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DIGITAL VS CONVENTIONAL PROSTHODONTICS

Prosthodontics is as much about art as it is about science and I guess this is where it differs from the rest. The conventional clinical procedures which are a part of our everyday prosthodontics have always been about the operators' capability to judge and correctly decide on the specific procedure where their clinical acumen and skill would be on abundant display. But in the fast evolving world of prosthodontics, there has been a gradual but a definite change from our conventional clinical procedures being taken over by technology and today we find ourselves in the midst of a technology revolution that is defying the conventional norms that we have based our foundations on!

The question to be asked here is how do we decide what is necessary and what isn't? Is everything digital good? Is it foolproof? How about longevity? Are certain questions that force us to look into evidence base and come up with answers. Though all technology revolutions do not have long term studies to provide sufficient evidence base, we still have to address questions of both the operators and the laymen.

A lot of research work in this regard is being done in developed countries and it is time we stepped up and focus more on these uncharted areas of prosthodontics as core areas for research. We have the resources and manpower and it is time we developed scientific temper to delve into providing answers in such areas hitherto unexplored.

AN INNOVATIVE TECHNIQUE TO SALVAGE FRACTURED ABUTMENT TEETH AND REFURBISH AN EXISTING FIXED PROSTHESIS

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Introduction:

Fracture of the abutment tooth is a commonmechanical cause of failure in fixed partial dentures (FPD).[1]According to Barreto, fracture of the abutment tooth is a biological consideration of failure of FPD(s).[2]Semi-precision attachments are an effective means to improve the retention, reduce coverage and increase patient acceptance of a cast partial denture.[3]Failure of abutment teeth supporting the fixed segment of an attachment retained prosthesis may have catastrophic consequences for both the dentist and the patient. Failure most commonly occurs by horizontal fracture of the tooth at the cemento-enamel junction.[1] This mode of failure is grouped under Class IV of the Grading of failures based on severity by JJ Manappallil.[4]Not all patients can afford the cost of refabricating, in these cases 'refurbishing' the existing FPD may be a cost effective alternative.This paper describes a unique technique to salvage fractured endodontically treated abutment teeth using cast post and core and reusing the existing fixed dental prosthesis.

Case Report:

The patient 57 year old, female was referred to the Department of Prosthodontics and Crown & Bridge, MCODS, Mangalore with the complain of a loose fixed prosthesis in relation with 11, 12 and 13. Clinical examination and history taking revealed splinted crowns in relation with root canal treated 11, 12 and 13. 11 was restored with a cast post while 12 and 13 were not prepared to receive posts.Extra-coronal semi-precision attachments (Rhein 83 OT CAP attachments system) were cast at the distal end of the splinted prosthesis.

Figure 1: intra-oral occlusal view of fractured abutment tooth (13)

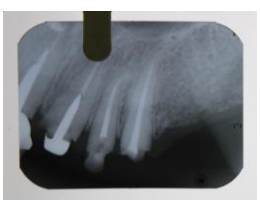

Figure 2: intra-oral periapical (IOPA) radiograph showing cast post and core i.r.t. 11 and root canal treated 12 and 13 with cast posts. Also fractured of crown structure of 13 is evident.

A similar prosthesis i.r.t 21, 22 and 23 was used to provide bilateral retention for a cast partial denture for missing 24, 25, 26 and 14, 15, 16 and 17. The mobile splinted prosthesis was easily dislodged and revealed a fracture of the crown of the 13 with minimal residual tooth structure. In this situation the cast partial denture would be rendered non-retentive in the absence of one of the retentive males attached to the dislodged fixed segment.

The fractured coronal tooth fragments of the 13 in the retainer were removed with the help of an ultrasonic scaler. Residual cement was removed from the surface of the tooth and using a finishing bur in an airotor and any sharp margins of the remaining tooth structure were rounded off. Care was taken to ensure that no alterations were made in the existing finish line.

Steps in fabricating the new cast post:

1. Preparation of post space: Using gates glidden drills 2, 3 and 4 the guttapercha was removed from the canal leaving behind 5-6mm of peri-apical guttapercha. Then using peso-reamers 2, 3 the canal walls were cleared of remnantguttapercha and shaped to have smooth walls, free of any grooves or ridges. **(Figure. 3)**Grooves and ridges are avoided as they may provide obstruction to the complete seating of the post and overlying fixed prosthesis.[5]

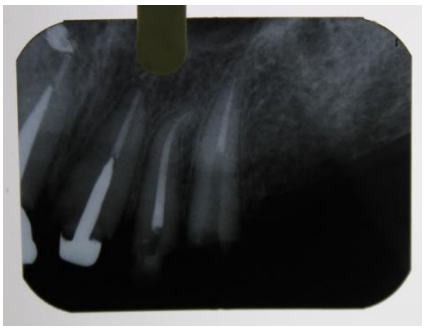

Figure 3: IOPA shows post space preparation for 13.

2. Making the post space impression: A match stick was shaped such that it would reach the complete depth of the preparation while fitting passively in the canal. Additionally, for this technique the height of the wooden stick was adjusted such that it would be long enough to support thecore without obstructing complete seating of the prosthesis.
3. The inner surface of the crown for the 13 and the prepared canal were lubricated with a thin layer of petroleum jelly.**(Figure.4)**

Figure 4: Fitting surface of splinted crowns i.r.t 11, 12 and 13 lubricated with a thin layer of petroleum jelly petroleum jelly

4. Pattern Resin™ LS (GC Tokyo, Japan) was mixed and carried into the canal with an endodontic K file of appropriate size. The wooden matchstick was also coated with pattern resin and seated in the canal to obtain the form of the post space.
5. Simultaneously, pattern resin was loaded in the fitting surface of the retainer for the canine and the fixed segment was seated intraorally.
6. The excess resin at the margins was removed and without wasting much time the cast partial denture was seated and maintained in place under occlusal bite pressure.
7. Once setting of the pattern resin was confirmed extra-orally, the cast partial denture along with the fixed prosthesis were removed.
8. The pattern resin impression came along with the crowns and was easily separated from its mould.**(Figure. 5 & 6)**

Figure 6: Lateral view of pattern resin impression (extra-oral)

Figure 5: Intra-oral occlusal view of pattern resin impression for custom cast post and core for 13.

9. The 0pattern resin impression of the post and core space wassprued and cast in Ni-Cr alloy (Wirolloy NB Bego, Germany). Pattern resin undergoes minimal dimensional changes and burns out completely without any residues. The cast post obtained by following this technique will require minimal adjustments. The sprue is cut, seating interferences are removed and the cast post and core is finished polished and prepared for cementation.**(Figure. 7)**

Glass Ionomer Cement (GC Fuji I®, Tokyo Japan) was the choice of luting agent used for cementation of the cast post and core as well as the crowns. First the post and core is luted in the canal. Next the splinted crowns are luted in place, the excess material at the margins of the restoration was removed and the cast partial denture was immediately seated in place and maintained under occlusal force.**(Figure. 8)** Once the cement is set, any residual cement at the margins is removed and the patient is recalled every 3 months for evaluation.

Figure 7: Intra-oral occlusal view of custom cast post cemented in position

Figure 8: Intra-oral occlusal view after the fixed and removable segments are cemented and seated in position respectively.

Discussion-

This paper proposes a simple and cost effective solution to abutment tooth fracture, ensuring restoration of function in two clinical appointments.Considering the extensive loss of tooth structure and the need to design a core that would conform perfectly to the fitting surface of the retainer, it was decided to fabricate a direct custom cast post using pattern resin. Rayyan et al have found no statistically significant difference in the accuracy of cast posts fabricated with direct and indirect technique.[6]Priest and Goerigdescribed this technique to repair fractured abutment teeth in FPDs using Duralay resin.[5]We have adapted this technique to suit the present case scenario.The recording of post space and core impressions simultaneously in pattern resin ensured proper binding of the two segments of the impression. This impression could then be casted immediately and fitted with minimal adjustments thus reducing chair-side time.

Conclusion-

The onus of maintenance of a delivered prosthesis is on the operating prosthodontist. The above mentioned technique can be employed as a quick and efficient method to salvage favourably fractured abutment teeth in biomechanically critical positions of any fixed or combined prosthesis. Besides repair one must always look into and treat the underlying cause of failure to prevent recurrence.

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ESTHETIC MANAGEMENT OF ANTERIOR TEETH USING CAST LITHIUM DISILICATE POST: A CASE REPORT

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Abstract

Anterior teeth poses great challenge in endodontic restoration due to their critical position in the mouth. Great emphasis on the esthetics in the present day scenario has led to great technologic advances to achieve superior life-like restorations. Numerous tooth colored post materials are currently available with their advantages and disadvantages. Dental practitioners should have the ability to evaluate the clinical situation at hand and based on the relevant findings discern the most appropriate post material. The purpose of this article was to briefly describe the different tooth coloured post materials available, their indications and a case report describing the rehabilitation of a badly broken down anterior teeth using a prefabricated Zirconia post (Cosmopost)

Keywords: Esthetics, Anterior teeth, Tooth-coloured post, Cosmopost

Introduction-

The present era of prosthodontics is witnessing a huge paradigm shift in their emphasis on esthetics. Today's patients not only expect us to provide them with healthy teeth, healthy periodontium and an undisturbed neuromuscular function, many of them also desire beautiful teeth. It is important that the dentist takes note of these expectations that the patient has and attempt within limits to fulfil these expectations.

In clinical practise when a patients presents with a severely broken down teeth, a corono-radicular post is required for the longevity of restorations placed on such teeth after an proper root canal treatment for the teeth is completed.. Earlier, metal ceramic posts were commonly employed because of their long term success. These metal ceramic post and core restorations were associated with compromised esthetics especially when an all ceramic restoration was planned. Metal posts and core may shine through in cervical root areas, altering the appearance of thin gingival tissue. Additionally, certain corrosion products may deposit in the gingival tissues and cause root discoloration. [1]

With the increasing use of anterior all ceramic restorations to meet esthetic needs, there is a need for tooth colored posts and cores that are as good if not better than their metallic non esthetic counterparts. Some other advantages of non-metallic posts are its easy retrievability, biocompatibility and their corrosion resistance. There are certain disadvantages of non metal posts like their long term success is lesser than metal posts. Metal posts are stronger in thinner sections therefore minimal ferrule is sufficient as opposed to increased ferrule that is required for non metal posts. [2]

The metal free posts are of two types based on the composition: composite and ceramic posts.

1. Composite materials: are composed of fibres of carbon or silica surrounded by a matrix of polymer resin, usually an epoxy resin. Recently a polyethylene material (Ribbond) has been used for direct posts. The advantage of this is that is doesn't need canal enlargement as the fibres adapt to the canal. [3]
   An important reason for the success of these restoration can be attributed to their biomimetic behaviour. Due to their greater similarity in elastic properties to dentine these posts allow for a uniform stress distribution to the tooth and surrounding tissues thus yielding a protective effect against root fracture. [4]

2. Ceramic materials: The proven ability of ceramic materials to mimic the appearance of tooth structure has been combined with improvements in strength and durability. The use of all ceramic posts is limited to situations where cast metal posts would have otherwise been indicated.3
   The major advantage of these all ceramic post systems is aesthetics. The colour of the final restorations will be dependent on an internal shade that is similar to the optical properties of the natural teeth. Even at the cervical regions it will aid in providing a certain depth at the cervical root areas.
   Methods used for fabrication of these all ceramic posts are slip casting, copy milling, two piece technique (Cerapost) and a Heat-Press technique. In this technique a glass ceramic core is heat pressed over a prefabricated zirconium dioxide post (Cosmopost). [5] Zirconia posts are a popular tooth colored post material especially in the anterior region. It is especially indicated for patients with high lip line and thin gingival tissue. [6] Certain disadvantages of the Zirconia posts is its propensity for vertical root fracture and its difficulty in post removal in case an endodontic retreatment is required. It also has a tendency to fracture in the canal. [7,8]
   The case report described below used Cosmopost to rehabilitate a fractured anterior tooth.

CASE REPORT:

Dental Examination and treatment plan:

A 23 year old male patient reported to the Department of Prosthodontics, MCODS, Mangalore with a fractured tooth in upper front region. History of previous dental treatment reported a PFM crown that been placed 2 years back which had fractured. On intraoral

examination there was a Ellis Class 3 in the upper left lateral incisor tooth region. (22). Bleeding on probing and clinical mobility of the tooth was not pathological suggesting good periodontal status. Further evaluation revealed insufficient tooth structure around the crown. Periapical radiograph showed sufficient length of the root and no loss of bone

Fig 1: Preoperative Frontal View of the Patient

around the tooth. The was greater amount of visibility of the upper teeth when the patient was asked to smile emphasising the need for an esthetic restoration.

Fig 2: Preoperative Occlusal view of the patient

Based on the these findings an all ceramic zirconia post followed by an all ceramic lithium disilicatecrown . (IPS eMax press)

Post and core preparation:

Crown height for the teeth was increased by crown lengthening procedure done using electrocautery. Post space was prepared till a length of 13 mm leaving 5 mm of the apical seal intact. The post space was enlarged using Peeso reamers of increasing size. A 1.5 mm of ferrule was created around canal orifice. A post space impression was recorded using an orthodontic wire in the post space to retain the light body and an elastomeric putty- light body impression was recorded.

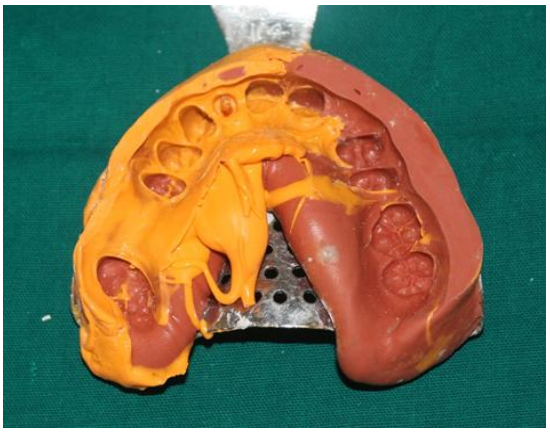

Fig 3: Light body and putty impression of the patient

The impression was sent to the laboratory where a cast was poured using a die stone. A Cosmopost of size 1.4 mm was selected as it adequately fitted the post space. Wax pattern of the core space was made. Heat pressing made a solid post and core restoration. This was tried in a patients mouth and radiograph was used to verify the fit.

Cementation of post and crown preparation:

The post part of the restoration was not etched or silanized. The contact portion of the post was etched using hydrofluoric acid and then silanized using Monobond S. The post was permanently cemented using Rely X Unicem Self Adhesive Universal Resin Cement (3M ESPE). Shoulder margins for the tooth preparation were produced using a flat end tapered bur and an elastomeric impression was recorded. An Emax Press all ceramic crown was fabricated and cemented using Resin cement.

Fig 4: Cemented Cosmopost

Fig 5: Prepared tooth

Fig 6:Final restoration with e. max crown

DISCUSSION:

The restoration of endodontically treated teeth has always been a challenge. In the recent times the material market for the posts has undergone a complete makeover. [9] Tooth colored posts are also gaining wide acceptance especially in the esthetically critical areas. In the present study as there was insufficient tooth structure Fibre reinforced posts was not an ideal option. This is because of their lower modulus of elasticity, and they may undergo flexure under functional stress and produce micromovement at the core, producing decementation of the crown.[10] Due to the high smile line that was observed during the diagonosis, the age of the patient and the teeth that required treatment a prefabricated post (Cosmopost) was used. This was selected instead of the cast metal post and pore as that would have significantly compromised the esthetics of the final crown.

To conclude it is important for the clinical practitioner to have knowledge of the recent advancements in the field of coronoradicular restorations and more so have the ability to deduce the best option based on the clinical situation at hand.

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INVITRO ACTIVITIES OF MELALEUCA ALTERNIFOLIA(TEA TREE OIL) AGAINST VARIOUS ORAL CANDIDA SPECIES - A PILOT STUDY

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Context:

Denture stomatitis is an inflammatory reaction occurring in denture wearers and oral yeasts like Candida species were predominantly associated with this condition. This in vitro study intends to investigate the inhibitory effect of natural alternatives like Tea Tree oil(Melaleuca Alternifolia) on growth of different Candida species.

Aims:*The aim of the current pilot study was to investigate the in-vitro activities of Melaleuca Alternifolia against various oral Candida species.*

Settings and Design*:Standard strains of five species of Candida in liophilized form were used to determine the MIC of Melaleuca Alternifolia with incubation period of 48hrs.*

Methods and Material*:*

Microbiological tests were used to perform this study. A total of five oral Candida isolates(C.albicans, C.dubliniansis, C.galbrata, C.Krusei and C.tropicalis) in liophilized form were used and revived in Sabourad's dextrose broth. Fifty tubes each having 100 µl of BHI(Brain Heart Infusion) broth were used. The concentrations of the test solutions were achieved by serial dilution method. After incubation period, by visual inspection of the tubes, the MIC values were determined. We have compared the MIC values of test solution Melaleuca Alternifolia with 0.2% fluconazole.

Results:*The results showed that 30% Melaleuca Alternifolia exhibited antifungal activities against Candida species which were comparable to the antifungal activity of 0.2% fluconazole.*

Conclusions:*The results signify that tea tree oil has a comparable/much better anti-fungal effect than the control(0.2% fluconazole).*

Key-words: *Candida species, Denture stomatitis, Fluconazole, Melaleuca Alternifolia.*

Introduction:

Denture stomatitis is an inflammatory reaction, occurring mostly in the palatal surface of maxilla, in denture wearing patients either partial or complete[4]. Denture stomatitis has been strongly associated with poor hygiene and continuous denture wearing, which

facilitates denture plaque formation in which Candida albicans can be regularly isolated, suggesting a pathogenic association between bacteria and fungi.

Various antifungal agents have been proposed for the treatment of denture stomatitis but because of numerous side effects, recurrence and resistance these have been less popular.[3] Thus, new therapeutic strategies like use of natural products can play an important role in the treatment. Among natural products, essential oils are emerging as promising therapeutic tools for oral infection.

MATERIALS AND METHODS:

The experiment was carried out in the Department of Prosthodontics and crown and bridge & Department of Microbiology at Maratha Mandal's Nathajirao G. Halgekar Institute of Dental Sciences and Research center, Belgaum-590010.

Five standard strains of oral candida isolates(C.albicans, C.dubliniansis, C.galbrata, C.Krusei and C.tropicalis) in liophilised form were used and revived in Sabouraud's dextrose broth (**Fig.1, 2**).

Fig 1

Fig2

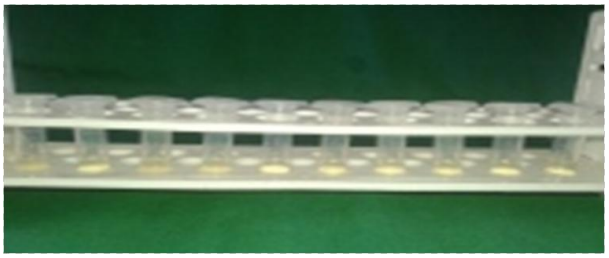

Fig3

Fifty tubes, each having 100 µl of BHI(Brain Heart Infusion) broth were used to which 100µl stock solution was added in the first MIC tube. After mixing well, 100µl solution from this tube was transferred to the second tube. This process was continued till the 10^{th} tube. From the 10^{th} tube which was the last tube 100µl of the final solution was discarded.

The concentrations of the test solutions achieved by this serial dilution method were as following- 500, 250, 125, 62.5, 31.25, 16, 8, 4, 2 and 1 mcg/ml[1] (**Fig.3**). Now 100µl standard isolated strains of different species of Candida (C.albicans,

C.dubliniansis, C.galbrata, C.Krusei, C.tropicalis) were added to each of the 10 such prepared MIC tubes with varying concentrations such that the final volume per tube was 200µl. These tubes were then incubated at 37^0C for 24-48hours . After incubation period, by visual inspection of the tubes, the MIC values of different candida species against control and test solutions were determined.

Results:

The comparisons showed that for Candida albicans the MIC value for both control and test was 4, where as for other four candida species MIC values showed wide variations, which were tabulated in (table 1 and 2).

	Concentrations of test solutions achieved by serial dilution method (in mcg/ml).										
Candida species	**Test solutions**	**500**	**250**	**125**	**62.5**	**31.25**	**16**	**08**	**04**	**02**	**01**
Candida albicans	30 % melaleuca alternifolia	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**R**	**R**
	0.2 % Fluconazole	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**R**	**R**
Candida dubliniansis	30 % melaleuca alternifolia	**S**	**S**	**S**	**S**	**S**	**R**	**R**	**R**	**R**	**R**
	0.2 % Fluconazole	**S**	**S**	**S**	**R**	**R**	**R**	**R**	**R**	**R**	**R**
Candida galbrata	30 % melaleuca alternifolia	**S**	**S**	**S**	**S**	**S**	**S**	**R**	**R**	**R**	**R**
	0.2 % Fluconazole	**S**	**S**	**S**	**S**	**R**	**R**	**R**	**R**	**R**	**R**
Candida krusei	30 % melaleuca alternifolia	**S**	**S**	**S**	**S**	**S**	**R**	**R**	**R**	**R**	**R**
	0.2 % Fluconazole	**S**	**S**	**S**	**S**	**R**	**R**	**R**	**R**	**R**	**R**
Candida tropicalis	30 % melaleuca alternifolia	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**R**	**R**
	0.2 % Fluconazole	**S**	**S**	**S**	**S**	**R**	**R**	**R**	**R**	**R**	**R**

Table 1:Comparison of MIC values of Test solutions on Five different Candida species

***Note:** S= Susceptible, R= Resistant.

Table 2: Comparision of MIC values of 30% melaleuca alternifolia with 0.2% fluconazole (in mcg/ml)

Candida species	30 % Melaleuca alternifolia	0.2 % Fluconazole
Candida albicans	4	4
Candida dubliniansis	31.25	125
Candida galbrata	16	62.5
Candida krusei	31.25	62.5
Candida tropicalis	4	62.5

In the graphical representation we can appreciate that the quantity of 30% Melaleuca alternifolia used to inhibit growth of Candida isolates was less compared to the quantity of 0.2% fluconazole (**fig 4**).

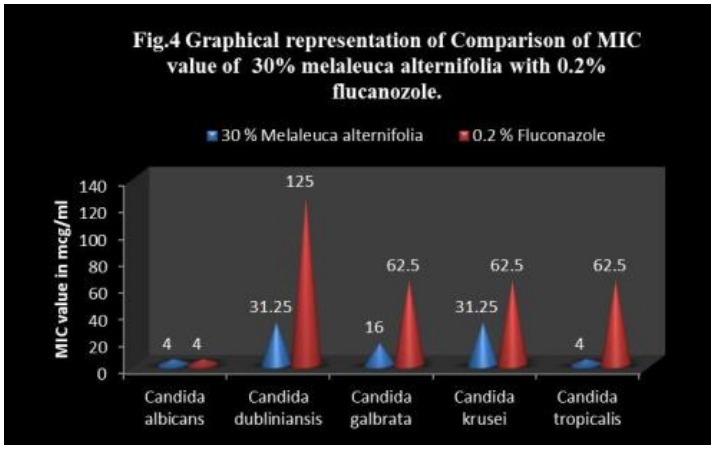

Fig 4

Discussion:

Candida species are considered important opportunistic pathogens due to the increasing frequency of infections they cause in the compromised patient groups and those on cancer chemotherapy, broad spectrum antibiotics[1]. Of the many pathogenic Candida species, C.albicans, C.galbrata, C.tropicalis and C.krusei are the most commonly found in the oral cavity. They frequently inhabit as commensals predominantly within the biofilms, which are spatially organized heterogeneous communities of fungal cells encased in the matrix of extra-cellular polymeric substances (EPS)[2]. Candida biofilms can also develop on surfaces of prosthesis and medical devices, and exhibit resistance to both anti-fungal and host defences compared

with their free-living planktonic counter parts. Melaleuca alternifolia mainly alters the permeability of candida cell, it also inhibits respiration in a dose dependent manner. Earlier studies have also shown that it inhibits formation of germ tubes or mycelial conversion in candida.[6]

In our study we compared the anti-microbial activity of 30% melaleuca alternifolia (tea tree oil) and 0.2% fluconazole against five different candidal strains out of which the tea tree oil showed significant inhibition of various candidal strains at lower concentrations when compared to flucanazole.

Other authors have also observed the antifungal and fungicidal effects of α – terpineol and terpinen-4-ol. Mondallo et al(2006) reported that terpinen-4-ol (main component of malaleuca alternifolia –tee tree oil) was fungistatic (MIC_{90} of 0.06%) and fungicidal (MFC_{90} of 0.125%) against fluconazole susceptible and resistant candidal isolates. These authors suggested that this compound could be a mediator of the in vivo activity of tea tree oil in a rat model of vulvovaginal candidiasis.

(Mondello F, De Bernardis F, Girolamo A, Cassone A, Salvatore G: Invivo activity of terpenin-4-ol. The main bioactive component of melaleuca alternifolia cheel (tea tree) oil against azole-susceptible and resistant human pathogenic candida species. BMC Infect Dis 2006, 6:158.)

Our study demonstrates anti microbial activity in vitro only. However since tea tree oil is known to have immune modulating activity(Cox SG, MannCM, MarkhamJL, BellHC, GustafsonJE, WarmingtonJR, WyllieSG:the mode of antimicrobial action of essential oil of melaleuca alternifolia (tea tree oil). J ApplMicrobiol 2000,88:170-175.

Its effectiveness clinically could be much better and in vivo studies would probably demonstrates better control of infections due to synergistic actions many active substances are present in tea tree oil and these individually contribute to bioactivity observed invitro some roles of individual constituents are known whereas some still unknown.

To conclude tea tree oil with its multipotential constituents may play an important role as an adjunct in the treatment of infectious and inflammatory diseases with candidal etiology. Since our sample size is less and in vitro results cannot be

extrapolated in vivo, further investigation is needed by launching in vivo clinical trials.

CONCLUSION:

There is an increasing trend of resistance shown by various Candida species. So there is an increasing demand to introduce natural materials. Tea tree oil with its proven antifungal activity can be an alternative to these antifungal agents. These in vitro results cannot be extrapolated in vivo and so further research is needed by launching in vivo clinical trials to assess whether any adverse effects exists or not.

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ANDREWS BAR SYSTEM A PROSTHETIC ALTERNATIVE – A CASE REPORT WITH MODIFIED TECHNIQUE

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Abstract:

The concept and advantages of the conventional Andrew's system are adequately reported in the literature. Andrew's system provides maximum aesthetics and optimum phonetics in cases involving considerable supporting tissue loss, jaw defects and when alignment of the opposing arches and/or aesthetic arch position of the replacement teeth create difficulties. This case presents with cleft palate defect affecting esthetics and phonetics with loss of tooth and minimal bone support.

The Andrew's system is constructed from a fixed bridge with removable pontics. The fixed bridge is made of PFM crowns, fused to a pre-manufactured bar that is permanently cemented to the prepared abutment, while the removable pontics are made of metal sleeve tract embodied within an acrylic removable partial denture. This technique possesses the advantage of flexibility in placing denture teeth as well as the stabilizing qualities of a fixed prosthesis.

This case reports on prosthetic rehabilitation of a patient with bilateral cleft lip and palate using Andrews fixed removable prosthesis designed to fulfill patient's functional and esthetic requirements.

INTRODUCTION

The cleft lip and palate is a congenital deformity that causes a multitude of problems and represents a special challenge to the clinicians. Secondary palate fistula is common complications following cleft palate repair, for which the practical solution seem to be an obturator .The removable appliance have certain disadvantage associated with increase in bacterial count or increasing incidence of dental caries. [1] Another acceptable alternative is

fixed bridge which not only replaces missing teeth but also maintains orthodontic expansion when it is placed between the segments. [2]

The fixed bridge unfortunately will not close a palatal fistula and a surgical approach is necessary. However, it is important to remember that adolescents with cleft palate/lip are at an elevated risk for developing psychosocial problems especially those relating to self concept, and appearance. There is a large amount of research dedicated to the psychosocial development of individuals with cleft palate. Self-concept may be adversely affected by the presence of a cleft lip and or cleft palate, particularly among girls. [3] Prosthetic treatments allows patient to feel more normal, increases their self esteem & offers them greater opportunity for fulfilling their social potential. [4]

Dr James Andrews of Amit, Louisiana introduced fixed removable Andrew's bridge system. In this technique abutment tooth stabilization is combined with removable partial denture to restore function and esthetics in patients with extensive alveolar bone and tissue loss in the pontic area. The concept of Andrews's bridge system is reported in literature. [5, 6, 7]

Andrew's bridge system provides maximum aesthetics and optimum phonetics in cases involving considerable supporting tissue loss, jaw defects and when alignment of the opposing arches and/or aesthetic arch position of the replacement teeth create difficulties.

The Andrew's system is constructed from a fixed bridge with removable pontics. The fixed bridge is made of PFM crowns, fused to a pre-manufactured bar that is permanently cemented to the prepared abutment, while the removable pontics are made of metal sleeve tract embodied within an acrylic removable partial denture. The principal advantage is the flexibility in placing denture teeth. Physiologic advantage is effective oral hygiene and increased stability of splinted teeth.

CASE REPORT

An 18 year old female patient referred by department of cleft and craniofacial surgery reported to department of prosthodontics with the chief complaint of worn out upper anterior teeth. (Fig 1)

Fig 1: preoperative extra oral view


Fig 2: preoperative intraoral view

On clinical examination patient had maxillary anterior 8 units fixed denture prosthesis with chipped porcelain on the facial and lingual surfaces (Fig 2). Her family history was uneventful. Patient had a history of bilateral cleft lip and palate for which bilateral cheiloplasty and rhinoplasty had been performed one year back and was undergoing treatment for the closure of anterior palatal fistulae. Clinical finding also revealed hyperplasic soft tissue covering hard palate defect and a severely resorbed residual alveolar ridge .The maxilla was partially edentulous with missing right and left central and lateral incisor. The upper lip was firm and thin. The missing teeth and maxillary defect greatly influenced patients chewing ability, appearance and speech. She had been treated with fixed partial denture (FPD) by general dentist one year back.

Treatment planning was discussed with cleft and craniofacial department, where we were advised for removal of FPD in the maxillary anterior region and replace the anterior teeth with removable partial denture till the closure of anterior nasal fistula was performed.


Fig 3: preoperative abutment evaluation

The existing worn out FPD was removed and abutment tooth were evaluated (Fig 3). Diagnostic impression was made with neocolloide alginate impression material (Zhermack, Italy). Face bow transfer was done and mounted on Hanau articulator. Among the various restorative treatment options available for the replacement of anterior missing teeth with ridge defect Andrew's bar system was selected to stabilize the abutment tooth in combination with removable partial denture as prosthetic alternative to resolve the existing esthetic problem for the patient.

Abutment tooth finish lines were modified and impression was made using light and medium body addition silicon (3M ESPE,Express^{TM} XT). The cast poured using die stone (Type IV,Kalrock,Kalabhai) and the obtained cast was duplicated using agar impression material(Castogel,BEGO,Germany) and poured with refractory material (wirovest,BEGO,Germany) by strictly following manufacturer's instructions during all the

above procedures. (Fig 4) Die preparation was done on the master cast and wax pattern (CrowaxHard,Renfert) was fabricated on the canine and first premolar on each side .In order to stabilize the prosthesis the appropriate bar following the residual ridge was positioned in the center of replacement teeth was attached to the copings on either side. This wax pattern assembly was transferred on to the duplicated refractory

Fig 4 : master stone cast duplicated and poured with refractory material

Fig 5: wax pattern on the refractory cast

Fig 6: wax milling

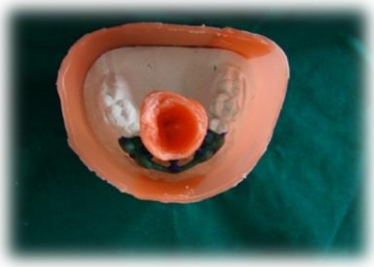

Fig 7 :spued pattern before investing and casting procedure

cast (Fig5), milled (Fig 6) and sprued (Sprue wax, Renfert). This method of ring less casting was preferred to avoid possible shrinkage of bar that would occur during normal casting procedure. Casting is done using nickel chromium alloy (Wiron 99, BEGO,Germany). After finishing and polishing of metal, metal try in was done to the patient (Fig 7) to assess the adaptation of the casting on margins both in labial and palatal side. Pick up impression was made with A – silicon putty(3M ESPE,Express^{TM} XT) impression material (Fig 8)

Fig 8: Metal tryin on patient 's mouth

Fig 9: metal coping stabilized with retentive rod and pattern resin in the pick up impression obtained

Fig 10: metal milling …

impression obtained was assessed for the accuracy .A 18 gauge orthodontic wire was placed in the center of metal coping in the impression and was looped at the end this was stabilized by filling the coping with pattern resin to stabilize in order to prevent breakage of abutment

teeth during metal milling. Remaining surface was filled with die stone and cast obtained was held on surveyor to carry out metal milling (Fig9) ceramic facing was given on to abutment and examined for the marginal adaptation and esthetics (Fig 10) after which the bar assembly was transferred on to the cast.

Bar was coated with petroleum jelly and pattern resin was added on to the surface with increments to make two sleeves encircling the bar .(fig 11) casting was done using cobalt chromium (WirobondC,BEGO,Germany) and fitted on the surface of bar after proper finishing and polishing.(fig 12) once active fit is obtained the remaining surface on the bar was blocked with plaster and both upper and lower cast were mounted on the articulator and maxillary anterior teeth was arranged considering esthetics, anterior over jet and overbite and flange completed with wax..(Fig 13) cast is now invested,dewaxed and packed with heat cure acrylic resin(to obtain the removable component of Andrew's bar system.(fig 14,15)

Fig 11 : examination for marginal adaptation after ceramic build up

Fig 12: sleeves made with pattern resin on metal bar

Fig 13: sleeves casted with cobalt chrom 1

Fig 14: arrangement of maxillary anterio

Fig 15: Fixed and removable components

Fig 16: post insertion

Fig 17 : Post operative facial profile

The fixed component was inserted on to the abutment using type I GIC(GC gold label,GCCorporation,Japan). Removable component was engaged through sleeves on to the metal bar of fixed component (fig 16). Final assessment was done to check for esthetics and phonetics. (**Fig 17**)

DISCUSSION

It's challenging for a Prosthodontist to design a dental prosthesis to bilateral cleft lip and palate patients to fulfill the esthetics as well as functional requirement. In the present case due to extensive supporting tissue loss the clinical factors and patients desire contributed to the selection of Andrew's bar system. The 2mm vertical bar supported the removable component of the system by providing strength to the prosthesis via fixed component. This assembly allowed for the coverage of large defect providing optimal esthetics. The bar was placed in such a way that there was no tissue proliferation and also patient could maintain casual oral hygiene procedure. This in turn led to the preservation of supporting structures along with replacement of lost tooth and tissue structure.

Previous study [5] demonstrated the use of solder joint which reported with the disadvantage of fracture at the joint over a period of time due to force exerted during repeated removal and insertion in the same direction. But in the present technique the entire assembly was cast using nickel chromium as a single unit.

In the present clinical report care was taken during casting procedure to avoid the possible shrinkage that would occur with normal casting using ring.

CONCLUSION

Most patients today not only appreciate the functional improvements provided by the prosthodontic rehabilitation, but also remarkable improvements in their social and spiritual well being as a result of the changes in their appearance. Although techniques continue to evolve over the decades, the basic principles of cleft surgery and prosthetic rehabilitation remain the same. Thus, while keeping the basic principles in mind, management of bilateral cleft lip becomes valuable and rewarding

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PLANNING FOR THE FUTURE: ALVEOLAR RIDGE PRESERVATION WITH "SOCKET PRESERVATION TECHNIQUE" AND DELAYED IMPLANT PLACEMENT IN ANTERIOR MAXILLA

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Abstract

Post-extraction alveolar ridge resorption is an inevitable biologic phenomenon which often leads to ridges which are deficient in height and width hampering future implant placement and aesthetics. Numerous preservation techniques along with a range of dependable bone-graft materials have made it possible to control this phenomenon to a certain extent. The "Socket Preservation Technique" combines advantages of flapless technique, atraumatic extraction and graft material to provide predictable ridge dimensions for successful implant theory in future. This purpose of this article is to a present "Socket Preservation" or "Socket Plug" technique employed in rehabilitating a horizontally fracture right maxillary central incisor.

Key Words: Socket Preservation, Socket Plug, Alveolar Ridge Resorption, Implant, Bone-Graft

INTRODUCTION

It is well documented in dental literature that every tooth extraction leads to alveolar bone resorption and atrophy of the respective region. Various ridge preservation techniques have been mentioned in history and modified overtime to limit this post extraction bone loss. "Socket Preservation" or "Socket" Plug technique is one such technique. Itconsists of atraumatic tooth extraction, placement of the appropriate biomaterials in the extraction site, preservation of soft tissue architecture employing a flapless technique, and placement and stabilization of the collagen plug[1]. This articleillustrates the steps used in this technique for a right maxillary central incisor.

CASE REPORT

A 42-year-old male patient reported to the outpatient department of prosthodontics with the chief complaint of fractured tooth following trauma. Intraoral examination revealed crown fracture with respect to right maxillary central incisor. Further clinical and radiographic evaluation revealed a fracture line immediately below the crest of the alveolar socket and no signs and symptoms of either periodontal or periapical infection. The fracture line was present immediately below the crest of alveolar socket. **(Figure I)** The patient was informed about the treatment plan and informed consent was obtained. Amoxycillin 500mg TDS was prescribed as pre-operative antibiotics prophylaxis.Local anaesthesia was administered using 2% lignocaine hydrochloride with epinephrine 1:200000. (Lox 2%, Neon Laboratories Ltd,India) The fractured crown segment was extracted followed by elevation and atraumatic extraction of root of the right maxillary central incisor. The socket was curated and condensed with β-tricalcium phosphate cylindrical bone-graftplug (R.T.R, Septodont Inc.)**(Figure II)**.3-0 silk sutures were placed. Post-Operative antibiotics and analgesics were continued for 5 days. Sutures were removed after 10 days. Provisional prosthesis was delivered to the patient for 6 months.

Fig I Horizontal Fracture with 11

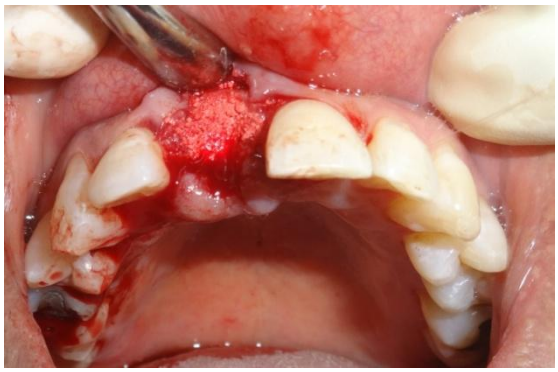

Fig II Socket augmented with R.T.R bone graft after extraction

Figure III Optimal Ridge contour 6 months post grafting

After a healing period of 6 months, optimal ridge height and weight was observed.(**Figure III**) Radiologic evaluation with Cone Beam Computed Tomography (CBCT) revealed adequate bone formation for endosseous implant. Local anaesthesia was infiltrated in the

Figure IV Implant placed with 11

grafted region and full thickness flap was raised. Osteotomy was prepared to receive an implant of 3.75* 11.5 mm (MIS SEVEN, MIS technologies, Israel).(**Figure IV**) Implant was placed and flap was sutured back. Post-operative antibiotics and analgesics were continued for 5 days. Sutures were removed after 10 days. Second stage surgery was done after 6 months followed by animplant level closed tray impression. A porcelain fused to metal cement retained implant crown was fabricated and cemented with glass ionomer cement.(**Figure V**) The implant crownwas cleared of any eccentric occlusal contacts. Patient was recalled for post-operative follow-up and maintenance.

Fig V Cementation of Porcelain fused to metal crown with 11

DISCUSSION

Extraction remains a common treatment modality for traumatic horizontal fractures. Extraction of teeth leads to approximately 40 % and 60% reduction in bone height and width respectively in the first 6 to 12 month of extraction, rendering them difficult for aesthetically sound prosthetic rehabilitations[2].First step in socket preservation technique is atraumatic extraction followed by condensing a “bone-filler”material in this socket. Thus,conserving original ridge anatomy. Theincreasing desire of dentist, to optimize the extraction site for future implant placement and availability of various easy-to-use bone graftmaterials has made “socket preservation” a popular technique. Commonlyused graft material to provide a scaffold for bone formationare: Osteoconductive:autogenous bone, anorganic bovine bone, freeze-dried bone allograft and β- tricalcium phosphates; Osteoinductive:Demineralized Freeze-Dried Bone Allograft (DFDBA)[3].

The findings of a recent randomized clinical study on alveolar ridge preservation in 27 patients confirmed that synthetic bone substitute (StraumannBoneCeramic®, Straumann AG, Basel, Switzerland) and a bovine xenograft (BioOss®, Geistlich Biomaterials, Wollhusen, Switzerland), in combination with a collagen barrier (Bio-Gide®, Geistlich Biomaterials, Wollhusen, Switzerland), preserve bone levels up to 8 months after post-extraction grafting of the sockets. There was a reduction of less than 1.0 mm in the interproximal bone levels at 4 and 8 months post-surgery in both groups[4]. In the presentcase report, the graft material used was β-tricalcium phosphate coated with bovine collagen fibres. β-tricalcium phosphate is a

porous alloplastic graft. During reabsorption, it supplies calcium and magnesium ions and creates an ionic environment which induces alkaline phosphatase activation, bone synthesis[5]. Although autologous grafts have faster rate of resorption than alloplastic grafts, the later prove better in time stability[6].Irrespective of itscomposition any graft materialdelays the natural bone healing process so, clinician is often trading the volume of bone for new vital bone.Thus, while selecting a graft material the time required for complete resorption of graft material and amount of vital bone formed in this period should be considered. For example, if medium-term preservation is desired an alloplastic graft which resorbs slowly in comparison to autograftscan be chosen like in the present case.

The flapless ridge preservation techniquepreserves blood circulation, soft tissue architecture, hard tissue volume at the site. It causes decreased surgical time, minimal patient discomfort, and accelerated recuperation[7]. Patients are able to resume normal oral hygiene procedures immediately after the surgery. Drawbacks of raising a flap and placing a membrane for ridge preservation are prevented, such as reduction of keratinized gingiva, alteration of gingival contours, and migration of the mucogingival junction due to coronal displacement of the flap in an attempt to achieve primary closure[8].

A major limitation of this technique is the need for a buccal cortical plate. In the present case the patient had intact buccal plate and a non-infected socket which indicated the socket preservation technique to be used. Insockets lacking buccal cortical plate, a barrier membrane should be used to prevent infiltration of soft tissue. Acute infection in surrounding tissues is an absolute contraindication[1]. Histologic outcomes of this technique have shown complete integration of allografts into the newly formed bone after 3 months of healing, anorganic bovine bone showed partial integration with distinguishable graft particles remaining[9]. Alloplastic material contains synthetic hydroxyapatite which sometime shows a tendency for granular migration and incomplete resorption.

The “Socket preservation technique” or “Socket Plug” technique is a promising method to attain ideal ridge contours necessary to deliver a functionally and aesthetically sound prosthesis. However, the choice of socket preservation technique and preferred graft material will vary according to the each patient’s individual needs.

CONCLUSION

Socket preservation technique is based on imperative steps like atraumatic extraction, appropriate choice of filler graft material and flapless design. Thus making post extraction

healing highly predictable with optimum ridge contours for easier implant placement and restoration in future.

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AUTOGENOUS BONE GRAFTS IN IMPLANTOLOGY – A REVIEW

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ABSTRACT:

Grafting is one of vital procedures enhancing predictability and successful outcome of dental implants.this article reviews the autogenous bone grafts that are currently used in the same.

INTRODUCTION:

Bone grafting has become one of the more frequently performed procedures in reconstructive surgery. The large number of reconstructive options brought about by advances in craniofacial surgery have created the need for large quantities of donor bone and for techniques that can reliably transfer bone material to distant and sometimes hostile tissue bed.

Autografts, both cancellous and cortical, are usually implanted fresh and are often osteogenetic, whether by providing a source of osteoprogenitor cells or by being osteoinductive. . All bone grafts are initially resorbed, but cancellous grafts are completely replaced in time by creeping substitution, while cortical grafts remain an admixture of necrotic and viable bone for a prolonged period of time.

Bone grafting in the past has been controversial and unpredictable. Strong proponents of bone grafting argue that the majority of healing studies show better success using grafting materials than open flap debridement in managing severe osseous defects. Others argue that the amount of bone regeneration possible with current techniques is too limited and unpredictable to be useful. [(2)]

A wide variety of treatment modalities have been developed, all with the goal of attaining tissue/bone regeneration. Regenerative procedures frequently include the use of barrier membranes and bone grafting materials to encourage the growth of key surrounding tissues, while excluding unwanted cell types such as epithelial cells. Although regenerative therapies have great potential, they remain unpredictable in their ability to consistently produce acceptable outcomes in all situations. [(5)]

History Of Autogenous Bone Grafts[6]

1. The earliest known repair of cranial and facial defects is by use of alloplast. Neolithic Peruvians used hammered gold and silver plates over frontal bone defect.

2. The first craniofacial reconstruction using a bone graft was performed by Van Meekren in 1632. He used xenograft from dog's calvarium.

3. The first successful bone implant was reported in 1809 by Merren.

4. The first successful allograft was reported by Macewen in 1881. He reconstructed humerus of a child.

5. The first surgeon to use autogenous bone graft in facial region was Seydel in 1889. He used autogenous bone from tibia.

6. The first bone harvest from calvaria is by Muller and Koneig in 1890.

7. In 1901, Marchandtheorised that the host tissue at grafted site and not the graft was responsible for osteogenesis. He was one of the first to describe bone repair by creeping substitution.

8. In 1908 Axhausen described the first free split calvarial graft.

9. In 1931 Pickrell used iliac crest graft for repairing skull defects.

10 In 1957 Longacre and De Stefano used autogenous split rib grafts to repair defects of cranium and facial skeleton.

11. Schallhorn et al., (1967) in an extensive series of case reports, showed bone fill in bifurcation, dehiscence and intra osseous defects of varying sizes and shapes. Iliac grafts were used either in frozen or fresh form. They also reported successful elimination of bifurcation defects with frozen autogenous hip marrow implants.

12. The concept of bone induction was elaborated by Urist M R in 1965 with the identification of bone morphogenic proteins.

13. Codvilla in 1905 described the concept of bone lengthening in femur. Then Ilizarov in 1965 popularised the technique of bone lengthening by means of distraction osteogenesis in long bones. This principle was first applied in maxillofacial region by McCarthy in 1989. Later Philips et al extended this principle to fill bone defects by means of bone transport.

14. Lauritzen et al in 1991 reported the use of autoclaved autogenous bone for reimplantation for benign tumors of the craniofacial region. Brusati et al in 2000 reimplanted resected fronto-orbital bone after several hours of exposure in a dry sterile environment.

Classification Of Grafts[12]

Bone grafts can be classified

1. Based on nature of bone (Graft anatomy).
2. Based on source of donor.
3. Based on vascularity.
4. Based on donor site.
5. Based on function.

I. <u>Based on nature of bone</u>

- Cancellous bone graft
- Cortical bone graft
- Corticocancellous grafts

. Blocks

. Chips

. Powder

- Marrow graft

II. <u>Depending on source of donor</u>

A. Autogenous bone graft – from same individual

   i. Extra Oral

   ii. Intra Oral

B. Allogenic – allograft – from another individual of same species

   i. Fresh frozen bone

   ii. Freeze-dried bone allograft

   iii. Demineralized Freeze-dried bone allografts

C. Isogenic bone graft – from genetically related individual

D. Xenografts from different species

E. Alloplastic bone grafts

i. Polymers

ii. Bioceramics

- Tricalcium phosphate
- Hydroxyapatite
- Dense, non porous, non resorbable
- Porous, non resorbable
- Resorbable hydroxyapatite derived at low temperatures

iii. Bioactive glasses.

F. Composite grafts: Partly allograft & Autograft.

III. <u>Depending on the vascularity</u>

Autografts can be divided into:

A. Non vascularised

B. Vascularised bone

- Pedicled
- Microvascular free transfer.

IV. <u>Depending on donor site:</u>

- Iliac crest graft
- from anterior ileum
- posterior ileum
- trephine grafts
- Rib graft
  - Full thickness
  - Split rib graft
- Calvarial graft
  - Full
  - Split
- Fibula
- Others

V. Depending on function

- Bridging graft or inlay graft
- Reconstruction graft
- Contour graft – onlay graft.

Uses of grafts [13]

Bone grafts have been used

1. To repair congenital defects.
2. To augment bone in congenital deformities like hemifacial atrophy, micrognathia, nasal deformities, etc.
3. To encourage healing of non united fractures.
4. To reconstruct posttraumatic deformity. Bone graft is used to restore facial projections, vertical stress pillars, continuity of mandible etc.
5. To spread union and restore continuity of bone at osteotomy sites following orthognathic surgery.
6. To fill cavities following cyst and tumour eneculeation.
7. To restore continuity of bone following tumour ablation.
8. To augment alveolar bone.
9. To improve facial contour for cosmetic purpose.

Principles of bone grafting

Mutaz B Habal [9] (1994) gave certain principles based on his experience and literature review. These include.

1. Harvest bone from areas you are familiar
2. Contour bone graft to fit the defect
3. Fix the bone graft to the defect in a tension free manner
4. Ensure absolute immobilisation – static VS dynamic zones

5. Differentiate between child and adult grafts
6. Avoid contaminated sites
7. Do not have graft exposed
8. Ensure adequate blood supply to the graft
9. Assess “graft take” periodically

Biology and healing of bone and bone grafts

Healing of bone grafts has two phases.

In the first phase revascularisation of the graft takes place. This depends on the type of bone graft. In vascularised bone graft where the vascularity of the graft is maintained healing is as any normal bone. In non-vascularised bone grafts, the bone graft is surrounded by haematoma, which is organised and replaced by fibrovascular tissue. Due to lack of blood supply most of the cells in the graft perish and only bone matrix is left behind.

Further healing of the graft is by one of the three mechanism of bone regeneration after bone transplantation.

1. Osteogenesis.
2. Osteoconduction.
3. Osteoinduction.

Osteogenesis: It involves new bone formation by surviving pre-osteoblasts within the graft. Healing by this mechanism is seen in vascularised bone grafts and to some extent in cancellous bone grafts due to rapid revascularisation.

Osteoconduction: It is a prolonged process. Here the bone graft functions as a nonviable scaffold for the gradual ingrowth of blood vessels and osteo- progenitor cells from the recipient site, with gradual resorption and deposition of new bone. This is called creeping substitution. It is seen predominantly seen in cortical grafts.

Osteoinduction: It involves transformation of local mesenchymal cells into bone-forming cells in the presence of an appropriate inductive stimulus. Insoluble polypeptide moieties and specific enzymes known as ‘bone morphogenic proteins" regulate it. Demineralisation of bone prior to implantation is required for osteoinduction to occur.

There are 8 factors, which induce bone formation called bone morphogenic proteins (BMP). These factors are BMP 2 (BMP 2a), BMP 3 (Osteogenin), BMP 4 (BMP2b), BMP 5, BMP 6, BMP 7 (Osteogenic protein 1), BMP 8 (Osteogenic protein 2) and Transforming growth factor. [14]

Phase I: Mesenchymal Cell Chemotaxis and Proliferation (Days 0-4)

During the first minute following DBM implantation, a blood clot forms producing a fibrin network. Aggregating platelets release multiple growth factors such as TGF and PDGF, and there is plasma fibronectin binding to the implanted matrix. During the next 18 hours, there is a chemotactic-driven arrival and accumulation of inflammatory cells such as PMNLs. Next,there is a 2-day period of fibroblast-like mesenchymal cell chemotaxis, a process largely driven by the aforementioned proteolytic peptides and growth factors. The mesenchymal cells arrive and subsequently attach to the implanted matrix. This interaction is mediated by fibronectin and other cell-adhesive proteins. As the chemotactic process nears completion, two activities are noted: 1) protein and nucleic acid synthesis is initiated to prepare for the ensuing cellular proliferation; and 2) further amplification of the bone induction cascade occurs through the release of additional growth factors.

The fibroblast-like mesenchymal cells then proliferate during the 3rd and 4th days postimplantation. A transduced signal between the matrix and cell surface appears to initiate mesenchymal cell differentiation. This step marks the transition to the second phase of bone induction, mesenchymal cell differentiation into cartilage.

Phase II: Mesenchymal Cell Differentiation Into Cartilage (Days 5-9)

Five days following bone matrix implantation, the first cells and molecular markers indicative of cartilage differentiation are seen. Histologically, chondroblasts are noted on Day 5, marking the beginning of the differentiation phase[35]. By Day 7, chondrocytes are evident and there is further synthesis and secretion of cartilaginous matrix. By Day 9, the typical pattern of cartilage maturation described in endochondral bone formation is observed. Finally, vascular invasion of the newly formed cartilage occurs. This is seen histologically and is also accompanied by the detection of Type-IV collagen, laminin, and factor VIII (all common blood vessel components. This vascular invasion marks the transition from the cartilage differentiation phase to the final phase of bone induction, osteogenic precursor differentiation into bone .

Phase III: Mesenchymal Cell Differentiation Into Bone (Days 10-21)

Ten days after DBM implantation, the first osteoblasts are noted, and new bone formation is observed on the surface of the remaining calcified cartilage matrix . These cellular events are associated with molecular processes consistent with bone formation, including Type I collagen synthesis (the major fibrillar collagen of bone, bone-specific proteoglycan synthesis, and a peak in ^{45}Ca incorporation and alkaline phosphatase activity. By Days 12 through 18,

multinucleated osteoclasts are observed histologically and begin the process of bone remodeling. The osteoclasts and osteoblasts work in tandem to replace gradually early bone and remaining calcified cartilage with pure bone ossicles. By Day 21, bone marrow differentiation occurs and the appearance of erythrocytic, granulocytic, and megakaryocytic lineages is noted.

As has been noted, this DBM bone induction cascade is a growth factor-driven, highly structured step-by-step process with multiple points of amplification and regulation.Although it bears considerable similarity with natural frature healing, bone graft incorporation, however, is considerably more complex with two processes including necrotic graft resorption and graft revascularization occurring concurrently with the bone induction cascade.

Factors influencing bone graft resorption or incorporation.

The factors can be broadly classified into graft factors, recipient factors and type of fixation.

Graft factors:

1. **Embryological origin of the graft**: Membranous bone retains their bony mass more than endochondral bone which show fibrous replacement. Wilkes, Kernahan& Christensen 1985 showed that in onlay grafting the membranous bone survived twice as well as endochondral bone. They found no correlation on the presence or absence of the periosteum on the survival of the graft. They attributed the survival of the grafts to the presence of piezoelectric effects through the action of stress.

2. **Nature of bone in graft**: Cancellous bone incorporation is better than cortical bone. This is due to presence of large amount of marrow spaces, which permits early revascularisation. They also retain viable osteogenic cells.

3. **Revascularisation of the graft**: Graft incorporation is better in early vascularisation of the graft. Thus vascularised bone grafts has better chance for incorporation followed by cancellous and cortical bone grafts.

4. **Size of the graft**: Smaller sized graft is better incorporated than larger ones.

5. **Presence of periosteum**: Periosteum in graft reduces the resorption rate and also incorporation is better.The role of periosteum in the regeneration of calvarial defects was emphasised by Reid, McCarthy &Kolber [(11)] (1981), they also found a positive influence of dura on bone regeneration. Thaller, Kim & Kawamoto (1989) also emphasised periosteal layer in bone regeneration. Burstein et al 1995 found that periosteal preservation significantly enhanced bone formation in both cortical and trabecular bone.

6.**Harvest of graft**:

Graft to be harvested in an atraumatic fashion for better take. Excessive heat to be avoided while using rotary instruments and graft to be placed immediately at the recipient site for better take.

Recipient factors

1. **Age**: Children and younger persons have more viable osteogenic cells, so the capacity for graft take is better in the young than in the adult.
2. **Site of placement**: The graft should be in contact with bone for incorporation.
3. **Vascularity of the recipient site**: Highly vascular bed favour graft incorporation better than less vascularised areas. Thus primary grafting is moresuccessful than secondary bone grafting. Also graft survives badly at irradiated site, scared tissue bed due to decreased vascularity.

Fixation of the graft:

Rigid fixation of the graft aids in faster graft healing.

Perren et al 1979 and Luhr have shown that if bones were adapted perfectly and under some compression, "primary bone healing" occurred. The approximation, compression and stable fixation that are required for primary bone healing are best provided by rigid fixation, with its three-dimensional stability utilising plate and screw fixation.

Other Factors:

Other factors that influence resorption or incorporation of autogenous bone grafts include the graft position in relation to mechanical stress.

The osseous flaps may be transferred on either an endosteal or periosteal blood supply with no difference in healing. When the circulation is restored by microvascular technique, autogenous bone flaps show improved osteocyte survival and enhanced bony incorporation in comparison with conventional bone grafts. Primary osseous healing with elimination of repair by creeping substitution is possible by transferring viable bone forming cells in a microsurgicallyrevascularised flap that is appropriately fixed. Vascularised bone flaps for mandibular reconstruction heal with similar rates of bone formation when transferred to non irradiated or irradiated beds. When mechanical strength or resistance to resorption are important, cortical bone is used.

Abbot (1947) has shown that graft containing a fatty marrow should be avoided as necrotic fat tissue is removed with difficulty and this delays the penetration of granulation tissue.

Complications of Bone Grafting:

This can be grouped into recipient site complications and donor site complication.

Recipient site complications are:

1. Infection
2. Rejection (Failure to take up)
3. Resorption
4. Alteration in dimension
5. Exposure
6. Movement or sinking of the graft
7. Defective contour
8. Resorption of graft and recipient bone

Infection is the most common complication in maxillofacial region. This is mainly due to movement of the recipient site and the graft, intraoral communication and improper fixation. With the use of rigid fixation by means of plates this has largely been reduced.

Failure of vascularisation is due to movement of graft and excessive bulk of graft tissue. Compact cortical grafts and grafts placed in irradiated areas may fail to vascularise.

Resorption and dimensional change is an inherent complication of allografts. Demineralized bone shows maximum resorption. Among autogenous graft, rib grafts show more resorption than other grafts. Due to this, use of rib for mandibular reconstruction was questioned by many authors.

Failure to contour the graft at the time of placement may lead to unacceptable appearance of grafted site. Excessive growth as in case of costochondral grafts may produce visible swelling and facial asymmetry warranting a second surgical correction. Contour defect of calvarium may be unacceptable in some cases.

Donor site complications:

These might be functional defect, sensory impairment or an aesthetic defect.

Iliac crest harvest is associated with the complication of gait problem(Tensor fascia muscle), hernia, sensory disturbance.

Rib harvest is associated with the complication of pneumothorax and persistent pain resulting in atelectasis and hypoxemia.

Elevation of pectoralis muscle can cause limitation in the movements of hand, sternocledomastoid flap can cause difficulty in neck flexion, temporalis flap can affect jaw function, and radius forearm flap is associated with morbidity of the forearm.

Unaesthetic effects are produced while harvesting the clavicle or sternum with sternocledomastoid muscle. [22]

Discussion:

Attempts to correct osseous defects in the periodontium have been numerous and varied. These include reshaping the alveolar process via osteoplasty and/or osteoectomy, fracture or swaging approaches, hemisection, root amputation, and attempts to regenerate portions of the lost supporting bone. Most recently, efforts to regenerate portions of the lost supporting bone have emphasized bone implant techniques. While favorable results have been produced with various types of implants, there is growing evidence that autogenous hematopoietic marrow in cancellous bone is presently the most optimal material available for bone grafting purposes. The feasibility of utilizing marrow in cancellous bone from the ilium in the correction of osseous crater and furcation defects has been demonstrated. In addition, the feasibility of performing iliac transplant procedures in a typical dental office environment has also been reviewed in many studies.

Reconstructive technique and materials have enhanced the ability to correct the bony defects. An understanding of the physiology of bone transfer and bone healing and the knowledge of bone survival following transfer will provide the basis for achieving better results in clinical application.

Replacement of extensive local bone loss is a significant clinical challenge. There are a variety of techniques available to the surgeon to manage this problem, each with their own advantages and disadvantages. It is well known that there is morbidity associated with harvesting of autogenous bone graft and limitations in the quantity of bone available.

Summary and Conclusion:

Allografts have been reported to have a significant incidence of postoperative infection and fracture as well as the potential risk of disease transmission. During the past 30 years a variety of synthetic bone graft substitutes has been developed with the aim to minimize these complications. The benefits of synthetic grafts include availability, sterility and reduced morbidity.

The purpose of this review was to examine autogenous bone graft materials which are in used in implant dentistry and their selection principles based on their use. Presently, predictable and satisfactory bone growth occurs from the application of autogenous bone grafts that initiate and enhance the biologic process to achieve true bone regeneration to its full potential.

However, in the field of bone growth and periodontal regeneration, there are still a lot of unknown territories, which are currently being explored, or need to be investigated in future.

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COMPLETE DENTURE WITH METAL DENTURE BASE: A CASE REPORT.

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Abstract:

Polymethyl methacrylate exhibits excellent physical properties. Unfortunately, complete dentures fabricated from this material may still fracture. The fracture of acrylic resin dentures is an unresolved problem in Prosthodontics. Metal framework reinforcement is used in complete dentures to improve the fracture resistance, dimensional stability, accuracy, weight, and retention of a definitive prosthesis. A potential method of preventing this fracture is metal reinforcement of the palatal portion of the prosthesis. A technique will be presented describing a sequence that incorporates predictable design, fabrication and finishing of a metal palate for a maxillary complete denture.

Introduction:

The most commonly used material to make complete denture in clinical Prosthodontic practice is acrylic resin.[1] However fracture of acrylic denture base is occasionally an avoidable complication because the mechanical properties of acrylic resin may not be sufficient to withstand masticatory stress.[2-4].Jagger et al.reported that despite the popularity of acrylic atsatisfyingaesthetic demands,it is still far from ideal and fulfilling the mechanicalrequirement of prosthesis.[4]

There is a greater risk of fracture of the acrylic denture, if the thickness of denture base is less or minimal. To overcome this problem, acrylic denture base can be made with cast metal denture base.[5]

They are stronger, have greater resistance to fatigue and are less likely to break under normal conditions.[6]

Complete dentures (CD) reinforced with metal bases (framework) (MB) are occasionally used in rehabilitation of edentulous patients, particularly in cases where there is a risk of fracture.

Certain investigations have proved metal framework to be effective in reducing fungal growth typically present in complete dentures.

Case report:

An 83 year old male patient reported to department of Prosthodontics with a chief complaint of fractured lower denture in the midline region and attritted teeth in the upper metal denture base and patient wanteda new set of dentures.

Procedure:

On examination, patient had class I ridge relation, with normal inter arch (20mm) space,midline fracture of lower denture extending from the interdental region between lower central incisors till denture flange area and attritedteeth in the upper metal denture(fig1). Lower denture was temporarily stablized with self cure acrylic resin.

Primary impression was made by using denture with elastomeric impression material.(fig 2)Cast was poured with plaster of Paris, custom tray was fabricated and border moulding was performed with low fusing type I impression compound (green stick).The final wash impression was made with low viscosity zinc oxide eugenol impression paste. Master cast was poured with dental stone.

Duplication of master cast was done by using reversible hydrocolloid (AGAR) impression material and poured with refractory material. Wax pattern was made on refractory cast,(fig 3) invested with phosphate bonded investment material and casting was done.

Wax pattern was made for denture base,(fig 4) flasking, dewaxing and packing done with heat cure acrylic resin.(fig 5) Wax occlusal rim was made and Jaw relation was carried out conventionally to record vertical and centric relation.(fig 6)

Teeth arrangement was done in aconventional manner in class I molar relation. Try in was done (fig 7) and acrylization of denture done with heat cure acrylic resin. Denture insertion was carried out.(fig 8) Post insertion instructions were given regarding denture maintenance and oral hygiene.

Figure 1: Attrited teeth in upper denture andmidline fracture of lower denture extending from interdental region of central incisor to flange area.

Figure2: Primary impression made with elastomeric impression material

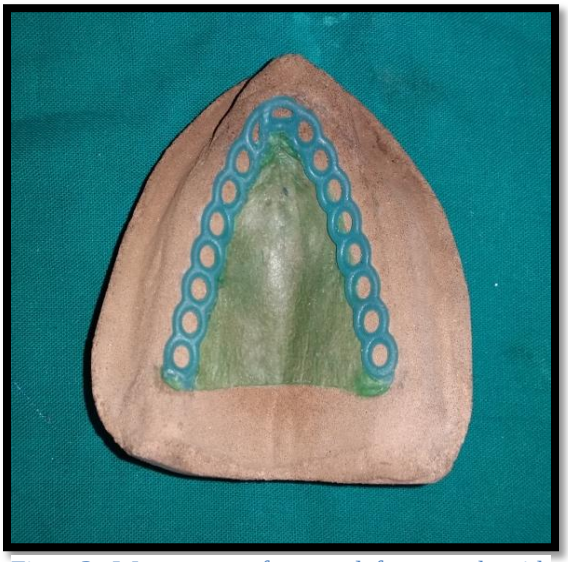

Figure3: Wax pattern for metal framework with casting wax 0.5 mm extending to crest of the ridge with retentive hole for metal and acrylic resin.

Figure4: Metal base and wax for smooth denture base

Figure5: Metal denture base

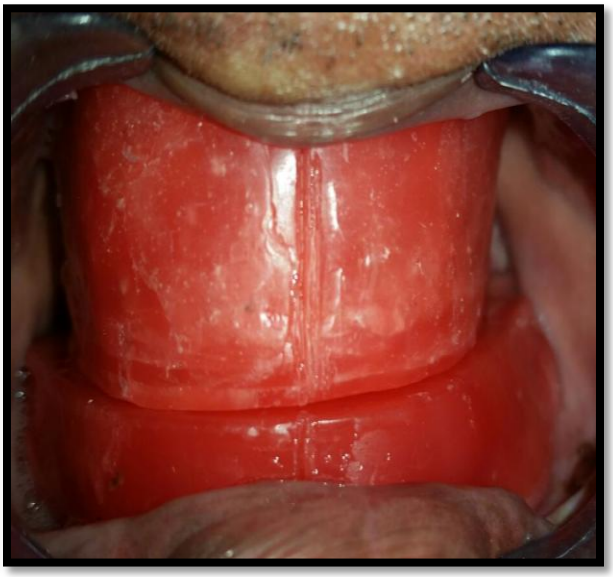

Figure6: Jaw relation done

Figure7: Try in done

Figure8: Denture insertion

Figure9: Preoperative

Figure10: Post operative

Discussion:

Denture base :

The part of a complete or removable partial denture which rests upon the basal seat and to which the teeth are attached. ”- GPT-8

Metal base :

The metallic portion of the denture base forming a part or all of the basal surface of the denture .It serves as a base for the attachment of the resin portion of the denture base and the teeth. GPT-8

Postic SD [7], conducted a study on design of complete denture reinforced with metal base. The study included 116 edentulous patients who received complete dentures. They were divided into two groups according to the type of denture used. Thirty one patients were rehabilitated withcomplete dentures reinforced with metal base, whereas 85 patients received conventional complete acrylic dentures. Metal bases were fabricated using Co-Cr-Mo alloy. Two designs different in regards to the vibrating line were fabricated: metal frame extended to the vibrating line and acrylic resin extended to the vibrating line.The design of upper denture where metal frame was extended to the vibrating line were the most favored and successful in prosthetic rehabilitation of experimental group of edentulous patients.[7]

In this study metal base was not extended till the vibrating line but acrylic resin base extended till vibrating line which shows favoured and successful rehabilitation of edentulous patient with metal denture base with regular follow-up period.

Anthony De Furio and Daniel H. Gehl (1970) conducted a study to determine the amount of force required to dislodge maxillary dentures made from aluminum, gold and acrylic resin. He used a precision machine to measure the force necessary to dislodge a maxillary denture base from its basal seat. He concluded that the chrome cobalt and aluminum alloy bases gave retention values which were significantly higher than those obtained with the acrylic resins and gold alloy bases.[8]

Ideal requirements of a denture base material[9]:

- Bio-compatible
- High flexural and impact strength
- Long fatigue life
- High abrasion resistance
- High thermal conductivity
- Low density
- Low solubility and sorption to oral fluids

Advantages of cast metal denture bases over acrylic bases:

- Lack of bulk with more strength
- The metal base prevents warpage during processing.
- Stronger and are less subject to breakage.
- More accurate fit and more faithful reproduction of tissue details.
- Less tissue changes occur under metal bases.
- Dimensional accuracy.
- Less porous.
- Better thermal conductivity
- Show less lateral deformation in function.

Besides rigidity and fracture resistance these metal bases haveseveral other advantages like excellent strength to volume ratio,good adaptation to the supporting tissues, enhanced plaquecontrol, high thermal conductivity,high biocompatibility, very little dimensional changesin time through fluids absorption, does not interfere with phonation due to its decreased bulk which also makes the denture light weight.[10]

The major disadvantages associated with these denture bases include increased cost, difficulty in fabrication, difficult to rebase.[11]Nevertheless; they may be indicated when polymer-based systems fail to provide acceptable physical properties.

Conclusion:

The dentist should possess sufficient knowledge of the properties of different Prosthodontics materials they deal with ,so that they can exercise prudent judgment in their

selection, which in turn will ensure treatment efficacy and effectiveness. The treatment modality of maxillary metal base and opposing natural dentition provided great comfort to the patient as the metal denture base was strong to resist catastrophic failure solving patients chief complain of recurrent fracture in addition the metal denture bases are good thermal conductors and less bulky thus patient perceive natural feeling from thin base which may also contribute to additional denture stability.

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ABILITY OF DENTAL OPERATORS TO IDENTIFY THE SHADE OF ELECTRONIC SHADE TAB – A CROSS SECTIONAL SURVEY

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ABSTRACT-

Introduction-The challenge of achieving accurate colour matching in restorative dentistry is central to success in aesthetics. For many years selection of tooth colour in restorative dentistry has relied on shade guides which present a number of tabs of differing hue. Signal difficulties do arise with their use, notably in terms of accuracy and variability under differing circumstances. The use of a digital device to evaluate, record and communicate tooth colour offers an advanced option as these are digitally accurate images.

Aim and Objective-The objective the of the study was to determine the ability of dental professionals inidentifying accurately the shade of electronic shade tab using Vita Classic shade guide.

Materials and Methods- The cross-sectional survey was conducted which involved total of 70 participants which included post graduate students and teaching faculty whose experience ranged from 0-20 yrs (0-5yrs, 5-10yrs, 10-15yrs and 15-20yrs).Each were shown eight electronic images of shade tab in which at least one shade of each groupi.e from group A, B, C and D. Options were also given for them to give inputs regarding the quality of image, and results were obtained and descriptive analysis was carried out.

Result –Out of the various shades B1 and A1 were selected accurately by 47% of the observers, least being the A4 shade which was 0%.

Key words – electronic shade tab, shade guide.

Introduction

In today's world of dentistry the fabrication of restoration has been switching from manual to digital, eliminating the operators fault and achieving the maximum precision, but this is not the exact situation when it comes to selection of shade in which the most common modality is still matching the shade manually.

Shade matching manually has many drawbacks one being wrong selection of desired shade which will lead to refabricate the restoration ,increase labor, increase material cost, increase patients appointment ,all these leading to overall increase in the cost of treatment.

Determination and precise communication of color is a requirement for a successful restoration and for obtaining an aesthetic restoration. Tooth shade matching in prosthetic dentistry involves five steps.

- Analysis of color; (shade selection)
- Color communication to the dental technician;
- Interpretation of the color information in the ceramic part selection;
- Making the restoration;
- Color verification before the final cementation in the mouth[3].

Traditionally, shade matching of teeth in dentistry is done by visually comparing the colour of tooth/teeth with standard shade guide tabs, the operator choosing that which he/ she deems to be the best or closest match.

These shade guides offer relatively quick and cost effective methods of shade matching, offset by the major problems of the subjective variability of shade matching, the polychromatic nature of teeth, and the limitations of dental shade guides that incompletely represent the colour range of natural teeth.

Differences in perception of colour (operator subjectivity), operator experience,fatigue and colour blindness are human physiological factors affecting visual tooth matching.

Colours appear different when viewed under varying light sources, which may have different colour distribution. This phenomenon is known as metamerism and may result in perceptible and unacceptable colour differences in changing settings.

Thus, ambient light has to be standardised before tooth colour is assessed, to minimise the influence of variables such as the light source, time of day, the surrounding background colour of the walls and the angle and distance at which the tooth is viewed by the operator[4].

Determination of the color changes in aesthetic dentistry, and providing a more practical and consistent method to determine the color in dental clinics and to transmit this information to dental laboratories should be obtained.

Materials and methods

Our study included total of 70 participants ,consisting of post graduate students and teaching faculty of different experience level and were as follows,

SR NO	SUB JECTS	TOTAL NUMBER
1	Participants having experience between 0-5yrs	31
2	Participants having experience between 5-10yrs	23
3	Participants having experience between 10-15yrs	2
4	Participants having experience between 15-20yrs	14

Total number – 70

Each participant was shown 8 electronic images of shade tabs and was asked to match the shade with physical Vita Classical Shade Guide.

Image .1

(electonic image of shade tab-B1) |

Image .2

(electonic image of shade tab-B4)

Image. 3

(electonic image of shade tab-B3)

Image. 4

(electonic image of shade tab-A3.5)

Image .5

(electonic image of shade tab-A4)

Image. 6

(electonic image of shade tab-A1)

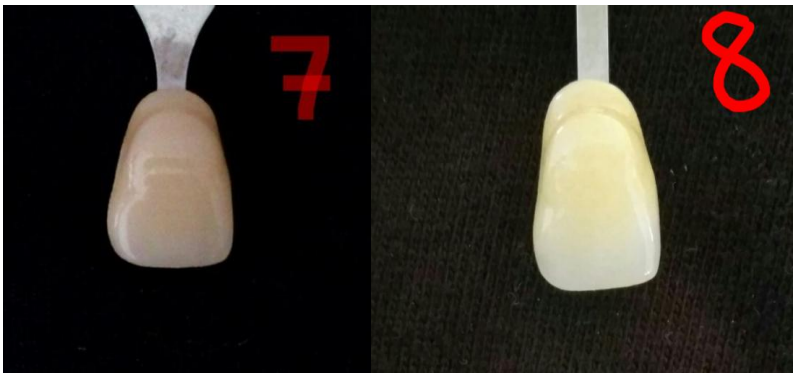

Image. 7 (electonic image of shade tab-C3)

Image. 8 (electonic image of shade tab-D4)

They were also provided with Vita Classical Shade guide compromising of all shades.

Image.9 (VITA CLASSICAL SHADE GUIDE)

The questioner provided to them consisted of following questions.

Sr no
Name-
Designation-
Method used for shade selection in practice-
Years of experience-
Outcome of shade selection: Excellent
(Please tick one) Good
Fair

Image	Shade selected
1	
2	
3	
4	
5	
6	
7	
8	

Please rate the image quality shown: Excellent
(Please tick one)
Good

Fair

Poor

RESULT

This Cross Sectionalsurvey had been conducted on 70 participants (dental faculty and post graduate students) with the help of electronic shade tab and vita classical shade guide.
The perception of the participants was compared and shade was obtained which was as follows and the analysis used was descriptive analysis.

Participants ranging from 0-5yrs of experience - 31 in number (table no .1)

Sr no	Shade shown	No of participants accurately matching the shade	Percentage
1	Image 1 –B1	22	71%
2	Image 2- B4	7	22.5%
3	Image 3-B3	4	12%
4	Image 4- A3.5	2	6%
5	Image 5- A4	0	0%
6	Image 6- A1	14	45%
7	Image 7- C3	3	9.6%
8	Image 8- D4	6	19%

Participants ranging from 5-10yrs of experience- 23 in number (table no. 2)

Sr no	Shade shown	No of participants accurately matching the shade	Percentage
1	Image 1 –B1	9	39%
2	Image 2- B4	2	8.6%
3	Image 3-B3	7	30%
4	Image 4- A3.5	6	26%
5	Image 5- A4	0	0%
6	Image 6- A1	15	65%
7	Image 7- C3	6	26%
8	Image 8- D4	2	8.6%

Participants ranging from 10-15yrs of experience- 2 in number (table no.3)

Sr no	Shade shown	No of participants accurately matching the shade	Percentage
1	Image 1 –B1	0	0%
2	Image 2- B4	0	0%
3	Image 3-B3	1	50%
4	Image 4- A3.5	1	50%
5	Image 5- A4	0	0%
6	Image 6- A1	1	50%
7	Image 7- C3	1	50%
8	Image 8- D4	0	0%

Participants ranging from 15-20yrs of experience- 14 in number (table no.4)

Sr no	Shade shown	No of participants accurately matching the shade	Percentage
1	Image 1 –B1	2	14%
2	Image 2- B4	2	14%
3	Image 3-B3	4	28%
4	Image 4- A3.5	4	28%
5	Image 5- A4	0	0%
6	Image 6- A1	3	21%
7	Image 7- C3	8	57%
8	Image 8- D4	0	0%

Individual shade matching accuracy (table no.5)

Sr no	Shade shown	No of participants accurately matching the shade	Percentage
1	Image 1 –B1	33	47%
2	Image 2- B4	11	15.7%
3	Image 3-B3	16	23%
4	Image 4- A3.5	13	18.5%
5	Image 5- A4	0	0%
6	Image 6- A1	33	47%
7	Image 7- C3	18	26%
8	Image 8- D4	8	11.5%

Overall accuracy

70 participants were shown 8 different electronic shade tabs i.e. 560 times the shade were matched out of which 132 got it correct ,so the overall accuracy is about **23.57%.**

Discussion

Because of the inherent property of the of the optical characteristics of natural teeth coupled with the operators variability and the visual environment in which shade selection is done it poses a challenge for accurate shade selection[15].

Communicating the shade selection done to the laboratory personel to recreate the shade interpretation as selected by the clinician is also a major hurdle.

It would be better if the technician has a reference picture of the dental structures and the surrounding pink structure while he is building up the restoration in ceramic in laboratory.

Electronic communication not only reduces the time factor involved in communication but also reduces the cost involved in doing a physical communication[16].

The use of image generated and transmitted electronically is a new development in the field of dentistry, with proliferation of electronic gadgets with image capturing capabilities and their ubiquitous prevalence of usage by everyone tempts dentist also to use this media as a tool in place of physical shade tabs and also to capture the image as a reference to the shade of the patient's natural teeth.

This survey was initiated to test the ability of the dental operators to match shades of images of shade tabs.

They were shown 8 electronic images of the different subgroups of the Vita Classical Shade Guide and were asked to identify the shade of the captured image with the help of physical shade guide.

The experience of the participants in the dental field ranged from 0-20 years with the average being about 3.5 years.

The percentage wise distribution of the shade tabs correctly matched is shown in table no.5.

The overall accuracy is 23.57%in this survey which was quite less,hence it can be stated that as the electronic gadgets increase to substitute the physical means more and more dental personel will become familiar with the digital modality ensuring a more accurate results.

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