

## Effect of orthodontic forces on pulp tissues

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### ABSTRACT

**Background:** *The relation between orthodontic force application and dental pulp tissue has been the subject of studies in the recent years. The present study was conducted to evaluate effect of orthodontic forces on pulp tissues. Materials & Methods:* 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. Results:* 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 ( $P < 0.05$ ). **Conclusion:** *There was no obvious histologic changes in pup resulted from mild intrusive force in both groups.*

**Key words:** *Orthodontic, Pulp, histologic changes*

### 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. Orthodontic forces are often followed by the biological response of dental pulp. The pulp's sensory role is important, but it has other roles as well. The pulp functions to form dentin, among other duties. It supplies nutrients and moisture the surrounding areas of the tooth.

The relation between orthodontic force application and dental pulp tissue has been the subject of studies in the recent years. However, there is no conclusive evidence on the effect of orthodontic forces on pulpal tissue, and therefore, the issue has been studied for many years in human.<sup>1</sup>

Previous researchers stated that orthodontic forces had a negative effect on pulp tissue. The research result through a histological test, showed that dental pulp was influenced by orthodontic dental movement, it was proven by pulp reaction i.e. disrupted blood circulation, and necrosis.<sup>4</sup> On the contrary, other researchers testified that orthodontic forces had no prolonged significant negative effect on pulp.<sup>5</sup> It is found that orthodontic forces had a negative effect on pulp tissue. The research result through a histological test showed that dental pulp was influenced by orthodontic dental movement, it was proven by pulp reaction i.e. disrupted blood circulation, and necrosis. The present study was conducted to evaluate effect of orthodontic forces on pulp tissues.

## MATERIALS & METHODS

The present study was conducted among 50 patients scheduled for orthodontic treatment. All had to undergo maxillary first premolar extraction. All were informed regarding the study and a written informed consent form was signed by all patients before starting the study.

Data pertaining to patients such as name, age, gender etc. was recorded. 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). 6 pairs of teeth were extracted after one week, and the remaining 5 pairs were extracted after one month of intrusion. Histologic changes were compared between the control and intrusive groups after 7 days and 1 month. Results thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant.

## RESULTS

Table I shows that out of 50 patients, males were 20 and females were 30.

**Table I Distribution of patients**

Total- 50		
Gender	Males	Females
Number	20	30

**Table II Effect of orthodontic forces on pulp tissues**

Duration	Groups	None	Mild	Moderate	Severe	P value
Inflammation at 7 days	Group I	70%	30%	-	-	0.02
	Group II	80%	20%	-	-	
Inflammation at 1 month	Group I	100%	-	-	-	1
	Group II	100%	-	-	-	
Fibrous tissue at 7 days	Group I	100%	-	-	-	1
	Group II	100%	-	-	-	

Fibrous tissue at 1 month	Group I	38%	62%	-	-	0.04
	Group II	100%	-	-	-	
Vascular dilatation at 7 days	Group I	62%	-	38%	-	0.27
	Group II	60%	-	40%	-	
Vascular dilatation at 1 month	Group I	60%	40%	-	-	0.14
	Group II	60%	40%	-	-	

Table II shows that 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 ( $P < 0.05$ ).

## DISCUSSION

Several researchers believed that intrusive orthodontic force can harm microcirculation of the pulp. Intrusion or other dental movement can obstruct pulp inside circulation causing pulp damage.<sup>7</sup> Proffit et al<sup>8</sup> reported that light continuous forces have little or no effect on dental pulp. On the other hand, the reaction of dental pulp to orthodontic forces has been reported to vary from mild hyperemia to complete necrosis in the literature. Type of the force application, duration and dimension of the force, age of the patients, and size of the apical foramen are among the contributory factors. More pulpal changes have been observed in response to intrusive orthodontic forces. Furthermore, higher incidence of irreversible pulpal reactions is usually expected in teeth with complete root formation.

Statement in pertaining to the effect of apical foramen was still controversial, some researchers considered that the impact of intrusion depended on root forming stage. Teeth with opened apex had better prognosis. The majority of researchers stated that orthodontic force will cause hyperemi, diapedesis, white blood cell marginalization, and vacuoles forming on odontoblast layer. Although the intrusive pressure was light, it can cause hyperemic pulp and decreased blood circulation into the pulp. Excessive force will end in an irreversible pulp damage.<sup>9</sup> Numerous researches on pulp tissue changes caused by orthodontic forces have been performed, among others are: pulp tissue respiration rate, pulp angiogenesis, pulp tissue response due to dental extrusion, aspartate aminotransferase and alkaline phosphatase, enzyme activities and pulp micro vascular response.<sup>10</sup> The present study was conducted to evaluate effect of orthodontic forces on pulp tissues.

In present study, out of 50 patients, males were 20 and females were 30. Abtahi et al<sup>11</sup> compared early and delayed histological effects of intrusive forces on dental pulp of adolescents and adults. Significant difference was not found in any histological parameters between intrusive and control groups 1 week and 1 month after intrusion in adolescents and adults ( $P > 0.05$ ). One month after intrusion, inflammatory cell response intensity ( $P = 0.032$ )

and frequency of chronic inflammation ( $P = 0.032$ ) were significantly higher in adults compared to adolescents.

We observed that 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.

Some studies have demonstrated that hemodynamic changes are the first observable signs after orthodontic movements.<sup>11</sup> However, there is a large controversy in this issue. Some studies have reported a considerable decrease of pulpal blood flow after intrusion, whereas Kvinnsland et al<sup>12</sup> have demonstrated an increase or no change.

## CONCLUSION

Authors found that there was no obvious histologic changes in pup resulted from mild intrusive force in both groups.

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