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CERAMIC INLAY RESTORATIONS OF POSTERIOR TEETH

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Dentistry has benefited from tremendous advances in technology with the introduction of new techniques and materials, and patients are aware that esthetic approaches in dentistry can change one's appearance[1]. Increasingly, tooth-colored restorative materials have been used for restoration of posterior teeth[2,3,4].

Tooth-colored restoration for posterior teeth can be divided into three categories: 1) the direct techniques that can be made in a single appointment and are an intraoral procedure utilizing composites: 2) the semidirect techniques that require both an intraoral and an extraoral procedure and are luted chairside utilizing composites: and 3) the indirect techniques that require several appointments and the expertise of a dental technician working with either composites or ceramics.

But, resin restoration has inherent drawbacks of microleakage, polymerization shrinkage, thermal cycling problems, and wear in stress-bearing areas. On the other hand, Ceramic restorations have many advantages over resin restorations.

Ceramic inlays are reported to have less leakage than resin restoration and to fit better[5], although marginal fidelity depends on technique and is laboratory dependent. Adhesion of luting resin is more reliable and durable to etched ceramic material than to treated resin composite[6,7,8].

In view of color matching, periodontal health, resistance to abrasion, ceramic restoration is superior to resin restoration[1].

Materials which have been used for the fabrication of ceramic restorations are various.

Conventional powder slurry ceramics are also available. Castable ceramics are produced by centrifugal casting of heat-treated glass ceramics, and machinable ceramics are feldspathic porcelains or cast glass ceramics which are milled using a CAD/CAM apparatus to produce inlays (for example, Cerec). They may also be copy milled using the Celay apparatus. Pressable ceramics are produced from feldspathic porcelain which is supplied in ingot form and heated and moulded under pressure to produce a restoration. Infiltrated ceramics are another class of material which are available for use as ceramic inlays. An example is In-Ceram®(Vident, California, USA) which consists of a porous aluminum oxide or spinell core infiltrated with glass and subsequently veneered with feldspathic porcelain.

In the 1980s, the development of compatible refractory materials made fabrication easier, and the development of adhesive resin cements greatly improved clinical success rates[9,10].

This case report presents esthetic ceramic inlays for posterior teeth.

CASE REPORT

An 26-year-old woman presented for consultation because of esthetic treatment of her left and right first mandibular molars, and she had experienced no pain on either tooth .

The patient was treated for amalgam restorations on both teeth 6 years ago, but their anatomical forms were unproper. So she wanted to have tooth-colored restorations.

Radiograph of both lower first molars showed previous amalgam restorations. There were small defects on both amalgam restorations, but are not of a serious nature .

The patient did not show any parafunctional habit.

Because she wanted tooth-colored restoration, we decided to retreat the old amalgam with ceramic restoration.

At first, her left mandibular 1st molar was treated with ceramic inlay. Shade was selected (A2, A3) and inlay preparation was performed on left 1st molar under anesthesia, using diamond burs (Inlay-Preparation-Set 4261 , Komet, Lemgo, Germany). Impression of the prepared tooth was taken using a polyvinylsiloxane material (Examix®, GC America Inc. USA). A resinous temporary filling material (Clip®, Voco, Germany) was filled in the cavity and light cured.

Ceramic inlay was fabricated according to the manufacturer's instructions. (Creation®, Klema, Meiningen, Austria).

The internal surface of the ceramic inlay was etched with 10% hydrofluoric acid (Choice®, Bisco, Schaumberg, U.S.A.) for 90 seconds, washed off with water for 20 seconds and dried with warm air. Then inner surface of the ceramic inlay was coated with a silane couping agent (Choice®, Bisco, Schaumberg, USA), and volatile silane was allowed to vaporize.

The prepared tooth was thoroughly cleaned with pumice slurry and etched with 37% phosphoric acid gel. The dentin adhesive system (ONE-STEP™, Bisco, Schaumberg, USA) and resin cement (Panavia F®, Kuraray, Osaka, Japan) were used for bonding procedure.

After removal of excess luting resin cement, restoration was gently seated with an instrument applied to the occlusal surface, making sure that a bead of composite was expressed at all margins.

The restoration was light cured for 120 seconds from each direction.

After light curing and examining the luting areas for defects, centric and eccentric occlusal contacts were adjusted using diamond finishing burs.

One month later, her right first molar was restored with ceramic inlay using above mentioned procedures .

Routine check-up was performed after three months.

The patient was satisfied with the results.

DISCUSSION

In Ceramic restoration, the first important procedure is case selection. This patient wanted more esthetic restoration than conventional amalgam restoration, and had no parafuntional habit.

There is only limited information on the long-term clinical results for ceramic inlay restorations[4,6,7]. The most commonly reported problems were hypersensitivity, inlay fractures, loss of retention, marginal integrity, microleakage and tooth fractures.

Generally when dealing with ceramic inlays and onlays, bulk fractures have been observed with all ceramic systems on the market. Fractures have been attributed to inadequate tooth preparation, occlusal adjustments disrupting the surface and triggering crack propagation[1]. For tooth-colored inlays, especially, postoperative hypersensitivities have been reported to be problematic due to possibly incomplete sealed dentin or detachment between lining material and dentin.

After treatment, she did not complain about hypersensitivity.

All ceramic inlay systems are subject to some degree of marginal deterioration in clinical situtations, and this is generally attributed to wear of the luting composite[11].

Sorensen et al.[10] showed that porcelain surface treatment with silane in combination with etching significantly reduced microleakage. When margins are located in dentine, there is greater potential for microleakage as dentine bonding agents have failed to completely prevent gap formation at cervical margins of ceramic inlays.

In a clinical situation where an inlay/onlay restoration with deep gingival seat is being cemented, the operator should apply the curing light from the buccal and lingual aspects of the restoration as well as through the occlusal aspect in order to maximize the amount of curing light that reaches the cement in the gingival seat areas.

Wear of luting composites is still an unsolved problem with adhesive inlays. Loss of luting composite possibly results in plaque accumulation and, consecutively, marginal staining, postoperative hypersensitivities, recurrent caries or complete loss of the restoration. Deep marginal ditching of the luting gap could cause marginal fractures of adhesive inlay systems due to lack of support for the marginal areas of brittle materials, such as enamel or ceramics.

In conclusion, tooth-colored ceramic inlays may produce a successful and esthetic restoration if the tooth etching technique is used and the inlays are etched, silane coated, and luted with dual cured luting resin composite.

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