

## **Association Between Number Of Walls Present And The Type Of Post Used In Maxillary Premolars - An Institution Based Retrospective Study**

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### **Abstract**

Most Endodontically Treated Teeth Require Post And Core For Restoring The Tooth Back To Its Form And Function. Selection Of An Ideal Post And Core System Poses A Challenge To The Clinicians As It Is Influenced By Several Factors Including Tooth Anatomy, Tooth Position, Remaining Tooth Structure, Root Length And Configuration, Forces Acting On Tooth, Esthetics And Patient's Affordability. This Study Was Undertaken To Evaluate The Association Of Number Of Walls Remaining And The Type Of Post Selected In Endodontically Treated Maxillary Premolars. This Was A Retrospective Analysis Done In A University Setup. The Case Records Of Patients Who Underwent Root Canal Treatment In Maxillary Premolars And Required Restoration With Post And Core In The Period Between June 2019 To April 2020 Were Taken And Evaluated. All The Data Was Compiled And Tabulated In Microsoft Excel And Exported To Ibm Spss Version 20. Descriptive Analysis Done To Evaluate The Frequency Percentage And Chi Square Test Done To Find The Association Between The Type Of Posts And The Number Of Remaining Walls. The Level Of Significance Was Set At 0.05. No Significant Association Was Found Between The Type Of Post Used In Maxillary First And Second Premolars (P Value- 0.836; Chi Square Test). There Was A Significant Association Between The Type Of Post Used And The Number Of Walls Present (P Value- 0.013; Fisher's Exact Test). Within The Limitations Of This Study It Was Found That Prefabricated Metal Post Was Preferred Over Prefabricated Fiber Posts In The Restoration Of Maxillary Premolars Irrespective Of Number Of Walls Remaining There Was No Significant Difference In Post Selection For A Maxillary 1<sup>st</sup> & 2<sup>nd</sup> Premolars.

**Key Words:** Fiber Post; Maxillary Premolars; Metal Post; Prefabricated

### **1.Introduction**

Endodontically Treated Teeth Are Weakened Due To Extensive Loss Of Tooth Structure From Caries, Trauma Or Cavity Preparation <sup>1,2</sup>. Most Often, Endodontically Treated Teeth Require Post And Core For Restoring The Tooth Back To Its Form And Function. The Purpose Of A Post Is To Retain The Core Of The Endodontically Treated Tooth To Enable Placement Of A Permanent Full Coverage Restoration. Several Studies Have Shown That A Good Post Endodontic Restoration Prevents Leakage Of Fluids And Bacteria And Hence Critical For The Long Term Prognosis Of An Endodontically Treated Tooth <sup>3</sup>.

Selection Of An Ideal Post System Depends On Several Factors Including Tooth Anatomy, Tooth Position, Remaining Tooth Structure, Root Length And Configuration, Forces Acting On Tooth, Esthetics And Patient's Affordability<sup>4</sup>. The Complexities In Root Morphology And Canal Configuration And The Intensities And Directions Of Occlusal Forces Acting On The Teeth, Especially In Posterior Teeth Like The Premolars Makes Post Selection Even More Challenging<sup>5,6</sup>.

Maxillary Premolars, Owing To Their Position In The Dental Arch, Can Be Subjected To Both Vertical And Shear Stresses<sup>7,8</sup>. It Is Also Subjected To A Lot Of Non Axial Force<sup>9</sup>. Among Them, Shear Stress Is Found To Be More Detrimental To The Tooth Structure. In Addition, The Many Medicaments And Endodontic Procedures Also Make The Radicular Dentine More Vulnerable To Fracture.<sup>10,11</sup> Also, The Health Of Periodontium Must Not Be Compromised After Post Placement As The Excessive Forces Get Redirected Towards Periodontium.<sup>12</sup>

A Wide Array Of Post Systems Are Available In The Market For A Clinician To Choose From. Posts Are Available In Prefabricated Size And Shape Or Can Be Customised According To The Tooth. Based On The Material, It Can Be Either Metallic, Glass Or Carbon Fiber, Composite, Ceramic Or Zirconia Posts.<sup>13-14</sup>. The Mechanical Properties Of The Posts Determines Its Behavior Under Occlusal Loading.

For Optimal Function And Long Term Prognosis, The Physical Properties Of The Post Must Be Similar To That Of Dentin. A Post With An Elastic Modulus Comparable To That Of Dentin Flexes Along With The Tooth Under Occlusal Loading. However, It Must Also Possess Enough Rigidity To Resist Greater Occlusal Forces Without Distortion. Previously Our Team Has A Rich Experience In Working On Various Research Projects Across Multiple Disciplines The<sup>15-17,18-29</sup>.

This Study Was Conducted To Assess The Association Between The Number Of Walls Present And The Type Of Post Used In Endodontically Treated Maxillary Premolars.

## **2. Materials And Methods**

This Was A Retrospective Study Done In A University Setup. The Study Was Approved By The Research Ethics Committee Of Saveetha Dental College, Saveetha University. The Case Records Of Patients Who Visited Saveetha Dental College From June 2019 To March 2020 Was Evaluated. A Total Of 167 Endodontically Treated Maxillary First And Second Premolars That Required Post And Core Restoration Were Included In This Study. The Data Was Cross Verified To Minimise Bias. The Cases Were Grouped According To The Type Of Post Used (Prefabricated Metal Post And Prefabricated Fiber Post) And According To The Number Of Walls Remaining (1 Wall, 2 Walls, 3 Walls And 4 Walls). The Data Was Compiled And Tabulated In Microsoft Excel And Exported To Ibm Spss Version 20. Descriptive Analysis Was Done To Evaluate The Frequency And Percentage. Fisher's Exact Test And Chi Square Test Were Done To Find The Association Between The Type Of Posts With The Number Of Remaining Walls And Tooth Number, Respectively. The Level Of Significance Was Set At 0.05. The Results Were Presented In The Form Of Tables And Graphs.

## **3. Results And Discussion**

A Total Of 167 Endodontically Treated Maxillary Premolars Were Evaluated In This Study. It Included 71 (42.5%) Maxillary First Premolars And 96 (57.5%) Maxillary Second Premolars [Table 1]. According To The Number Of Walls Remaining, The Highest Number Of Maxillary Premolars Evaluated Had 2 Walls Remaining (53.3%), Followed By 3 Walls (34.1%), 4 Walls (7.2%) And 1 Wall Remaining (5.4%) [Table 2]. Prefabricated Metal Posts (91%) Were Used More Frequently Than Prefabricated Fiber Posts (9%) [Table 3].

Previous Studies Have Shown That Teeth With 2 Or More Walls Missing Require Post And Core For Restoration Of The Tooth. Posts Are Used When There Is Insufficient Tooth Structure Present To Support The Final Restoration<sup>3</sup>. In Accordance With That, Post And Core Was More Frequently Performed In Teeth With 2 Walls Remaining In Our Study And Only 7.2% Of Teeth That Underwent Post Placement Had All The 4 Walls Present [Table 2]. When Adequate Tooth Structure Is Present, A Post May Not Be Required For The Retention Of The Core. It May However Be Required When The Tooth Is Under Increased Functional Stress Or To Be Used As An Abutment<sup>30</sup>. Hence We Can See Only A Small Number Of Teeth Treated With Posts When All 4 Walls Were Remaining In This Study. When There Is Severe Loss Of Tooth Structure, A Custom Made Cast Post And Core Is Preferred Over Prefabricated Posts

## Association Between Number Of Walls Present And The Type Of Post Used In Maxillary Premolars - An Institution Based Retrospective Study

As They Have A Long History Of Clinical Success<sup>31</sup>. This Could Have Contributed To The Less Number Of Teeth That Had Only 1 Wall Remaining (5.4%) Being Restored With Prefabricated Posts As Seen In Our Study [Table 2].

Although The Number Of Prefabricated Metal Posts Were More, No Significant Association Was Found Between The Type Of Post Used In Maxillary First And Second Premolars (P Value- 0.836; Chi Square Test) [Table 4/Figure 1]. This Could Be Because Both The First And Second Premolars Are Subjected To Occlusal Forces Alike And Have Similar Function<sup>32</sup>.

We Can See From Table 3 That Prefabricated Metal Posts (91%) Were Used More Frequently Than Fiber Posts (9%). There Was A Significant Association Between The Type Of Post Used And The Number Of Walls Present (P Value- 0.013; Fisher's Exact Test) [Table 5/Figure2]. The Use Of Prefabricated Metal Posts Was Higher Than Fiber Posts Irrespective Of The Number Of Walls Remaining.

The Predominant Use Of Prefabricated Metal Posts As Seen In This Study Can Be Attributed To Several Factors. Several Previous Studies Have Shown That The Metal Posts Have Higher Fracture Strength Compared To The Glass Fiber Post<sup>33,34</sup>. The Metal Posts Are Also Easily Available And Economical As Compared To The Fiber Post. Fiber Post Systems Require Precise Etching And Bonding Protocols To Be Followed And Also Requires The Use Of Resin Luting Cements, Making It Technique Sensitive And Not Economical. Aforementioned Reasons Accounts For Metal Posts Are Being Used So Widely.

Fiber Posts Can Be Used When Adequate Coronal Dentin Remains And The Crown Is Well Supported By Remaining Tooth Structure. One Of The Key Advantages Of Using The Fiber Post System Is The Extended Survival Time<sup>35</sup>. As The Modulus Of Elasticity Of The Fiber Post Systems Matches That Of Radicular Dentine, The Stress Distribution Is Better<sup>36,37</sup> Which Causes Less Chances Of Fracture Of Tooth Structure. Most Metal Posts Fail Due To The Difference In The Coefficient Of Modulus Of Elasticity Between Dentin And Metallic Posts. The Most Common Reason For Failure Is Root Fracture When Metal Posts Are Used While It Is Debonding Or Loss Of Retention When Fiber Posts Are Used. Hence, The Failure Caused After The Use Of Fiber Post Is Restorable Which Is Not The Case In The Metal Posts<sup>38</sup>. This Must Be Taken Into Consideration During Post Selection.

Both Metal And Fiber Posts Have Their Pros And Cons. Previous Studies Suggest That The Significance Of A Particular Post System Used Is Not As Important As Following The Principles Of Adequate Length, Adequate Resistance Form, Adequate Strength To Allow Preservation Of Dentin, And An Adequate Ferrule And Most Post Systems Perform Well When These Principles Are Followed. The Amount Of Remaining Coronal Tooth Structure Is A Critical Factor In Determining The Post Selection<sup>39,31</sup>. The Ferrule Effect And The Amount Of Residual Dental Structure Influence The Survival Of Endodontically-Treated Teeth For Both Metal And Fiber Posts, As Failure Rates Increase Because Of Reduced Tooth Structure. Our Institution Is Passionate About High Quality Evidence Based Research And Has Excelled In Various Fields ( <sup>40-50</sup>).

Future Studies Must Include Other Types Of Post Systems With A Larger Sample Size. Other Factors That Influence The Success Of Endodontically Treated Teeth Restored With Post And Core Like Occlusion, Functional Load, Quality Of Full Coverage Restoration Must Also Be Evaluated. Follow Up Of The Cases Is Necessary To Evaluate The Long Term Success Of Each Post System. A Double Blinded Randomised Control Trial With Larger Sample Size Will Further Validate The Results Of The Current Study.

### **4. Conclusion**

Within The Limitations Of This Study It Was Found That Prefabricated Metal Post Preferred Over Prefabricated Fiber Posts In The Restoration Of Maxillary Premolars Irrespective Of Number Of Walls Remaining There Was No Significant Difference In Post Selection For A Maxillary 1<sup>st</sup> & 2<sup>nd</sup> Premolars.

### **5. Acknowledgement**

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Data.

## 6.Conflict Of Interest

Nil

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Association Between Number Of Walls Present And The Type Of Post Used In Maxillary Premolars - An Institution Based Retrospective Study

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## 8.Tables And Charts

Tooth Number	Frequency	Percent (%)
14,24 Max First Premolars	71	42.5
15,25 Max Second Premolars	96	57.5
Total	167	100

Table 1: Represents Frequency Of Maxillary First And Second Premolars That Underwent Post Placement. The Study Included 71 (42.5%) Maxillary First Premolars And 96 (57.5%) Maxillary Second Premolars.

Association Between Number Of Walls Present And The Type Of Post Used In Maxillary Premolars - An Institution Based Retrospective Study

<b>Number Of Walls Remaining</b>	<b>Frequency</b>	<b>Percent (%)</b>
1 Wall Remaining	9	5.4
2 Wall Remaining	89	53.3
3 Wall Remaining	57	34.1
4 Wall Remaining	12	7.2
Total	167	100.0

Table 2: Represents The Frequency Of Maxillary Premolars With The Different Number Of Walls Remaining. The Highest Number Of Maxillary Premolars Evaluated Had 2 Walls Remaining (53.3%), Followed By 3 Walls (34.1%), 4 Walls (7.2%) And 1 Wall Remaining (5.4%).

<b>Type Of Post</b>	<b>Frequency</b>	<b>Percent (%)</b>
Prefabricated Metal Post	152	91.0
Prefabricated Fiber Post	15	9.0
Total	167	100.0

Table 3: Represents The Frequency Of Prefabricated Metal Post And Prefabricated Fiber Post Used In Endodontically Treated Maxillary Premolars. Prefabricated Metal Posts (91%) Were Used More Frequently Than Prefabricated Fiber Posts (9%)

<b>Type Of Post</b>	<b>Tooth Number</b>			<b>Chi Square Test P Value</b>
	<b>Maxillary First Premolars (14,24)</b>	<b>Maxillary Second Premolars (15,25)</b>	<b>Total</b>	

<b>Prefabricated Metal Post</b>	65	87	152	0.836
<b>Prefabricated Fibre Post</b>	6	9	15	
<b>Total</b>	71	96	167	

Table 4: Represents The Association Between The Type Of Post Used In Maxillary First And Second Premolars. Prefabricated Metal Posts Were Used More Frequently In Both Maxillary First And Second Premolars. However, No Significant Association Was Found Between The Type Of Post Used And Tooth Number (P Value  $0.836 > 0.05$ ; Chi Square Test)

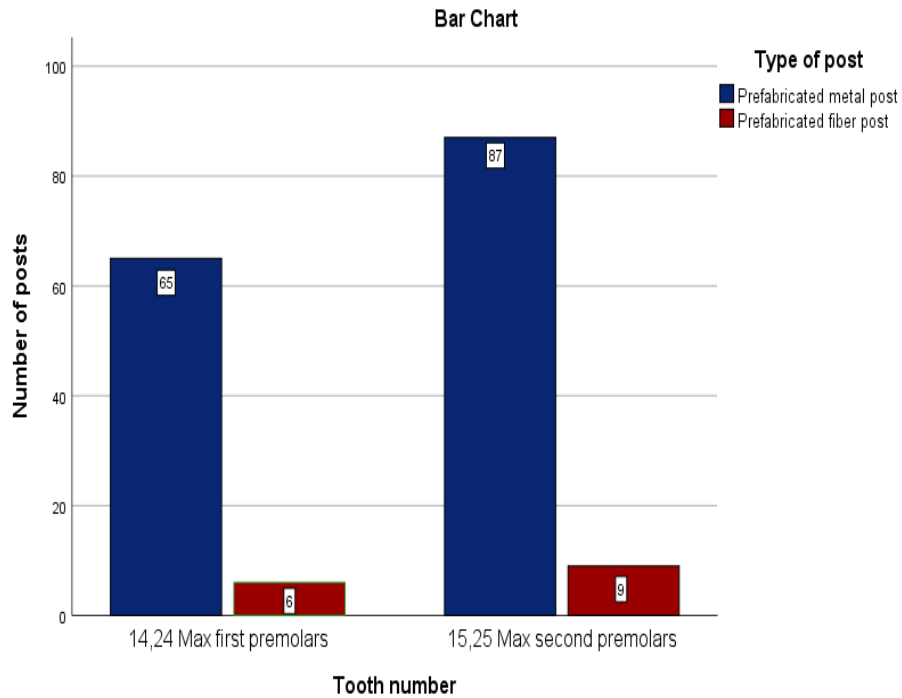


Figure 1: Bar Diagram Showing The Association Between Tooth Number And The Type Of Post Used. X-Axis Represents The Tooth Number And Y-Axis Represents The Number Of Posts Used. No Significant Association Was Found Between The Type Of Post Used And Tooth Number (P Value  $0.836 > 0.05$ ; Chi Square Test)

Type Of Post	Number Of Walls Remaining				Fisher's Exact Test (P Value)
	1 Wall Remaining	2 Wall Remaining	3 Wall Remaining	4 Wall Remaining	



Association Between Number Of Walls Present And The Type Of Post Used In Maxillary Premolars - An Institution Based Retrospective Study

<b>Prefabricated Metal Post</b>	6	84	53	9	<b>0.013</b>
<b>Prefabricated Fiber Post</b>	3	5	4	3	
<b>Total</b>	9	89	57	12	

Table 5: Represents The Association Between The Type Of Post Used And Number Of Walls Remaining In Endodontically Treated Maxillary Premolars. Prefabricated Metal Posts Were Used More Frequently Irrespective Of The Number Of Walls Present. A Statistically Significant Association Was Found Between The Type Of Post Used And The Number Of Walls Present (P Value-  $0.013 < 0.05$ ; Fisher’s Exact Test).

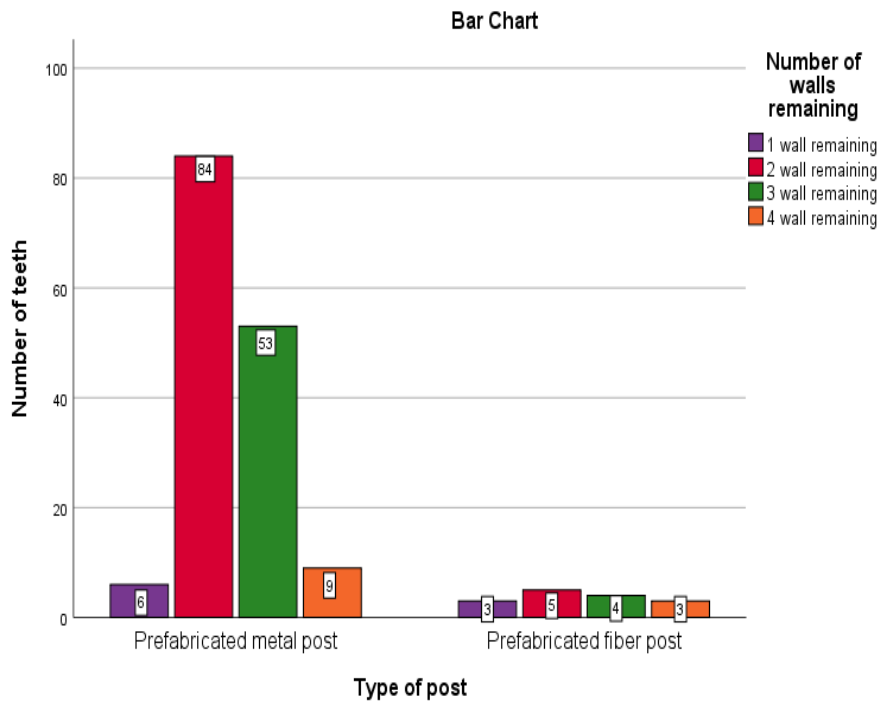


Figure 2: Bar Diagram Showing The Association Between The Type Of Post Used And Number Of Walls Remaining In Endodontically Treated Maxillary Premolars. X-Axis Represents The Type Of Post And Y-Axis Represents The Number Of Teeth. This Association Between The Type Of Post Used And Number Of Walls Remaining Was Found To Be Statistically Significant (P Value-  $0.013 < 0.05$ ; Fisher’s Exact Test).

