



Hyalinization of dental pulp tissue due to occlusal trauma (Experimental study)

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Abstract

Dental pulp tissue is a highly specialized connective tissue contains a formative and protective cells that can be affected easily by stimuli such as occlusal trauma subjected by occlusal overhang filling.

Sixteen albino rats aged range (6-8 months) weight range (0.5-0.75 kg) were subjected the occlusal overhang filling made for upper first molar for 2 periods, and according the periods, rats divided in the 2 groups. Groups I (8rats) subjected for occlusal trauma for 2 weeks duration group II (8rats) subjected for occlusal trauma for 8 weeks duration. Histological evaluation have been done for 2.8 weeks using hematoxyline and eosin stain.

Occlusal trauma for 2 weeks in group I showed wide irregular predentin formation will displacement in odontoblast cell.

While in group II for 8 weeks duration, histological feature for pulp tissue showed hyalinization (50-95 μ m) in length.

Occlusal trauma for long period cause hyalinization of pulp tissue that negatively influence on endodontic treatment in future.

Key words: dental pulp, hyalinization occlusal trauma.

Introduction

Tooth and its surrounding structures are continually challenged by microbial flora and restorative dentistry⁽¹⁾. Glickmen in 1996⁽²⁾ reported that a mouth with a healthy status may be affected by restorations of poor quality, and a restoration of highest quality may be fail in a mouth with dentogingival disease. The presence of caries, broken, missing over restorations and open or light contacts may lead the altered chewing pattern due the food impaction⁽³⁾, or an unstable occlusal relationship. Occlusal trauma represented by over hang dental

restorations are a major dental health problem and may promote dental tissue change⁽⁴⁾.

A review of articles summarized on over hang fillings concern with over extended margins. Affecting periodontium system included bone loss, pocket formation, attachment loss and inflammation. They showed significantly greater severity of disease associated with overhangs, compared to homologous teeth without overhanging dental restoration^(5, 6).

Larg et al (1983)⁽⁷⁾ reported in a study of dental students where

restoration temporarily placed for a limited period with overhangs. A change in oral flora with presences of specific periodontal pathogens may damage the embrasure by impinging on interproximal space and the biologic width. Excessive occlusal forces showed to enhance the rate of tissue destruction in periodontal disease. No report was found up to our knowledge studied changes in pulp tissue due to overhang restoration therefore the present study was designed.

Histological feature of dental pulp:

The dental pulp is a loose connective tissue and made up of a combination of cells embedded in an extracellular matrix of fibers in a semi fluid gel⁽⁸⁾. The extracellular matrix made up of a versatile group of polysaccharides and protein secreted by the cells of the tissue and assembled into a complex frame work closely associated with pulp cells (odontoblast, fibroblast, undifferentiated mesenchymal cell) collagen type I is the predominant extracellular matrix of pulp it is present as a fibrils thin scattered through pulp. There are also a large amount of type III have collagen similar pattern to type I collagen .Small amount of type V and type VI collage are also present⁽⁹⁾.

Hyalinization

A degenerative process resulting from long-continued occlusal trauma in which fibers become hyalinized in to homogeneous mass. It appears as an acellular avascular glassy area illustrated in periodontal ligament results in orthodontic forces in which ligament subjected to compression⁽¹⁰⁾.

Aim of the study

To study the effects of Occlusal overhang filling on dental pulp tissue (histologically)

Materials and Methods

Sixteen albino rats, aged range (6-8) months, weight range (0.5-0.75 kg) were included in the present study. Amalgam occlusal CI fillings, for upper first molar teeth with, overhang, up to anatomic contours of the tooth being restored.

Histological preparation

Two groups of rats subjected to overhang filling for 2 periods group I (8rats) for 2 weeks. Group II (8rats) for 8 weeks. Histological study have been done for 2 groups under light microscope using hematoxyline and cosine stain⁽¹¹⁾.

Results

Histological feature of dentin- pulp tissue response to occlusal overhang filling for a period of 2 weeks showed wide irregular pre dentin. Odontoblast cells showed displacement and congested blood vessels illustrated in the pulp figures (1, 2).

For a period of 8 weeks duration dentin pulp tissue complex responded occlusal overhang filling and illustrated resorption in dentin, showing odontoclast cell as a multinucleated giant cell Hyalinization of pulp appears as a cellular glassy mass scattered in pulp tissue figures (3,4,5).

Table (1) shows width of predentin (25.4-308 μm) in 2 weeks duration wider in comparison to 8 weeks duration (6.7-10.3 μm) hyaline length also estimated in pulp tissue of group II (50-75 μm) in length.

Discussion

Dental restorations (fillings, inlays, crowns, etc) should be made to blend smoothly with the contours of tooth being built with restoration, other wise it may cause a damage to dental tissue if the restoration being beyond the border of the cavity⁽¹⁾.

Excessive occlusal forces have been implicated in the development of dental problem, and enhance the rate of tissue destruction⁽²⁾.

All studies indicated the necessity of were organized successful restoration treatment and the one that could not adapt would lead a destruction of dental tissue and bone loss⁽¹²⁾.

Clinical consideration for restorative dental treatment specially for proximal caries must be compatible with periodontal health, so therefore many researches studied the inter-relationship between restorative dentistry and periodontics. They found that poorly contoured dental restorations may progress gingivitis that affected gingival attachment fibers to bone destruction⁽⁴⁾.

Other study showed that colonization of *prophyromonas gingivitis* bacteria, is one of a major causative agent of adult periodontitis due to accumulation of subgingival dental plaque as a result of proximal overhang filling⁽³⁾.

Von et al in (2004)⁽⁶⁾ evaluated the histological changes in the periodontal structures of beagle dogs after using high and low force during tooth movement small patch of hyalinization were found at the pressure side while other area showed long areas of necrotic tissue.

Von et al in 2009⁽¹⁶⁾ analyzed literature was concerning hyalinization in relation to experimental tooth movement in animals and humans. They found that all studies considered

hyalinization as undesirable side effect of orthodontic tooth movement and it needs for well-designed to elucidate the role of hyalinization.

Miyoshi et al (2001)⁽¹³⁾ studied response of periodontal tissue to orthodontic force, histologically. Using two groups one subjected to light period force second group subjected to long period.

The light group showed less extensive hyalinization of periodontal ligament than the long period group.

Some authors studied dental pulp morphology and distribution of acid and neutral mucopolysaccharides in teeth subjected to orthodontic therapy.

They found that number of collagen fibers increased, densely packed and a certain degree of hyalinization was observed and they suggested that these changes in dental pulp are irreversible and correspond to those of aging⁽¹⁴⁾.

Vier et al 2007⁽¹⁵⁾ evaluate the effects of radiotherapy on the dental pulp and they illustrated nuclear alteration with hyalinization status in dental pulp tissue of rats. The present results showed a changes in dentin pulp tissue included odontoblast displacement which may be reversible to hyalinization of pulp which is a irreversible response depending on the period of subjection to occlusal trauma illustrated by overhang filling. The present study suggested of negatively influence of long period occlusal trauma to endodontic treatment in future and to a fact that a restoration may preclude a permanent dental damage if it not done carefully and correctly.

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Table (1): Morphometric parameter of dentin-pulp tissue in study groups.

Groups	Parameter
Rang-Dentin width μm	
Group I	136-146
Group II	130-133
Range per dentin width μm	
Group I	25.4-30.8
Group II	6.7-10.3
Range hyalinized one length (μm)	
Group I	Negative
Group II	(50-95)

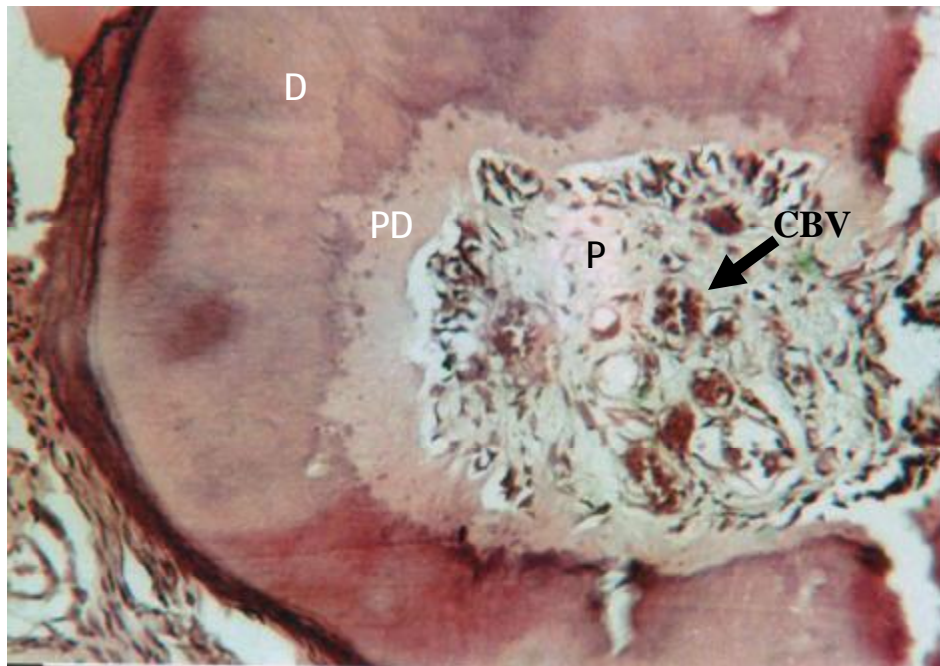


Fig: 1: Microphotograph view for rat's dentin- pulp tissue subjected occlusal amalgam hang filling for period of 2 weeks the view shows wide irregular predentin [PD], dentin [D], pulp [p], congested blood vessels [CBV] H&E x100.

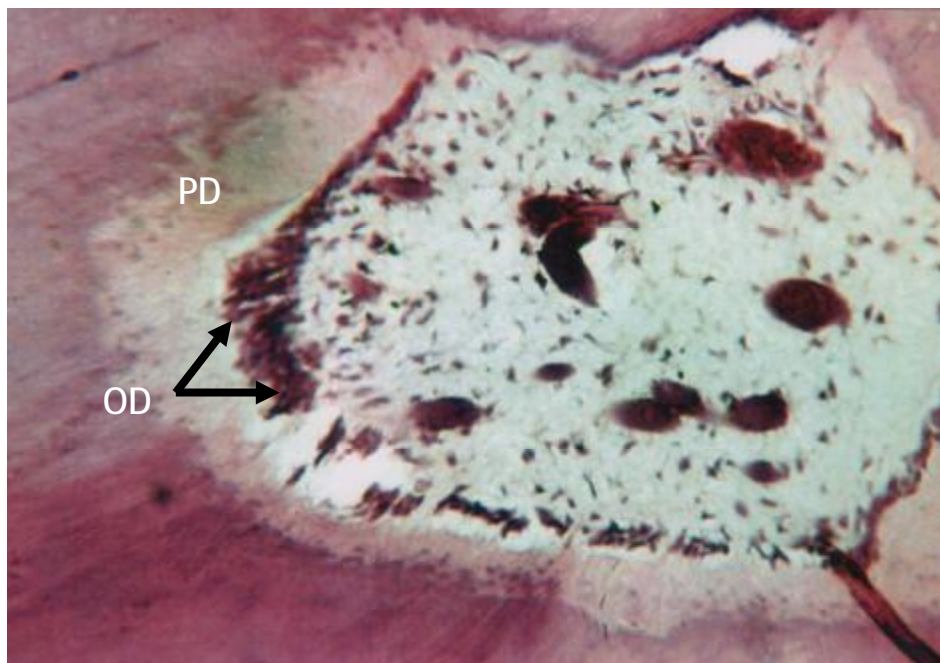


Fig: 2 High magnification view for rats dentin pulp tissue subjected to occlusal amalgam hang filling for 2 weeks duration, showing displacement of odontoblast cells [OD], wide irregular predentin [PD]. H&E x 200.

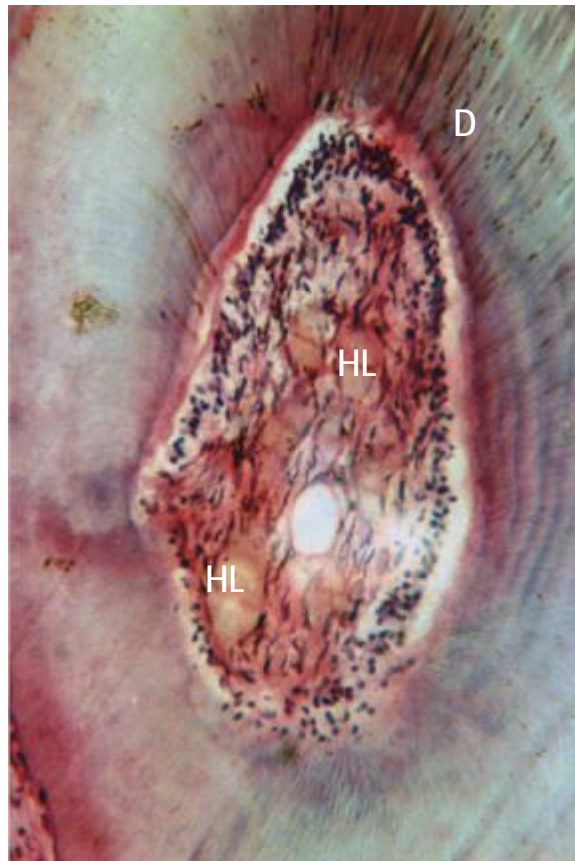


Fig: 3 Microphotograph view for rats dentin pulp tissue subjected to occlusal amalgam hang filling for 8 weeks, shows hyalinization of pulp [HL] H&E x200.

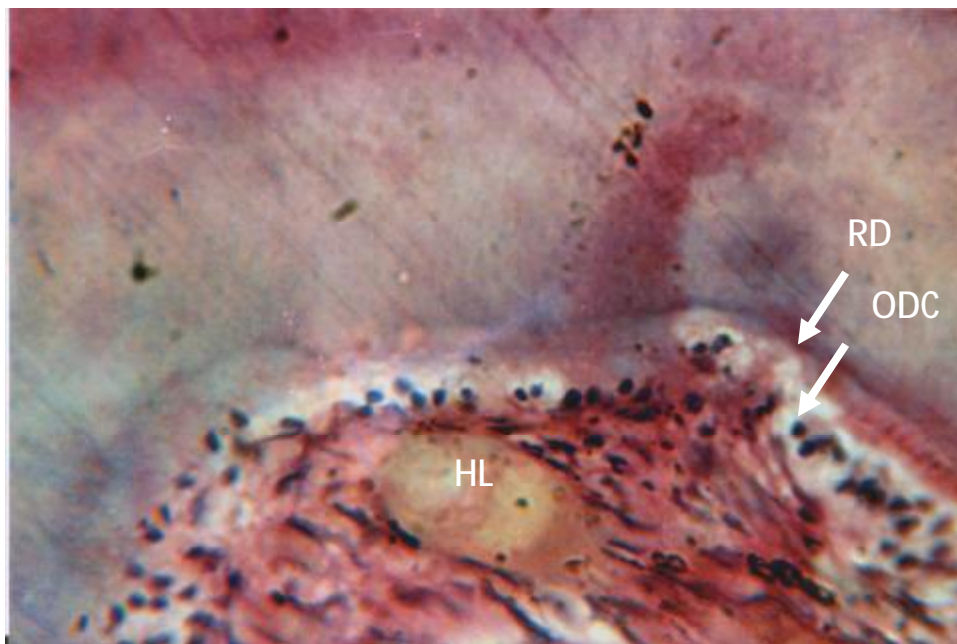


Fig: 4 View for odontoclast [ODC]cell, occupied resorbed dentin [RD] and hyaline mass [HL] can be detected in pulp rat subjected to occlusal amalgam hang filling for 8 weeks duration H&E x200.

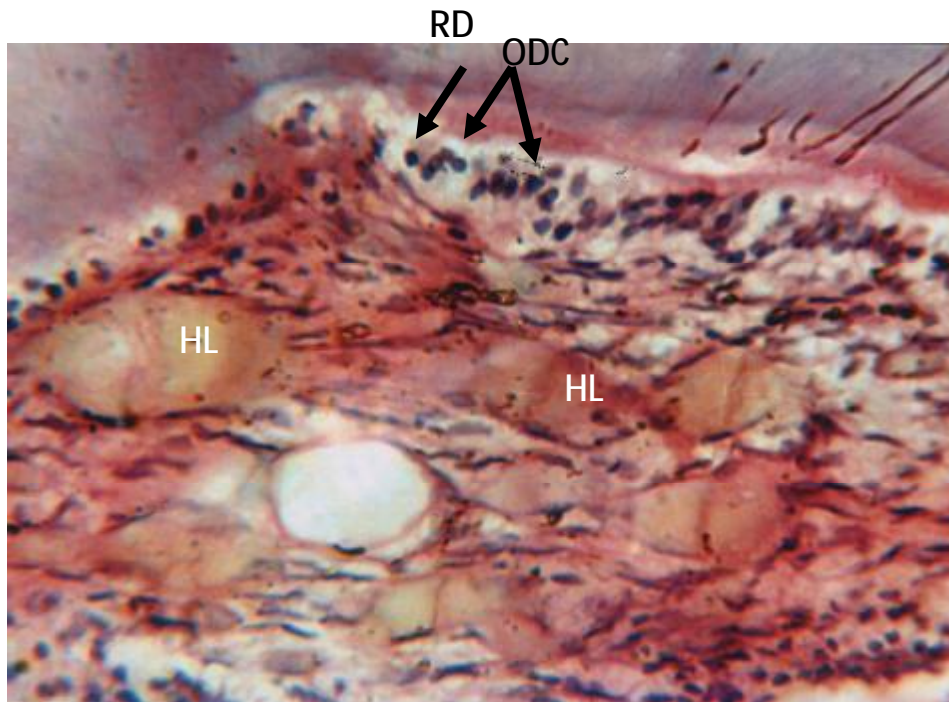


Fig: 5 High magnification view of figure [4] shows odontoclast cell [ODC] in howshipus lacunae, resorbed dentin [RD H&E x400.