

Is it essentially required to Provide Crowns to Endodontically Treated Maxillary Premolars? A Clinical Study Determining Success Ratio between the Direct Restorations and Full Coverage Prosthesis in Maxillary Premolars

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ABSTRACT

Aim: To evaluate the success outcome of direct restorations as compared to metal ceramic crowns in endodontically treated maxillary first premolars.

Methods: This descriptive study was carried out at Akhtar Saeed Dental Hospital, Bahria Town, Lahore from 1st July 2016 to 31st December 2016. A total number of 88 patients were selected. Sixty seven patients were male and 21 were females. All the patients had got their maxillary first premolar (right or left) root filled. All the teeth were sound and having maximum bulk of enamel in the buccal aspect. The patients were categorized randomly into three groups. Group 1 received full coverage metal ceramic crown. Group 2 got the silver amalgam restoration and group 3 received the resin composite fillings. The evaluation of all three groups were performed at six months interval and finally evaluated at the end of 12th month. All evaluations were by the modified Ryge criteria.

Results: The null hypothesis was accepted. The obtained result was not declared to be significant at $p < 0.05$.

Conclusion: Indirect restoration may be a good option for the endodontically treated maxillary first premolars regarding the longevity of tooth and being socioeconomically beneficial for the patients.

Keywords: Resin Composite, Amalgam, Ceramic, Esthetics, Bruxism, Endodontics

INTRODUCTION

The teeth are an important part of our body that plays a vital role in chewing, biting, mastication, speech and aesthetics. In fact, they are great blessings of Allah (SWT). Almighty Allah says in the Holy Quran, "And if all the trees on the earth were pens and the sea (were ink wherewith to write), with seven seas behind it to add to its (supply), yet the Words of Allah would not be exhausted. Verily, Allah is All-mighty All-Wise" (Surah Luqman). This means we are unable to even imagine the blessings of Allah (SWT) bestowed upon us.

The decaying of the teeth is common phenomena present in the community. Ironically, this decaying of teeth is mostly due to the lack of oral hygiene. In addition, there are a number of etiological factors that are responsible for the decaying of teeth.

In fact the genetic factor has also been discovered as a risk factor for dental caries.¹ This decaying process leads to the breakdown of the tooth structure and results in the cavity formation. This cavity may further aggravate the carious and the defect remains a stagnation point for the food, debris and bacteria. All these associated phenomena deteriorate the tooth structure and ultimately formation of a gross lesion that may contact directly to the dental pulp. This progression of lesion if not treated in time causes irreversible pulpitis and loss of tooth vitality. Whenever the tooth loses vitality due to carious lesion and becomes non-vital, it needs special treatment protocols in order to preserve it. This procedure is termed as endodontics. The posterior teeth are meant for chewing and biting with heavy forces applied to crush the food. Among them, the premolars are less bulky and small as compared to the molars. Whenever these premolars are treated endodontically, their bulk is further reduced making them weaker and liable to fracture. Because endodontic procedure makes tooth free of dental pulp, this space occupied by the pulp is taken over by the restorative material later on at completion of treatment. It has been widely accepted that the root filled tooth may need full coverage prosthesis in order to increase its longevity. Improvements in esthetics

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are also a major plus point in this aspect. Moreover increased aesthetic satisfaction has also been documented in patients having their premolars retained².

But the question lies which is best for the patient? Is it essential for the treated tooth to get full coverage crown or there might be any other good alternate that may be as successful as the crown. In this study, we want to judge the alternates of the direct restorations in addition to the crown in root filled maxillary premolars. The masticatory function is a complex phenomena that involves the teeth, muscles of mastication, the condyles and the occlusal harmony.³ First molar and the premolars are most working teeth while chewing. It is thought that 90% of mastication involves first molar and premolars³. The endodontic procedure involves the preparation of the canals which weakens the tooth due to reduction in tooth bulk. Thus root filled tooth is more likely to fracture especially in case of having compromised remains. In such type of cases, longitudinal fracture is observed more commonly.⁴

Azodo et al⁵ claimed the frequency of split tooth being 8% and 5% in maxillary first and second premolars. Our aim is to find out the success of these restorations. Two treatment modalities are there for restoration of tooth, direct restoration and the indirect restoration. Direct restoration involves the filling of the tooth directly by a restorative material like silver amalgam, resin composite and glass ionomer cements in the prepared cavity. The indirect restoration involves the crowns of ceramic or metal and inlays, onlays etc. The use of these types of restorations depends upon the condition of the tooth remaining structure and its feasibility to restore. Silver amalgam has been used since long as a good restorative material. This material has a good compressive strength and wonderful retentive feature. This material has advantage of being used as a sole restorative material as well as the core build-ups in case of grossly damaged teeth that require the crown. The other beneficial properties include the increased marginal integrity with passage of time due to corrosion by-products formed in between the tooth restoration interface. The resin composite is a material of new era. It has got a lot of modifications in its composition since invention to make it better and successful restorative material. Different types of resin composites have been innovated for the anterior and posterior teeth. A new flow able type has also been developed for ease of fillings in class II cavities. This type is meant for filling of the proximal box of posterior teeth to ensure a thorough voids free compact restoration in this area of cavity. This is further supported by the conventional condensable resin material. In this study

we would try to find out how successful is the direct restoration as compared to the indirect full coverage crown in maxillary premolars.

PATIENTS AND METHODS

This descriptive study was carried out at Akhtar Saeed Dental Hospital, Bahria Town, Lahore from 1st July 2016 to 31st December 2016. A total number of 88 patients were selected. Sixty seven patients were male and 21 were females. All the patients had got their maxillary first premolar (right or left) root filled. To be on safe side only those cases were selected to take part in the study who had finalized their endodontics at least two months before. The rationale was to avoid and asses any signs and symptoms of failures. At the start of the treatment the periapical radiographs were taken to assess and evaluate the periapex, sound bone structure and adjacent periodontium. The oral hygiene of all the patients was good and they were further briefed to maintain it after having the restorations. All the teeth were sound and having maximum bulk of enamel in the buccal aspect. Some teeth had slightly broken palatal cusp but there was no need for any post or core. These were restorable by the direct restorations. The patients were categorized randomly into three groups. Group 1 received full coverage metal ceramic crown. Group 2 got the silver amalgam restoration and group 3 received the resin composite fillings. The cavity was filled with either silver amalgam or the resin composite before the start of crown preparation. For metal ceramic crown, the preparation was done by the air turbine and copious irrigation. Tapering fissure bur was used and shoulder margin was prepared in the halfway the measured depth of gingival crevice. Occlusal surface was prepared by the diamond wheel bur according to the cuspal contours.. For amalgam restoration, whole box like cavity was made. The pulp chamber was made free of gutta percha and was made smooth so that the remaining root fillings were leveled to floor giving a uniform neat and smear free appearance. The silver amalgam was then filled into the cavity and contoured and finally occlusion was checked. The patient was instructed not to eat from that side until 24 hours. For resin composite restorations, three steps etch and rinse system was used. The obturation material was removed from the pulp chamber and the tooth was isolated with cotton rolls. Acid etching was done for upto one minute. Then it was washed out and adhesive resin was applied on all the inner surface of the tooth cavity. After that the packable restorative resin composite was introduced into the cavity in smaller increments. Each increment was cured and followed by the next one. In this way

restoration was completed. At the end, the occlusion was checked. The evaluation of all three groups was performed at six months interval and finally documented at the end of 12th month. These all were examined and evaluated carefully by the modified Ryge criteria.⁶ The data was entered and analysed in SPSS 20.

RESULTS

The Chi square statistic value obtained with degree of freedom (Df) 2 is 0.0506. The critical value is 5.9915 and p-value is 0.975006. The result is not significant at p<0.05. Therefore, what stands out in tables are that we cannot reject the null hypothesis in our obtained data (Table 1-2).

Table 1: Frequency of successful and failure of patients

| Restoration Type | Successful | Failure | Total |
|--------------------------------|------------|---------|-------|
| Porcelain fused to metal crown | 19 | 06 | 25 |
| Silver amalgam restoration | 20 | 06 | 26 |
| Resin composite | 29 | 08 | 37 |
| Total | 68 | 20 | 88 |

Table 2: Contingency table with expected values and Chi square statistic for each cell

| Restoration Type | Successful | Failure |
|--------------------------------|--------------|-------------|
| Porcelain fused to metal crown | 19.32 (0.01) | 5.68 (0.02) |
| Silver amalgam restoration | 20.09 (0.00) | 5.91 (0.00) |
| Resin composite | 28.59 (0.01) | 8.41 (0.02) |

DISCUSSION

The non-vital or root canal treated teeth pose a challenge to the clinician. The primary concern of the patient is to restore the tooth in its original form without any gross difference from the natural one. The maxillary premolars are also part of smile and are visible during smiling. While smiling, the side spaces that are marked between the posterior teeth and lip corner are called buccal corridors.⁷ This space is a pronounced factor in smile analysis. It is measured in reference to the buccal aspect of maxillary premolars. So a properly restored maxillary premolar may directly affect the smile analysis. Therefore, the emphasis should be given on the exact replica in accordance to the natural tooth. It would be possible only when there is minimum intervention applied to the tooth. Thus restoring the tooth would be a better option instead of the full coverage prosthesis.⁷ Taking in account the tooth wear and metal ceramic crown, porcelain causes a significant wear of the enamel tissue.⁸ An extracted

tooth may result in the drifting of the adjacent teeth and thus an initiative for the malocclusion. The damage caused to the tooth may not only create complications but also the deteriorating effect to the prosthesis as well. According to Corazza et al⁹, the loading impact of the porcelain can result in the success or failure of the porcelain as the directly applied force on the cuspal areas can be more damaging. What is distinctive in their study is the failure of the restoration. The exact inter digitations in the occlusion may change due to drifting of teeth. Moreover, there is no alternative of a natural tooth. So the increased awareness about the dental health and the associated diseases in the community lead to patient defending about the conservation of what is left. On the other hand, resin composite is also considered as one of most accepting restorative material in both the anterior as well as posterior teeth. Result of some researchers is writ large in the aspect of good survival rate of composite, and the failure rate is only 1%-3% annually¹⁰. It has been a common practice to give a crown to the root filled tooth. Also there are a number of reasons for the composite failures in posterior teeth and main reason includes the recurrent caries and the restoration fracture.¹¹ Sande et al¹² have shown that this failure of composite is more in patients who are having high caries risk. Thus, there is clear relationship between them. Some investigators have also concluded that the failure rate was increased in children who had high DMFT index¹³.

So, the direct restorations like amalgam and resin composite are good alternate. Our objective was to assess the successfulness of the direct restorative materials in the root filled maxillary premolars as compared to full coverage metal ceramic crown. Generally it is thought that the root filled teeth have compromised tooth bulk and thus they need crown to increase the strength of very tooth. In case of bruxism, the restorative failure is mainly the fracture¹⁴. The effects of the parafunctional habits has also been observed in the amalgam restorations¹⁵. It has also been observed that the survival of the restorations were more marked in the patients having a good socioeconomic status as compared to the poor patients.¹⁶ This finding is still under research and need to be probed further. As it has been mentioned earlier that the main reason for the restoration failure is the secondary caries¹⁷, there has always been an increased demand by the patients to enhance the aesthetics. Strategies to enhance aesthetics might involve selection of the material. Therefore, the resin composite remains a good choice for the patients in order to meet their needs. The commonly used restorative materials are not successful in case of

grossly damaged tooth lacking main bulk. Our study results show that there is no significant difference among the two types of restorations and the crown given to the teeth. These conventional restorations are easy to manipulate and whole procedure may be done in a single visit. No catastrophic failure was observed in any of the three categories. The failure reasons for crown included the chipping of the porcelain in four cases while one case had mobile restoration and other case had extended crevice with deep penetration. In the direct restorations placed there were 2 cases each observed in the amalgam and resin composite that lost the marginal integrity and went to failure. In case of resin restorations 6 restorations got the fracture and were missing at the end of study. However, 4 cases with loss of marginal integrity were observed in the amalgam restorations. Two important themes emerge from the discussion so far, one being the ease of treatment manipulation and secondly the affordable cost of the direct restoration in socioeconomic glance.

CONCLUSION

The treatment planning for crown is not only difficult and time consuming but it may also be a burden on the patient to pay the extra cost of fabrication and fee of clinician. So it should be emphasized that in the maxillary premolars that have gone under endodontic procedure should be restored by the conventional direct restorative materials. The full coverage crown option should be reserved only for the badly decayed teeth. Whole ball of wax at conclusion is that the crown is necessary in case of gross tooth fracture, endodontically treated tooth with significant tooth damage and other associated conditions. It should not be considered merely an indication for a root filled tooth. Dentist should always brief the patient about all the pros and cons of the treatment performed and whatever floats his boat. However, more research on this topic needs to be undertaken before making a strong decision.

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