AESTHETIC RESTORATIVE MATERIALS IN PROSTHODONTICS

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ABSTRACT
The word Esthetics comes from a Greek word that is “aisthetikos” meaning insightful. It refers to beautiful or the science which leads from nature and taste the rules and principles of art. Around the year 1950 the word esthetics was invented and later on it was related to the theory of beauty as fine arts. The esthetic revolution started during 1970s. Esthetic restorative materials have quickly developed in number and use. Ceramic materials are mainly the restorative choice since they can recreate the color and shape of the natural dentition. The most extensively used type of ceramic system is still the metal ceramic. Patients interest for dental restorations that replicate the beauty of natural teeth has invigorated the further advancement of composite and ceramic materials.

Key words: esthetics, restorative materials, ceramics, composite, zirconia.

INTRODUCTION

The fabrication of Dental materials is particularly designed for use in dentistry.[1] An ideal restorative material would be biocompatible and also similar to the natural tooth in terms of strength, appearance and bonding to the tooth structure. It should have properties which can be compared to the natural tissues of the tooth and should be able to fix or restore the missing or impaired tissue. Preventive materials and Restorative material are the two types of category for materials in dentistry. Dental materials in preventive category include sealants for filling the pits and fissures etc. In clinical dental practice restorative dentistry is one of the major specialties. For restoring or replacing the tooth structure, dental materials in Restorative category are used. Different types of dental restorative materials with varieties of characteristics according to their intended purpose are available and include compomers, resin modified glass ionomer cement, composite resin, amalgam that falls into the direct restorative materials category whereas gold, ceramic-resin hybrid, composite resins falls into indirect restorative material category. [2]One of the patients’ demands is esthetic dental appearance. Webster has defined ‘Esthetic’ as having wisdom about the beauty or fine culture and being responsive or enthusiastic or passionate towards it. Perception for beauty differs for every individual and it depends on culture experience and self image.[3]

Around the year 1970s the evolution of esthetics started unintentionally as during the process of mastication the mercury that is being liberated from the amalgam could be taken in. The tooth colored materials replaced the amalgam restorative materials since it releases mercury which is toxic for the health. There is rising requirement for tooth colored restorations since last ten years.[4] Both the number and use of esthetic restorative materials have quickly grown over the past decade. The frequently used restorative material choice is ceramic as they can exactly mimic the natural dentition. The most commonly used type of ceramic system is porcelain fused to metal. But, there has

been rapid all round development of all-ceramic restorative systems which do not require a metal base. The objective is to produce a natural restoration that imitates the translucency of our teeth. There are a wide variety of systems which are available in the market that aids us in the fabrication of materials with raised strength and translucency.

The development of restorative materials such as resin-based composites has helped a lot for the clinicians in moving towards an ideal restorative material. Removing the caries and then filling it with an ideal restorative material is ideal for treating the dental caries. One of the treatment modality is using is resin-based composite filling material which is a type of tooth-colored light cured restorative materials and is more clinically accepted from the year1970 after which evolution took place and has since been used largely as a restorative material. Rate of success for resin composites is becoming popular day by day in the field of dentistry, so it is being widely used in recent times. The increasing demand for dental restorations that mimic the exquisiteness of natural teeth has stirred the gradual development of composite and ceramic materials.

CURRENT TRENDS IN ESTHETIC DENTISTRY

The significance of technology evaluation in dental practices has been recognized by many countries. A review for dental advancement is required cause there is rising dental-care expenditures and increase of published research for the latest variety of dental management choice available. The speed of progress with which the dental clinicians are adapting up every

day in their practices has greatly increased. A major role in a dental practice is done by taking, evaluating, adopting, and implementing new technologies. Few of the advances in the field are the use of Tooth colored and metal free Post systems, Ceramics , CAD –CAM porcelain Veneers and Dental Composite Restorations.

Aesthetic Posts

Because of the start of aesthetic posts, it has greatly helped in the restoration of teeth that are endodontically treated. Due to the advancement in technology there is better modification and also more enhancements of the post shape and materials since their introduction. As the utilization of advanced adhesive systems and cementation techniques are increasing day by day, it has given us the opportunity to get a good bonding within the canals of the root, thereby helping in the development of new posts which make sure that the dental tissue conservation is achieved. Polyethylene fibers which are almost undetectable in the matrix of the resins and helps to enhance with the toughness of the composite materials therefore they are the most suitable fibers for giving the strength to the composite.[5]

Ceramic Crowns

Metals are being substituted by the ceramics for fabrication of crowns and also in other biomechanical prostheses. Even if crowns that are alumina-based which are substituting the crowns that are metal-based but there is increase in the failure rates which stills remains as a problem. The main reported issue of failures of ceramic crowns is the fracture of the bulk even if it is a layered otherwise monolith structure.[5]

Ceramic Veneers

During the start of the year around 1990's the beginning of Ceramic veneers as a major mode of restoration have got a huge recognition in the field of esthetic dentistry. Since the patient's aesthetic expectations are continuously increasing day by day so the dental teams are challenged to formulate and work on a organized proposal for getting more natural facial as well as oral aesthetics when we are using or working with porcelain veneers. The progress in techniques that includes the materials such as ceramics and veneering have allowed the dentists for re-establishing the purpose and esthetics of the patient by following the methods that are more conventional and biologically sound along with giving us a lasting good dental health of the patient.[5]

CAD/CAM FOR CERAMIC CROWNS

All-ceramic Posterior crowns using CAD CAM generated copings are usually made either as core crowns that are veneered manually by the lab technician or computer-generated as monolithic crowns. Dentists have been using the CAD-CAM system for almost two decades for intraoperative dental restorations using prefabricated ceramic mono blocks. For the development of fixed prosthetic restorations such as inlays,onlays,veneers and crowns, CAD/CAM systems have been used.CAD/CAM system can give advantage of both stock and laboratory processed custom abutments with negligible shortcomings using the custom abutments. For the fabrication of implant abutments, technology related to CAD/CAM technique has been using various metal alloys including Ti and its alloys, ceramics including ZrO_2 and Al_2O_3.[5]

TYPES OF ESTHETIC RESTORATIVE MATERIALS

GLASS IONOMER CEMENTS

GIC falls into the category of materials that are called as acid-base cements. They are based on the reaction product of weak acids that are polymers along with a base containing powdered glasses which is an ionomer. GIC mainly consist of a polyacrylic acid, silicate glass powder and water. The acid, base and water are present as an aqueous solution of polymeric acid and glass powder that are blended together by a correct method inorder to form a paste which is viscous. GIC usually releases fluoride which has significant advantages. It usually shows an alternating patterns of fast release initially and then followed by sustained one having a lower diffusion release. [6]

There are nine types of GIC which includes the following:

1. GIC used as a luting material
2. Restorative type of GIC
3. GIC for Liner or bases
4. GIC used as sealants for Pit & fissure
5. GIC used as Luting agent for orthodontic purpose
6. GIC used as material for Core buildup
7. GIC that releases High fluoride
8. GIC used for Atraumatic restorative treatment
9. Pediatric Glass Ionomer Cements.

RESIN CEMENTS:

Newest category of cements for indirect restorations are resin cements. The capability to attach to the structure of the tooth as well to the restoration is excellent. Restorative material such as composite and cements such as resins includes similar type of basic component but resin cements have lower concentration of filler particles in them. They have superior tensile, compressive as well as flexural strength than most of conventional cements and can be utilized for variety of dental restorations. The most important thing which affects success rate of resin cements is its bond strength. Bond strength gets influenced by pretreatment measures along with the curing steps along with the amount of polymerization of the resin cement etc.[7]

ORMOCERS

A novel kind of restorative material which is termed as Ormocer, which is a short form for organically modified ceramic technology that was introduced for deal with the shortcomings as well as issues which were linked with commonly used conventional composites. These materials consist of inorganic and organic co-polymers along with inorganic silanated filler particles. It is synthesized from thioetheracrylate alkoxysilanes and multifunctional urethane that goes through a process of solution and gelation. They are commonly narrated as cross-linked copolymers of 3 dimensions. The matrix of ormocers is a polymer earlier than the light cure resin based composites. The matrix is made up of ceramic polysiloxane, which has considerably low shrinkage. Polymerisable side chains are mixed to the polysiloxane chains in ormocer for a reaction to

occur throughout curing and hence form the setting matrix. The surplus polymerization opportunities in these materials allows them to cure without leaving residual monomers which in turn results in biocompatibility with the tissues to a much greater extent.[8]

COMPOMERS

They are included in class of aesthetic materials and they find their utiliation for restoration of teeth. They were introduced to dentistry during the beginning of 90s. Compomers fall under a new category of dental material that were planned to permit and facilitate combination of aesthetics which were provided by traditional composite resins with the properties like fluoride releasing & bond of glass-ionomer cements. Compomers do not contain water and the majority of the components they contain are similar to that of composite resins. These are macro-monomers, such as bisglycidyl ether dimethacrylate or its derivatives and/or urethane dimethacrylate which are combined with viscosity-reducing diluents to improve the properties. Non-reactive inorganic powders, like quartz or a silicate glass are also filled in these polymer systems. These powders are coated with a silane for increasing the bonding between the filler and the matrix in the set material. These materials release fluorides in clinically beneficial amounts.[9]

CERAMICS

The use of dental ceramics as restorative materials has disadvantages and limitations mainly because they are not capable to resist the functional forces present in the oral cavity. For this reason, it was found that there is very limited application in the posterior region. Additional improvements in ceramics have helped them so that it can be used in cases of long span FPDs and also in super structures of dental implants when compared with other dental materials such as metals ceramics which have less fracture toughness.

CLASSIFICATION

Based on microstructure:

1. SiO_2 containing Glass based system
2. Fillers mainly crystalline containing Glass-based system.
3. Glass filler containing Crystalline - based systems.
4. Polycrystalline solids.

Classification based on processing technique:

1. Powder/liquid and glass-based systems
2. Glass-based systems consisting of Machinable or Pressable blocks
3. Slurry or computer assisted die-processed systems.[10]

ZIRCONIA

Zircon is a precious stone since long. Zirconia name have evolved from zargun which means Golden in colour and it has evolved from Iranian language zar means Gold and Gun means colour. Zirconia is an oxide of zirconium. In medical field zirconium oxide was first used in the year 1969 by orthopedicians. It was used for hip replacement. In the field of dentistry, it was used in late 20s to replace the unesthetic metal based restorations with a more esthetic one. Like ceramic, the strength as well as esthetic property of this material is harnessed in the field of prosthodontic restoration. It is now utilized for the manufacturing of endodontic post, crown and bridge. It is also used for the fabrication of brackets for orthodontics. Zirconia have become a popular substitute to alumina as a biomaterial.[11]

CONCLUSION

The interest for esthetics in dentistry has created an alarming assortment of different dental restorative materials like porcelain, composite and ceramic that are available for dental treatments. Like instance, ceramic restorations are so characteristic looking that even the clinicians may need to cautiously assess what they examine in the patient's mouth. Some constrains are present which we have to keep in mind when the restorations are done, even though it has a natural aspect and are esthetically pleasant. Because of the masticatory forces and also parafunctional habits, there is a possibility of failure cause of the brittle character even though ceramics are quite strong.

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