Special Article

Osteoblastic Functions: A Lesson from Biochemical Bone Markers

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The present study showed the lowest values of bone markers from osteoblast, NMID osteocalcin, 10.81 ± 3.9 ng/ml and PINP 15.88 ± 7.09 ng/ml at lowest level of osteoclast, betaCTx, 0.066 ± 0.22 ng/ml should be the cut value for osteoblastic function. At this level betaCTx, had no correlation with PINP (r = 0.198, p = 0.003) or NMID osteocalcin (r = 0.035, p = 0.606) compared to the normal value of the control group and the correlation (r) between betaCTx and NMID osteocalcin, betaCTx and PINP, which were 0.757 and 0.752 (p = 0.001) respectively and recognized as normal bone turnover with coupling effect.

So, bone markers of osteoblast at the lowest value of betaCTx (0.066 ng/ml) with NMID osteocalcin, 10.81 ± 3.9 ng/ml and PINP 15.887.09 ng/ml may be the cut value of osteoblast reflecting poor functions. The benefit of identifying the cut values of osteoblast will help in making decisions in osteoporotic management.

***Keywords**: Osteoblastic function, PINP, BetaCTx (betacrosslap), NMID-osteocalcin*

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Ten years experience of biological bone markers showed another aspect of bone markers for evaluating osteoblastic functions. In addition, bone markers can identify the real time of bone status compared with normal value[1,2]. The bone activities will be limited by many factors such as medication[3-5], food, exercise[6]. The application for these situations will help for adjust medication, optimum food, modification of exercise. The earlier detection of bone functions, the greater chance of correction.

Material and Method

The data got from

Group (A):

The 71 volunteers of young adult females were without underlying diseases and free of medication. The fasting blood 3 ml was investigated for betaCTx, PINP and NMID osteocalcin. These data were used for standard control of bone markers and comparison with the other group.

Group (B):

The retrograde study from 223 patient history files which had completely investigated bone markers including betaCTx, NMID osteocalcin and PINP with include criteria was the value of betaCTx that below 0.1 nanogram per milliliter.

All data were analyzed by SPSS ver.10 for mean and correlation (r).

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Results

The data of volunteer female showed that the mean value of betaCTx, NMID osteocalcin and PINP were 0.392 ± 0.187 ng/ml, 22.06 ± 7.6 ng/ml and 46.22 ± 20.63 ng/ml, respectively (Table 1).

The linear correlation (r) between betaCTx and NMID osteocalcin, betaCTx and PINP were 0.757 and 0.752, p = 0.001, respectively, as the graphs show (Fig. 1).

Data from patient's records with the values of NMID osteocalcin and PINP were compatible with the value of betaCTx, below 0.1 ng/ml (Table 2). The correlations were calculated showing betaCTx and NMID osteocalcin, betaCTx and PINP, r = 0.035 (p = 0.606) and 0.198 (p = 0.003) respectively (Fig. 2).

Discussion

The bone markers in group (A) showed that normal bone turnover by the value of betaCTx and PINP had good linear correlation (r) = 0.752 that bone formation can cope with bone resorption or the more

Table 1. The statistic data of Bone markers from the young adult female. BetaCTx (bone resorption marker), NMID osteocalcin (bone turnover marker) and PINP (bone formation marker)

	n	Minimum	Maximum	Mean	Std. Deviation
CTx	71	0.116	0.969	0.39251	0.187312
NMID osteocalcin	71	7.160	41.940	22.06437	7.607478
PINP	71	17.010	118.900	46.62901	20.638474
Valid N (listwise)	71				

Table 2. The NMID osteocalcin and PINP which were compatible with the value of betaCTx, 0.1 ng/ml

	n	Minimum	Maximum	Mean	Std. Deviation
CTx	223	0.10	0.099	0.06654	0.022619
NMID	223	2.99	26.33	0.066	3.90223
PINP	223	5.00	53.82	15.8873	7.09719
Valid n (listwise)	223				

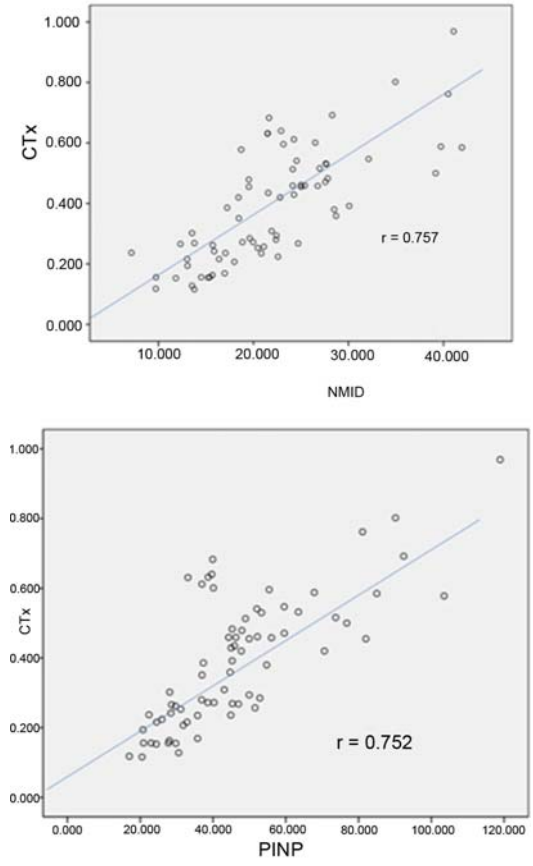

Fig. 1 Showed the liner correlation between betaCTx, NMID osteocalcin and betaCTx, PINP, correlation co-efficiency = 0.757, 0.752 respectively (p = 0.0001)

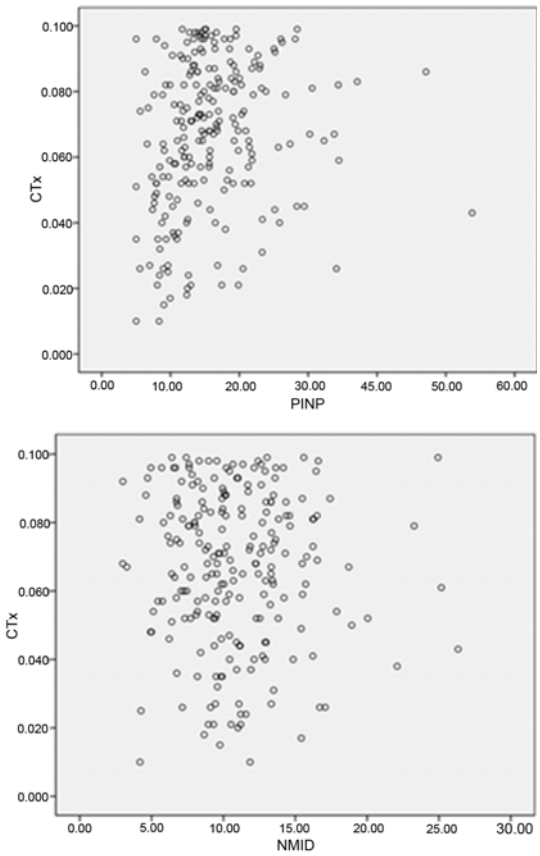

Fig. 2 The correlation (r) of betaCTx-PINP and betaCTx-NMID osteocalcin was 0.035 and 0.198 respectively (From patient's records)

bone resorption the more bone formation after being called a coupling effect. While group (B) showed no correlation between betaCTx and PINP (r = 0.198), which is different from the group (A), the pattern of these markers were called low bone turnover. The osteoblasts could not synthesize collagen which was reflected by the low value of PINP at tiny value of betaCTx (0.066 ng/ml). There is no relationship between betaCTx and PINP as group (A). The small products of osteoblasts *i.e.*: NMID osteocalcin (10.81 $\pm$ 3.9 ng/ml), PINP (15.88 $\pm$ 7.09 ng/ml) in this situation showed the bone cells do perform their function independently and are recognized as cut value of osteoblastic functions. This condition can be found in some group of elderly groups, using bisphosphonate or anti-resorption therapy intake. This cut value of osteoblast will help for making decisions for the treatment of osteoporosis.

Potential conflicts of interest

None.

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การศึกษาหน้าที่ของ osteoblast ที่ได้จากการผลการตรวจ bone marker

ณรงค์ บุณยะรัตเวช

จากการศึกษาข้อมูล bone marker ย้อนหลังจำนวน 223 ราย ที่มีค่า betaCTx ต่ำหรือน้อยกว่าตั้งแต่ 0.1 นาโนกรัม/มิลลิลิตร พบว่ามีค่า NMID osteocalcin ค่า P1NP 10.8 $\pm$ 3.9, 15.88 $\pm$ 7.09 ng/ml ตามลำดับ แล้วนำมาหาค่าความสหสัมพันธ์ทางเส้นตรง ว่าค่าระหว่าง betaCTx กับ NMID osteocalcin และ CTx กับ P1NP พบว่าไม่มีความสำคัญเลย โดยมีค่า 0.035 และ 0.198 ตามลำดับแสดงว่าเซลล์กระดูกไม่ทำงานร่วมกันแบบปกติ เท่ากับแต่ละเซลล์ทำงานอิสระไม่ขึ้นต่อกันและได้หาข้อมูลเพื่อเปรียบเทียบจากสตรีวัยเจริญพันธุ์จำนวน 71 ราย พบว่าค่าความสัมพันธ์สูงตามลำดับคือ 0.757, 0.752 แสดงว่าเซลล์ osteoblast และ osteoclast ทำงานสัมพันธ์ซึ่งกันและสภาพเซลล์ปกติ เมื่อเป็นเช่นนี้ค่า bone marker ที่ได้จากค่า betaCTx น้อยกว่า 0.1 นาโนกรัม/มิลลิกรัม คือค่า NMID osteocalcin ค่า P1NP 10.8 $\pm$ 3.9, 15.88 $\pm$ 7.09 นาโนกรัม/มิลลิกรัม ตามลำดับ สมควรเป็นค่าบ่งบอกการทำงาน ของ osteoblast ในสภาพแย่กว่ากลุ่มควบคุม การศึกษานี้ซึ่งมีประโยชน์ ใช้ในการประเมินการทำงานของเซลล์กระดูก และการตัดสินใจในการรักษาภาวะกระดูกพรุนที่เซลล์ด้อย ความสามารถ