Amalgam Inlay- An Innovative Technique

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Abstract: Dental amalgam is the most thoroughly researched and tested restorative material, which has been used successfully in dentistry for more than a century. Despite its poor esthetic and lack of adhesion, it is still one of the most widely used restorative materials in dental practice. This case report describes a novel clinical technique of fabricating an inlay using silver amalgam for restoring a large cervical abrasion cavity. A patient with large and deep cervical abrasion cavity in relation to mandibular right posterior region was reported. The impression of the abrasive cavity was done using rubber base impression material. Later, cast was fabricated, amalgam was condensed into the cavity, contoured and inlay was prepared. Fit of the inlay was checked on the patient, thereafter it was finished and polished and cemented using luting glass ionomer cement.

Keywords: Bonding, inlay cavity, silver amalgam.

INTRODUCTION

The state of art in intra coronal restorations is changing rapidly, as patients are getting accustomed to non-metal restorations. However, some of the new restorative materials have not been adequately researched to date and most of the information available on them is from the company's manufacturing them. Numerous older restorative options are being used by practioners with success but with a compromise in esthetics.

Silver amalgam is the most thoroughly researched and tested restorative material, and has been used successfully for more than a century. Despite the decrease in the placement of amalgam restorations which has been attributed to its poor esthetic characteristics, lack of adhesion and mercury toxicity, this material still remains as a direct posterior restorative material in many dental practices [1, 2]. Such popularity can be attributed to its good clinical performance and relatively low cost [3]. In many of the developed countries, amalgam has been superseded by resin composites [4] due to the imagined fears related to the safety of amalgam. Even though mercury present in the amalgam can be toxic, the amount of mercury vapor released by amalgam restoration is small and well below the daily intake of 40µ which is considered to be acceptable for general public [5]. Clinical trials comparing the safety and efficacy of silver amalgam and resin composites concluded that amalgam is both efficacious and safe as a restorative material [6, 7]. The major health organizations in United States like National Institute of Dental and Craniofacial Research and the US Food and drug association have declared that amalgam is a safe and effective restorative material and its use should not be restricted [8].

Placement of conventional amalgam restoration may be difficult in elderly patients because of inability to completely open the mouth for long duration, root caries, inaccessible areas and limitation posed by the patient. In these conditions, placement of amalgam in an unconventional method may be convenient. One of the unconventional methods to place silver amalgam in these situations is to fabricate amalgam restoration on a die and to cement it on the patients tooth using luting cement. Previously, the use of amalgam to fabricate an inlay in a small cervical abrasion cavity has been reported [9]. However, the present case report demonstrates the restoration of extensive cervical abrasion cavity using conventional amalgam in the form of inlay i.e. "amalgam inlay".

CASE REPORT

A 55 year old male patient presented with the complaint of food lodgment in the right lower back region. On clinical examination, there were cervical

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abrasion cavities in relation to 43, 44 and 45. There was extensive loss of tooth structure in relation to 45 (Figure **1**). The underlying periodontal condition was

Figure 1: Preoperative photograph demonstrating an extensive cervical abrasion cavity on the right mandibular second premolar.

unremarkable, and the medical history was non-contributory. An intraoral periapical radiograph in relation to 45 revealed a deep abrasion cavity without any periapical changes. Tooth was non-tender to percussion. The dimension of the abrasion cavity was, 7 mm occulso-cervically and 6 mm mesio-distally. Pulp sensibility testing with electronic pulp tester (Parkell Electronics Division, New York, USA) revealed a positive response confirming the tooth to be vital. A treatment strategy of composite resin build up was advocated. However, after a week the patient returned with the complaint of dislodged restoration. Hence, an innovative technique of amalgam inlay was planned because conventional approach was considered to be very difficult if not impossible. A preliminary alginate impression of the mandibular arch was done and the cast was fabricated. An individualized sectional tray extending from 43 to 47 was prepared on the cast using self-curing acrylic resin (Dentsply India Pvt. Ltd, Gurgaon, India). The tray was then checked in the mouth for any undesirable impingement on the soft tissue. Rough and irregular margin around the cervical abrasion cavity was removed using gingival marginal trimmer. Gingival tissue was retracted using gingival retraction cord (Ultradent Products, Inc., Utah, USA). A thin layer of glass ionomer cement (Fuji II- GC Corporation, Tokyo, Japan) was placed into the deepest portion of the cavity. Then tray adhesive (Dentsply, Milford, USA) was applied on the entire tissue surface of the sectional tray and was allowed to dry for 10 minutes. Later, double mix single impression technique was employed for making the impression of the cervical cavity. Light bodied rubber base impression material (Dentsply, Milford, USA) was used for syringe application to the cavity, and the heavy bodied material (Dentsply, Milford, USA) was used for filling of the tray. Both of these impression materials were mixed according to the manufacturer's instruction. The abrasion cavity was then dried and the tip of the filled syringe was directly placed on the deepest portion of the cavity. The impression material was injected into the cavity by continuous pressure on the syringe until the entire cavity and the surrounding tissues were completely covered. The loaded tray was then carried into the place, seated with a firm pressure, and then merely stabilized to prevent its movement while the impression material was setting. Once the impression material was completely set, the tray was removed and the cast was fabricated using die stone. Later, a thin layer of separating medium was applied to the abrasion cavity and amalgam was condensed. Once the amalgam obtained its initial set, the restoration was contoured using amalgam carvers. After the complete set, the restoration was removed from the cast using an explorer. Restoration was then placed in the patient mouth to check for the proper fit and contour. The amalgam inlay was then subsequently finished and polished on the cast using amalgam polishing kit

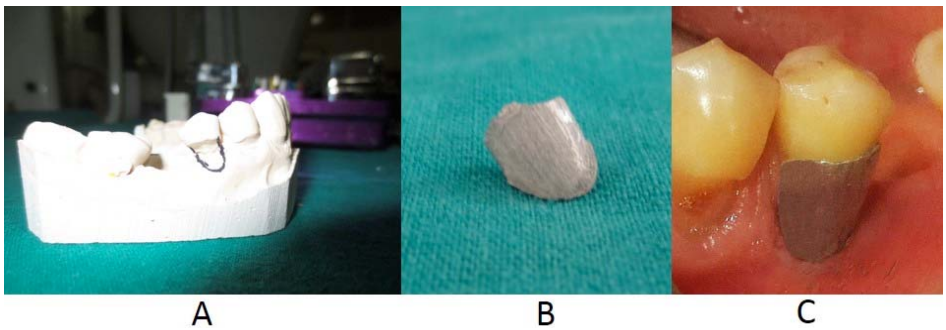

Figure 2: Steps in amalgam inlay fabrication. (**A**) Cast fabrication with die stone; (**B**) Fabrication of inlay; (**C**) Inlay try-in on the cast.

(Shofu Dental Corporation, NJ, USA) and cemented on to the cavity using luting glass ionomer cement (GC Corporation, Tokyo, Japan) (Figure **2**). Patient was advised the correct method of brushing with the appropriate tooth paste and brush. Six months post-operative recall (Figure **3**) revealed that, the margin of the inlay restoration was intact without any marginal ditching except at the mesial side, where there was a small marginal discrepancy which was repaired with glass ionomer cement. On pulp sensibility testing, the tooth revealed a positive response.

Figure 3: Six months post-operative recall view of the amalgam inlay.

DISCUSSION

The importance of maintaining an intact dental arch in order to ensure lasting dental health has been appreciated more in recent years. The loss of single tooth may start a destructive chain of events which, if allowed to progress could lead to the breakdown of the entire dentition.

Although, advances in material science has not yet established a restorative material which fulfills the criteria of an ideal restorative material, recent developments have enabled the best use to be made of the existing restorative materials singly or in combinations. Christensen has quoted that “Criticizing amalgam is similar to criticizing your mother”. It has served dental patients and the profession for years [10]. It is usually indicated in large class I, II and V cavities, proximal cavities extending gingivally, replacement of old defective amalgam restoration and also as foundation restorations. Even though the resin composite materials can be used in small to moderate lesions, their effectiveness in large lesion is reduced. A randomized clinical trial generated from New England demonstrated that, resin composites required replacement or repair seven times greater than that of silver amalgam restorations [11]. However, the technique of using composite resin for direct or indirect inlay is growing because of the development of new composite products. In one appointment, a composite resin inlay can be made and cemented. This reduces the time spent by both the dentist and patient, does not require a provisional restoration and also provides the opportunity for the resin based composite inlay to be cemented while the resin is still in an active chemical state where it can bond to resin cement. However, compared to composite inlay, amalgam inlay has an advantage of being inexpensive, less technique sensitive and have more wear resistance [12-14]. Disadvantages of amalgam inlay include multiple appointments and also cannot be used in esthetic areas.

Amalgam inlay in cervical cavities is particularly useful in elderly patients who cannot open their mouth for long duration, who do not have control over the pressure applied during tooth brushing, who are not esthetically concerned, in large cervical cavities where composite resin is not effective and also where the access for direct restoration for the cervical cavities is difficult. Even though the amalgam has been used for onlay restoration [15], it has not been tried as an inlay restoration for the extensive cervical lesion. Glass ionomer cement has shown to have a good bonding ability to amalgam and also can prevent microleakage when used as a liner under amalgam restoration [16, 17]. Hence, in the present case glass ionomer (Fuji I) was used to cement the inlay to the cervical abrasion cavity.

CONCLUSION

This novel technique of amalgam inlay provides an alternative method of restoring a tooth especially in elderly patient, where conventional amalgam restoration is difficult to be placed. However, further clinical cases of amalgam inlay in different types of cavities are warranted to establish the long-term results of this novel technique.

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