Aesthetic Inlays
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Abstract
Aesthetic Inlays has an important role in conserving sound tooth structure with more esthetic results. Composite resins and Ceramic restorations can be used to restore a tooth which needs an inlay. This review discusses the details of various aesthetic inlays systems.

Key Words: Inlays; Composite resins; Ceramics; CAD/CAM Restorations

In recent times the field of aesthetic dentistry has picked up speed and has turned as one of the most important branch in dentistry. There are different aesthetic materials and techniques used to prepare inlays, an important restorative procedure. Inlays were earlier prepared with different alloys including Cast gold alloys. With the introduction of newer materials and techniques in the field of aesthetic dentistry, the role of restoring a tooth with an aesthetic inlay has become more desirable for the patients and dentists alike. Newer Composite resins and Ceramics can be used for inlay restorations in the field of aesthetic dentistry. This review discusses the details of various aesthetic inlays systems.

Composite resins can be used to restore a tooth which needs an inlay. With the introduction of newer posterior composite resins with better material properties, this treatment modality benefits the patients immensely. Inlays can be prepared after the shade selection, both with direct or indirect technique.

The direct technique includes, chair side preparation, good aesthetic properties and cost effectiveness. The indirect technique gives accurate fit with pulse curing and secondary pulse curing. The chair side repair possible with less shrinkage and better strength as it is oven cured.

Ceramic Inlay Restorations
Recent advances in porcelain have given better overall advantage for aesthetic dentistry. Porcelain is the most natural appearing synthetic replacement material for the missing tooth structure. The developments of new all-ceramic systems have better strength and precision fit which was lacking in conventional porcelain. These can also be bonded to the tooth with newer dentinal adhesives and resin cements. With the introduction of upgraded materials and machineries, a variety of treatment options have opened up including aesthetic inlays. All the materials and techniques in ceramic inlay preparation are discussed below.

Single-visit Direct Ceramic restorations: Cerana Restorations: This system uses matched drills with pre-etched and silanated Lucite inserts cemented with a conventional composite resin material. The technique is based on a ceramic insert with the optional use of a size-matched bur for cavity preparation.

I. Conventional Power-slurry ceramics

The powder is available in a variety of shades including stains and glazes. Optec HSP has good flexural strength (146 Mpa) and produces uniform translucency and shade throughout. It can be etched to bond to the tooth structure with an accurate fit.

Duceram LFC has good flexural strength and greater density with greater fracture resistance, as its hardness close to that of tooth.

II. Castable ceramics

It is supplied in solid ceramic ingots. These are used to fabricate cores and full contour restorations using the lost wax technique. Dicer (DENTSPLY) and Dicor plus has good flexural strength (152 Mpa) and good fracture resistance. It can be etched to bond to the tooth. But it need special investment and casting equipment.

III. Machinable ceramics

It is available as ingots in different shades and sizes. These are used in CAD CAM and CAD CIM technologies. These ingots are placed at the cutting end of the Machinable apparatus to produce required contour. In this technology an image (Optical impression) is taken after the tooth is prepared and is transferred to the computer. It is then assessed for the right dimension and contour. This information is then passed on to proceed with machining the ingot at the cutting end. It is then placed on the prepared tooth to check the fit. Occlusal adjustment is done followed by polishing and etching the fitting surface. It is then bonded to the prepared tooth.

Cerec Vita Block 1 and Cerec Vita Block 2: The latter has finer grains and produces less abrasive wear of opposing tooth with an increased strength (152Mpa).

Celay is fine grain size feldspathic porcelain similar to Cerec Vita Block 2.
Dicor MGC has greater flexural strength (216Mpa) with less wear of opposing tooth.

Copy milling Technique: In this technique, a provisional inlay restoration is prepared with a composite resin. This is kept on the reading end of the CAD CAM machine, with an ingot of the selected shade on the cutting end. When activated, the machine reads the details of the provisional restoration on the reading end and cuts the ingot on the cutting end with exact details to obtain the final product.(15, 16) It gives excellent fit with a single sitting treatment option. Here the disadvantage of marginal gap is minimized.(17)

Double Inlay Technique: In this technique two different materials are used in restoring an inlay preparation. Here, gold is used to restore the body of the restoration and the occlusal half is restored with ceramic inlay restoration.(18) This use the advantage of biocompatibility of gold and good aesthetics of ceramic, as occlusal half is of ceramics. Its disadvantage could be the factor that it is a multiple cemented or bonded restoration.

IV. Pressable ceramics

IPS Empress: This Feldspathic porcelain is supplied in ceramic ingots. Here, a pattern is prepared, invested and is placed in a mold that has alumina plunger. The ceramic ingot is placed under the plunger. The entire unit is heated to a temperature of 1150°C and the plunger is released which presses the ceramic into the mold. This pressed ceramic is then baked for good translucency and good flexural strength (182Mpa) after heat treatment.(19)

V. Infiltrated ceramics: This has two components, which are aluminum oxide and magnesium oxide spinel powder and glass infiltrate. It has high flexural strength (450Mpa) and gives accurate fit. It is sand blasted, as it is difficult to etch. Advance in material science.

Recent advances in the field of ceramic material have improved the quality of different techniques used for restorations. Development of shrink free ceramics and hybrid ceramics has helped tremendously. Shrink free ceramics provides an option for optimal marginal fit and longevity as the shrinkage of material is minimized. Hybrid ceramics helps in prevention of crack propagation in the material thereby reducing the chances of fracture of restorations.

Zir Cad: All-ceramic restorations have flexural strength of 900Mpa, fracture toughness of 6Mpa, good biocompatibility and low heat conduction.

Zirconia: Zirconia is the oxidized form of zirconium and can exist in several phases, depending on the temperature. In dental ceramics, zirconia can inhibit crack growth and prevent catastrophic failure. The following case report demonstrates the use of zirconia as a framework material. Overall, zirconia has proven to be a strong and reliable framework material. In combination with CAD/CAM, this material allows for the fabrication of esthetic all-ceramic restorations in all areas of the mouth.(20)

Conclusion

Clinicians should provide a treatment option which is most conservative and at the same time suitable functionally as well as aesthetically with predictable longevity. They are always faced with the problem of deciding what restoration and material they should use when restoring deficient tooth structure.(21) Composite resin material selection as well as the technique followed for tooth cavity preparation is equally important for the success of the restoration in terms of longevity.(22)

Ceramic inlay restorations, especially in defects of posterior teeth requires proper care both in tooth/cavity preparation and material selection. Placement of ceramic inlay materials in high-stress areas may result in less predictable long-term performance. Ceramic inlays are advantageous for restoring moderately sized defects when proper restoration contours and esthetics is desired. Successful clinical use of ceramic inlay materials is absolutely dependent on the creation of an uncompromised adhesive tooth/ceramic interface. Ceramic inlay restorations perform well in terms of long-term retention, color match, and anatomic contour stability. Ceramic inlays fail predominantly as a result of crack propagation from material flaws leading to bulk fracture. Superficial ceramic defects can be repaired with composite resin. Internal material flaws are minimized by industrial production of indirect pressable glass-ceramic materials or ceramic blocks designed for computer-aided design / computer-assisted manufacturing (CAD/CAM). External surface flaws are limited by careful polishing techniques. Strategic placement of ceramic inlays in teeth that are not subject to heavy occlusal loading will result in more predictable long-term performance.(23)

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