THE ANSWER TO CERAMIC INLAY , Emax – A CASE REPORT

Prof. (Dr.) Utpal Kumar Das¹ MDS, Dr. Niladri Maiti² BDS

¹(HOD, Department of Conservative Dentistry & Endodontics, Guru Nanak Institute of Dental Science and Research, Kolkata, India)
²(Post Graduate Student, Department of Conservative Dentistry & Endodontics, Guru Nanak Institute of Dental Science and Research, Kolkata, India)

ABSTRACT:

One of the primary challenges faced by today’s dental restorative team is the need to deliver high-strength restorative options without compromising the esthetic outcome fueled by ever-increasing patient demands. The availability of improved ceramic materials, bonding techniques, new technology and issues of amalgam safety have led to a revival of interest in ceramic inlays in dentistry over the past ten years. The increased demand for esthetically pleasing restorations has led to the introduction of new all ceramic materials together with improvements in resin bonding agents. Bonded ceramic inlays can eliminate the need for conventional means of retention and allow the restoration of lost tooth structure. Ceramics have excellent biocompatibility, inertness, improved physical bonding, and natural appearance. This case report describes the innovative technique that outlines the reconstruction of damaged posterior teeth with lithium disilicate ceramic inlay.

Key words: ceramic inlay, IPS e.max, adhesive bonding

I. INTRODUCTION

Increased interest in tooth-colored non-metallic posterior restorations has stimulated the development of new materials. This escalating demand has been attributed to an increasing interest in esthetic dentistry and the growing concern over the use of metallic alloys. The first attempt to use esthetic inlays were described during the end of the nineteenth century[1]. However, it was not until the introduction of bonding procedures that the process achieved wider acceptance. Several systems and techniques are available today for tooth-colored inlays using both resin composite and all-ceramic materials, but few studies have evaluated these materials longitudinally [2,3].

All-ceramic restorations can be produced using various techniques. One of the most common techniques uses refractory dies and feldspathic ceramic materials. Restorations sintered using this technique undergo substantial shrinkage during firing [4] and microporosity may initiate fracture within the material[5]. Casting techniques that minimize porosity have been introduced, but the casting process is followed by a ceramming cycle that results in shrinkage [6].

The hot-pressing technique and the material (IPS Empress, Ivoclar, Schaan, Liechtenstein) have been described elsewhere[7,8]. The material was designed for the fabrication of single restorations and introduced in 1991. and a clinical evaluation after 1.5 years has been reported [9]. Examination of the 10 inlays revealed good performance.

Significant developments in all-ceramic materials have created wonderful opportunities for the fabrication of lifelike restorations that provide reliable, long-term results. To maximize the functional requirements of these materials, Ivoclar Vivadent, Inc. has introduced IPS e.max lithium disilicate glass ceramic, a material that provides optimum esthetics, yet has the strength to enable conventional or adhesive cementation. IPS e.max lithium disilicate has a needle-like crystal structure that offers excellent strength and durability as well as outstanding optical properties. IPS e.max lithium disilicate can be traditionally pressed or contemporary processed via CAD/CAM technology. Due to its strength and versatility, the material can be utilized for the following applications-anterior/posterior crowns, inlays/onlays, veneers, thin veneers, telescopic crowns, implant restorations, anterior three-unit bridgework (press only).
II. CASE REPORT

An 26-year old female patient reported to the Department of Conservative Dentistry and Endodontics with the chief complaint of food lodgement in right lower back teeth region since 2 months.

The medical history of the patient was non-contributory.

On clinical examination, a carious lesion was present on the disto-proximal aspect .The tooth was asymptomatic and no pain could be elicited. The tooth responded positively to the thermal and electric pulp testing. The involved tooth showed no signs of mobility.(Fig.no.1)

Her radiographic examination revealed the presence of a carious lesion approaching but not involving the pulp with no signs of apical involvement.(Fig.no.2)

The patient’s informed consent and necessary ethical clearance were obtained.

III. CLINICAL PROCEDURE

After removal of the caries lesion, tooth preparation was performed with medium and fine-grit diamonds.

Impression of both upper and lower arch was made using light body and heavy body putty material and finally the cast was poured using die stone . After setting, the cast was trimmed. Wax pattern was made and investment was done . After the setting it was put into the furnace for wax burn-out. Then e.max ingot(Ivoclar Vivadent LOT NO. R81645 (Fig.no.3) was placed inside the casting ring and immediately pressed in pressing unit (MULTIMAT NT press) (Fig.no.4) approximately at 930°C for 15 minutes.

Anatomic form and contour, marginal integrity, interproximal contacts, occlusion, color of the ceramic, and surface quality were assessed first on casts and then intraorally (Fig.no.5a,5b)

After this, glazing of the restoration is done with e.max glaze.(Fig.no.6)

For a durable adhesive interface, optimal dry field conditions are required. A clean surface and careful execution of the bonding procedure according to the manufacturer’s instructions are also prerequisites for success.

The internal surfaces of the all-ceramic restorations were etched with 5% hydrofluoric acid (IPS Ceramic etching gel, Ivoclar Vivadent) for 3 minutes and then silanated with Monobond-S (Ivoclar Vivadent) for 60 seconds.

The preparation surfaces were cleaned with pumice paste. The total-etching technique was used to condition the tooth surfaces with 37% phosphoric acid gel (Ivoclar Vivadent) for 30 seconds per manufacturer’s instructions. The dentin was conditioned with the Syntac Classic dentin adhesive (Ivoclar Vivadent), Heliobond (Ivoclar Vivadent) was used as a bonding agent.

After the bonding agent was air thinned, the cementation was performed immediately with resin cement (Variolink N, Ivoclar Vivadent). Excess cement was removed with a dental probe and dental floss. Light polymerization was performed for 40 seconds from each side. The occlusion and the articulation were checked carefully after the inlay was luted.(Fig.no.7a,7b)

Patient was recalled after 6 months for follow up (Fig.no.8)

IV. DISCUSSION

The microstructure of the pressable lithium disilicate material consists of approximately 70% volume of needle-like lithium disilicate crystals that are crystallized in a glassy matrix. The crystals of both the IPS e.max Press and IPS e.max CAD are the same in composition. Both microstructures are 70% crystalline lithium disilicate, but the size and length of these crystals are different. This is why material properties such as co-efficient of thermal expansion, modulus of Elasticity, and chemical solubility are the same, yet the flexural strength and fracture toughness are slightly higher for the IPS e.max Press material.

The monolithic nature of the lithium disilicate material provides significant durability to the final restoration.

From an esthetic standpoint, the lithium disilicate material is very versatile. The opacity is controlled by the nanostructure of the material.

Wear resistance and compatibility are critical properties of all dental materials. With ceramics, the concern reflects on their compatibility with opposing tooth structures. The wear of the opposing enamel by lithium disilicate has been tested with the OHU machine for the simulation of 5 years worth of wear. In comparison to other ceramics and even enamel in the study, the wear of lithium disilicate was very low, showing a kind surface with respect to wear of any opposing dentition.

The biocompatibility of ceramic materials in the oral environment is tested using a variety of methods (e.g., cytotoxic testing and agar diffusion testing). In 2008, Brackett, Wataha, and others examined the cytotoxic response of lithium disilicate dental
ceramics. They concluded “In spite of the mitochondrial suppression caused by the lithium disilicate materials in the current study, these materials do not appear to be any more cytotoxic than other materials that are successfully used for dental restorations. The lithium disilicate materials were less cytotoxic than several commonly used composite materials and were comparable to cytotoxicity reported for several alloys and glass ionomer. Furthermore, the improvement of these materials over the course of several weeks of aging and the relative stability of the cytotoxic response post-polishing suggests that they will perform well clinically in the long term.” Also, agar diffusion tests have been run in accordance to ISO 10993-5 guidelines and the results demonstrate the e.max materials are considered non-cytotoxic.

V. CONCLUSION

Of all the treatment options available for aesthetic intracoronal restorations, ceramic inlays have performed reasonably well in clinical situations compared with other materials. Nevertheless, they are extremely technique sensitive and their cost remains high. There does not appear to be any one ceramic inlay material or technique which clearly provides clinical performance superior to the others, however the use of a dual-cure cement for luting appears to be compatible with high success rates. The IPS e.max lithium disilicate offers exciting new opportunities in restorative dentistry. The material’s strength and optical properties offer dental professionals multiple options for achieving highly durable and esthetically pleasing restorations.

References


Pictures

Fig.no.1 Pre-operative view

Fig.no.2 Pre-operative IOPAR
Fig. no. 3  E-max ingot

Fig. no. 4  Multimat NT press

Fig. no. 5a  Try in on cast

Fig. no. 5b  Try in intraorally

Fig. no. 6  E-max glaze

Fig. no. 7a  Post operative view

Fig. no. 7b  Post operative IOPAR

Fig. no. 8  6 months follow up