

BONE REGENERATION INFLUENCED BY FOLIC ACID AND ANABOLIC DRUGS

M. Dobrev

Key-words: bone regeneration — folic acid — anabolic drug — radiology — histology

The problem of medicamentous activation of bone regeneration continues to be actual and to provoke an interest among medical scientists.

R. Babayan (9) reported in 1979 an experiment on 113 rabbits treated either with folic acid, or with an amino acid. The effect of folic acid on rabbit fracture healing was more favourable. However, data concerning the stimulating action of folic acid on bone regeneration were scanty.

This effect can be due to the fact that folic acid takes part in the synthesis of nucleic acids, of choline and methionine. It also participates in methyl group transfer (11). It is not toxic and thus can be administered for a long period of time (10). Its food content is about 200—400 mg. However, it disintegrates rather rapidly because of its unstability (in 50—90 per cent). Folic acid stimulates by means of protein synthesis improvement cell division and especially erythro- and leukopoiesis. Thrombocytopoiesis is also favourable influenced. Folic acid helps iron and vitamin B₁₂ utilization.

Anabolic drugs enhance RNA content being the basis of protein synthesis. Therefore, they exert a positive effect on bone regeneration as already proved by numerous investigators (1—8). This action is undoubted because of the fact that anabolic drugs stimulate osteoblast reaction.

Material and methods

Our study started in 1983 and covered 50 rats with mean b. w. of 250—300 g, i. e. adult animals. Fracture of the right crus was caused in all the animals. Then they were divided into 5 groups. 1st group was control. Animals from the 2nd group were given decamevit one lozenge daily reduced to powder together with diet. One lozenge bionabol of 2 mg reduced to powder was added to the diet of the animals from the 3rd group. Folic acid at dose of 25 mg was given to the animals of the 4th group by the same way of administration. Animals from the 5th group received simultaneously folic acid and decamevit in order to achieve much better effect. Drug administration was carried out 3 months long once daily.

Callus formation was roentgenologically and morphologically examined. Roentgenograms were taken on the 30th and 60th day of the experiment. A total of 30 animals was histologically studied. They were divided into 3 groups. 1st — controls; 2nd with bionabol, and 3rd with folic acid application. Examinations were performed on the 10th, 20th, 30th, 45th and 60th day.

Results and discussion

Bionabol was administered because of its well-known positive influence upon osteoporosis and deficit callus formation. Decamevit presented a complex of vitamins and improved metabolism and processes of vital importance in the organism, it strengthened the defence functions of the organism and exerted a general stimulating effect.

On the 30th day callus was established in 5 animals from the 1st group (50 per cent), in 6 ones from the 2nd (60 per cent), in 7 ones from the 3rd (70 per cent) but in 8 ones in both 4th and 5th groups (80 per cent). On the 60th day there was callus in all the animals studied. It was best expressed in the animals from the 3rd, 4th and 5th groups which did not differed from each other.

Histologically, on the 20th day bone transformation with increased osteoblast number and formation of islets of bone framework located irregularly was observed when animals from the first group were concerned. Osteoid callus transformation was present in the animals from the 2nd group. Osteoblast reaction was also very well manifested. Bone framework formation was pronounced and a tendency towards frame orientation parallelly to the longitudinal bone axis appeared. Animals treated with folic acid demonstrated an advanced osteoid transformation and well expressed subperiosteal osteoblast reaction. Subperiosteal bone framework formation was strongly outlined.

The comparison with the data on the 60th day revealed a beginning tendency towards bone framework orientation in the animals from the 1st group (controls). Most of them were still irregularly located whereas callus transformation in the knitting line was already complete when animals from the 2nd group were concerned. Callus was also well differentiated, knitted with the bone fragment and more advanced in its transformation in the animals from the 3rd group.

On the basis of roentgenological and morphological results obtained in our experiment concerning callus stimulation by folic acid and bionabol we could conclude that both medicaments possess almost equal effect. Animals treated with these drugs anticipate considerably control ones. Having in mind that folic acid does not cause any complications which, however, may occur after prolonged anabolic drug or calcitonin application, we can recommend it as a callus stimulating means in elderly and old people. Besides folic acid can be applied for an undetermined period of time.

REFERENCES

1. Булатова, А. А. В: Биохимия гормонов и гормональной регуляции. М., Наука, 1976, 126—144. — 2. Дарбинян, Т. М. Руководство по клинической реаниматологии. М., Медицина, 1974, 180. — 3. Ермаков, Д. Г. В: Применение стероидных гормонов в хирургии, травматологии и ортопедии. Алма Ата, 1968, 77. — 4. Каплан, А. В. Травматология пожилого возраста. М., Медицина, 1977, 351. — 5. Малова, М. Н., В. М. Лирцман. Предоперационная подготовка и послеоперационное лечение больных пожилого и старческого возраста с переломами костей. М., Медицина, 1980, 147. — 6. Перепуст, Л. А. Физиология, биохимия и патология эндокринной системы. Вып. 4. Киев, 1974, 141—145. — 7. Першин, Г. Г. Дясс. канд. мед. наук (автореферат). М., 1969. — 8. Самойлов, К. А. *Ормэн. травматэл. и протэз.*, 1974, № 3, 27—31. — 9. Вабауан, R. *Arch. Orthop. Unfallheilk.*, 94, 1979, No 1, 63. — 10. Bernard, Z. *Metabolisme de l'acide folique-anemies. Notions fondamentales.* Toronto, 1983, 72. — 11.*** *The Pharmacological Basis of Therapeutics.* L. S. Goodman, A. Gilman, Eds. 5. ed. New York, etc., MacMillan, 1975, 1704.

КОСТНАЯ РЕГЕНЕРАЦИЯ ПОД ВЛИЯНИЕМ ФОЛЕВОЙ КИСЛОТЫ И АНАБОЛЬНЫХ ПРЕПАРАТОВ

М. Добрев

Р Е З Ю М Е

Вопрос о влиянии различных медикаментозных средств на костную мозоль продолжает представлять интерес. В 1979 г. Р. Бабаян сообщил о проведенном эксперименте на 113 кроликах, при котором, после применения фолевой кислоты, был получен очень хороший результат.

В 1983 г. нами был заложен эксперимент на 80 крысах. Был вызван перелом правой голени. Было проведено сопоставление между влиянием фолевой кислоты и анабольного препарата (бионабол). Образование костной мозоли проверялось рентгенологически в 30-ый и 60-ый день, а также и морфологически в 10, 20, 30, 45 и 60-ый день. Было установлено, что фолевая кислота и анабольный препарат приводят к одинаковому результату, немного лучшему, чем у животных контрольной группы.