

## Original Research

### Effect of orthodontic treatment on dental pulp

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#### ABSTRACT:

**Background:** Orthodontics is a field of dentistry that corrects the malposition of the jaw bones and teeth in order to optimize occlusion for functional and aesthetic purposes. After orthodontic tooth movement, there is a series of changes in dental pulp. Hence, the present study was conducted for assessing the effect of orthodontic treatment on dental pulp. **Materials & methods:** A total of 20 patients within the age group of 15 to 25 years who underwent fixed orthodontic treatment were enrolled. Complete demographic details of all the subjects were obtained. Dental primary impression was made and treatment planning was done. All had to undergo maxillary first premolar extraction. A cantilever spring made of 16 × 22 steel wire was used to apply intrusive force to upper first premolars (Group A) and the opposing teeth were considered as control group (Group B). Premolars on the control side were extracted after 1 week, and the premolars on the opposite side were extracted after 6 weeks of intrusion. Histologic changes were compared between the control and intrusive groups. **Results:** Mean age of the patients was 19.6 years. Out of 20 patients, 15 were males and 5 were females. At 1 week interval, mild inflammation was seen in 20 percent in group A and 10 percent in group B. At 6 weeks interval, non-significant results were obtained while comparing the inflammation among group A and group B. Non-significant results were obtained while comparing the fibrous tissue among group A and group B. **Conclusion:** After one month follow-up, no obvious histologic changes occur in pulp tissue against mild intrusive force.

**Key words:** Orthodontic treatment, Pulp

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#### INTRODUCTION

Orthodontics is a field of dentistry that corrects the malposition of the jaw bones and teeth in order to optimize occlusion for functional and aesthetic purposes. When the nerve tissue is damaged, often bacteria begin to multiply in the pulp chamber, leading to infection. In fact, dental pulp maintains the biological and physiological vitality of the dentin. In addition, it has a highly responsive sensory nervous system that generates unbearable pain when the tooth is inflicted by mechanical trauma. Considering that, dental pulp insures many vital functions; it is legitimate to seek answers for the relationship between pulpal health safety and orthodontic forces.<sup>1-3</sup>

After orthodontic tooth movement, there is a series of changes in dental pulp. Because pulpal tissue is located in a rigid dentinal cover, its vitality depends on blood vessels passing through the apical foramen. Changes in pulpal blood flow or vascular tissue

pressure can endanger the health of dental pulp. The pulpal response to orthodontic force involves cell damage, inflammation, and wound healing.<sup>4-6</sup> Hence; the present study was conducted for assessing the effect of orthodontic treatment on dental pulp.

#### MATERIALS & METHODS

The present study was conducted for assessing the effect of orthodontic treatment on dental pulp. A total of 20 patients within the age group of 15 to 25 years who underwent fixed orthodontic treatment were enrolled. Complete demographic details of all the subjects were obtained. Dental primary impression was made and treatment planning was done. All had to undergo maxillary first premolar extraction. A cantilever spring made of 16 × 22 steel wire was used to apply intrusive force to upper first premolars (Group A) and the opposing teeth were considered as control group (Group B). Premolars on the control side were extracted after 1 week, and the premolars

on the opposite side were extracted after 6 weeks of intrusion. Histologic changes were compared between the control and intrusive groups. All the results were compiled in Microsoft excel sheet and were subjected to statistical analysis using SPSS software.

## RESULTS

A total of 20 patients were enrolled. Mean age of the patients was 19.6 years. Out of 20 patients, 15 were

males and 5 were females. At 1 week interval, mild inflammation was seen in 20 percent in group A and 10 percent in group B. At 6 weeks interval, non-significant results were obtained while comparing the inflammation among group A and group B. Non-significant results were obtained while comparing the fibrous tissue among group A and group B.

**Table 1: Comparison of inflammation**

Time interval	Groups	Inflammation		p- value
		None	Mild	
1 week	Group A	80%	20%	0.001*
	Group B	90%	10%	
6 weeks	Group A	100%	0	1
	Group B	100%	0	

\*: Significant

**Table 2: Comparison of fibrous tissues**

Time interval	Groups	Fibrous tissue		p- value
		None	Mild	
1 week	Group A	100%	0	1
	Group B	100%	0	
6 weeks	Group A	90%	10%	0.42
	Group B	100%	0	

## DISCUSSION

Orthodontic tooth movement occurs by remodeling changes in the periodontium, including periodontal ligament (PDL), cementum and alveolar bone. The force applied within the periodontium will also produce mechanical damage and inflammatory over the pulp-dentine complex. Dental pulp is composed of fibroblasts, odontoblast, undifferentiated mesenchymal cells, capillaries and sensory nerve fibers. The primary function of the dental pulp is to form dentin. Other functions, such as nutrition, sensory and protection are also important. Pulp tissue may also regulate pulp blood flow and dentinal fluid dynamics. These mechanisms provide reflexes to preserve dental tissues and promote wound healing.<sup>5-7</sup> Orthodontic forces should produce periodontal inflammatory reactions but should not show effects beyond mild inflammation of human dental pulp. It is known that orthodontic forces are capable of stimulating the whole vascular system in the dental pulp. Results of published histological data demonstrated that the dental pulp is affected by the orthodontic forces in the form of circulatory vascular stasis to necrosis.<sup>7-9</sup> Hence; the present study was conducted for assessing the effect of orthodontic treatment on dental pulp.

In the present study, a total of 20 patients were enrolled. Mean age of the patients was 19.6 years. Out of 20 patients, 15 were males and 5 were females. At 1 week interval, mild inflammation was seen in 20 percent in group A and 10 percent in group B. In 2015, Javed F et al systematically reviewed the influence of orthodontic force on human dental pulp.

The addressed focused question was "Do orthodontic forces affect the human dental pulp?" which was based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, a specific question was constructed according to the PICO (Participants, Interventions, Control, Outcomes) principle. Databases were explored from 1952 up to and including August 2014 using different combinations of the following keywords: "orthodontic force"; "dental pulp"; "reaction" and "tooth movement". Literature reviews, letters to the editor, commentaries and case-reports were excluded. Thirty studies were included. Six studies assessed the effect of orthodontic forces on pulpal blood flow and 20 studies investigated the pulpal cellular responses to orthodontic forces. In 4 studies, pulpal responses to orthodontic forces were compared between previously traumatized- and non-traumatized teeth.<sup>10</sup>

In the present study, at 6 weeks interval, non-significant results were obtained while comparing the inflammation among group A and group B. Non-significant results were obtained while comparing the fibrous tissue among group A and group B. Mago G et al, in another study assessed the effect of orthodontic forces on pulp tissues. 50 patients required maxillary first premolar extraction for orthodontic treatment were included in the study. A cantilever spring made of 16 × 22 steel wire was used to apply intrusive force to upper first premolars (Group I) and the opposing teeth were considered as control group (Group II). Histologic changes were compared between the control and intrusive groups after 7 days and 1 month. Inflammation at 7 days in group I was none seen in

70% and mild in 30% and in group II was none seen in 80% and mild in 20%. At 1 month was none seen in 100% in both groups. Fibrous tissue at 7 days was none seen in 100% teeth in both groups and at 1 month was none seen in 38% in group I and 100% in group II and mild in 62% in group II. Vascular dilatation at 7 days was none seen in 62% and moderate in 38% in group I and none in 60% and moderate in 40% in group II. Vascular dilatation at 1 month was none in 60% and mild in 40% in both groups. The difference was significant ( $P < 0.05$ ). There was no obvious histologic changes in pulp resulted from mild intrusive force in both groups.<sup>11</sup>

### CONCLUSION

After one month follow-up, no obvious histologic changes occur in pulp tissue against mild intrusive force. However; further studies are recommended for better exploration of results.

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