give the clinician the ability to reproduce the established emergence profile to the final restoration in an accurate way which is crucial in rehabilitations involving anterior teeth. Thus, this case report supports successful implant placement with desired stability by immediate loading in the fresh extraction socket with appreciable esthetic outcome.

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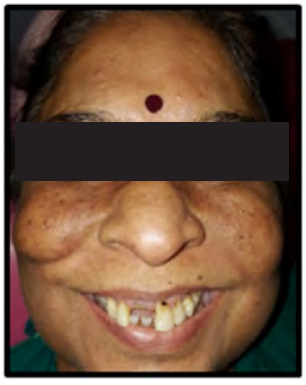

Fig. 1. Preoperative view - (a) Extraoral view

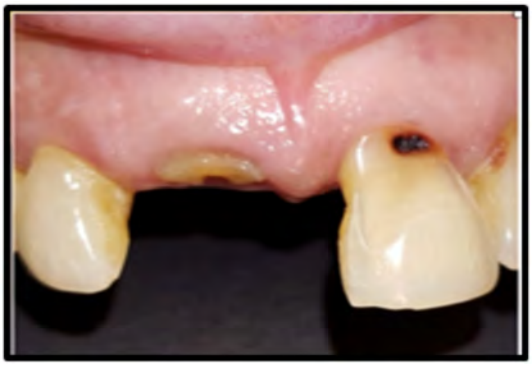

Fig. 1. Preoperative view - (b) Intra oral view

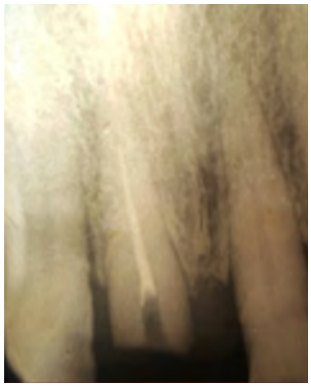

Fig. 2. Radiographic evaluation - (a) IOPA

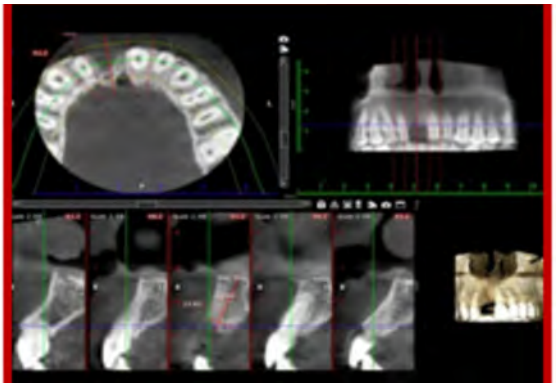

Fig. 2. Radiographic evaluation - (b) CBCT scan

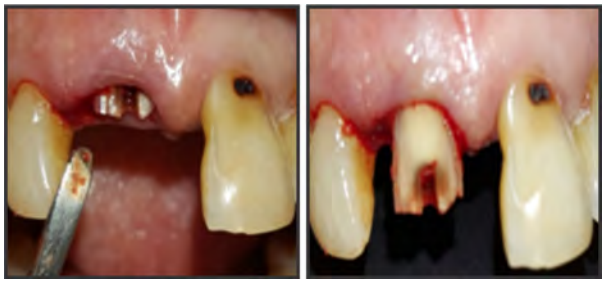

Fig. 3. Atraumatic extraction

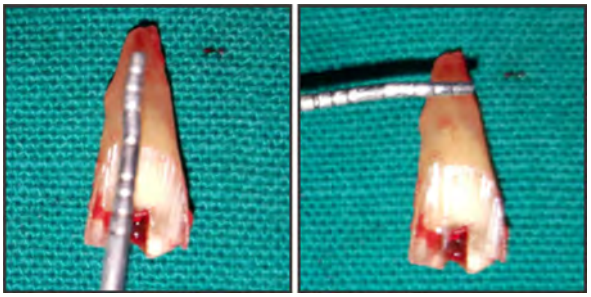

Fig. 4. Measuring the extracted tooth

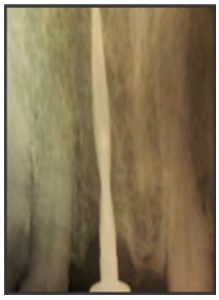

Fig. 5. Lancet drill

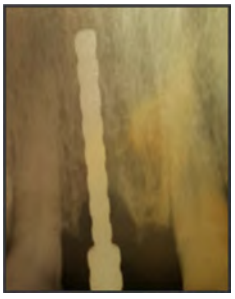

Fig. 6. Paralleling pin

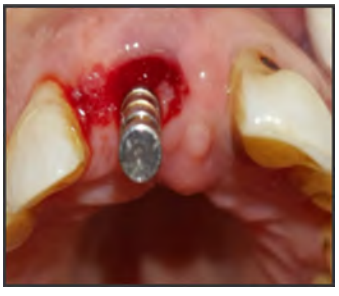

Fig. 7. Implant placed palataly

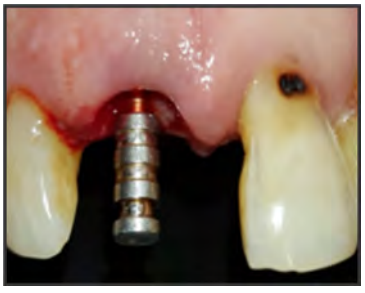

Fig. 8. Mesio-distal position of implant

Fig. 9. Implant 3mm apical to crestal bone

Fig. 10. Osstell implant stability quotient (ISQ) meter

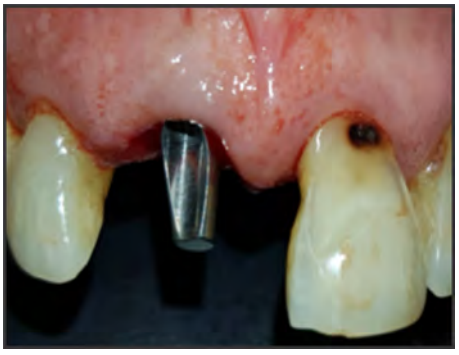

Fig. 11. Preformed abutment

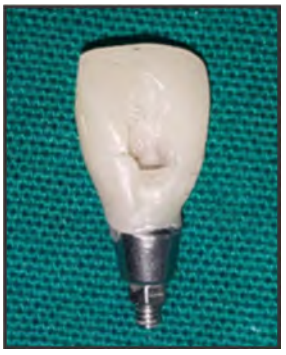

Fig. 12. Provisional prosthesis

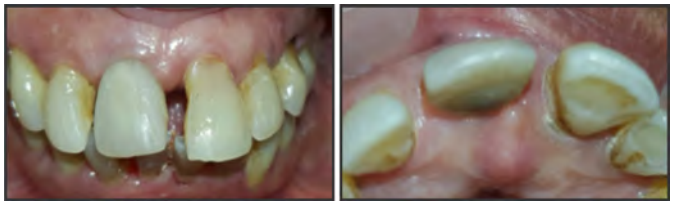

Fig. 13. Provisional prosthesis intraorally

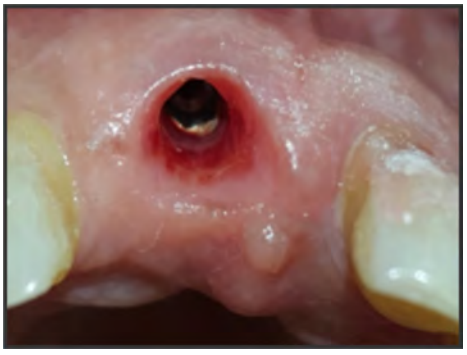

Fig. 14. Gingival contour

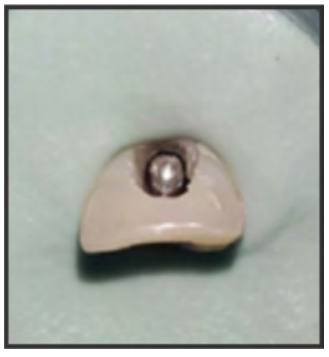

Fig. 15. Impression of provisional prosthesis made in putty

Fig. 16. Emergence profile replicated in putty

Fig. 17. Impression post attached to lab analouge

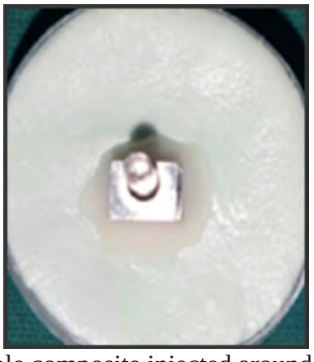

Fig. 18. Flowable composite injected around the impression post

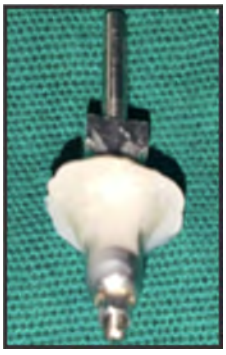

Fig. 19. Customised impression post

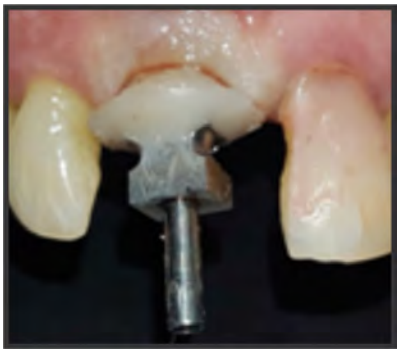

Fig. 20. Impression post attached intraorally

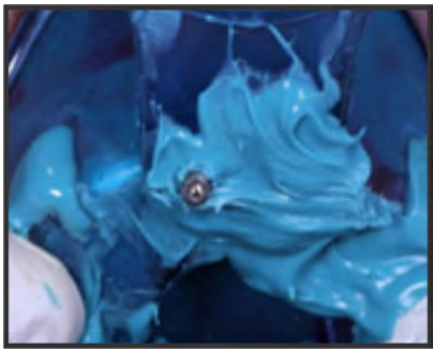

Fig. 21. Open tray impression with light body

Fig. 22. Transfer moulding

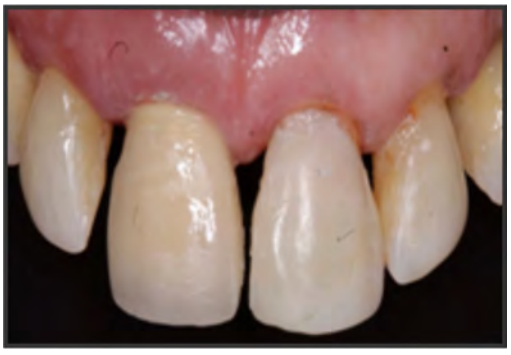

Fig. 23. Final prosthesis

Fig. 24. Extraoral view

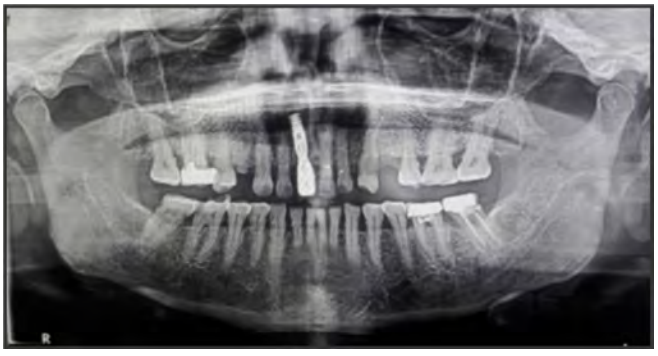

Fig. 25. OPG after 6 months

A Hollow Denture - A Simplified and Economical approach for Atrophic Maxilla

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Abstract: Retention,stability and support are the basic principles on which the success of a complete denture relies. The skill lies in applying these principles efficiently in critical situations. Resorption of bone occurs as the age advances. Although the resorption process is generally a more serious clinical problem in the mandibular arch,significant loss of alveolar bone in the maxillae can prove equally problematic. The severely resorbed maxillary and mandibular edentulous arches that are narrow and constricted with increased inter-arch space provide decreased support,retention and stability. The consequent weight of the processed complete denture only compromises them further. Such an atrophic maxillary arch that requires wearing a heavy maxillary denture may consistently lose its peripheral seal. The severely resorbed jaw can have various treatment options. The advantage of a hollow denture is the reduction of excessive weight of acrylic resin,which normally replaces lost alveolar ridge in the inter-ridge space of the denture wearer.

Keywords: Retention, Stability, Support, Resorption, Atropic Maxillary Arch, Resorbed jaw, Inter-ridge space.

Introduction: A major problem in dentistry is the prosthetic rehabilitation of deficient edentulous ridges.(1) "No step in denture construction should be stopped short of perfection yet many dentures are worn, which have imperfections built into them, provided they have peripheral seal sufficient to hold them in place"(3). Residual Ridge Resorption is predictable phenomenon following the loss of dentition occurring in edentulous individuals. However, the rate of resorption varies depending on the anatomic, metabolic or mechanical factors(4). Following severe resorption of ridge there is substantial increase inter-ridge space. This leads to fabrication of complete dentures that are more in weight. Heavy dentures, regardless of whether maxillary or mandibular causes poor denture bearing ability. Further, extreme and constant pressure results to bone resorption as well as decrease in retention(5) and stability of denture. Also, these dentures are causes discomfort and inconvenience to the patients(6).

Reducing the weight of a maxillary prosthesis has been shown to be beneficial when constructing an obturator for the restoration of a large Maxillofacial defect[6,7]. Given the high volume of the denture base material in prostheses provided to patients with large Maxillofacial defects or extreme residual ridge resorption, reduction in prosthesis weight may be achieved by making the denture base hollow(9). To decreased the leverage forces, reduction in the weight of the prosthesis was recommended and was also found to be beneficial(3). Different approaches like using a solid 3-dimensional spacer, including dental stone[10–14], cellophane wrapped asbestos [15], silicone putty[16, 17], or modelling clay have been used during laboratory processing to exclude denture base material from the planned hollow cavity of the prosthesis. Fattore et al.[11] and Holt[16] have used different techniques for fabricating a hollow prosthesis.

Case Report: A 60 year old male patient reported to the Department of Prosthetic Dentistry of Vidarbha Youth Welfare Society's Dental College and Hospital, Amravati for prosthetic rehabilitation

of maxillary and mandibular edentulous ridges. Patient's medical history was not significant. Past dental history revealed that patient was a denture wearer since 3 to 4 years and the maxillary denture were loose. Intra oral examination revealed severely resorbed maxillary edentulous ridges with increased inter-ridge distance. Labial, buccal mucosa, hard palate, soft palate and floor of the mouth were normal. Hence, hollow maxillary complete denture and conventional mandibular denture was planned for this patient.

Technique:

1) Upper and Lower Primary impressions were made by means of Impression Compound(Fig1)

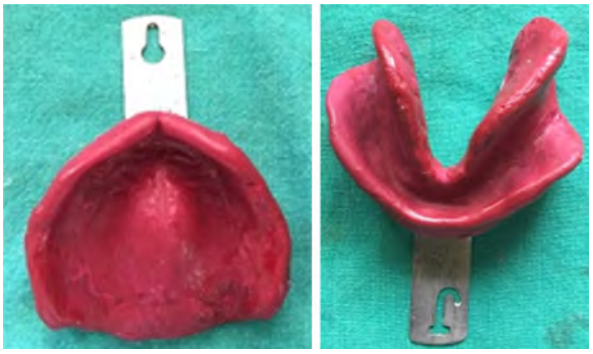

Fig. 1

2) The Impressions were poured with dental plaster (Fig. 2) and primary maxillary and mandibular casts were retained. Special trays were fabricated on these casts with auto-polymerizing acrylic resin. Border moulding were done with green stick compound and Final impression was made with Zinc Oxide Eugenol Paste. (Fig 3)

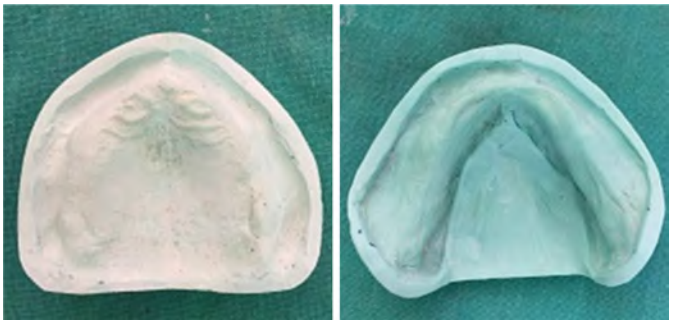

Fig. 2

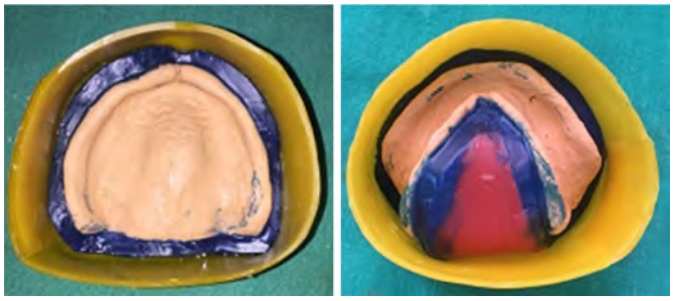

Fig. 3

3) The impressions were beaded and boxed and then poured with Type 3 dental stone and master casts were retrieved.

4) Record bases were fabricated with auto-polymerizing resin. Facebow recording(Fig.4), vertical and centric jaw relation were made.

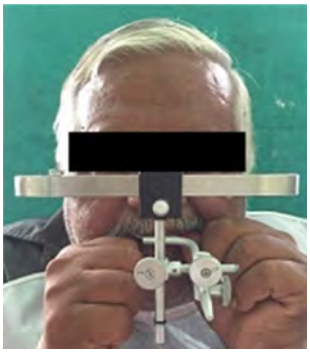

Fig. 4

5) This was transferred to articulator and mounting of maxillary and mandibular cast was done. (Fig.5)

Fig. 5

6) Teeth arrangement was done. Try in was verified (Fig.6) for retention, aesthetics and maxillary-

mandibular relationship.

Fig. 6

7) The trial denture was then processed in the standard manner up to the wax elimination stage in base 1 counter 1 flask.
8) Adapt 2 layers of baseplate wax (Anutex; Kemdent, Wiltshire, UK) (Fig.7) to the definitive cast in the drag, conforming to the border extensions. Use a second flask to invest the baseplate wax and again complete the wax elimination process. Pack the cope and second drag with heat polymerized acrylic resin (Lucitone 199; Dentsply, York, Pa) and process.

Fig. 7

9) Separate the cope, with the polymerized acrylic resin still attached, from the drag. Place the clear matrix on the definitive cast using the indices in the land area as seating guides. Use an endodontic file with a rubber stop to measure the space between the matrix and the processed resin.(Fig.8)

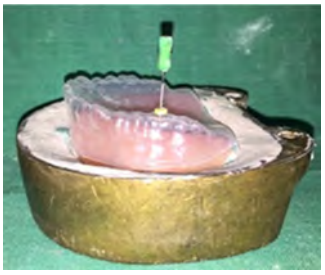

Fig. 8

Mix and adapt vinyl polysiloxane putty (Reprosil; Dentsply Caulk, Milford, Del) to the bur roughened acrylic resin and shape to the approximate contours of the matrix. Shape the polymerized putty with a bur (H251E; Brasseler USA, Savannah, Ga) to leave 2-3 mm of space between the putty and matrix. Provide an additional 1-mm space over the tooth portion of the denture (Fig.9). Fix the putty to the acrylic resin using cyanoacrylate (Superglue; Pacer Technology, Rancho Cucamonga, Calif).

Fig. 9

11) A glycerin soap (Pears, Hindustan Unilever Ltd., Mumbai, India) replica of the putty spacer was hand carved using a Lacron carver (Hu-Friedy, Chicago, IL) for use during the final closure and acrylization. The exact replication was ensured by measuring with a Vernier's calliper.
12) After this,a trial closure was carried out using the temporary putty spacer. The flasks were opened and temporary putty spacer retrieved. The mould space was visually assessed for adequate resin thickness all around the hollow cavity. The hollow space left by the temporary putty spacer was now filled with the soap spacer and final closure of the flasks was achieved. The denture was acrylized in conventional manner.
13) After finishing the denture two openings were cut with a bur into the denture base distal to the most posterior tooth (Fig.10). The denture was then immersed in a bowl of water to allow dissolution of soap. Also, a cleaning brush was pushed in and out through the openings to aid in mechanical removal of the soap. Water spray was used to flush traces of soap completely. The

hollow cavity was air dried and the openings were sealed using auto-polymerizing acrylic resin

Fig. 10

14) The denture was immersed in water overnight and weighed before and after immersion to assess leakage into the cavity. A water test was performed to evaluate the hollow space as evident by the floating denture (Fig11).

Fig. 11

15) Upper and Lower dentures were then finished, polished, and delivered to the patient. The patient was reviewed after a week, and minor adjustments were made.

Discussion: The goal of Prosthodontics treatment is to palliate the anatomical and functional deficiencies resulting from tooth loss. Tooth loss leads to residual ridge resorption which is a complex phenomenon driven by various anatomic, prosthetic, functional and metabolic factors[18,19]. Extreme resorption of either ridge will lead to a reduced denture-bearing area, which in turn will affect retention, stability and support for the complete denture. Excessive ridge resorption also results in a large restorative space between the residual ridges[20].Prosthetic rehabilitation in such scenarios often results in increased height and weight of the prosthesis, overloading the residual ridges and further compromising the retention and stability of the prosthesis. Literature reports various techniques for the fabrication of a hollow complete denture [21-25]. Few authors suggest processing the denture in parts around a 3-D spacer, which are then fused at the denture borders, following spacer removal. [23,24] Nevertheless, additional laboratory steps were needed, and post-insertion adjustments could result in a perforation, leading to fluid seepage into the hollow cavity[23,24]. Other techniques involved incorporation of the spacer within the denture base to form the hollow cavity during processing [21,22,26-39]. However, this necessitated designing large openings in the Cameo surface to facilitate spacer removal. Several spacer materials have been used, such as, gauze coated with addition silicone impression material[23], ice[26], asbestos[27], silicone putty[22,28-32], dough of dental plaster and pumice[31], dough of dental plaster-pumice and sugar syrup[32], modelling clay[33], thermocol[34] and salt[35]. Aggarwal *et al.*[35] proposed the lost salt technique to overcome the following shortcomings encountered in the aforementioned techniques: (a) Extra laboratory steps for the fabrication of a special lid and (b) tedious retrieval of high viscosity materials such as putty and thermocol.

The problem encountered while using salt is its inability to sustain pressures produced during flask closure resulting in a failure to achieve a hollow cavity inside the prosthesis. Hence, no substantial difference in weight of the prosthesis can be achieved. The technique described here uses a soap spacer specifically hand carved out of a glycerin soap bar due to its easy retrievability that can be attributed to a high content of glycerine and other humectants in it, rendering it highly water soluble compared to other soaps. Other advantages of using a glycerine soap spacer are that it can sustain curing temperatures (boiling point of glycerine 290ºC) and doesn't interfere with the polymerization of heat cure acrylic resin or leave any residues inside the hollow cavity. Also because the soap spacer is

eventually removed leaving behind a clean hollow cavity, any concern regarding its biocompatibility in the oral cavity is dismissed[36].

Conclusion: This technique overcomes the disadvantages of the older techniques. The glycerine soap spacer has the advantages of easy retrievability, ease of carving and it doesn't adhere to acrylic resin. Hence, it's a simple, economical, time-saving and a predictable technique[36]. Also the clear matrix of the trial denture helps to facilitate shaping of silicone putty spacer to ensure an even thickness of acrylic to resist deformation and prevent seepage of saliva into the cavity[37]. Pre-prosthetic surgeries and implant-retained prosthesis may not be possible in all cases due to systemic diseases or cost. In such cases, a lightweight complete denture is a logical alternative to counteract the lateral forces better and decrease leverage by reducing extra loads on underlying tissues[36].

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Endocrown with deep margin elevation as a conservative approach for Management of endodontically treated teeth: A clinical report

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Abstract: Restoration of extensively damaged endodontically treated teeth remains a challenge. With the advancement in adhesive technology and minimal invasive approach taking precedent in practice today endocrowns are an excellent alternative to posts combined with full coverage restorations. Endocrowns gain their retention from the coronal portion integrated into the apical projection that fills the pulp chamber space. Endocrowns provide good retention, minimizes microleakage and have high success rate. The present report discusses the advantages and indications of endocrown and presents a clinical case of endodontically treated 46 wherein the excessively damaged distal wall was constructed by deep margin elevation and the teeth was restored using a bonded lithium disilicate endocrown. With careful case selection and adherence to specific guidelines endocrown restorations present a satisfactory clinical outcome. Use of CAD CAM technology is adjunct with adhesive technology has opened the exciting avenues towards the single day dentistry.

Key words: Endocrowns, Deep margin elevation, Endodontically treated teeth, All ceramic, Adhesive Restoration

Introduction: The Evolution of superior adhesive techniques has established minimally invasive dentistry as a successful treatment option.[1] Pissis was the forerunner of the endocrown technique and has described it as the 'mono-block porcelain technique'.[2] The term endocrown however was first used by Bindl and Mormann in 1999 described an adhesive monolithic ceramic restoration anchored in the pulp chamber, exploiting the micromechanical retention properties of the pulp-chamber walls.[1] Rehabilitation of endodontically treated teeth presents an important challenge for most dentists.[3] Moreover, the limitations to the use of intraradicular posts, such as calcified root canals, narrow canals, or a fracture of an instrument, have led practitioners to consider other alternatives.[3]

Endocrowns offers certain distinct advantages over their counterparts as it is more conservative and adhesive thus minimizes microleakage.[4] It ensures better periodontal health due to supragingival position of the joint.[5] Endocrowns are superior to full crowns in cases with minimal crown height but sufficient tooth structure available for stable and durable adhesive cementation.[6]

The incorporation of computer-aided designing computer-aided manufacturing (CAD/CAM) technology into this process has opened new horizons, both in material processing, as well as in the restoration of teeth, providing accuracy, esthetics, and less time consuming restorative procedure.[7] Endocrowns are also a perfect integration into a single day dentistry due to these advantages.[8] Clinical studies have also revealed the success rates of as high as 95% after 2 years.[8] The present report describes a clinical case of endocrown along with deep marginal elevation.

Case Report: A 40 year old Male Patient reported to the Department of Prosthodontics and Crown & Bridge at VYWS Dental College and Hospital, Amravati for post endodontic restoration with #46. A thorough clinical and radiographic evaluation was performed. Medical History was non-significant and Patient presented with good oral hygiene and fair

occlusion.(Figure 1). Radiographic findings revealed well-obturated canals with no evident periapical changes. (Figure 1) Various treatment options were discussed with the patient. The Prosthetic decision was made to restore tooth (46) with an endocrown fabricated from lithium disilicate ceramic taking into consideration the amount of remaining tooth structure and the thickness of the walls. Distal wall of the tooth was subgingival due to carious destruction thus the distal margin was build using Glass Ionomer Cement to an acceptable height.(Figure 2)

The technique for the tooth preparation of endocrown as it differs from conventional preparation was followed. An overall 2 mm of occlusal reduction was done in the axial direction using cylindrical diamond bur and diamond wheel bur was used to create the flat surface to get a cervical margin or "cervical sidewalk" in the form of a butt joint. The cervical margin is kept supragingival as given and enamel less than 2mm in thickness was eliminated. Continuum was created between the access cavity and the coronal pulp chamber of the tooth. The axial preparation was done using cylindrical bur to eliminate any undercuts present. Care was taken to keep the depth of minimum 3 mm. a heated plunger was used to remove 1mm gutta purcha from the canals. (Figure 3)

After finishing and polishing of the preparation evaluation of the entire preparation and interocclusal space was done. The preparation was thoroughly cleaned. A Single step double mix elastomeric impression was made using Polyvinyl Siloxane impression material. Impression of the antagonist arch was made using irreversible hydrocolloid. Shade Selection was done. Provisionalization was done using self-cure tooth molding material and cementation with eugenol free zinc oxide. The cast was poured and sent to laboratory.

The endocrown was fabricated from lithium disilicate-based ceramic. (Figure 4) Occlusal and proximal adjustments was done during try in using finishing burs. The crown was sent back to laboratory for final polishing and application of glaze. The finished and polished endocrown was checked on master cast to verify complete seating.

The tooth was isolated and etched using Phosphoric acid for 20 seconds. Then it was washed and dried followed by application of adhesive and curing for 20 seconds. (Figure 5) The inner layer of the endocrown was etched using hydrofluoric acid followed by washing air drying with three way syringe. silane coupling agent was coated onto the crown and air dried. A layer of dual cure acrylic resin was applied on the crown and crown was positioned on the tooth. (Figure 6, 7) Curing was done for 5 sec which makes the removal of excess cement easy. All the excess cement was cleaned out using floss and curing was performed from all the directions for 30 seconds. (Figure 8, 9, 10) Post cementation radiograph was taken to ensure complete seating and regular follow up was kept at the interval of 1, 3 and 6 months. (Figure 11)

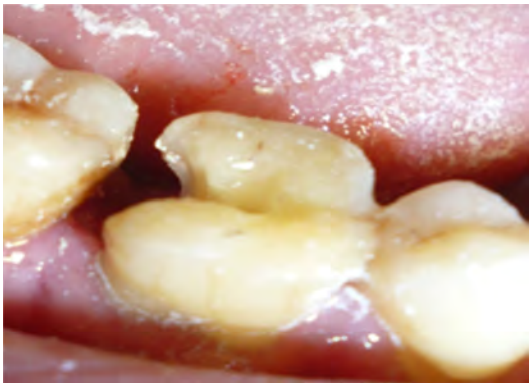


Figure 1: Pre-operative view (A) Clinical

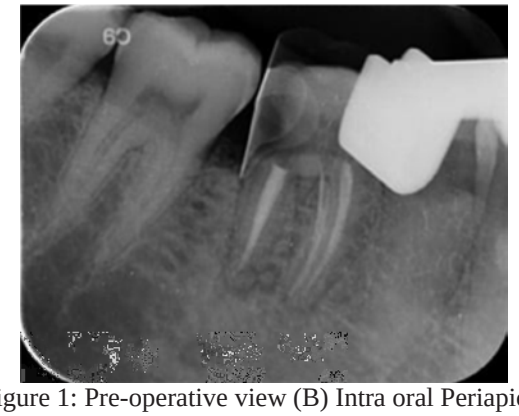


Figure 1: Pre-operative view (B) Intra oral Periapical Radiograph showing obutrated canals

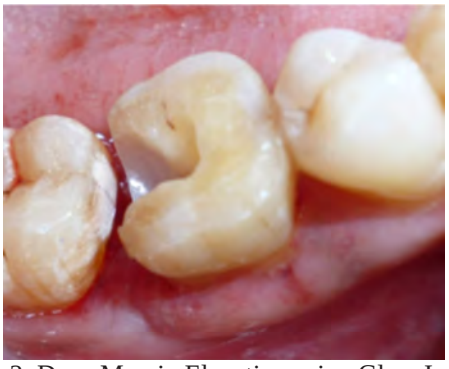
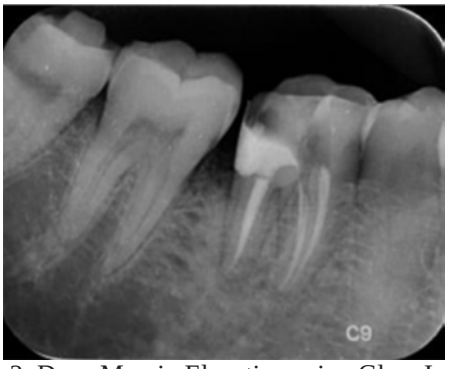


Figure 2: Deep Margin Elevation using Glass Ionomer Cement.



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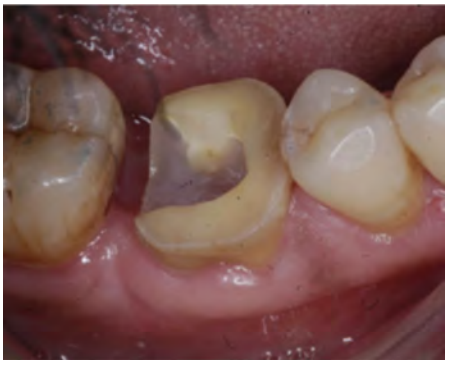

Figure 3: Tooth preparation (A) Intracoronal preparation

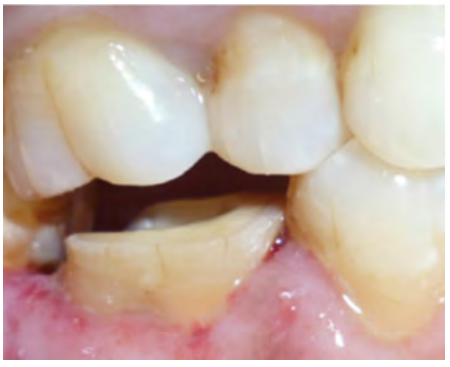

Figure 3: Tooth preparation (B) Occlusal clearance

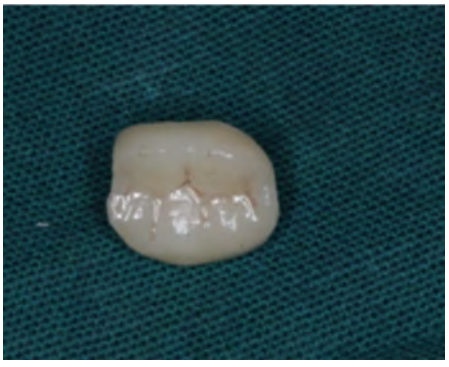

Figure 4: Endocrowns fabricated of lithium Disilicate

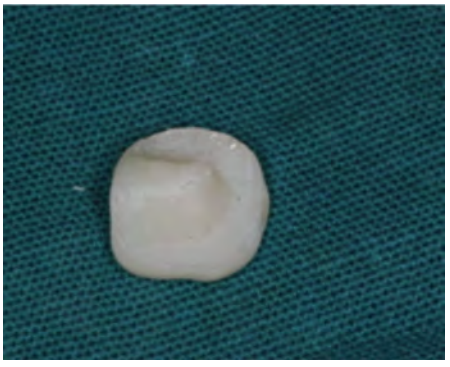

Figure 4: Endocrowns fabricated of lithium Disilicate

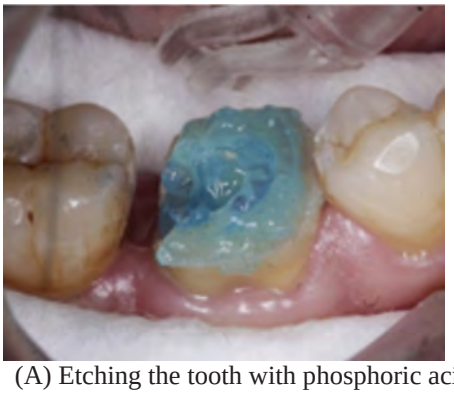

Figure 5: (A) Etching the tooth with phosphoric acid for 20 seconds

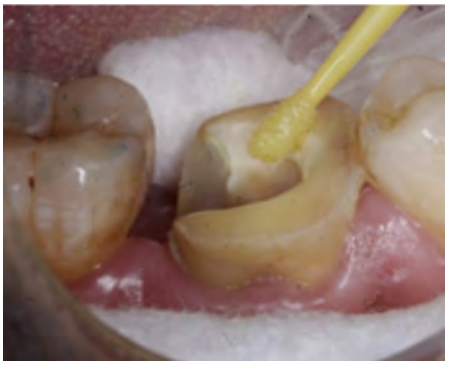

Figure 5: (B) Application of Bonding Agent

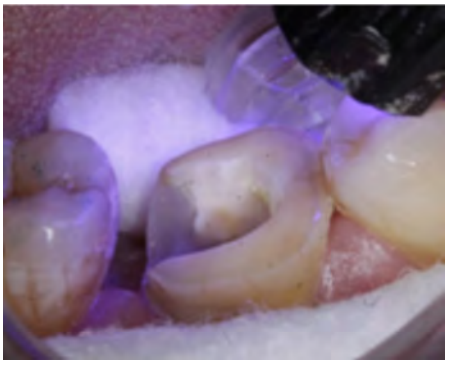

Figure 5: (C) Curing the Bonding agent

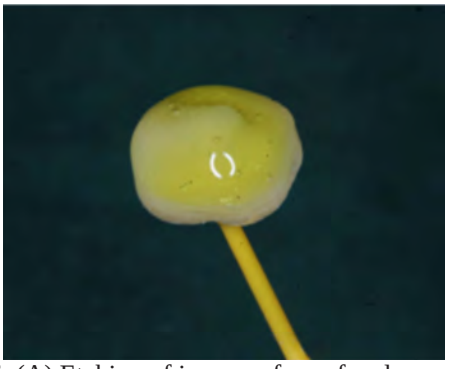

Figure 6: (A) Etching of inner surface of endocrown using hydrofluoric acid

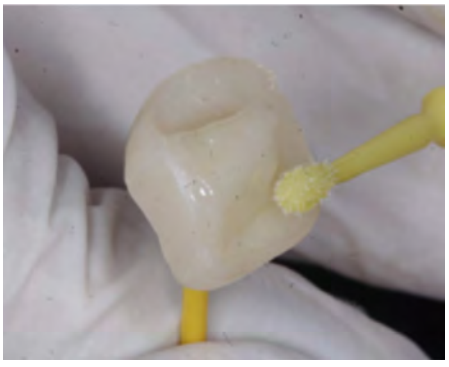

Figure 6: (B) Application of Silane Coupling Agent

Figure 6: (C) Layer of Dual Cure Acrylic resin on inner surface of Endocrown.

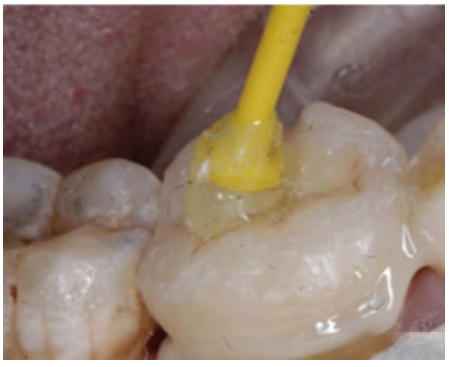

Figure 7: Placement of endocrown on the prepared tooth.

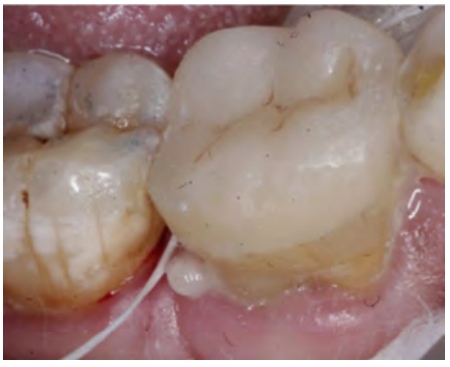

Figure 8: Removal of excess cement from Interdental Area.

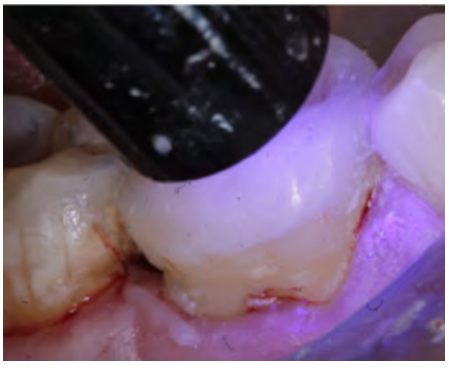

Figure 9: Final curing

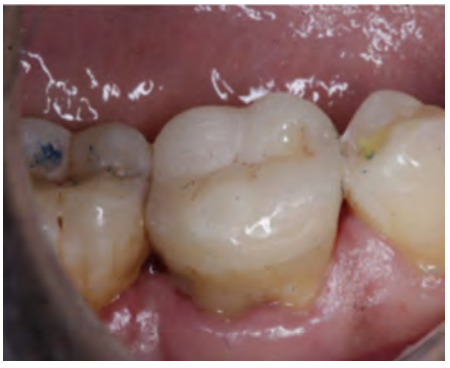

Figure 10: Final Prosthesis in Place

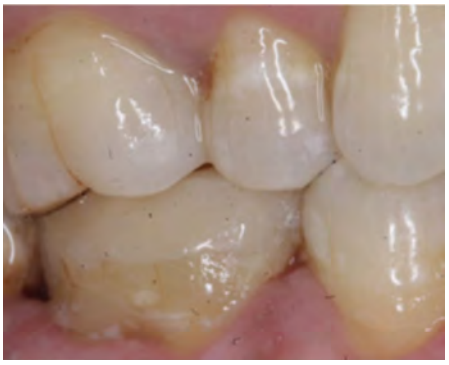

Figure 10: Final Prosthesis in Place

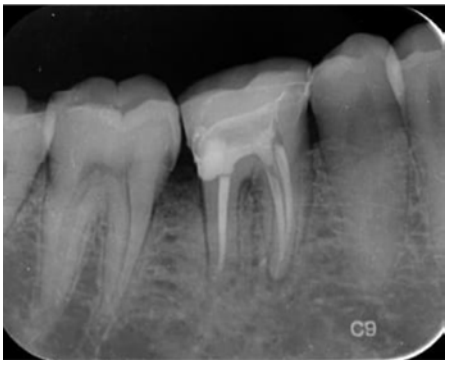

Figure 11: Postoperative Radiograph

Conclusion: In the literature, there has always been a controversy regarding the ideal treatment for restoration of endodontically treated teeth.[9] For long term success, conservation is the new mantra and with the adhesive technology available today endocrown presents an exciting alternative.[9] Various researches and clinical evidence conforms to the claim that the endocrown fits perfectly with the concept of biointegration and is the novel and successful restorative options for posterior endodontically treated teeth and badly damaged molars.[10]

Conflict of Interest: Authors declare no Conflict of Interest.

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EVAC-AERO: Modified Extraoral High Volume Evacuator

Dr. Shreyasi Jogi[1], Dr. Anushree Bhoge[2], Dr. Rohit Patil[3], Dr. Vaishnavi Banode[4].

VSPMDCRC, Nagpur.

Abstract

Background: Dentists and dental hygienists are exposed to ubiquitous aerosolized cloud which mainly consists of particulate matter and fluid which is contaminated with pathogens due to use of high-speed hand-pieces and ultrasonic scalers.

Aim: To provide inexpensive and highly effective extra oral suction device which will minimize the microbial load during routine dental procedures and also will be highly effective in controlling transmission of air borne infections.

Materials and method: Evac aero works on the principle of negative suction pressure which being modified from a household vacuum cleaner evacuates coarse, fine and ultra fine particles of aerosol effectively which in turn will create a comparative safer zone for dental health care workers. Mobility of working arm will offer easy adaptability in all areas of function.

Conclusion: The EVAC AERO is highly effective in preventing air contamination by dental procedures. Main advantages are that it can be easily modified for its use with any dental unit and is relatively inexpensive.

Keywords: aerosol, dentistry, covid 19, extra oral suction, household vacuum cleaner

Presented at: 48th IPS National Virtual Conference 2020, Nagpur.

Introduction: Dentistry is classified under high-risk profession in terms of air borne infections. The novel corona virus now renamed as SARS CoV-2 has brought a significant setback in dentistry which gave room for research and inventions for exposure control from aerosols. Dentists and dental hygienists are exposed to ubiquitous aerosolized cloud which mainly consists of particulate matter and fluid which is contaminated with pathogens due to use of high-speed hand-pieces and ultrasonic scalers.

This current SARS COVID-19 pandemic gave us an eye-opening situation.

It gave us an introspect to look things minutely, as minute as an aerosol particle. Dentistry cannot work without production of aerosols which puts us into a high-risk zone for numerous airborne infections.

Also talking about dental clinical setup where we use intra oral suction tips for isolation and fluid

control in the oral cavity why there is a need of extra oral suction device? The answer lies in the definition of aerosol itself. Definition by Micicle and colleagues which says aerosols are particles of less

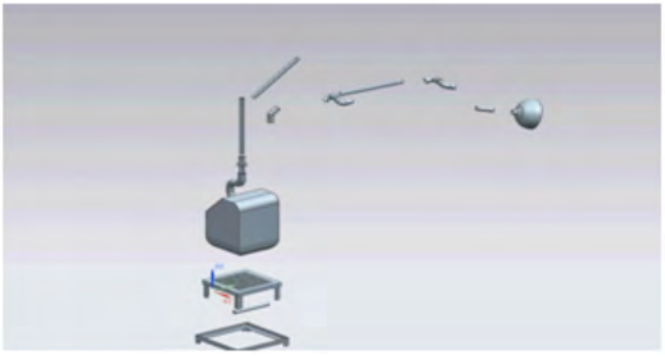
than 50 micrometers in diameter which are small enough to stay airborne for extended period. Yes, for extended period.! Various diseases known to spread by droplets or aerosols are Pneumonic Plague, Tuberculosis, Influenza, Legionnaires' Disease, Severe Acute Respiratory Syndrome.

This gave us the scope of extra oral suction device which when used as a separate unit with all other universal precautions can help in substantial reduction of health hazards of aerosols.

Materials and methods: The central idea behind this innovative technique was to develop an inexpensive device using **household vacuum cleaner** for extra oral suction in clinical practice. It is portable and concise in a way that it can fit in any clinical space without interfering with four handed dentistry.

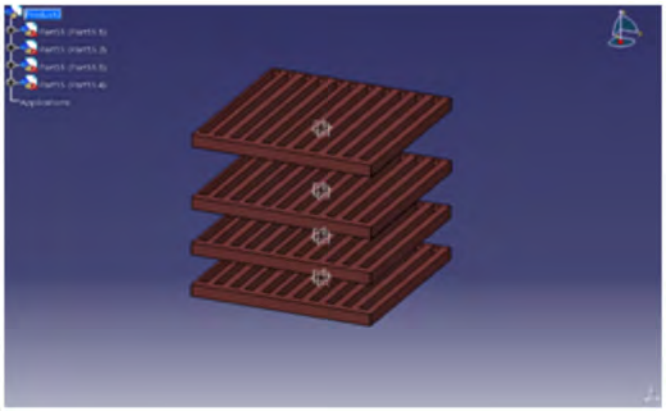
Evac aero works on principle of negative suction pressure. Suction pressure of 260 Kpa was used in the prototype device made and can be manufactured up to 320- 600 Kpa in the actual model.

It has a freely movable an arm length connector long enough with a funnel shaped suction which works to an effective height of 5.5 meters for better capture of bio-aerosols which makes it **hands-free high-volume evacuator.** The funnel shaped suction opening works best when kept around 15 cms from the aerosol generating source.

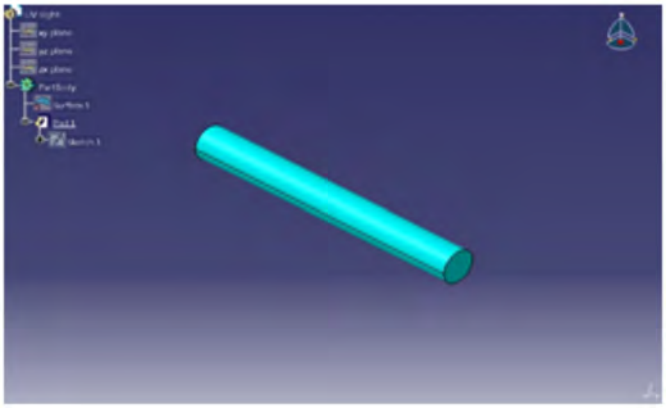


By placing the extra-oral suction device in the effective range, the evacuated particular matter is captured with the help of vacuum pump inside the chamber, which then passes through four filter layers:

1. Prefilter for blood and contaminants
2. Moisture filter
3. HEPA filter
4. An additional Carbon filter



All of these layers are enclosed in the closed chamber where UV light of 220 Nm. is present which ensures the complete disinfection of the enclosed space of the device.



Power source used in this device is around 1400 Mpa and material used in the assembly of this prototype device is (stainless steel) SS304/ SS316/ SS3254 but fiber can also be used for final product.

Advantages:

1 One of the major advantages of it is being Cost effective.

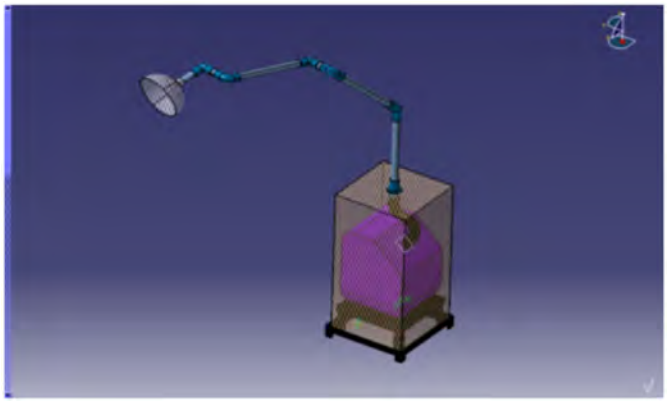
2 Reduces microbial load in clinical environment, therefore reduces chances of airborne infections.

3 Filters the collected particulate matter and air through stages.

4 Mobile and easy to store.

Disadvantages: Drawback of using an extra oral suction device is the noise generated during the procedure.

But to overcome this in this prototype, the entire chamber assembly is covered with foam sheet from inside, also rubber push button is used to ensure sound control. Furthermore, in the final manufactured product use of sound absorbing material can be considered.

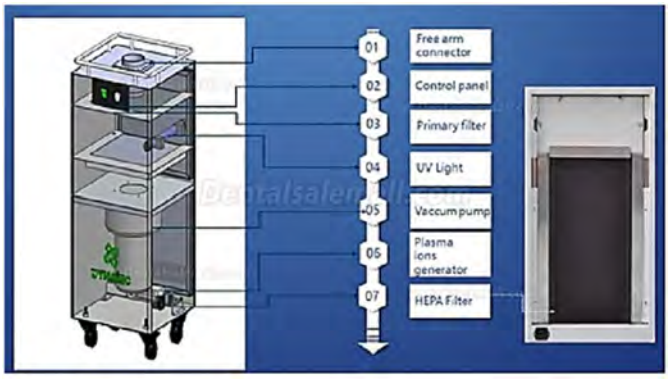


Discussion: Extra oral suction devices are proved to control and deplete the microbial load in a clinical environment but can sometimes impede the work flow as it occupies space and creates noise. To make it portable and freely movable was to overcome these drawbacks also a regulator knob was incorporated to ensure the control of suction pressure by the operator during procedures generating less aerosol and while operating in pediatric patients.

Another important feature to be highlighted is to filter the particulate matter before emitting it out as it will to control further contamination of the surrounding. The outlets will receive waste that has passed through filter layers making it safer.

Conclusion: As a strict measure for infection control in dentistry use of extra oral suction devices are increased and also with the SARS-Cov-2 pandemic, practical additional means of protection become more critical. The use of ESUs for clinical procedures helps in reduction of procedural splatter, surface contamination, and potential transmission of the SARS-Covid-virus in the dental setting.

The EVAC-AERO developed is maneuverable, did not impede work flow, and provided an additional level of protection for clinical providers. Patient screening, PPE, proper infection control, and procedural isolation with intra oral techniques like rubber dam, as well as intra oral high-volume evacuation are still necessary to mitigate the risk of experiencing procedural contamination and transmission.



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Introduction should define the reason for the study, the nature of the problem, and its relation to previous work, quoting the references by numbers within brackets in the order in which they are cited. Materials and Methods should contain sources of special chemicals, kits, animals, case material and all the actual methods employed briefly with references. Use generic names with the trade name in parenthesis. All measurements must be in metric units and temperature in degrees Celsius. Use only standard abbreviations, symbols and acronyms that are universally accepted.

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Results: Present the results in logical sequence using appropriate, tables and figures without duplication. Results must include statistical analysis when ever applicable.

Discussion: Distinguish clearly new information from previous findings, and speculation from fact. Problems arising out of the study may be identified, and relevant hypotheses may be generated. Indicate the conclusions that may be drawn and place them in the context of a critical appraisal of previous work.

Acknowledgement: Acknowledgement of those who have actually contributed substantially to the study mentioning their contribution.

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Articles: Penner A, Timmons V. Seniors, attitudes: oral healthand quality of life. Int J Dent Hygiene 2004; 2:2-7.

Books: Whittaker DK, MacDonald DG. Bite marks in flesh. In: Whittaker DK, MacDonald DG, editors. A Colour Atlas of Forensic Dentistry. London: Wolfe Medical Publications Ltd.; 1989.p. 26-43.

Abstracts: Nath N. Effect of certain compounds on the lysomal stability in vitro. Proceedings of All India Seminar on Contemporary development in bioenergetics and membrane function. Waltair,1982:82.

Others: Unpublished work, work in preparation, and personal communications should only be mentioned in the text and not used as references. Personal communication must carry the date of the communication. However, work accepted for publication should be included in the reference list as 'In Press' giving the name of the Journal. 'Quoted by' references are not accepted.

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