Thai Journal of Obstetrics and Gynaecology
September 1998, Vol. 10, pp. 161-165

GYNAECOLOGY

Serum osteocalcin and urine type I collagen degradation product in women within the first five years after menopause

Vorapong Phupong MD,
Nimit Taechakraichana MD,
Kobchitt Limpaphayom MD.

Department of Obstetrics and Gynecology, Faculty of Medicine, Chulalongkorn University Hospital, Bangkok, Thailand.

ABSTRACT

Objective To study the level of serum osteocalcin and urine type I collagen degradation product of women who entered menopause within the first five years.

Study Design Descriptive study.

Setting Menopause clinic, Department of Obstetrics & Gynecology, Faculty of Medicine, Chulalongkorn University.

Subjects Healthy women who entered menopause within the first five years were recruited for the study. All the women which were natural menopause visited menopause clinic, Chulalongkorn hospital from January 1996 to June 1997. Neither women had any medication which had effect on bone, nor had any hormone regimen within the previous one year. None were smoking or had regular alcohol consumption.

Main outcome measure Level of serum osteocalcin and urine type I collagen degradation product were measured by ELISA method. Kits tests were manufactured from Osteometre A/S, Denmark. For serum osteocalcin, the measuring range was 4.7-75 ng/ml. Between-run and within-run coefficient of variation's were 4.74 % and 4.27 %, respectively. For urine type I collagen degradation product, the measuring range was 100-6,750 mg/ml. Between-run and within-run coefficient of variation's were 6.60 % and 4.68 %, respectively.

Statistics Descriptive statistics were used to calculate mean and standard deviation.

Results One hundred and eleven subjects were recruited for the study. Mean ± standard deviation of serum osteocalcin of the studied population was 20.74±7.76 ng/ml. Considering the serum level at each menopausal year, the mean serum level of osteocalcin at 1, 2, 3, 4 and 5 years after menopause were 18.74±7.81, 21.66±6.95, 23.92±8.88, 21.46±6.36 and 17.83±7. 59 ng/ml, respectively. Mean ± standard deviation of urine type I collagen degradation product of the studied population was 268.88±129.05 mg/mol creatinine. The urine level of type I collagen

degradation product in women at 1, 2, 3, 4 and 5 years after menopause were 228.5±91.6, 269.9±127.5, 325.5±163.2, 267±126.5 and 256.1±121.2 mg/mol creatinine, respectively.

Conclusions The level of serum osteocalcin and urine type I collagen degradation product obtained in this study was the mean level in women who entered menopause within the first five years and visited Chulalongkorn hospital. It was found that there was a tendency of these markers to increase and it seemed to be highest at the third year and then decreased. However, further prospective study is needed to confirm this changes.

Key words : osteocalcin, type I collagen degradation product, menopause.

At present, the development of medical science is in progress. Life expectancy of population is also increased then women will spend more time in the postmenopausal period, thus exposing them to greater risk of developing postmenopausal osteoporosis.[1-2] A lot of methods are used for detection of osteoporosis.[3] Recently, there is new methods for detection of osteoporosis, that is biochemical markers of bone turnover.[3-7]

Recently, we conducted a study using osteocalcin[3-7] (serum marker of bone formation) and type I collagen degradation product[3-7] (urinary marker of bone resorption) to assess bone turnover status in women who entered menopause within the first five years.

Materials and methods

From January 1996 to June 1997, 111 healthy women aged 40-60 years, who visited the menopause clinic, Chulalongkorn hospital, and entered menopause within the first five years were recruited for the study. Neither women had any medication which had effect on bone, nor had any hormone regimen within the previous one year. None were smoking or had regular alcohol consumption.

Fasting serum and second void urine samples were collected at 8.00-10.00 AM , then were stored at -20 °C until analyzed. Serum and urine samples were measured for osteocalcin and type I collagen degradation product, respectively by ELISA method. Duplicated tests were done and calculated for mean. Kits tests were manufactured from Osteometer A/S, Denmark. For serum osteocalcin, the measuring range was 4.7-75 mg/ml. Between-run and within-run coefficient of variation's were 4.74% and 4.27% respectively. For urine type I collagen degradation product, the measuring range was 100-6,750 mg/ml. Between-run and within run coefficient of variation's were 6.60% and 4.68% respectively. Descriptive statistics were used to calculate mean and standard deviation.

Results

In this studied population, postmenopause was defined as having no vaginal bleeding during the last 12 months and measurements of serum gonadotropin and estradiol level was within the menopausal range.

Demographic characteristics of the studied population are shown in table 1. Of all the studied population, 53.2% had age range between 50-54 years, and 89.1% had age range at menopause between 45-54 years. The serum level of osteocalcin and urine level of type I collagen degradation product is shown in table 2 and these biochemical markers level according to years since menopause is shown in table 3 , figure 1 and figure 2. It shows that the serum level of osteocalcin and urine level of type I collagen degradation product seemed to increase according to the year since menopause and was maximum at 3 years then it lowered.

Table 1. Demographic characteristics of the studied population (N = 111).

Characteristics	Mean ± SD / Percentage
1. Age (years)	51.75 ± 3.13
2. Body mass index (kg/m^2)	23.33 ± 2.95
3. Age at menopause (years)	49.08 ± 3.00
4. Time since menopause (years)	2.78 ± 1.40
5. Educational background	
- University / college and above	54 %
- Below university / college	46 %
6. Income (Baht/month)	
- < 20,000	67.6 %
- 20,000-50,000	23.4 %
- > 50,000	9.0 %

Table 2. Serum level of osteocalcin and urine level of type I collagen degradation product (N = 111).

Characteristics	Mean ± SD	Range
1.Serum osteocalcin (ng/ml)	20.74 ± 7.76	5.00 - 48.40
2.Urine type I collagen degradation product (mg/mol creatinine)	268.88 ± 129.05	14.01 - 853.30

Table 3. Serum level of osteocalcin and urine level of type I collagen degradation product according to years since menopause.

	Mean ± SD				
Years since menopause(years)	1 (N=23)	2 (N=33)	3 (N=21)	4 (N=13)	5 (N=21)
Serum osteocalcin(ng/ml)	18.74 ±7.81	21.66 ±6.95	23.92 ±8.88	21.46 ±6.36	17.83 ±7.59
Urine Type I collagen degradation product (mg/mol Cr)	228.5 ±91.6	269.9 ±127.5	325.5 ±163.2	267 ±126.5	256.1 ±121.2

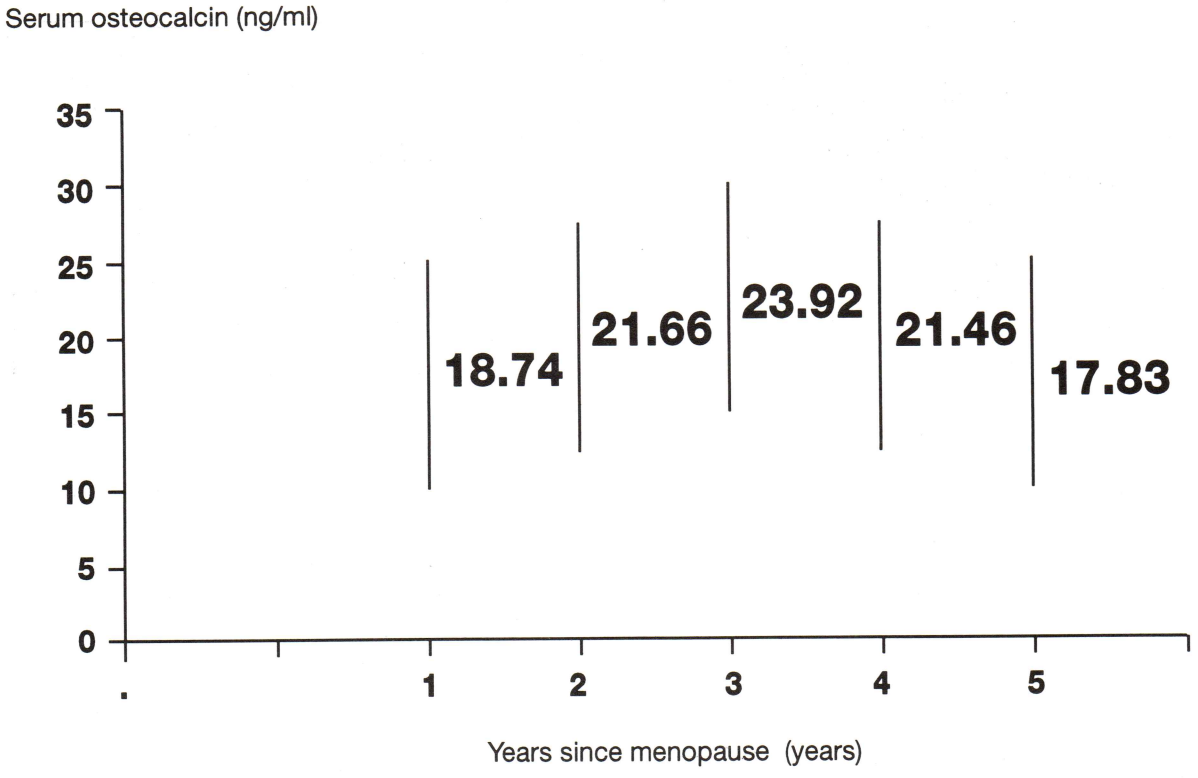

Fig. 1. Serum osteocalcin (mean±SD) according to years since menopause.

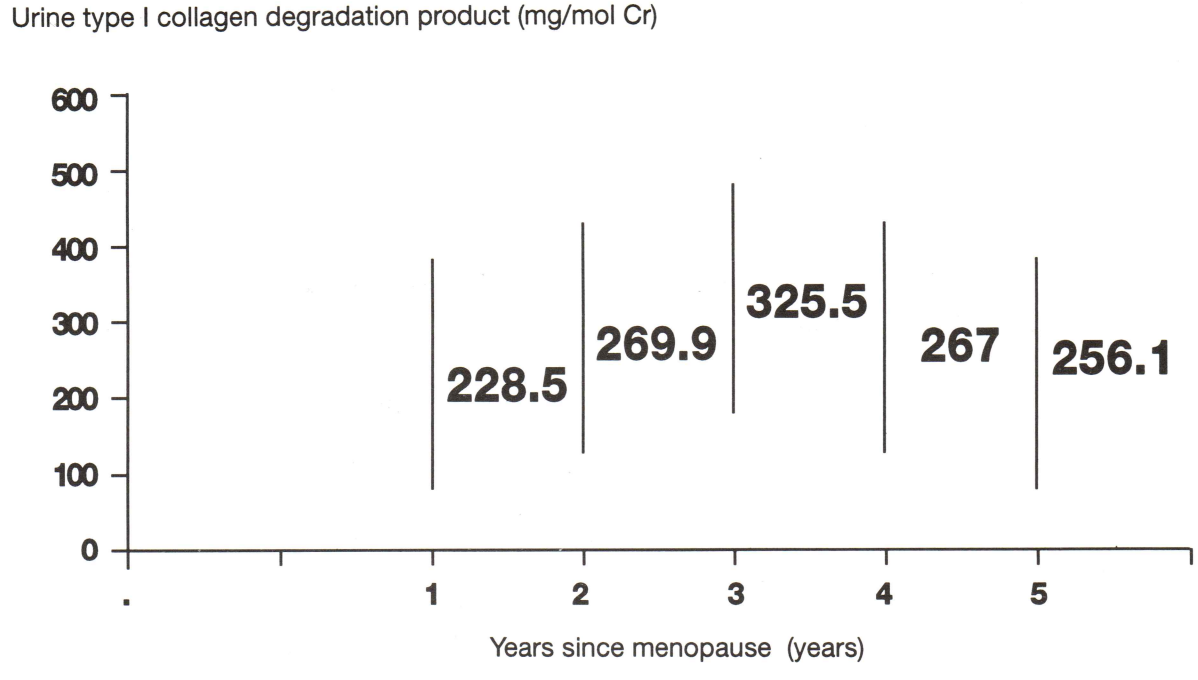

Fig. 2. Urine type I collagen degradation product (mean±SD) according to years since menopause

Discussion

We studied serum level of osteocalcin and urine level of type I collagen degradation product in healthy women aged 40-60 years, who entered menopause within the first five years and the body mass index was between 19-31. The value of serum osteocalcin In this study was 20.74 ± 7.76 ng/ml. When compared with other studies: Christian Rosenquist, et al.,[8] studied in 24 cases of early postmenopausal women, mean age 51.2 ± 2.1 years, found that the value of serum osteocalcin was 11.8 ± 4.5 ng/ml; Seiichi Yasumura, et al.,[9] studied in 114 cases of postmenopausal women, mean age 58 ± 7 years, the value of serum osteocalcin was 10.1 ± 9.4 (SEM) ng/ml and Masayuki, et al.,[10] studied in 122 cases of postmenopausal women, mean age 61.6 ± 0.58 years and years since menopause 14.0 ± 0.76 years, the value of serum osteocalcin was 7.8 ± 1.04 (SEM) ng/ml. The value in this study was different from other studies, this is probably due to the difference of race, nutrition, geography, lifestyle or laboratory conditions. Other reasons may be the difference in population characteristics ie. body mass index, years since menopause, etc.

The value of urine type I collagen degradation product in this study was 268.88 ± 129.05 mg/mol creatinine. When compared with study of Martin Bonde, et al.,[11] which studied in 410 cases of postmenopausal women (early postmenopause 245 cases, late postmenopause 165 cases), the value was 416 ± 189 mg/mol creatinine. The reasons of these differences is probably the same as mentioned earlier.

This report was a descriptive study which demonstrated the mean level and tendency of bone turnover in early postmenopausal women visited menopause clinic, Chulalongkorn hospital. The samples were collected at 08.00-10.00 AM after an overnight fasting for at least 8 hours. Since these markers have diurnal variation, [4] this may be the reason for explaining the difference from other studies. The samples in this study were measured by ELISA method which was easy, took a short time, and between-run and within-run coefficient of variation's were lesser than 10 % which was in the acceptable range.

Furthermore, this study also revealed tendency of the activity of bone turnover according to years since menopause which seemed to increase in the first three years and highest at the third year then it lowered. This tendency was the same as previous studies[6,12,13] that bone loss is rapid during the first 3-5 years after menopause. However, further prospective study is needed to confirm these changes.

References

1. Taechakraichana N, Limpaphayom K, Jaisamrarn U. An epidemiologic review of postmenopausal osteoporosis. Chula Med J 1993 ;37:549-53.
2. Taechakraichana N, Limpaphayom K, Jaisamrarn U. Postmenopausal osteoporosis: Progress in hormonal replacement therapy. Chula Med J 1993 ;37:751-64.
3. Taechakraichana N, Limpaphayom K, Jaisamrarn U. Postmenopausal osteoporosis: Recent advancement in bone biology study and diagnosis of osteoporosis. Chula Med J 1993 ;37:529-41.
4. Delmas PD, Garnero P. Utility of biochemical markers of bone turnover in osteoporosis. In: Marcus R, Feldman D, Kelsey J, editors. Osteoporosis. New York: Academic Press, 1996 : 1075-88.
5. Rosen CJ. Biochemical markers of bone turnover. In: Rosen CJ, editor. Osteoporosis, diagnostic and therapeutic principles. New Jersey : Humana Press,1996 :129-41.
6. Delmas PD. Biochemical markers of bone turnover I: Theoretical considerations and clinical use in osteoporosis. Am J Med 1993 : 95 (Suppl 5A) ;11s-16s.
7. Riis BJ. Biochemical merkers of bone turnover II: Diagnosis, prophylaxis, and treatment of osteoporosis. Am J Med 1993: 95 (Suppl 5A);17s-21s.
8. Rosenquist C, Bonde M, Fledelius C, Qvist P. A sample enzyme-linked immunosorbent assay for detection of human osteocalcin . Clin Chem 1994;40:1258-64.
9. Yasumura S, Aloia JF, Gundberg CM, Yeh J, Vaswani AN, Yuen K, et al. Serum osteocalcin and total body calcium in normal pre- and postmenopausal women and postmenopausal osteoporotic patients. J Clin Endocrinol Metab 1987;64:681-5.
10. Iki M, Kajita E, Dohi Y, Nishiro H, Kusaka Y, Tsuchida C, et al. Age, menopause, bone turnover markers and lumbar bone loss in healthy Japanese women. Maturitas 1996; 25: 59-67.
11. Bonde M, Qvist P, Fledelius C, Riis B J, Christiansen C. Immunoassay for quantifying type I collagen degradation products in urine evaluated. Clin Chem 1994;40:2022-5.
12. Kato T, Chen JT, Katase K, Hirai Y, Shiraki Y, Hasumi K, et al. Time course changes in bone metabolic markers after menopause : a cross-sectional study. Acta Obstet Gynecol Jpn 1995:47;43-8.
13. Hedlund LR, Gallagher JC. The effect of age and menopause on bone mineral density of the proximal femur. J Bone Miner Res 1989:4; 639-42.