

# HISTOLOGICAL EVALUATION OF FDA-APPROVED HYALURONIC ACID BASED SCAFFOLD IN REVASCULARIZATION OF NECROTIC MATURE PERMANENT TEETH WITH APICAL PERIODONTITIS IN DOGS

Alaa M. El Taweel <sup>1\*</sup> M.Sc, Raef A. Sherif <sup>2</sup> PhD, Dina A. Nagui <sup>3</sup> PhD, Salma M. Genena <sup>4</sup> PhD, Ahmed Z. Ghareeb <sup>5</sup> PhD

1. PhD candidate at the Endodontic Department, B.Sc. in 2007 - Faculty of Dentistry –Alexandria University – Egypt.

2. Professor of Endodontics - Faculty of Dentistry –Alexandria University- Egypt.

3. Assistant professor of Oral Biology- Faculty of Dentistry - Alexandria University – Egypt.

4. Lecturer of Endodontics - Faculty of Dentistry - Alexandria University- Egypt.

5. Experimental Surgery Researcher - Preclinical Studies Department, Pharmaceutical and Fermentation Industries Development Centre, The City of Scientific Research and Technological Applications – Egypt.

\* Corresponding author

## INTRODUCTION

Hyaluronic Acid (HA) hydrogel scaffolds have shown promising potential in promoting cell viability, mineralization and odontoblastic differentiation in many regenerative pulp investigations in vitro. <sup>(1)</sup> Commercially available HA dermal fillers have controlled preparations and enhanced mechanical integrity through crosslinking technology. Moreover, they are easy to acquire, handle, and inject into the root canal. Previous studies have shown promising results when FDA-approved Restylane Lyft sterile injectable dermal filler was used as a scaffold for pulp regeneration in vitro and in immature teeth in vivo. <sup>(2,3)</sup> However, to date, the performance of Restylane Lyft hasn't been histologically investigated as scaffold in mature teeth.

## METHODOLOGY

Twenty mature permanent incisors of two healthy adult mongrel dogs were selected. Under general anesthesia, apical periodontitis was induced by extirpating pulpal tissue and leaving the access cavities opened for three weeks. Disinfection protocol was applied then access cavities were sealed. After two weeks, teeth were assigned into two groups. In group I (n=10) revascularization was carried out using HA scaffolds combined with induced blood clot. In group II (n=10) HA scaffolds were used alone. MTA was applied and teeth were sealed with resin reinforced glass ionomer cement. A sound tooth served as negative control. After 3 months, dogs were sacrificed and teeth with supporting periapical tissues were dissected out, processed and stained with Hematoxylin and Eosin stain for histological examination. (Figure 1).



Figure (1): Revascularization using Restylane Lyft hydrogel

## RESULTS AND DISCUSSION

Histologic examination showed ingrowth of newly formed vital pulp-like tissues including fibrous connective tissue and hard tissue depositions in the revascularized teeth. The newly formed fibrous tissue (NFT) consisted of collagen fiber bundles (CB) with scattered blood vessels (B.V). The new hard tissue depositions included bone-like tissues (NB) and cementum-like tissues (NC) with both cellular (NCC) and Acellular (NAC) types. Some of newly formed fibers were found to resemble Sharpy's fibers (Sh).

The control sound tooth showed normal pulp tissue and vascularity. (Figure 2).

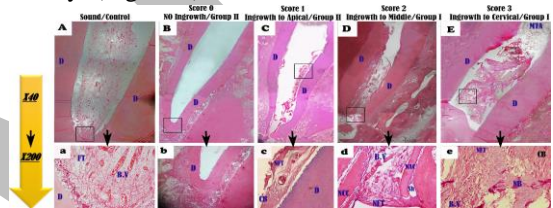


Figure (2): Photomicrographs representing the nature and extension of the newly formed tissues after revascularization.

There was no difference regarding the type of formed tissues in both groups. <sup>(3)</sup> However; Revascularization using HA scaffolds with induced blood clot significantly enhanced tissue formation with better coronal-apical extension than using HA scaffolds alone. (Table 1).

Table (1): Comparison between the two groups in tissue extension

Extent of new formed tissue	Group I (n = 10)	Group II (n = 10)	U	P
Score 0: No tissue formed	2 (20%)	6 (60%)	16.0*	0.009*
Score 1: Ingrowth to apical	1 (10%)	4 (40%)		
Score 2: Ingrowth to middle	3 (30%)	0 (0%)		
Score 3: Ingrowth to cervical	4 (40%)	0 (0%)		
Mean rank	13.90	7.10	Mann Whitney test	Significant at p ≤ 0.05

## CONCLUSION

Injectable, FDA-approved, HA hydrogel filler (Restylane Lyft) combined with blood clot is a promising approach for revascularization of necrotic mature permanent teeth with apical periodontitis.

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