

Surgical Treatment of Parodontitis by "Bio-Oss", Combination of "Bio-Oss" and Recombinant Human Bone Morphogenetic Protein-2 (rhBMP-2) and Evaluation of Obtained Results by Osteometric Method

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Abstract

The aim of our study was the evaluation of obtained results after surgical treatment with Bio-Oss (group II) and complex application of Bio-Oss and recombinant human bone morphogenetic protein-2 (group III) by osteometric method. Analyses of obtained results shows that Bio-Oss and rhBMP-2 represent the modern technologies that could be used for acceleration of bone tissue regeneration. Combination of Bio-Oss and rhBMP-2 gives us opportunity to reduce the duration of bone regeneration practically by 3 months in comparison with Bio-Oss surgery without combination. So, could be concluded that the combination of Bio-Oss and rhBMP-2 is high-effective method for surgical treatment of parodontitis and it could be widely implemented in stomatologic practice.

Keywords: *Bio-Oss, protein-2 (rhBMP-2), parodontitis, regeneration*

Introduction

Pathology of Parodontium belongs to the most common diseases of human beings. According to the latest data of WHO, different forms of parodontitis have been found in 80-85% of world population. The high frequency of this pathology together with many other factors basically is caused by lack of knowledge of stomatology and pathogenesis of given pathology [T.V. Kudryashova 1996]. Due to its high frequency, this pathology represents one of the main directions in modern stomatologic studies [A.I. Gryadov 1998]. In complex treatment of parodontium surgery has been considered as one of the best. We'd like to the results and analysis of these results obtained through surgery by combination of alogenic tissue graft an

d bone morphogenetic protein.

The aim of our study was the evaluation of obtained results after surgical treatment with Bio-Oss (group II)

and complex application of Bio-Oss and recombinant human bone morphogenetic protein-2 (group III) by osteometric method.

"Bio-Oss" represents biological agent with small hydroxyl groups compounding as well osteoplasts and osteoblasts.

Recombinant human bone morphogenetic protein-2 (rhBMP-2) represents exceptional system of differentiated factors, causing new bone formation in the site of defect while putting it on the site of bone defect due to high stimulation of bone regeneration [Worney J.M. 1995].

The techniques of surgical interference with "Bio-Oss" and "Bio-Oss" and rhBMP-2 complex application differs from classical surgery with maximal preservation of gingival and bone tissues at the threshold of bone defect, as well as parodontal junctions in this case. The storage of soft tissues is

necessary for covering of defect, where after proper proceeding (we mean removing of pathological tissues) has been used "Bio-Oss" in one case and "Bio-Oss" and rhBMP in combination in another one. In both of cases have been used protective membranes.

During application of these materials, in groups II and III, on the mandible, at be-wall defects the surgery has been performed through the following stages:

II group

- Vertical and horizontal dissections;
- Formation of mucous-periosteal shaft
- Remove of pathological tissues (granulations, stones)
- Filling of defects with "Bio-Oss"
- Covering and fixation of membrane
- Suturing of lacerate

III group

- Vertical and horizontal dissections;
- Formation of mucous-periosteal shaft;
- Remove of pathological tissues (granulations, stones);
- Filling of defects with "Bio-Oss";
- Covering and fixation of membrane;
- Suturing of lacerates;

Materials and Methods

Osteometrical Method of Study

For objective evaluation of bone tissue restoration has been used X-ray examination. The lack of this widely used method is non-informativness at its early stages of application. Moreover, often application of X-ray is not desirable. The same should be mentioned about radio-isotopic diagnosis, which is more expensive in comparison with the above-mentioned method. Therefore, austic examination method could be considered as a more acceptable, cheap and appropriate method [G.V. Golikin 1962; I.K. Asy 1968; N.K. Loginova 1984; E. Tyhak 1996].

Ultrasound diagnosis is widely used in modern studies in Stomatology for diagnosis of inflammatory processes, bone tissue pathologies and observation of consolidation dynamics of fractions as of bone as well as tumor genesis [O.V. Tatushkin 1965; A.N. Balashov 1975; E.I. Dubrov 1975; N.K. Loginova, N.A. Kipiani 2000, Z.R. Odjonikidze 1987].

Application of ultrasound method is based on delay of a sound distribution in tissues, in parodontal tissue at our case. Speed of sound distribution should be measured in the same areas, on the same distances as at norm as in pathology.

Density of bone tissue (parodontal tissue) has been measured by method of Echo-Osteometry that is used for evaluation the state of bone tissue by assuming the speed data of passing ultrasound.

Taking into consideration that, the thickness of soft tissues in mandibular area is not big, has been chosen the absolute regime. During application of Echo-Osteometric apparatus, one of diagnostic ultrasound head performed the function of ultrasound conductor, while the other served as a receiver. At the same time has been measured speed of ultrasound distribution in soft and hard tissues simultaneously in mandible area at the levels of sixth and seventh teeth, so that the distance between conductors came up to 14cm at all cases of observation. For improvement of ultrasound passing through skin, at all observation, the diagnostic heads of Echo-Osteometer have been covered with thin layers of vaseline or proper jellies for this procedure was used. Afterwards they were tightly placed on both sides of mandible. At ultrasound passing through mandible parodontal tissue, the Echo-Osteometer has been taken off light indicator and the speed were determined by formula:

$V=S/t$ where:

V - speed of ultrasound distribution in bone tissue

S - distance between conductors

t - speed of ultrasound distribution (m/sec)

Echo-Osteometric studies have been carried out before and post-surgery - in 14, 30, 45 days and 3,6,9 and 12 months (II group) after placing "Bio-Oss" on parodontal tissues.

In group III combination of Bio-Oss and rhBMP has been placed on parodontal tissue and periods of investigation were the same.

Echo-Osteometric Studies at Clinic

Echo-Osteometric studies have been performed on postoperative patients undergone Bio-Oss (II group) and rhBMP-2 and Bio-Oss (III group) surgeries. Control group consisted of 26 persons, 25-26 of ages. They applied to the clinic with diagnosis: caries and pulpitis. Parodontal diseases have not been found in patients of these groups. Ultrasound study on above-mentioned patients' groups showed that speed of ultrasound distribution was 3068 ± 64 m/sec (n=26).

Type of Surgical Interference	Terms of Study								
	Before surgery	In 14 days after surgery	In 30 days after surgery	In 45 days after surgery	In 3 months after surgery	In 6 months after surgery	In 9 Months after surgery	In 12 months after surgery	All
Placement of Bio-Oss collagen on parodontal tissues	66	54	44	36	20	15	13	12	260
Placement of Bio-Oss and rhBMP combination on parodontal tissues	56	53	47	39	30	26	18	15	284

Tab.1 Placement of Bio-Oss and rhBMP combination on parodontal tissues.

Groups for clinical study		Terms of Study								
		At norm	Before surgery	In 14 days after surgery	In 30 days after surgery	In 45 days after surgery	In 3 months after surgery	In 6 months after surgery	In 9months after surgery	In 12 months after surgery
Control group	M±m	3068±64	-	-	-	-	-	-	-	-
	n	26	-	-	-	-	-	-	-	-
Surgery with Bio-Oss II group	M±m		2622±68	2634±90	2704±64	2746±62	2784±106	2804±74	3014±88	3042±56
	n	-	66	54	44	36	20	18	18	12
	P ₁	66	<0,001	<0,001	<0,001	<0,001	<0,001	>0,05	>0,05	>0,05
	P ₂		-	>0,05	>0,05	>0,05	>0,05	>0,05	>0,05	>0,05
Surgery with Bio-Oss and rhBMP III group	M±m		2622±68	2670±84	2687±58	2749±61	2814±94	3004±76	3034±62	3054±44
	n	-	56	53	47	39	30	26	18	15
	P ₁	56	<0,001	<0,001	<0,001	<0,001	>0,05	>0,05	>0,05	>0,05
	P ₂		-	>0,05	>0,05	>0,05	>0,05	>0,05	>0,05	>0,05

Tab.2 Surgery with Bio-Oss and rhBMP III group.

At clinic, except of control group, 122 patients with parodontitis have undergone Echo-osteometric study. Results of study showed that speed of ultrasound distribution in parodontal tissue was 2618±82 m/sec (n=122).

Data of Echo-Osteometric study in I, II and III groups is given in the *Tab.2*.

Conclusions

Analysis of Echo-Osteometric data shows that speed of ultrasound distribution in parodontal tissue is decreased up to 2622±68 m/sec (n=122) at moderate and severe forms of parodontitis.

These findings have not been changed in II and III groups after 14 days from surgery. Light changes have been found in both groups in 30 and 45 days after surgery, though increased speed of sound distribution indicates to the onset of regenerative processes in bone. After 3 months from surgery speed of sound starts to increase in both groups and in group III has been indicated the better finding - 2814±74 n=18, while in group III has been observed significant increase of this parameter, approaching its to the norm. Speed of sound distribution in this group comes up to 3034±62 m/sec (n=18). Actually in 12 months after surgery speed of sound is equal to norm (3068±64, n=26) in both II (3042±56m/sec) and III groups - (n=12 - 3054±64, n=15), respectively.

It should be emphasised that by X-ray observation in group II complete regeneration of parodontal tissue is revealed after 9 months while in group I the same index was achieved after 6 months.

Analysis of obtained results shows that the state of parodontal tissue regeneration should be considered by application of ultrasound study. Of great importance is that this study has no adverse effects and it is harmless.

Analyses of obtained results shows that Bio-Oss and rhBMP-2 represent the modern technologies that could

be used for acceleration of bone tissue regeneration. Combination of Bio-Oss and rhBMP-2 gives us opportunity to reduce the duration of bone regeneration practically by 3 months in comparison with Bio-Oss surgery without combination.

So, could be concluded that the combination of Bio-Oss and rhBMP-2 is high-effective method for surgical treatment of parodontitis and it could be widely implemented in stomatologic practice.

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Хирургическое лечение с "Bio-Oss" - ом, комбинацией "Bio-Oss" с рекомбинантным костным морфогенетическим протеином-2 человека (rhBMP-2) и оценка результатов методом Остеометрии

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Р Е З Ю М Е

Цель исследования - оценка полученных результатов при хирургическом лечении с использованием Bio-Oss - группа II и комбинацией Bio-Oss с рекомбинантным костным морфогенетическим протеином-2 (rhBMP-2) - группа III, обсуждение результатов исследования и остеометрический анализ. Анализ полученных данных показывает, что Bio-Oss и рекомбинантный костный морфогенетический протеин-2 (rhBMP-2) представляют собой средства, которых можно использовать для ускорения регенерации костных тканей. Комбинация Bio-Oss с рекомбинантным костным морфогенетическим протеином-2 (rhBMP-2) дает возможность уменьшить время регенерации практически на 3 месяца по сравнению с лечением Bio-Oss. Установлено, что комбинация Bio-Oss с рекомбинантным костным морфогенетическим протеином-2 (rhBMP-2) высоко-эффективное средство для хирургического лечения пародонтита и оно может быть широко внедрено в практической стоматологии.

Ключевые слова: *Bio-Oss, протеин-2 (rhBMP-2), пародонтит, регенерация*