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Densitometric evaluation of periapical bone healing using an oily Calcium hydroxide suspension. A preliminary controlled study

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Introduction

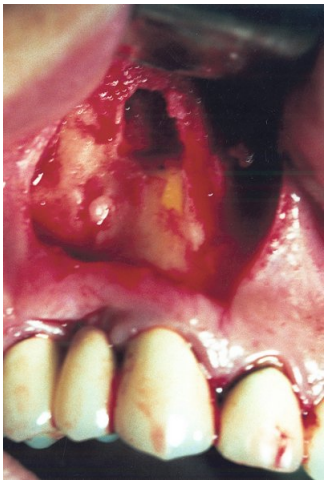
Results of basic research as clinical studies have suggested the influence of an oily Calcium Hydroxide suspension on bone regeneration in closed defects as post-extraction alveolae. Its osteostimulative effect seems to rely on many factors, as the deposit action of the Calcium Hydroxide, which sustains the bone metabolism in a constant, mild alkalic environment, the stimulation of the angiogenetic bone growth with concentration of the growth factors next to the defect wall, and the reduction of the inflammation both in animals and humans, seem to indicate a predictable regeneration of closed bone defects. Such results have recently led to attempts to use the oily Calcium Hydroxide suspension alone or under various combinations, in treating post-surgical bone defects of endodontic origin.

Objectives

Aim of this study was the densitometric comparison of the effect of an oily Calcium Hydroxide suspension vs. curettage alone in the surgical treatment of bone defects of endodontic origin.

Material und Methods

Twelve patients (7 female and 5 male), between 28-56 years old, each displaying one or more bone lesions of endodontic origin with diameters varying between 7-20 mm, were treated either with apicoectomy followed by curettage and an oily Calcium Hydroxyde suspension (Osteoinductal®, Osteoinductal GmbH, Muenchen, Germany), or with apicoectomy followed by curettage alone. All patients underwent complete root canal therapy (primary or re-entry) two weeks prior to surgery. Root canals were treated with the ProTaper® (Dentsply-Maillefer, Ballaigues, Switzerland) system and were filled with the Thermafill plus® (Dentsply-Maillefer, Ballaigues, Switzerland) system. All patients were instructed and motivated to maintain a good oral hygiene level, verified by a reduction of the PI (Silness and Löe) < 1. Radiographic examination was performed using the conventional RIO technique. Before surgery, each defect was randomly assigned either to the curettage & Osteoinductal® group (test), or to the curettage alone group (control). Surgery was performed under local anesthesia. According to the clinical situation, a full thickness flap was raised after intrasulcular and release incisions, or after a convex incision below the estimated location of the defect. After location and the exposure of the apex, the apicoectomy was performed, the granulomatous tissue careful removed and the bone curetted until reaching the sound limits of the area. The bone defects of the test group were filled with Osteoinductal® of creamy consistence in direct contact with the rough, vital bone surface, while the defects of the control group were filled with patient's own blood. Flaps were carefully replaced and sutures placed, so that the lesions in the test group could retain as much suspension as possible. Post surgical care included antibiotherapy for one week (3x500 mg Amoxycilin daily) and 0.2% Chlorhexidin (Plak-Out®, Santa Balanos, Greece) mouth rinses, twice a day, for the following two weeks. Evaluation was made on the radiographs at two months by using EvalDens, an original computer-assisted densitometric method, based on the comparison of the gray-scale shades of standard areas of sound and periapical areas of regenerated bone, on each same radiograph. The Mann-Whitney U non-parametric test was used to compare the differences between values corresponding to sound bone, and values corresponding to regenerated bone, at two months after the surgery.



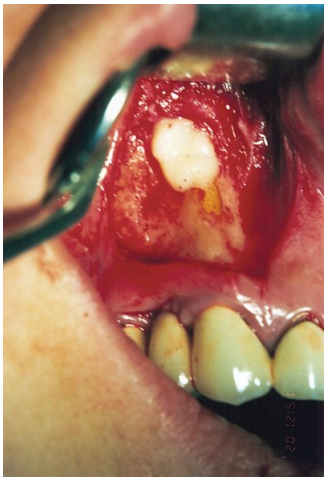


Fig.1 Apical Bone defect exposedd

Fig.2 Defect filled with the oily Calcium Hydroxyde suspension Osteoinductal

Results

The healing phase progressed uneventful. Slight signs of postoperative oedema, no infection, no allergy or severe pain were present. Postoperative values of the relative bone density in the two treated groups are displayed in the table No.1 and table No.2.

Nr.	Patient	Tooth type	Relative density (%)
1.	B.M.	4.6.	63
2.	M.B.	2.4.	104
3.	M.B.	2.5.	105
4.	B.A.	1.2.	85
5.	D.S.	2.2.	50
6.	M.L.	2.2.	68
7.	R.S.	1.4.	75
8.	A.A.	1.2.	79

Mean relative density 79 ± 19,7

Table 1. Two months relative density evaluation after treatment of bone defects of endodontic origin with curettage and Osteoinductal®

Nr.	Patient	Tooth type	Relative density (%)
1.	S.I.	3.1.	75
2.	S.I.	4.1.	107
3.	S.I.	3.2.	115
4.	B.L.	2.4.	102
5.	B.P.	1.2.	100
6.	G.I.	1.3.	83
7.	T.S.	1.2.	64
8.	T.S.	1.3.	71

Mean relative density 89 ± 18,7

Two months relative density evaluation after treatment of bone defects of endodontic origin with curettage alone

The relative density between individual standard areas of sound bone and the periapical areas of surgically treated teeth varied between 50% and 108% within the Osteoinductal® group, with a mean value of 79 ± 19,7%, and between 64% and 115% with a mean value of 89 ± 18,7% within the control group. The control group displayed higher relative densities than the group treated with Osteoinductal®.
Examination of Rx reveals a visible defect fill in all treated cases at two months.

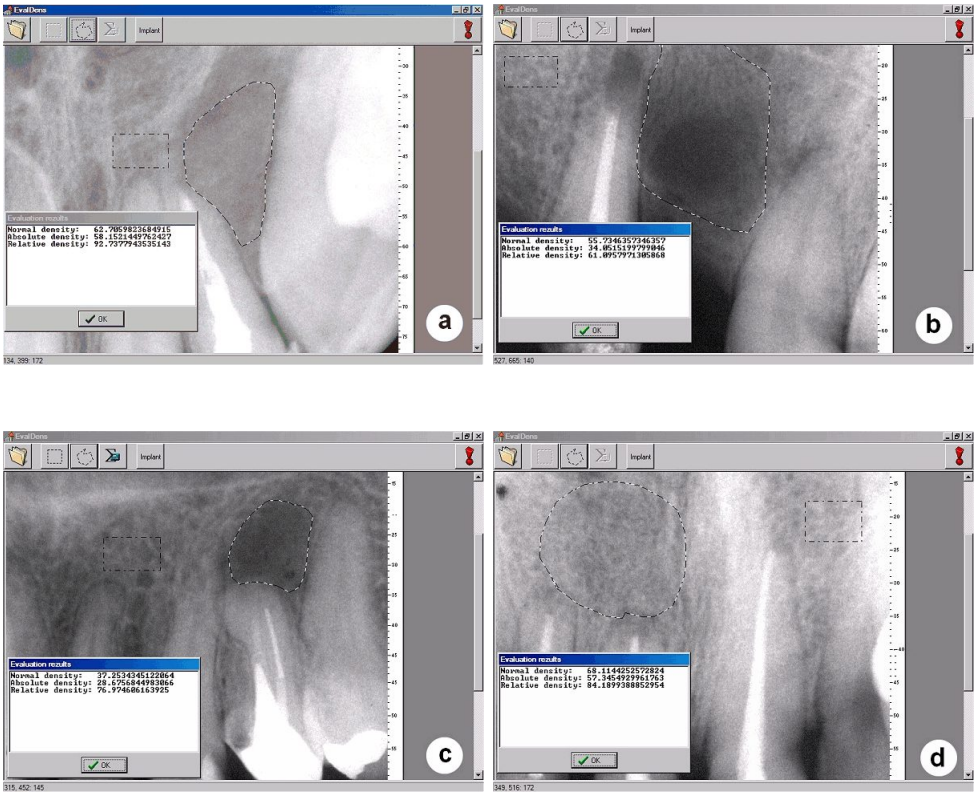


Fig.3 (a-d) Application of the EvalDens densitometric analysis to assess the relative density of four apical defects treated with Osteoinductal; rectangular area = the standard reference area of sound periapical bone; irregular area = area of the previous lesion treated with Osteoinductal

Discussion and Conclusions

The results demonstrate that both treatments may result in radiographic defect fill, although the oily Calcium hydroxide suspension did not improve the relative bone density of surgically treated periapical lesions at two months. The difference between the groups was not statistically significant. Although the EvalDens densitometric evaluation method is especially designed for non-equivalent compared areas (i.e. the relative density does not depend on the shape and surface of the selected areas, but on the intensity of the radiographic shade), results also indicate the limits of the densitometric analysis in groups with large dispersion of the values, and the need of a standardization of the regenerated/healed area. Subsequently, the results show a strong dependence of the analysis on the initial size of the defect and on the number of cases. Additionally, the oily Calcium Hydroxide suspension Osteoinductal® seems to improve the healing process.

Abbreviations

- PI = Plaque Index
- RIO = Retroalveolar Isometric Orthoradial

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Poster Faksimile:

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Stratul S-I, Rusu D, Jianu R, Enache S, Ogodescu A.- Victor Babes Medical University Timisoara, Romania; Popescu M.- Vasile Goldis University Arad, Romania*

ABSTRACT

Bone regeneration using bone substitutes and/or bone promoters have become a widely considered adjunct to surgical endodontic therapy. Numerous bone grafting materials claimed over the years to promote osseous healing of lesions of endodontic origin.

An oily Calcium Hydroxide suspension (Osteoinductal®, Osteoinductal GmbH, Muenchen, Germany), clinically proven to reduce post-extraction pain, inflammation and bleeding, has been used in this preliminary controlled study to promote bone healing in surgically treated periapical lesions.

16 lesions with diameters varying between 7-20 mm were randomly treated either with apicoectomy, curettage and Osteoinductal® (treatment group), or with apicoectomy and curettage alone (control group). Standardized radiographs were taken before and two months after the surgery. The Osteoinductal® group displayed an excellent clinical healing. Evaluation was made on the radiographs at two months by using a computer-assisted densitometric method. Statistical analysis used the Mann-Whitney non-parametric test.

Relative density between individual standard areas of sound bone and the periapical areas of surgically treated teeth varied between 50% and 108% within the Osteoinductal® group, with a mean value of 79±19.7%, and between 64% and115% with a mean value of 89±18.7% within the control group.

The results show that the oily Calcium hydroxide suspension did not improve the relative bone density of surgically treated periapical lesions at two months, but the difference between the groups was not statistically significant. Results also indicate the limits of the densitometric analyses in groups with large dispersion of the values, and, subsequently, a strong dependence of the analysis on the initial size of the defect and on the number of cases.

INTRODUCTION

Results of basic research as clinical studies have suggested the influence of an oily Calcium Hydroxide suspension on bone regeneration in closed defects as post-extraction alveolar. Its osteostimulative effect seems to rely on many factors, as the deposit action of the Calcium Hydroxide, which sustains the bone metabolism in a constant, mild alkalic environment, the stimulation of the angiogeneric bone growth with concentration of the growth factors next to the defect wall, and the reduction of the inflammation both in animals and humans, seem to indicate a predictable regeneration of closed bone defects. Such results have recently led to attempts to use the oily Calcium Hydroxide suspension alone or under various combinations, in treating post-surgical bone defects of endodontic origin.

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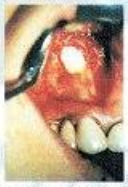

Fig 2. Defect filled with the oily Calcium Hydroxyde suspension Osteoinductal®

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Mean relative density: 79 ± 19.7			

Table 1. Two months relative density evaluation after treatment of bone defects of endodontic origin with curettage and Osteoinductal®

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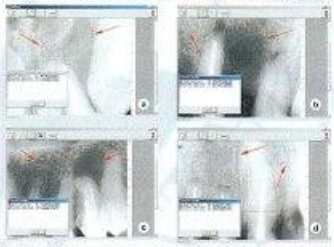

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