REVIEW ARTICLE

SHARONLAY – A NEW DESIGN OF RESTORATION

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Abstract

A tooth after non-surgical endodontic treatment needs an immediate post endodontic restoration to prevent it from fracture under occlusal load. After an endodontic treatment a tooth gets structurally compromised due to various factorslikeaccess cavity preparation and instrumentation, decreased dentinal moisture after endodontic treatment and presence of pre-existing carious lesion or fracture, trauma, parafunctional habits like bruxism, attrition etc. Failure rate of uncrowned or unrestored endodontically treated teeth is six times greater than that of coronally restored endodontically treated tooth. Most of the time a tooth can be restored as a full coverage crown or onlay after endodontic treatment depending on the amount of remaining tooth structure aftertreatment. Only full crown or onlay does not prevent horizontal fracture of tooth that occurs due to shear forces of mastication so many a times radicular support is taken to retain coronal restoration and strengthening of cervical region of tooth.In case of structurally compromised tooth cast post and core is provided to gain additional resistance to fracture. But many times it is not feasible to fabricate cast post in various clinical situation. Researchers are developing newer methods to improve function of tooth and restoration in such cases. Among them one is sharonlay. Sharonlay is an onlay design where a post extends from onlay into the radicular portion of the tooth providing cervical reinforcement against horizontal forces acting at cervical region.

Key Words Endodontically treated tooth, Post-endodontic restoration, onlay, crown, sharonlay.

INTRODUCTION

A non-surgical endodontic treatment is considered complete only after the post obturation proper permanent restoration is done.[1] Delay in definitive restoration after obturation for long time increases the risks of periapical recontamination, fracture and future failure. A potential cause of endodontic failure is bacterial recontamination of the root canal from the oral cavity, due to loss of temporary restorations or leakage of an inadequate final restoration.[2] The objectives of a restoration after non-surgical endodontic treatment are: to restore form, function and aesthetics, to prevent bacterial micro-leakage into the root canal system, to ensure periodontal health, to protect the residual tooth structure against fracture, to prevent fracture and wear of the restoration and the abrasion of the antagonistic teeth. In order to prevent coronal micro-leakage it is better to commence the final restoration as immediately as possible after endodontic treatment, preferable on the same day of the completion of the non-surgical endodontic treatment completion/obturation. Restoration of endodontically treated teeth can be challenging due to structural differences between vital and non-vital root filled teeth. Dentin dehydration, reduction

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of micro-hardness, collagen alteration, effects of irrigants and medicaments and especially bio-mechanical changes like loss of tooth structure, loss of proprioception due to the endodontic treatment, increase the susceptibility to dental fracture.[2] There are variety of methods used to provide radicular support in the form of full coverage crown and other forms of cusp coverage such as gold, ceramic, composite onlays or cusp coverage amalgam can also be considered in appropriate clinical situations.[3] The treated tooth is susceptible to fracture under occlusal load if proper coronal protection is not provided due to increased brittleness after treatment.[4] In cases where the buccal and lingual surfaces are adequate after endodontic treatment, partial coverage with onlay is indicated with adequate resistance form and more conservative approach than full coverage crown.[5]

A decision to provide a full crown or an onlay depends on the remaining tooth structure; if the cuspal width to length ratio is 1:2 or more, an onlay can be placed.[6] When the ratio is less than 1:2, a full crown has to be planned. In single-rooted teeth, cast post and core or a prefabricated post has shown similar long-term results.[7] Single rooted premolars are subjected to more compressive and tensile forces. In cases of premolars, they are subjected to horizontally acting forces at the cervical region. Thus a post is preferred to counter the horizontal forces by providing adequate cervical reinforcement along with a coronal restoration to counter the occlusal load.[8-13] The purpose of the core restoration, with a post, is to replace lost dentin, provide internal support and better retention for the crown and ensure resistancea gainst cervical tooth fracture. Sharonlay is a new onlay design where a post extends into the radicular portion of the endodontically treated tooth with an onlay as a coronal restoration. The post extending into the radicular portion of the premolar provides the required reinforcement in a conservative manner and protects it against both vertical and horizontal forces whereas the onlay component protects the endodontically treated premolar from fracture under compressive load. Herewith we would like to discuss about sharonlay as a new design of restoration after non surgical endodontic treatment.

According to literature search - Indications for sharonlay are

1. In single-rooted premolars,
2. Teeth with short clinical crown
3. In premolars with two roots where at least one of the roots is parallel to the line of draw planned for the onlay.
4. In single-rooted molars where additional retention by means of extension into root canal is required.

Contraindication are -

1. Extensively damaged crown which cannot support an Onlay.
2. Where extensive radicular dentin removal is required to align the post with the Onlay specially in mandibular first premolar where crown is inclined at 30° to the root.

Materials Used for fabrication of Sharonlay are–

1. Base metal alloy,
2. Cast Gold alloy
3. Ceramic (CAD-CAM).

Fabrication of Sharonlay with cast metal

Non-surgical endodontic treatment is to be done first. After obturation the canal for post is enlarged up to minimum 7mm lengthfrom the canal orifice depending upon the root length. If additional retention is required, the canal may be enlarged more than 7mm depending upon the canal configuration and root length. If crown length is less, a shorter post may be opted. The canal is enlarged with any one of the Peeso reamers, Number #3, #4, #5 (corresponding to file size 110, 130, 140)depending on the initial canal diameter to avoid excessive tooth structure removal at the cervical region. Internal walls of the coronal cavity are finished with 5° taper on each wall. The buccal and lingual cuspsare reduced1-2 mm depending on the choice of material i.e. metal / zirconia used for the restoration based on amount of remaining coronal tooth structure. Contact points are kept intact, 0.5 mm counter bevel is given on buccal cusps for esthetic purpose and 1 mm on lingual cusps is placed for the esthetic requirements and to obtain the hooding effect. Post space impression is take neither by direct method with inlay wax (Type I) or by indirect method with rubber base material. For rubber base impression first full arch impression is made with heavy body rubber base impression final impression of post space is made with impression pin and light body rubber base material. After impression a removable die is prepared and a wax pattern is made (Type II inlay wax).Casting is done according to material used by routine casting procedure. After recovery of casting, finishing and polishing is done as required and try in is done on the die before trying in the patient's mouth. In patient mouth occlusion, contour and contact is checked and then final polishing is done. After that sharonlay is cemented into the tooth with an adhesive luting cement.

Fabrication of Sharonlay by CAD-CAM technology -

Sharonlay can be prepared with zirconia using CAD-CAM (Cerec). It requires extensive tooth preparation because there is possibility of fracture at the post-onlay junction if post is narrow. Thus larger post space preparation is preferred but there are

difficulties in preparing post length of greater than 7 mm through CAD-CAM procedures.

Advantages of CAD CAM:

- ▸ Good Esthetic
- ▸ Shade matching is easy
- ▸ Can be prepared multiple times
- ▸ No classical impression making procedure
- ▸ No laboratory work.

Disadvantages of CAD CAM:

- ▸ Extensive and meticulous tooth preparation may required
- ▸ Prone to fracture at the post onlay junction if post is narrow.
- ▸ Less conservative preparation.

DISCUSSION

Successful function of tooth after root canal treatment depends on various factors. The biomechanical changes due to the root canal treatment and the degree of healthy dental tissue lost because of pathology and iatrogenic factors are the critical points leading the clinician to the restorative treatment planning. The full crown is considered as the gold standard according to the literature and is indicated in case of teeth that are heavily weakened by dental caries, fractures or previous conservative-prosthetic preparations. Adhesive overlays preserve coronal structure, avoid contamination of the root canal system, reinforce residual dental tissues, guarantee optimal form, function, and aesthetics and offer ergonomic and economic undoubted clinical advantages. The success of an endodontic treatment is dependent on the final restoration of the tooth. Cusp fracture is a common occurrence in endodontically treated teeth if only intra-coronal restorations are done. Loss of strategic internal architecture of the tooth leads to increased

	Crown	Onlay	POST and core+ crown	**Sharonlay**
1	Circumferential as well as occlusal reduction - up to 1.5 mm is required	Only occlusal 1mm reduction of tooth is required	Radicular and coronal tooth structure reduction is required	Only occlusal 1mm reduction of tooth is required
2	Contact point is broken	Contact point is intact	Contact point is intact	Contact point is intact
3	Made up of metal , metal ceramic or only all ceramic	Made up of metal or only All ceramic	Made up of metal, metal ceramic or All ceramic	Made up of metal, metal ceramic or only ceramic
4	multiple appointments are required	Two appointments are required	multiple appointments are required	Two appointments are required
5	Made with indirect method of impression only	Made with direct or indirect of impression method	Made with indirect method of impression only	Made with direct or indirect method of impression
6	Proper laboratory support required	Proper laboratory support required	Proper laboratory support required	Proper laboratory support required
7	Provide esthetic if made from ceramic	Provide esthetic	Provide esthetic if made from ceramic	Provide esthetic
8	No conservation of tooth structure	conservation of tooth structure	No conservation of tooth structure	conservation of tooth structure
9	Not very Economic	Economic	Not very Economic	Economic
10	Failure occurs due to shear forces lead to fracture at cervical region	Failure occurs due to shear forces lead to fracture at cervical region	Failure occurs due to root facture if metal post and due to debonding if fiber post is used	Very less chances of failure

Figure 1

(a) Tooth prepared to receive SHARONLAY

(b) Coronal tooth preparation with buccal and lingualreverse bevel

Figure 2

(c) Cemented SHARONLAY on tooth

(d) Postcementation radiograph of tooth with SHARONLAY

*Picture courtesy : Dr. S M Sharath Chandra

cuspdeflection during occlusal function, which is most pronounced in endodontically treated bicuspids.[2] The clinical longevity of endodontically treated posterior teeth (molars and bicuspids) is significantly improved with coronal coverage. Placement of a crown to encircle the tooth can increase the resistance of posterior teeth to fracture. The main cause of failure of endodontically treated tooth is fracture. The fracture resistance of endodontically treated teeth to horizontal and vertical forces is related to the remaining amount of healthy dentin. The main objective during the endodontic treatment and thereafter coronal restoration is maximum conservation of internal dentin. Adequate remaining healthy dentin tissue is good to combat fracture due to vertical and horizontal forces.[3] Vire(1991) evaluated and classified failures of endodontically treated teeth according to prosthodontic, periodontic, and endodontic categories. Teeth that had been crowned had a greater longevity (87 months) than uncrowned tooth (50 months). Interestingly, of the 116 endodontically treated teeth, 59.4 % were prosthetic failures, primarily due to crown fracture. Posterior teeth after endodontic treatment gets structurally more weakened in cases of MO, DO or MOD preparations where it is subjected to more occlusal loading. This type of cuspal deflection creates stress within the tooth and can lead to catastrophic coronal fractures (Fennis et al. 2002). Based on these findings, it is suggested that all posterior teeth receive full-coverage restorations following endodontic treatment. The only exception to this rule may be the mandibular first premolar. In some cases, when the lingual cusp of this tooth is underdeveloped, it may not be subject to the wedging forces of opposing cusps when restored with an occlusal repair of the endodontic access (Hansen et al. 1990). Thus to conserve more tooth structure in cases of premolars onlay is preferred. But the premolars are subjected to sheer forces that tend to fracture the tooth at the cervical region. A post fabrication in these cases prevents the fracture by cervical reinforcement.[14-15] Adequate length, taper and diameter of the post depend on the root morphology and canal configuration. Sharonlay is new design of onlay with post. In Sharonlay the post and the onlay component acts as a single unit to counter the forces on treated

tooth. It will preserve the contact points and reinforce the cervical region of tooth.[1] That is why it was introduced in clinical practice of dentistry. Many researchers have done case study for that and it was proven successful. Direct adhesive restorations, indirect bonded restorations and traditional full crown are three therapeutic options for the single posterior endodontically treated teeth,16 among them sharonlay is new option where root length is short and canal are narrow.

CONCLUSION

The amount of remaining sound tooth structure is the most significant factor influencing the therapeutic approach after endodontic treatment. Because of more failure rate of full crown, onlay, and post and core restoration a new design sharonlay is good alternative for restoration of endodontically treated teeth where more shear forces are acting on tooth during mastication. The clinician's operative skill is a determining aspect for long-term success of adhesive restorations.

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