



A CLASSIFICATION SYSTEM FOR SELECTING TREATMENT OPTIONS FOR POSTERIOR POST ENDODONTIC SITUATIONS

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ABSTRACT

Post endodontic restoration is one of the most important steps after root canal treatment and before placement of crown. There is a dire need for a classification so that dental practitioners can visualize and communicate with fellow dental practitioners as well as with patients for a proper treatment planning. It is also important from an academic point of view while training the dental students. The conditions of the remaining dentinal structure always determine the support for the post endodontic restoration. The system of classification for posterior teeth given here has five classes with two categories and three modifications for each class the height of the remaining dentinal wall in the defect area has also been addressed. This system of classification also aims at prescribing the mode of treatment for each class, defect, type and modification.

KEYWORDS : post endodontic restoration, Classification, Class, Defect, Type and Modification.

INTRODUCTION

Post endodontic restoration is the most essential step connecting the process of rehabilitation of an infected tooth with root canal followed by crown. The prognosis and long term success of the final crown is determined by the remaining healthy dentinal structure and the post endodontic restorations that are planned. The restoration of endodontically treated teeth has undergone significant changes in the last 20 years. Most of these changes are associated with the preservation of tooth structure¹. The support for the endodontically treated tooth depends on the condition of the remaining dentinal structure. Loss of tooth structure from caries, trauma or both makes the endodontically treated teeth more susceptible to fracture^{2, 3}. Many teeth that require endodontic therapy, have been so damaged by caries, previous restorations, and the endodontic access that limited coronal structure remains to be used for retaining the final structure. Traditionally a pulpless tooth received a dowel to reinforce it and a crown to protect it⁴. But some studies suggest that a post should be used only when there is insufficient tooth substance remaining to support the final restoration⁵. There are at times severe undermining of the lesion that masks the severity of the destruction. All these suggest that a classification system is required for proper treatment planning regarding the need for crown lengthening, use of a permanent restoration or a post and core either a prefabricated, custom made, or a fiber post. A classification system helps in proper visualization and communication among practitioners and students of dentistry for their academic training.

CLASSIFICATION

The classification is based on four factors The presence or absence of four walls of the tooth i.e., buccal, lingual or palatal, mesial and distal Height of the dentinal wall in the defect area The remaining dentinal wall around the pulp cavity The occlusogingival length of the crown The presence or absence of four walls of the tooth i.e., buccal, lingual or palatal, mesial and distal determines the class. The remaining dentinal wall that is taken into consideration should extend more than half of the tooth on that side. There are 5 classes, from Class I to Class V.

Class I

In this case the pulp cavity is surrounded by dentinal wall on all sides. The four walls are the buccal wall, lingual or palatal wall, mesial

and distal wall. The dentinal wall should have a vertical height of more than 2mm. (Fig. 1)

Class II

In this class the pulp cavity is surrounded by a continuous dentinal wall on three sides and there is a defect on one wall. (Fig. 2)

Class III

In this class the pulp cavity is surrounded by a dentinal wall on two sides and there are defects on remaining two sides. (Fig. 3)

Class IV

In this class the pulpal cavity is surrounded by a dentinal wall only on one side and defects on three sides. (Fig. 4)

Class V

In this class the dentinal wall is completely absent, except for 1 – 2 mm of vertical wall around the pulp cavity to be used as ferrule effect. (Fig. 5)

After the carious lesion is removed, the height of the remaining dentinal structure left in the defect side may be minimal or at times extend upto the gingival. Defect is considered only if the height of the remaining dentinal wall has a minimum of 2mm from the gingival finish line. If the height of the wall involving the defect is more than 2mm, it is not considered as a defect. There are three types of defect

Defect 1

Vertical height of the defect is just 1-2mm above the gingival

Defect 2

The tooth structure is at the gingival line

Defect 3

The tooth structure is below the gingival line.

Each of the above class is further subdivided into two types depending on the presence or absence of the undermined dentine adjacent to the pulp cavity.

Type A

Here dentinal wall is present adjacent to the pulpal cavity. (Fig. 9)

Type B

In this type, there is no dentinal wall adjacent to the pulp cavity. (Fig. 10)

Each type is further divided into three modifications according to the height of the crown.

Modification

Occluso-gingival length is important in both retention and resistance of a crown. The modification is primarily determined by the occluso-gingival length of the tooth⁴.

Modification 1

More than half of the vertical height of the tooth is present. (Fig. 6)

Modification 2

Half of the vertical height of the tooth is present. (Fig. 7)

Modification 3

Less than half of the vertical height of the tooth is present. (Fig. 8)

TABLE 1

	MODIFICATION 1	MODIFICATION 2	MODIFICATION 3	DEFECT 1	DEFECT 2	DEFECT 3
CLASS I	PF	PF	FB,CP			
CLASS II	PF	PF	PFP+A,FB,CP	PF	PF	CL
CLASS III	PFP	PFP+A,FB	FB,CP	PFP	FB	CL
CLASS IV	FB	FB,CP	FB,CP	FB,CP	FB,CP	CL
CLASS V	No modification in class V situation Treatment of choice is FB, CP					

Extension of the abbreviation
 PF – permanent filling, PFP – pre fabricated post, PFP+A – prefabricated post with additional pins, FB- fibre post, CP – custom post, CL – crown lengthening,

Criteria to be considered for classification

The tooth should be classified only after complete removal of carious lesion and preparation of access cavity for endodontic therapy.

A wall should have a vertical height of more than 2mm or extend more than half of the tooth on that side, if it has to be included in the classification

If there is difficulty in determining the occlusogingival height of the tooth due to destruction =, the occlusogingival height of the adjacent teeth is taken into consideration Class V situation does not have any modification.

If the height of the wall involving the defect is more than 2mm, it is not considered as a defect.

There is no defect in Class V situation.

Table 2

CLASS	TYPE A	TYPE B
CLASS I	PF	PFP, FB
CLASS II	PF	PFP+A, FB
CLASS III	PFP, FB	PFP+A, FB, CP
CLASS IV	FB	FB, CP



FIG.1 CLASS I

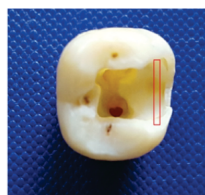


FIG.2 CLASS II

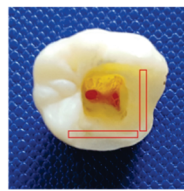


FIG.3 CLASS III

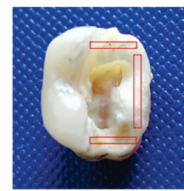


FIG.4 CLASS IV

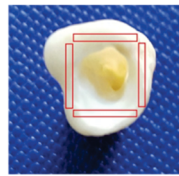


FIG.5 CLASS V

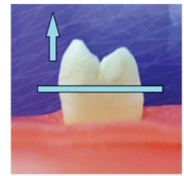


FIG.6 MODIFICATION 1

DISCUSSION

Endodontically treated tooth should be properly restored before going for crown preparation. Any remnant caries should be removed completely during the initial stages of root canal treatment¹. The decision to restore the tooth with a permanent filling material or a post and core depends on the remaining sound dentinal layer. There is no particular criteria to do a treatment plan in such cases. Most often it depends on individual preference. The amount of tooth structure destroyed is only one of the factors to be considered in selecting a restorative material and designing a preparation. Equally important is the location of the destruction and the amount of tooth structure involved. Location can be classified as peripheral occurring on the axial surface of the tooth; central, in the centre of the tooth, or combined, with destruction on both sites⁶. The construction of a core buildup is necessary as the amount of residual tooth substance decreases and the build-up augments the development of retention and resistance provided by the remaining tooth structure⁷. The greatest factor influencing the strength of endodontically treated teeth was the amount of remaining tooth structure. If a tooth is not fractured or severely damaged by caries before endodontic treatment, it may be sufficient to treat the endodontic access with a simple restoration³.

A classification system is the need of the hour. It is important while training students so that they can easily decide the treatment plan. This will also be helpful for proper visualization and communication between practitioners. The classification is based on four factors, the presence or absence of the dentinal wall, i.e., buccal, lingual or palatal, mesial or distal that determines the class, the height of the dentinal wall in the defect area that determines the defect, the presence or absence of undermined dentine that determines the modification. The presence of a dentinal wall adjacent to the pulp cavity is important when choosing different post systems. Active posts derive retention directly from the root dentine by the use of threads whereas passive posts gain retention passively seating in close proximity on the luting cement for their retention⁹.

According to Shillingberg, a minimum of 1-2 mm vertical wall is necessary for restoring the tooth⁴. This is the reason why Class V has been given the base line to decide whether the tooth needs to be extracted or restored. Cast crowns with ferrule, reduces the cervical stress by distributing the stress along the entire root¹⁰. To accommodate this multidimensional problem within the classification, the dentinal wall that has been lost due to the defect was also considered. Occlusogingival length is an important factor while determining the retention and resistance of a crown. For restoration to succeed, the length must be great enough to interfere with the arc of casing pivoting about a point on the margin on the opposite side of the restoration⁴. There will be many situations in which subgingival margins are unavoidable, because preparation length is such an important factor in resistance and retention^{11, 12}. The placement of finish lines can be altered from ideal location by caries^{11, 12}. Crown lengthening may be done to surgically move the

alveolar crest 3mm apical to the location of the proposed finish line to guarantee the biological width and prevent periodontal pathology⁴. Planning is required not just to provide support to the core but also to plan the final finish line for the crown. This classification system helps to plan whether; crown lengthening is required before going for the crown preparation. Whenever we encounter a defect 3 situation, crown lengthening has to be kept as a treatment option if required.

The classification helps us to decide regarding the type of restorations for posterior teeth as well as the post systems to support the core. Different types of post systems are available to treat endodontically treated tooth. Metal posts may be active or passive, tapered or parallel, custom cast post and core^{9, 13}. Non-metallic posts available are Fibre reinforced resin post systems, carbon fibre posts and ceramic or zirconium posts^{9,13}.

Most endodontically treated molars do not require a post because they have more tooth substance and a larger pulp chamber to retain a core build up¹⁴. This is true in case of Class I, Class II, Class I Type A, Class II Type A, Class I Modification 1, Class I Modification 2 and Class II Modification 1 and 2. When core retention still is insufficient after a single post is inserted, placement of pins can be considered for additional retention¹⁴. Prefabricated post for single canal can be planned for Class I Type B, Class III Type A and Class III Modification 1. Single posts with additional pins can be considered for Class II Type B, Class III Type B, Class II Modification 3 and Class III Modification 2 (refer table I and II).

Although recent trends in clinical practice has been towards non-metal bonded post systems which seems promising, the research is not entirely supportive and there are still unanswered questions¹³. Non metallic posts like fibre posts strengthen the roots at least for a short time, due to their bonding effect. But this strengthening effect is probably lost with time¹⁵. Fibre posts offer good results for Class I Modification 3, Class II Modification 3, Class III Modification 2 and 3, Class IV, Class V, Class I Type B, class II Type B, Class III Type A, Type B, Class IV Type A, B and Class V cases. Base metal alloys have been used for custom cast post and core, but their hardness may be a major disadvantage in adjustment and may predispose the tooth to root fracture. Many practitioners prefer to use a cast gold post and core for endodontically treated anterior teeth. The major disadvantage is esthetics, as the metal shows through the all- ceramic restorations. Another disadvantage is that it requires two visits and laboratory fabrication⁸. Custom made cast post and core can be selected for Class I Modification 3, Class II Modification 3, Class IV Modification 2 and 3, Class V, Class III Type B and Class IV Type B (refer table I and II). Resin based composites have good strength, low stability and good esthetics⁸. Glass ionomer cement has weak tensile strength, compressive strength, low fracture resistance, poor condensability and high solubility¹⁵. Therefore, the use of glass ionomer cement as core material should be avoided⁹. One in vitro study comparing resin based composites, amalgam and cast gold as core material under a crown in endodontically treated teeth found no significant difference in fracture and failure characteristics among these materials, provided a 2mm ferrule existed on the margin of healthy tooth substance¹⁶. When we encounter a defect 3 situation, where the tooth lies below the gingival margin, crown lengthening is required (refer table 1).

CONCLUSION

Post endodontic restoration is one of the most important steps in rehabilitation of an endodontically treated tooth. The multidimensional nature of the destruction causes confusion even among experienced practitioners regarding the selection of treatment. The decision to go for a permanent restoration or choose which type of post system is best suited for a particular condition, or even the decision to go for crown lengthening treatment requires proper visualization and communication. In this regard a classification system is the need of the hour. In this article a classification system has been suggested catering to the needs of almost all aspects of an endodontically treated tooth. The

classification system may have certain limitations taking into account the complex nature of tooth destruction. Further modifications may be required to accommodate the vast sea of defects.

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