

The Histological Comparison of Pulp Disease between Dental Trauma and Pulp Exposure

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Abstract: The aim of this study was to investigate the histological changes of dental pulp following luxation of tooth, and compared with that of pulp exposure mechanically. Upper left first molar of twenty male, 5 weeks age, Wister rats were used for this study; ten were used for trauma group by luxation and ten for mechanically expose group. In trauma group, teeth were luxated using special forceps, and pulp expose groups were exposed by #1/2 round bur with water spray and left alone. Five rats from each group were sacrificed under anesthesia one week following treatment and the remaining 5 rats from each group were sacrificed after two weeks in the same manner. Thereafter 5µm thickness paraffin sections were prepared and stained with haematoxylin –eosin. All sections were observed by light microscopy. In the trauma group 2 weeks following operation, pulp necrosis and formation of bone-like materials in it were seen. While in the mechanically pulp expose group, There were no bone-like materials in the pulp. Therefore bone-like materials in the pulp after necrosis might be related to the strong damage in a short period such as luxation.

Key words: dental trauma, luxation, bone-like materials formation, pulp expose, histological evaluation

Introduction

The dental pulp, which is surrounded by dentin and cementum, has a high possibility to receive various damages by caries, trauma, and periodontal disease. Generally dental pulp has an ability to recover from temporary slight pulpitis even though its damage ranged from slight to middle degree of caries or trauma. However, dental pulp fails to recover from injured of deep caries, where bacteria can invade into the pulp or due to damage from trauma such as luxation or malocclusion; they produce progressive pulp degeneration and even necrosis, too. Although there were several reports of pulp injury by orthodontic force and tooth replantation, the effect of other source of strong force such as luxation is few. Therefore, in this study histological changes of dental pulp subjected to external strong force (luxation) was evaluated, and compared with that of pulp expose mechanically.

Materials and Methods

Upper left first molar of twenty-five weeks age male Wister rats, weighting 150-160g, were used for this study; ten were used for trauma group by luxation and ten for mechanically expose group. In trauma group, teeth were luxated using special forceps under an anesthesia (Fig 1), and in pulp expose group, they were expose by #1/2 round bur with water spray under an anesthesia. They were then stored with no additional treatment. Five rats from each group were sacrificed under anesthesia one week following treatment using perfusion with a solution containing 4% paraformaldehyde and 2mM sucrose in PBS, pH 7.4 through their ascending aorta. The remaining 5 rats from each group were sacrificed after two weeks in the same manner. Upper light first molar of all rats were used for control; they were left untreated.

After fixation by 4% paraformaldehyde, maxillary molar and surrounding bone and tissues were carefully dissected out and demineralized with 10% EDTA, pH7.4 for 4weeks, and then they were embedded by paraffin. Longitudinal sections (5µm in

thickness) were prepared and stained with haematoxylin –eosin. All sections were observed by light microscopy.

Results

Light microscopic observations of untreated control teeth sections showed that there were several layers of odontoblasts under the dentin, and a lot of fibroblasts were located into whole area of the pulp (Fig 2 a).

In the trauma group, a lot of inflammatory cells permeations were observed in the root area of the pulp one week after operation. On the other hand, decrease of fibroblasts and presence of vacuolar degeneration were seen in the crown area of the pulp instead of inflammatory cell permeation.

2weeks following operation, remarkable pulp necrosis and formation of bone-like materials in it were seen; bone-like materials were mainly located root area of the pulp (Fig 2 b).

In the mechanically pulp expose group, crown area of pulp

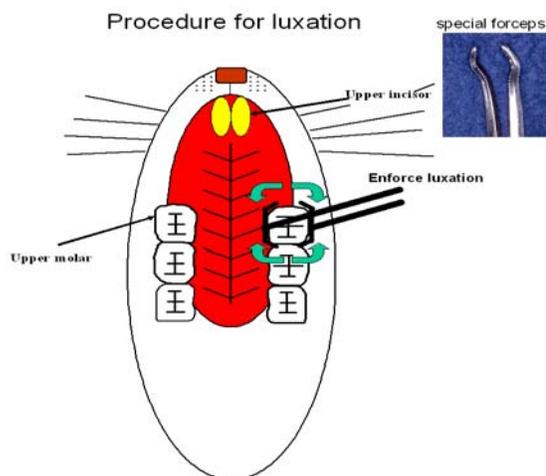


Fig. 1; Procedure for luxation

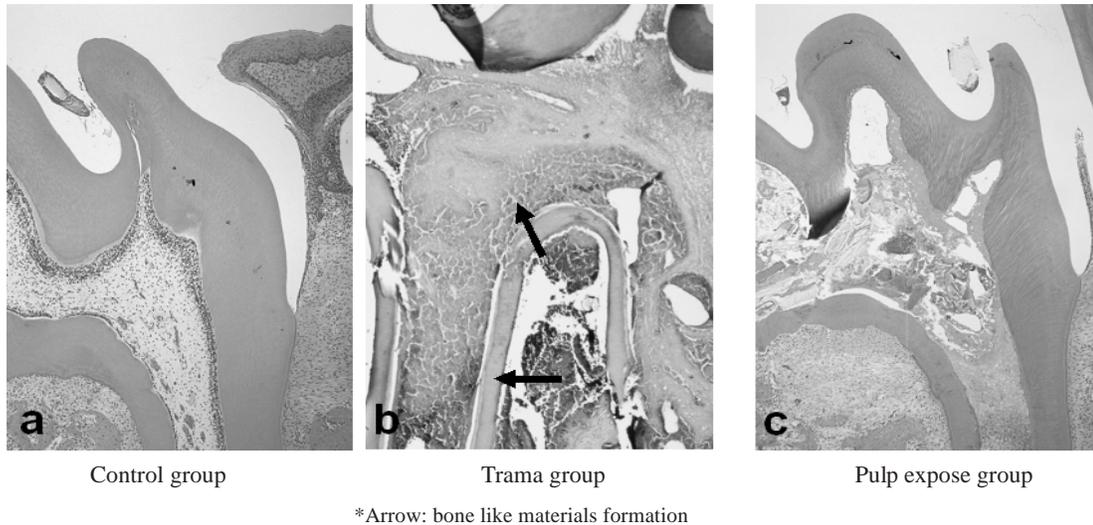


Fig. 2. The histological difference in each group pulp.
 a : control group, b: trauma group, c: pulp expose group

were completely destroyed and inflammatory cell permeation was seen around bifurcation area of dental pulp 1 week following operation; inflammatory cell permeation was noted advancing to the center of root pulp 2 weeks following operation. However, root apex side of the pulp showed normal. Bone-like materials were not seen in all rat's pulp (Both 1 week and 2 weeks) of this group (Fig 2 c).

Discussion

Traumatic external force causes the interruption of nerve and blood supply to the dental pulp; some cases of traumatic injuries were successful healed after luxation¹⁾. However, excessive strong force as applied in over present study model may destroy both nerve and blood pathway which might lead to necrosis of the pulp because of interrupting the neurovascular supply to odontoblasts and pulp cell.

The crown area of pulp did not receive heavy damage one week following operation in the trauma group of our present study. This phenomenon indicated that neurovascular supply to the pulp was not disturbed completely one week after operation. Whole area of dental pulp tissues in the trauma group two weeks after operation was necrosed completely and bone like materials were observed in it. Generally reparative dentin is developed after bacterial inversion in deep caries or heat of cavity preparation. However, formation of bone like materials were observed after pulp tissue necrosis and they were completeley different from

reparative dentin. Several previous reports also demonstrated similar bone like materials following replantation^{2,3)}.

On the other hand, dental pulp in expose pulp group showed no bone like materials formation in it, although there were heavy inflammatory cell permeation and destruction of crown area of pulp. These differences may related to the differences of destructive process of the pulp. Strong external force such as luxation might cause strong damage to the pulp with a short period.

However, local damage was advanced gradually to the pulp following pulp expose mechanically in pulp expose group of the present study. It can be suggested that strong damage to the pulp have some special role to start signal switch for the formation of bone-like materials, and mechanically exposed pulp might have no ability to start signal switch for formation of bone-like materials.

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