

**Ministry of Higher Education  
& Scientific Research  
Baghdad University  
College of Dentistry**



**Histological, histomorphometrical and  
Immunohistochemical Evaluation of Local  
Application of Collagen I and /or Vascular  
Endothelial Growth Factor  
(An Experimental Study in Rats)**

A thesis submitted to  
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## Abstract

**Back ground:** Healing socket consists of three new tissue components; epithelium, connective tissue, and bone tissue. Interactive dynamic changes take place between these 3 components during healing period.

During the process of healing of the extraction socket the following events occur: firstly, a blood clot (mainly blood cells and network of fibrin) forms and fills the empty socket. Then, the blood clot matures and is organized by the formation of granulation tissue (rich in newly formed vascular structure, abundance of inflammatory cells. The granulation tissue replaces the blood clot completely by the seventh day. After 20 days, the granulation tissue was replaced by collagen, and bone began forming at the base and the periphery of the extraction socket. Epithelium covers the newly formed bone that filled the socket.

The healing cascade of all wounds ultimately requires neovascularization, collagen deposition, and collagen constriction by myofibroblasts. Neovascularization in the adult is known to occur by two distinct processes, angiogenesis and vasculogenesis which needs for expression of VEGF.

**Aim of the study:** Histological ,Histomorphometrical and immunohistochemical studies to evaluate the effect of local application of exogenous VEGF/collagen I separately and as a combination in socket healing.

**Materials and Method:** Sixty male Albino Wistar rats were subjected for a surgical tooth extraction of upper 1<sup>st</sup> molar of both sides ( right side was considered as experimental site ,while left be the control one).

The animals were divided into following groups according to the applicable of biomaterials.

**A. Control group** the tooth socket treated with 1 $\mu$ L of normal saline

**B. Experimental group** includes

- **Group I contains (20) rats**, the tooth socket treated with 1 $\mu$ L of VEGF
- **Group II contains (20) rats** the tooth socket treated with 1 $\mu$ L of collagen type I
- **Group III contains (20) rats**, the tooth socket treated with 1 $\mu$ L of a combination of VEGF and collagen I.

Each group is composed of 20 rats that will be studied in four periods 3,7,14,28 days (5 rats for each period).

The specimens were studied histologically histomorphometrical and immunohistochemical identification of fibroblast growth factor 2 (FGF2) and tissue non specific alkaline phosphatase (ALP).

## **Results:**

1. Histological findings for all groups illustrate formation of blood clot at 3 days .
2. Granulation tissue appears in all groups at 7 days period, and new bone is demonstrated in collagen group and a highly cellular woven bone with active proliferative osteoblast and newly blood vessel is detected in combination group.
3. At 14 days new epithelization and new bone trabeculae with fibrous tissue are presented mostly in all groups but with different constitution.

4. At 28 days all groups show reepithelization but in different thickness, and with newly bone apposition and with different maturity.

5. For positive cells expressed ALP

VEGF group records a high mean values at 3,14,28 days periods and with high differences in comparisum to other groups while control group reports a high mean value at 7 days .

6. For positive cells expressed FGF2.

Control group illustrates a high record for the mean of positive cells expressed FGF2 at 3,7days periods and with high differences in comparisum to other groups, while combination group reports a high mean value at 14 days .

7. Results demonstrated that in most periods for each group ,whenever ,ALP is a high value in expression ,records a low expression in FGF2.

### **Conclusion:**

Results ,high lighted on the effect of local application of VEGF in extracted tooth socket that facilitated epithelization ,while combination of (Collagen and VEGF ) shows a high mineralization zone .