RATIONALE CORRECTION OF MAGNESIUM DEFICIENCY IN GENERALIZED PERIODONTITIS

Rozhko M., Plaviuk L., Gereliuk V., Makhlynets N., Melnyk N., Stasiuk N.

Ivano-Frankivsk National Medical University
Department of Therapeutic Dentistry, Ivano - Frankivsk, Ukraine.

Abstract.
Periodontal diseases and especially generalized periodontitis (GP) are a significant health and social problem, which nominated in dentistry on the first place. People lose 15 to 20 teeth, most of which are extracted due to periodontal disease, at the age of 40 till 60 years old. The following article is indicated on the effectiveness of the proposed method of treatment of (GP) I and II degree of development with or without a concomitant osteoporosis in the face of moderate or severe hypomagnesemia using a drug of magnesium variety that evidenced by the disappearance of clinical signs of inflammation in the periodontal tissues and prevention of inflammation recurrence in the long terms. Also, it was shown that usage of the offered method of the GP differentiated osteotropic therapy with including of magnesium variety medicines leads to stabilization of macroelements homeostasis, due to statistically significant growth of serum magnesium, decreasing of urine calcium excretion and optimization of Ca:Mg ratio for the persons of study groups against to the values of control groups.

Summary.
Periodontal diseases and especially generalized periodontitis (GP) are a significant health and social problem, which nominated in dentistry on the first place. People lose 15 to 20 teeth, most of which are extracted due to periodontal disease, at the age of 40 till 60 years old. According Ukrainian scientist’s investigations - complex treatment of GP at age 35 - 44 years require more than 30% of the population. Such, at young persons (18 - 20 years) periodontal diseases are diagnosed in 92% of cases, and in patients aged 40 years and older the incidence reaches 100%. This situation is obviously associated with a decrease in immune status, the growing number of somatic pathology, changes in environmental conditions which certainly reflected in the overall resistance of the organism [3].

Traditional treatment of GP is to eliminate inflammation in the periodontium by removing local irritating factors and use in local and general therapy antimicrobial, anti-inflammatory, antioxidant, antihistamine, immunomodulating, vitamin preparations [1, 2]. However, these schemes of treatment rarely supplemented agents that specifically and purposefully influence the metabolism of bone.

In the pathogenesis of GP main place takes the relationship of the alveolar bone resorption with systemic osteoporosis. Resorption of alveolar bone is directly correlated with the depth of periodontal pockets, gingival fluid volume and content second type of prostaglandins there (PGE2, PGI2) and leukotrienes fourth type (LTB4) at different degree of GP. These data indicate a role of lipid mediators in causing of local osteoporosis in GP. Disruption of bone remodeling under the influence of systemic factors leads to the development of osteoporosis and causes alveolar bone resorption, decreasing in bone mass of the jaws. If we look at the teeth-jaw system as part of all the support skeleton, so systemic osteoporosis development certainly reflected on the state of periodontal tissue and alveolar process [7,8].

The problem of systemic osteoporosis in general and its relationship with dystrophic-
inflammatory periodontal disease interested of many researchers and practitioners, because these diseases have a common pathogenesis [9].

The analysis of the literature indicates that the problem of the imbalance of alveolar bone remodeling in particular and the skeletal system as a whole is considered incomplete. In periodontics specialists make the emphasis on calcium supplementation and active metabolite of vitamin D, and unreasonably forget about such important macronutrient like magnesium, although that was improved: to proper digestion of calcium in the body should be a normal concentration of magnesium, only under these conditions can be obtained osteotropic positive effect in the treatment of GP in the background of accompanying osteoporosis.

A problem of rational medicamental treatment of GP is especially actual. The literature review shows the diversity of pathogenetic mechanisms of development of GP in conditions of magnesium deficiency. It was proved significant role of magnesium in the inhibition of inflammation and correction of the positive activity of calcium in the body. According to extensive research it was found that normal levels of magnesium in the blood, even among those with moderate and high level of life is rare (1 case per 100 investigated). Conditions of modern life lead to the spread in the body of magnesium deficiency: psycho-emotional stress, impaired diet, sedentary lifestyle, alcohol, progressive aging of the population - and this is not an exhaustive list of factors that contribute to the development of hypomagnesemia in humans. The highest frequency of magnesium deficiency is observed in individuals older than 50 years – 100%.

The following article is indicated on the effectiveness of the proposed method of treatment of (GP) I and II degree of development with or without a concomitant osteoporosis in the face of moderate or severe hypomagnesemia using a drug of magnesium variety that evidenced by the disappearance of clinical signs of inflammation in the periodontal tissues and prevention of inflammation recurrence in the long terms. Also, it was shown that usage of the offered method of the GP differentiated osteotropic therapy with including of magnesium variety medicines leads to stabilization of macroelements homoeostasis, due to statistically significant growth of serum magnesium, decreasing of urine calcium excration and optimization of Сa:Mg ratio for the persons of study groups against to the values of control groups.

Key words: generalized periodontitis, magnesium deficiency, magnesium medicines.

Objective

To improve the efficiency of complex medicamental treatment of GP using of differentiated osteotropic therapy, especially medicines of magnesium variety «Magnicum».

Materials and methods.

The object of the study was a group of 60 people suffering from GP 1 and 2 degrees with diagnosed osteoporosis, that equal for 46.2% of the all examined patients (130). WHO recommendation in diagnostics of osteopenia and osteoporosis should be done due to T-test: normal values are ±1 SD; value from -1 to -2,5 SD evaluated as osteopenia (preclinical stage of osteopo-

PHARMACIA, vol. 64, No. 1/2017

PHARMACIA, vol. 64, No. 1/2017

PHARMACIA, vol. 64, No. 1/2017

PHARMACIA, vol. 64, No. 1/2017

PHARMACIA, vol. 64, No. 1/2017

PHARMACIA, vol. 64, No. 1/2017

PHARMACIA, vol. 64, No. 1/2017
of magnesium variety «Magnicum» ("Kyiv Vitamin Factory", Ukraine) 1 tablet three times a day, after that antiresorptive agent "Calcemin Advance" ("Sagmel Inc.", USA) 1 tablet twice daily with food; 2A - patients diseased on GP II degree with concomitant osteoporosis (15 persons) – basic treatment combined with antiresorptive agent "Calcemin Advance" ("Sagmel Inc.", USA) 1 tablet twice daily with food; 2B - patients diseased on GP II degree with concomitant osteoporosis (15 persons) – basic treatment combined with a complex preparations of magnesium variety «Magnicum» ("Kyiv Vitamin Factory", Ukraine) 1 tablet three times a day, after that antiresorptive agent "Calcemin Advance" ("Sagmel Inc.", USA) 1 tablet twice daily with food.

For the purpose of comparative characteristics of performed methods of GP differentiated osteotropic therapy was carry out assessment of blood concentration of Ca, Mg and P, urine excretion of Ca, periodontal tissues indexes (index of inflammation PMA, index of bleeding PBI, index of hygiene by Green-Vermilyon, depth of periodontal pockets and total index of the severity of inflammation in periodontal tissues).

Results

In patients with GP I and II degree of development and with concomitant osteoporosis after 2 - 3 sessions observed improvement of periodontal tissue in relation to complaints of patients: disappeared halitosis, decreased discomfort or pain in the gums, color of gums normalized, disappeared or decreased swelling and bleeding of gums. It is really observed a gradual reduction of symptomatic gingivitis signs due to objective examination, exudation of periodontal pockets in majority of patients completely stopped to 4 sessions. The mucous membrane of the gums became more dense, closely adjacent to the necks of the teeth, acquired a pale pink color, decreasing swelling and bleeding on palpation. Timely conducted curettage (at the II stage of GP) leads to a reduction in the depth of periodontal pockets, cessation of exudation and epithelization of bottom. The normalization of clinical parameters in all groups of patients, regardless of the proposed treatment became on 4 - 5 visits. The number of treatment sessions depended on the degree of GP development and severity of symptomatic gingivitis. The average number of sessions in groups of patients with GP I and II degree of development using the proposed method of treatment was 4,25 ± 0,42; in patients with GP I and II degree of development using traditional treatment - 4,52 ± 0,47. After treatment with objective examination observed normalization of color, texture and configuration of the gums, gingival margin relief recovery, elimination of edema and pastosity of gums.

After 1, 6, and 12 months after treatment persists stabilization of periodontal tissues in all groups. However, in the study group, which applied the proposed treatment is a statistically significant positive trend in reducing PMA indices, bleeding index (PBI), depth of periodontal pockets and the total index of the severity of inflammation in periodontal tissues in comparing both with initial values and the parameters of control groups.

Consequently, in patients of all groups was achieved stabilization of dystrophic-inflammatory process in the periodontal tissues, but in the study group was provided a better effect. Clinical results of treatment were confirmed according to the index and instrumental assessment of periodontal tissues.

Usage on the background of basic treatment magnesium and calcium drugs: «Magnicum» and «Calcemin Advance» in patients with GP I degree of development with concomitant osteoporosis, gave the following results: serum calcium content statistically significantly increased on stages of treatment compared with the initial data in groups of patients which received the "Calcemin Advance" therapy - groups 1A and 1B, respectively (2,31±0,003) mmole/l and (2,30±0,01) mmole/l before treatment, (2,41±0,004) mmole/l and (2,48±0,004) mmole/l immediately after treatment, (2,54±0,004) mmole/l and (2,59±0,004) mmole/l.
1 month after treatment, (2.51±0.004) mmole/l and (2.57±0.004) mmole/l 6 months after treatment, (2.5±0.003) mmole/l and (2.56±0.004) mmole/l 12 months after treatment (p<0.001).

Also marked authentically significant difference in parameters of groups who received basic treatment and "Calcemin Advance" on the background of magnesium balance normalization by using «Magnicum» (p<0.001).

The content of serum phosphorus in patients with GP I degree of development with concomitant osteoporosis at stages of treatment has not undergone significant difference, values were within the reference, though statistically authentically distinguished in the groups treated with "Calcemin Advance" on a background of basic therapy and "Magnicum" (p<0.001).

The content of serum magnesium on stages of treatment varied as follows: in patients of the study group, which in the complex with traditional therapy received magnesium medicines "Magnicum" showed statistically significant increase of this figures compared to the control group and the initial data. Thus, this data immediately after treatment in group 1B was equal (0.92±0.004) mmole/l against the parameters of the control group 1A (0.83±0.004) mmole/l (p <0.001); 1 month after treatment - (1.01±0.003) mmole/l against (0.86±0.004) mmole/l (p <0.001); 6 months after treatment - (1.04±0.003) mmole/l against (0.85±0.004) mmole/l (p <0.001); 12 months after treatment - (1.04±0.003) mmole/l against (0.83±0.004) mmole/l (p<0.001). Thus using of the "Magnicum" helps eliminate the phenomenon of hypomagnesemia in patients with GP I degree of development with concomitant osteoporosis and possibly normalize of bone metabolism and bone remodeling.

In groups with diagnosed osteoporosis, in which calcium excretion before treatment was higher than norm, there was a statistically authentically difference between parameters on the stages of treatment influenced by use of antiresorptive agent "Calcemin Advance" and, additionally, of magnesium medicine "Magnicum".

So, in group 1B urine calcium excretion in the stages of treatment amounted to: (8.2±0.004) mmole/day immediately after treatment; (7.31±0.004) mmole/day month after treatment; (6.84±0.004) mmole/day 6 months after treatment; (6.46±0.004) mmole/day 12 months after treatment against (8.4±0.005) mmole/day in the same group before treatment (p<0.001).

In addition, it was found that the excretion of calcium in urine was significantly decreased in patients of group 1B against 1A group (p <0.001), which received in complex treatment antiresorptive agent "Calcemin Advance" after the saturation of the body with magnesium - "Magnicum."

According to the data, it appears interesting to study the dynamics of Ca:Mg ratio on the stages of GP I degree of development and with concomitant osteoporosis treatment.

We found that in the study group of patients with GP I degree of development with concomitant osteoporosis that with basic treatment received magnesium therapy by "Magnicum" there was a positive trend on the approximation of the Ca:Mg ratio to the recommended values, and the findings are statistically authentically different from the initial and from those in the control group (p<0.001). Thus Ca:Mg ratio in group 1B equal: before treatment 2.88:1 against 2.69:1 immediately after treatment; 2.56:1 month after treatment; 2.47:1 six months after treatment; 2.46:1 twelve months after treatment respectively. In group 1A known data were: 2.9:1 immediately after treatment; 2.95:1 month after treatment; 2.95:1 six months after treatment; 3.01:1 twelve months after treatment.

Established direct correlation of medium strength between the Ca:Mg ratio and PMA, PBI index, total index of inflammatory activity in periodontal tissues and depth of periodontal pockets.

Usage with basic treatment magnesium and calcium drugs: "Magnicum" and «Calcemin Advance» in patients with GP II degree of development with concomitant osteoporosis, gave the following results: serum calcium content
statistically significantly increased on stages of treatment compared with the initial data in groups of patients who received "Calcemin Advance" therapy - a group 2A and 2B, respectively (2.23±0.01) mmole/l and (2.21±0.01) mmole/l before treatment, (2.33±0.004) mmole/l and (2.38±0.004) mmole/l immediately after treatment, (2.46±0.004) mmole/l and (2.49±0.004) mmole/l 6 months after treatment, (2.41±0.004) mmole/l and (2.46±0.004) mmole/l 12 months after treatment (р<0.001). Also marked authentically significant difference in parameters of groups who received basic treatment and "Calcemin Advance" on the background of magnesium balance normalization by using «Magnicum» (р <0.001).

The content of serum phosphorus in patients with GP II degree of development with concomitant osteoporosis at stages of treatment has not undergone significant difference, values were within the reference, though statistically authentically distinguished in the groups treated with "Calcemin Advance" on a background of basic therapy and "Calcemin Advance" (р<0.001).

Content of serum magnesium on stages of treatment varied as follows: in patients of the study group, which in the complex with traditional therapy received magnesium medicines "Magnicum" showed statistically significant increase of this figures compared to the control group and the initial data. Thus, this data immediately after treatment in group 2В was equal (0.85±0.004) mmole/l against the parameters of the control group 2А (0.77±0.003) mmole/l (р <0.001); 6 months after treatment - (0.94±0.004) mmole/l against (0.80±0.003) mmole/l (р <0.001); 12 months after treatment - (0.97±0.004) mmole/l against (0.79±0.003) mmole/l (р <0.001). Also using of the "Magnicum" helps eliminate the phenomenon of hypomagnesemia in patients with GP II degree of development with concomitant osteoporosis and possibly normalize of bone metabolism and bone remodeling.

In groups with diagnosed osteoporosis, in which calcium excretion before treatment was higher norm, there was a statistically authentically difference between parameters on the stages of treatment influenced by use of antiresorptive agent "Calcemin Advance" and, additionally, of magnesium medicine "Magnicum".

Thus, urine excretion of Ca on treatment stages in groups 2A and 2B was respectively: (9.13±0.004) mmole/day and (9.4±0.005) mmole/day immediately after treatment; (9.1±0.004) mmole/day and (9.2±0.004) mmole/day month after treatment; (8.4±0.004) mmole/day and (8.5±0.004) mmole/day 6 months after treatment; (8.0±0.003) mmole/day and (8.2±0.004) mmole/day 12 months after treatment against (9.45±0.003) mmole/day and (9.8±0.005) mmole/day in the same groups before treatment, respectively (р<0.001).

In addition, it was found that the excretion of calcium in urine was significantly decreased in patients of group 2B against 2A group (р <0.001), which received in complex treatment antiresorptive agent"Calcemin Advance" after the saturation of the body with magnesium - "Magnicum."

Content of serum magnesium on stages of treatment varied as follows: in patients of the study group, which in the complex with a traditional therapy received magnesium medicines "Magnicum" showed statistically significant increase of this figures compared to the control group and the initial data. Thus, this data immediately after treatment in group 2B was equal (0.85±0.004) mmole/l against the parameters of the control group 2А (0.77±0.003) mmole/l (р <0.001); 6 months after treatment - (0.94±0.004) mmole/l against (0.80±0.003) mmole/l (р <0.001); 12 months after treatment - (0.97±0.004) mmole/l against (0.79±0.003) mmole/l (р <0.001). Also using of the "Magnicum" helps eliminate the phenomenon of hypomagnesemia in patients with GP II degree of development with concomitant osteoporosis and possibly normalize of bone metabolism and bone remodeling.

In groups with diagnosed osteoporosis, in which calcium excretion before treatment was higher norm, there was a statistically authentically difference between parameters on the stages of treatment influenced by use of antiresorptive agent "Calcemin Advance" and, additionally, of magnesium medicine "Magnicum".

Thus, urine excretion of Ca on treatment stages in groups 2A and 2B was respectively: (9.13±0.004) mmole/day and (9.4±0.005) mmole/day immediately after treatment; (9.1±0.004) mmole/day and (9.2±0.004) mmole/day month after treatment; (8.4±0.004) mmole/day and (8.5±0.004) mmole/day 6 months after treatment; (8.0±0.003) mmole/day and (8.2±0.004) mmole/day 12 months after treatment against (9.45±0.003) mmole/day and (9.8±0.005) mmole/day in the same groups before treatment, respectively (р<0.001).

In addition, it was found that the excretion of calcium in urine was significantly decreased in patients of group 2B against 2A group (р <0.001), which received in complex treatment antiresorptive agent"Calcemin Advance" after the saturation of the body with magnesium - "Magnicum."

We found that in the study group of patients with GP II degree of development with concomitant osteoporosis which basic treatment received magnesium therapy by "Magnicum" there was a positive trend on the approximation of the Ca:Mg ratio to the recommended values, and the findings are statistically authentically different from the initial and from those in the control group (р<0.001). Thus Ca:Mg ratio in group 2B qual: before treatment 3.03:1 against 2.8:1 immediately after treatment; 2.64:1 month after treatment; 2.54:1 six months after treatment; 2.53:1 twelve months after treatment respectively. In group 2A known data were: 3.03:1 immediately after treatment; 3.075 month after treatment; 3.06:1 six months after treatment; 3.1:1 twelve months after treatment.

So, detected a positive effect of differential osteotropic therapy using preparations "Magnicum" and "Calcemin Advance" on the
Ca:Mg ratio by eliminating of hypomagnesemia effects and normalization of calcium homeostasis in patients with GP II degree of development with concomitant osteoporosis.

**Discussion.**

Using of medicines which regulate metabolism of bone tissue contributes of metabolic processes in periodontum normalization, increasing of interdental and interradicular septas reconstruction speed due to inhibition of resorption and stimulation of alveolar bone osteogenesis, according to different authors. [1, 2, 3, 4, 11].

It is reasonable to prefer medicines with many-sided activity, that afford to have an effect on different aspects of aetiology and pathogenesis of disease for optimization of complex therapy efficiency, taking into account polyaeiology of GP. [5, 6].

The resulted data confirming that GP with concomitant osteoporosis develops on a ground of negative calcium balance very often. Insignificant changes of Ca concentration in blood serum in examined groups may be explained by engaging of compensatory mechanisms, which regulate homeostasis of physiologically very important macroelements. [7, 9].

It was detected authentically correlation between the level of serum’ magnesium and intensity of periodontal inflammation, deepness of periodontal injury and dynamics of disease. [8].

It is known, that anti-inflammatory effect of magnesium specified by a lot of magnesium properties: magnesium is physiological antagonist of calcium, cofactor of majority metabolic reactions, affords for positive effect of calcium remedies on bone tissue and alveolar bone in particular, decreases a concentration of acetylcholine in CNS, in peripheral nerve system that is why it has anti-inflammatory, sedative, analgesic, anticonvulsive, spasmylytic, choleric, tocolytic activity etc [10, 11].

So, additional prescription of magnesium’ medicines and combination of them with complex Ca medicines in patients diseased of GP I and II degree of development with concomitant osteoporosis makes a strongly pronounced effect on inflammation and mineral density of bone tissue, that allows to optimize the treatment process of GP and reach a long-term remission. [7, 8, 9].

**Conclusions.**

1. It was shown the efficiency of proposed methods of GP I, II degree and with concomitant osteoporosis on a base of moderate or expressed hypomagnesiaemia treatment using of magnesium’ medicines and complex Ca medicine, due to results of clinical and index evaluation of periodontal status. The above-mentioned data were proved by extinction of inflammation’s clinical signs in periodontal tissues and prevention of disease recurrent in long-terms.

2. As a result of proposed method of differentiated osteotropic therapy administration for treatment of GP with employment of magnesium medicine and complex Ca medicine stabilization of macroelemental homeostasis takes place. It was proved by statistically authentically increasing of serum magnesium, decreasing of Ca excretion with urine and optimization of Ca:Mg ratio in patients of study groups in comparing to data of control groups.

3. Implementation of proposed method of treatment statistically authentically improved condition of bone tissue in patients of study group as contrasted to data of control group patients, which was represented in characteristics of dual-energy x-ray absorptiometry and due to peculiarities of panoramic X-ray.

4. The proposed schema of GP with concomitant osteoporosis on a base of hypomagnesiaemia complex treatment ensure more prominent decreasing of systemic and local inflammation’s symptoms in patients of studying group in comparing of control one.

**Prospects for further researches.**

The prospective results of the proposed method of complex treatment of patients with GP and concomitant osteoporosis on a base of hypomagnesiaemia will be subject to thorough
evaluation and follow-up.

Literature.


Corresponding author

Associated professor Lev Plaviuk, DDS, PhD. Therapeutic Dentistry Department Stomatological Faculty Ivano-Frankivsk National Medical University 2 Grushevskogo str., Ivano-Frankivsk, Ukraine email: plawiukl77@gmail.com

Professor Mykola Rozhko, DDS, PhD, DSci Honored Scientist of Ukraine Dental Postgraduate Department The Postgraduate Institute Ivano-Frankivsk National Medical University 2 Grushevskogo str., Ivano-Frankivsk, Ukraine email: plawiukl77@gmail.com
Professor Vitalii Gereliuk, DDS, PhD, DSci
Therapeutic Dentistry Department
Stomatological Faculty
Ivano-Frankivsk National Medical University
2 Grushevskogo str., Ivano-Frankivsk, Ukraine
email: gerelyk@gmail.com

Associated professor Natalia Makhlynets,
DDS, PhD
Therapeutic Dentistry Department
Stomatological Faculty
Ivano-Frankivsk National Medical University
2 Grushevskogo str., Ivano-Frankivsk, Ukraine
email: makhlynets11@yahoo.com

Associated professor Nadiia Melnyk, DDS, PhD
Therapeutic Dentistry Department
Stomatological Faculty
Ivano-Frankivsk National Medical University
2 Grushevskogo str., Ivano-Frankivsk, Ukraine
demail: plawiukl77@gmail.com

Assistant of professor Nadiia Stasiuk, DDS
Therapeutic Dentistry Department
Stomatological Faculty
Ivano-Frankivsk National Medical University
2 Grushevskogo str., Ivano-Frankivsk, Ukraine
email: plawiukl77@gmail.com