

دراسة معملية لأستجابة أنسجة العظم والتغيرات  
التي تحدث فى جدران العاج لقناة الجذر  
المصاحبة لأستخدام عنصر فعال لمقاومة تآكل  
العظم مقارنة بهيدروكسيد الكالسيوم

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جامعة القاهرة

توطئة للحصول على درجة الدكتوراة  
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## DEDICATED TO

**To the soul of my mother that is  
always encouraging and pushing  
me in the way of success**

**To my father with his endless  
love and sacrifices**

**To my brothers for their love and  
support**

**To my beloved supporting wife, to  
my son Ahmed and to my little  
baby Karma whom they made my  
life more meaningful and cheerful**

Keywords:

Bisphosphonate, calcium hydroxide, osteocalcin, alkaline phosphatase, total protein, transmission electron microscope

# LISTS OF CONTENTS

	Page
INTRODUCTION.....	1
REVIEW OF LITERATURE.....	3
▪ Historical Review.....	3
▪ Bisphosphonate.....	3
▪ Effect of bisphosphonate on alveolar bone resorption.....	8
▪ Effect of bisphosphonate on root resorption.....	17
▪ Calcium hydroxide.....	22
▪ Uses of calcium hydroxide.....	23
▪ Biological properties of calcium hydroxide.....	24
▪ Effect of calcium hydroxide on root resorption.....	24
▪ Effect of calcium hydroxide on pH of radicular dentin.....	26
▪ Comparison between bisphosphonate and calcium hydroxide as regard Antiresorptive capabilities.....	31
▪ Biochemical markers for bone turnover.....	32
▪ Osteocalcin.....	34
AIM OF THE STUDY.....	36
MATERIALS AND METHODS.....	37
RESULTS.....	54
DISCUSSION.....	85
SUMMARY AND CONCLUSIONS.....	99
RECOMMENDATIONS.....	103
REFERENCES.....	104
APPENDIX .....	122
ARABIC SUMMARY.....	

## **LIST OF TABLES**

<b>Table no.</b>	<b>Title</b>	<b>Page no.</b>
<b>1</b>	Steps for determining alkaline phosphatase enzyme activity.	<b>46</b>
<b>2</b>	Steps for determining total protein.	<b>48</b>
<b>3</b>	Descriptive statistics and test of significance of osteocalcin in both experimental groups and their control.	<b>57</b>
<b>4</b>	Descriptive statistics and test of significance of Alkaline Phosphatase Enzyme activity in both experimental groups and their control.	<b>58</b>
<b>5</b>	Descriptive statistics and test of significance of Total Protein values in both experimental groups and their control.	<b>59</b>
<b>6</b>	Mean count of bone trabeculae in both materials and groups.	<b>74</b>
<b>7</b>	Mean trabecular size in both materials and groups.	<b>74</b>
<b>8</b>	Calculated pH of bisphosphonate and calcium hydroxide in three different medium.	<b>80</b>

## **LISTS OF FIGURES**

<b>Figure no.</b>	<b>Title</b>	<b>Page no.</b>
<b>1</b>	Chemical structure of pyrophosphate and geminal bisphosphonates.	<b>4</b>
<b>2</b>	Exposure of the tibia after the longitudinal incision using mucoperiosteal elevator.	<b>39</b>
<b>3</b>	Longitudinal groove of an average 4mm length and 1mm depth was made in the tibia.	<b>39</b>
<b>4</b>	The polyethylene tube was filled flush at both ends with the experimental material and is placed in the prepared groove.	<b>40</b>
<b>5</b>	Shows suturing over of right (experimental) and left (control) tibia.	<b>40</b>
<b>6</b>	A chart representing the level of osteocalcin in both experimental and control groups.	<b>57</b>
<b>7</b>	A chart representing the level of alkaline phosphatase enzyme in both experimental and control groups	<b>58</b>
<b>8</b>	A chart representing the level of total protein in both experimental and control groups.	<b>59</b>
<b>9</b>	Histologic section of control tibia (Bisphosphonate group). (H&E, x40)	<b>61</b>
<b>10</b>	Histologic section of control tibia (Bisphosphonate group). (H&E, x100)	<b>62</b>
<b>11</b>	Histologic section of a control tibia (Bisphosphonate group). (H&E, x200)	<b>62</b>
<b>12</b>	Histologic section of the experimental tibia (Bisphosphonate). (H&E, x40)	<b>63</b>
<b>13</b>	Histologic section of the experimental tibia (Bisphosphonate). (H&E, x100)	<b>63</b>
<b>14</b>	Histologic section of the experimental tibia (Bisphosphonate). (H&E, x200)	<b>64</b>
<b>15</b>	Histologic section of the experimental tibia (Bisphosphonate). (H&E, x100)	<b>64</b>
<b>16</b>	Histologic section of the experimental tibia (Bisphosphonate). (H&E x200)	<b>65</b>
<b>17</b>	Histologic section of a control tibia (Calcium Hydroxide group). (H&E, x40)	<b>67</b>



<b>18</b>	Histologic section of a control tibia (Calcium Hydroxide group). (H&E, x100)	<b>67</b>
<b>19</b>	Histologic section of a control tibia (Calcium Hydroxide group). (H&E, x200)	<b>68</b>
<b>20</b>	Histologic section of the experimental tibia (Calcium hydroxide group). (H&E, x40)	<b>69</b>
<b>21</b>	Histologic section of the experimental tibia (Calcium hydroxide group). (H&E, x100)	<b>69</b>
<b>22</b>	Histologic section of the experimental tibia (Calcium hydroxide group). (H&E, x200)	<b>70</b>
<b>23</b>	Histologic section of the experimental tibia (Calcium hydroxide group). ( H&E, x100)	<b>70</b>
<b>24</b>	Histologic section of the experimental tibia (Calcium hydroxide group). (H&E, x200)	<b>71</b>
<b>25</b>	A chart representing the mean count of bone trabeculae in both groups.	<b>75</b>
<b>26</b>	A chart representing the mean size of bone trabeculae in both groups.	<b>75</b>
<b>27</b>	Transmission electron photomicrograph of control tibia. (Magnification 6000x)	<b>77</b>
<b>28</b>	Transmission electron photomicrograph of experimental tibia (Bisphosphonate group). (Magnification 6000x)	<b>78</b>
<b>29</b>	Transmission electron photomicrograph of experimental tibia (Calcium hydroxide group). (Magnification 6000x)	<b>79</b>
<b>30</b>	Scanning electron micrograph of Control group. (Magnification 2000x)	<b>82</b>
<b>31</b>	Scanning electron micrograph of Bisphosphonate treated group. (Magnification 2000x)	<b>83</b>
<b>32</b>	Scanning electron micrograph of calcium hydroxide treated group. (Magnification 2000x)	<b>84</b>

## **LIST OF ABBREVIATIONS**

N	Nucleus
NU	Nucleolus
M	Mitochondria
JC	Junctional complexes
RER	Rough Endoplasmic Reticulum
L	Line of demarcation
C	Calcospherites
ng/ml	Nanogram per millilitre
g/dL	Gram per decilitre
ALN	Alendronate
M	Fibrocellular matrix
T	Trabeculae of osteoid tissue
O	Osteoblasts
U	Union between trabeculae
BV	Blood vessel
OS	Osteocytes
NB	Newly formed bone
OB	Old bone
FBM	Fibrous bone marrow
µm	Micrometer
µg	Microgram
mg/ml	Milligram per millilitre

## - مستخلص الرسالة

صممت هذه الدراسة لتحري تأثير البيسفوسفونات وماءات الكالسيوم كعنصر مضاد للامتصاص على:

- أ- العيوب المحرصة داخل العظم عند الجرذان (دراسة حيوانية)
  - ب- الجدران العاجية للأقنية الجذرية (دراسة سنّية).
- أ- الدراسة الحيوانية :

شملت الدراسة ٣٠ جرذاً أبيضاً ذكراً متوسط وزنهم ٢٠٠ غ  
١. الاختبار الكيميائي الحيوي:

أ- معايرة التلكس العظمي. ب- معايرة إنزيم الفوسفاتاز القلوي. ج- معايرة بروتين العظم الكلي

٢. التقييم النسيجي.

٣. التقييم باستخدام المجهر الالكتروني المبعوث.

ب- الدراسة السنّية:

التقييم بالمجهر الالكتروني الماسح:

قطعت ١٥ قاطعة علوية وحيدة الجذر دائمة بشرية حديثة القلع عند الملتقى المينائي - الملاطي.

أنجزت المعالجة اللبية للأقنية الجذرية وتم حشي خمسة منها باستخدام مادة البيسفوسفونات وخمسة أخرى باستخدام ماءات الكالسيوم بينما تركت خمسة أقنية فارغة دون حشو كعينة شاهدة.

جهزت عينات الأسنان لتقييمها باستخدام المجهر الالكتروني الماسح. تم تقييم درجة الحموضة Ph لكل من معجوني البيسفوسفونات وماءات الكالسيوم في ثلاثة أوساط مختلفة:

أ- الماء المقطر.

ب- محلول المخدر الموضعي.

ج- السالين.

النتائج

لم يلاحظ وجود أي اختلاف هام في مستوى الفوسفاتاز القلوية والتلكس العظمي بين كلتا المجموعتين الاختباريتين.

كان البروتين العظمي الكلي في البيسفوسفونات أقل بشكل ملحوظ إحصائياً من ماءات الكالسيوم. ولم يكن هناك اختلاف هام إحصائياً بين العينة الشاهدة والاختبارية في نفس المجموعة.

## (Abstract)

This study was designed to investigate the effect of bisphosphonate and calcium hydroxide as an antiresorptive agent on:

- a. Rat intraosseous tissue (Animal study)
- b. Root canal dentin wall (Teeth study)

### **A. Animal study**

Thirty white male rats of average weight of 200 grams The animals were classified into two main experimental groups of 15 rats each:

Group I: received polyethylene tube filled with alendronate paste implanted in the in the right tibia. Group II: received polyethylene tube filled with calcium hydroxide paste implanted in the right tibia tibia.

the implant sites were investigated by.

I-Biochemical investigation:

II-Histological evaluation

III-Transmission electron microscope evaluation.

**B. Teeth study** : i- pH assessment of both bisphosphonate & calcium hydroxide paste in three different medium.

ii- Forty five recently extracted human permanent single rooted maxillary upper incisors, and were subjected to scanning electron microscopy assessment.

### **Results**

No significant difference in osteocalcin and bone alkaline phosphatase level in both experimental groups. Total bone protein in bisphosphonate was significantly lower than calcium hydroxide.

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Resorption is a condition associated with either a physiologic or a pathologic process that results in loss of substance from a tissue such as dentine, cementum and alveolar bone. Root Resorption is a process affecting the cementum and/or dentine of root of a permanent tooth.

The mechanism of root resorption is similar to that described for bone in which the osteoclasts remove the organic material from bone first, and then the inorganic salts have lost their framework and are carried away by the tissue fluids and macrophages.

The term “anti-resorption agent” as applied to bone tissue refers to a compound that blocks bone resorption by suppressing remodeling or the activity and/or lifespan of osteoclasts.

The bisphosphonates are a class of chemicals that share a basic phosphate-carbon-phosphate core and bind strongly to calcium. The bisphosphonates inhibit osteoclastic bone resorption and may have effect on the osteoblasts. They are structurally similar to pyrophosphate, a normal product of human metabolism. This structure gives the drug a high affinity for bone and they probably remain in bone for many years. The bisphosphonates appear to be taken up by osteoclasts active upon bone, and to inhibit crucial intracellular processes. Bisphosphonates bind to bone matrix to decrease osteoclastic activity, which prevent bone resorption. It appears to directly inhibit osteoclast function and trigger osteoclast apoptotic cell death, thereby decreasing the osteoclast stimulation and bone calcium