

ORIGINAL RESEARCH

Assessment of effect of orthodontic forces on pulp tissues

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ABSTRACT:

Background: The present study was conducted to assess effect of orthodontic forces on pulp tissues. **Materials & Methods:** The present study was conducted on 48 patients required maxillary first premolar extraction for orthodontic purposes. 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 66% and mild in 34% and in group II was none seen in 84% and mild in 16%. 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 40% in group I and 100% in group II and mild in 60% in group II. Vascular dilatation at 7 days was none seen in 65% and moderate in 35% 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:** Mild intrusive force in closed apex teeth causes no significant histologic changes in both groups.

Key words: Intrusive force, Orthodontic, Pulp

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INTRODUCTION

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.¹ Proffit *et al*² 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.³

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.⁴ On the contrary, other researchers testified that orthodontic forces had no prolonged significant negative effect on pulp. 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.⁵ The present study was conducted to assess effect of orthodontic forces on pulp tissues.

MATERIALS & METHODS

The present study was conducted in the department of Orthodontics. It comprised of 48 patients required maxillary first premolar extraction for orthodontic purposes. A written informed consent form was signed by all patients before starting 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). 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, graph I shows that out of 48 patients, males were 16 and females were 32.

Table I Distribution of patients

Total- 48		
Gender	Males	Females
Number	16	32

Table II shows that inflammation at 7 days in group I was none seen in 66% and mild in 34% and in group II was none seen in 84% and mild in 16%. 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 40% in group I and 100% in group II and mild in 60% in group II. Vascular dilatation at 7 days was none seen in 65% and moderate in 35% 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

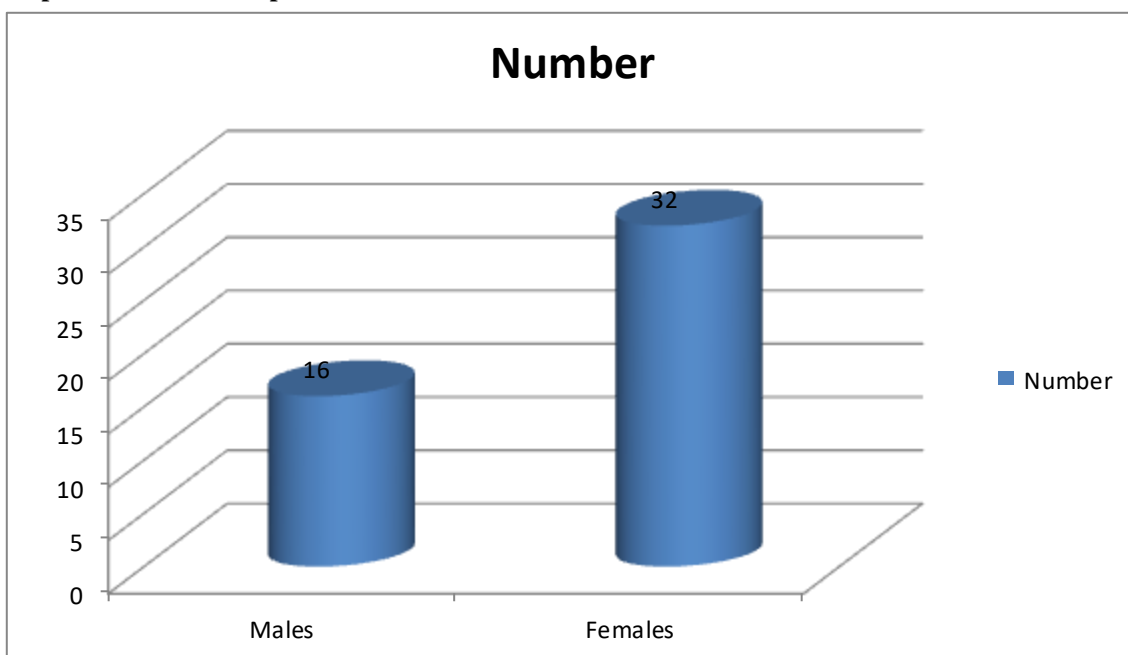
Several researchers believed that intrusive orthodontic force can harm microcirculation of the pulp. Intrusion or other dental movement can obstruct pulp inside circulation causing pulp damage.⁶

Table II Effect of orthodontic forces

Effect	None	Mild	Moderate	Severe	P value
Inflammation at 7 days					
Group I	66%	34%	-	-	0.04
Group II	84%	16%	-	-	
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	40%	60%	-	-	0.05
Group II	100%	-	-	-	
Vascular dilatation at 7 days					
Group I	65%	-	35%	-	0.18
Group II	60%	-	40%	-	
Vascular dilatation at 1 month					
Group I	60%	40%	-	-	0.12
Group II	60%	40%	-	-	

One of the researchers said that the use of light force interrupted by several breaks will definitely decrease pulpal iatrogenic process, therefore, it was advisable to give an orthodontic force not more than a capillary pressure of 20 mm/Hg, because blood constriction can be followed by necrosis.⁷ Excessive intrusion and extrusion will lead to necrotic pulp tissue without any odontoblast layer regeneration.

Graph I Distribution of patients



It was noticed that teeth with open apical foramen was prone to receive the impact of dental intrusion.⁸ 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.⁹ 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. 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.¹⁰ The present study was conducted to assess effect of orthodontic forces on pulp tissues.

In present study, out of 48 patients, males were 16 and females were 32. We found that inflammation at 7 days in group I was none seen in 66% and mild in 34% and in group II was none seen in 84% and mild in 16%. At 1 month was none seen in 100% in both groups. Abtahi et al¹¹ 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 fibrous tissue at 7 days was none seen in 100% teeth in both groups and at 1 month was none seen in 40% in group I and 100% in group II and mild in 60% in group II. Vascular dilatation at 7 days was none seen in 65% and moderate in 35% 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. 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*¹² have demonstrated an increase or no change.

CONCLUSION

Authors found that mild intrusive force in closed apex teeth causes no significant histologic changes in both groups.

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