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Serum Sclerostin Profile in Healthy and Immobilized Women

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Abstract We have measured the serum sclerostin profile to observe the bone resorption status in 85 healthy women according to age and in 38 immobilized women according to rest time. Research result shows the serum sclerostin levels were increased with increasing age up in healthy women. Sclerostin has positive correlation with age, *WHR* and *BMI* in healthy women. The sclerostin levels have negative correlation with *BMD*, E_2. Serum sclerostin levels were higher in bed rest women than same aged healthy women and they were increased according to rest month up.

Key words sclerostin, immobilization, women

Introduction

The great leader Comrade **Kim Il Sung** said as follows.

"**Research in the basic sciences should be intensified.**"("**KIM IL SUNG** WORKS" Vol. 35 P. 312)

The fracture occurs in post menopausal women more than pre-menopausal women. This is the result of decreased bone mineral density by deficit of estrogen secreted from ovary and the fracture happens more often despite of same strength from outside according to the decreasing of bone mineral density.

Nowadays, the role of sclerostin was elucidated and to estimate the bone remodeling course with serum sclerostin profile is the recognized method in the world-wide.

Sclerostin, a glycoprotein, is secreted from osteocytes and reaches on the bone surface through the canaliculus in the osteocytes and then it binds to the coreceptors LRP 5, LRP 6 and blocks Wnt signal to decrease the formation of osteoblast, inhibit formation of bone and accelerate the bone absorption [1, 2].

The complex roles of the Wnt signalling pathway are well-known in normal physiologic processes of bone formation in response to loading and unloading [8].

The Wnt is a group of secreted lipid-modified signaling proteins(palmitoylation) of 350～400 amino acids, it bines to Freezled receptor and coreceptors LRP 5, LRP 6 and activates the osteoblasts which produce collagen for the formation of bone [4, 5]. But in women, aging up and immobilized status increase the sclerostin which is antagonist to Wnt, results accelerating of bone resorption [3]. Because of the serum sclerostin levels are different according to continent and race, to determine serum sclerostin level is the first target and several studies on it were published [6, 7, 9, 10].

So we determined the serum sclerostin levels in healthy and immobilized women.

1. Subjects and Method

1.1. Subjects

1.1.1. Subjects for measurement of serum sclerostin in healthy women

85 healthy women were recruited for the measurement of serum sclerostin level.

Table 1. Subjects according to age (n=85)

Age	20～29	30～39	40～49	50～59	60～69	70～
Cases	14	13	16	15	15	12
Composition rate/%	16.5	15.3	18.8	17.6	17.6	14.2

Table 1 shows 40～49 years old women were 16 cases (18.8%) which is the most and over 70 years old women were 12 cases (14.2%) which is the least.

Table 2. Data of healthy women

Data	20～49(n=43)	Over 50(n=42)	p
Age	33.83±8.41	62.38±8.34	< 0.000 1
Age at menarch	12.46±3.82	13.20±4.16	> 0.05
Parity	1.28±0.21	2.18±3.23	< 0.001
BMI /(kg·m^{-2})	21.48±4.30	31.63±6.07	< 0.000 1
E_2 /(pmol·L^{-1})	369.2±87.3	35.1±3.6	< 0.000 1
WHR	0.817±0.082	0.897±0.082	< 0.001
BMD /(g·cm^{-2})	1.079±0.279	0.991±0.074	< 0.001

BMI: body mass index, E_2: serum estradiol level, *WHR*: waist-to-hip ratio, *BMD*: bone mineral density

Table 2 shows the significant differences in age, parity, *BMI*, E_2 *WHR*, and *BMD* except of age of menarche in two groups.

1.1.2. Subjects for measurement of serums sclerostin levels in immobilized status

38 postmenopausal women (60～69 years old) due to stroke who had more than 1 month totally bed rest in their home.

All subjects for bed rest were recruited on a volunteer basis, according to the following inclusion criteria and exclusion criteria.

Inclusion criteria: bed rest objects more than 1 month, objects were unable to walk without physical assistance from other people, objects had no significant cognitive deficits.

Exclusion criteria: objects used in the last 12 months of drugs affecting bone metabolism (including bisphosphonates), objects used glucocorticoid for more than 3 months, diseases affecting bone (Paget's disease, rheumatoid arthritis, hyperparathyroidism, hypercortisolism, malignant tumors, renal bone disease, chronic liver disease, history of serious cardiovascular diseases (myocardial infarction, uncontrolled hypertension)), mental disorders.

1.2. Method

1.2.1 Bone mineral density(*BMD*)

BMD was determined for the anteroposterior lumbar spine 2～4 by dual-energy X-ray absorptiometry.

1.2.2. Concentrations of serum sclerostin and estradiol

We extracted the blood 2mL in peripheral venous and then the blood was centrifuged at the rate of 1 000r/min for 10min at 4℃ and stored at －80℃ until analysis.

Concentrations of serum sclerostin and estradiol were measured by enzyme-linked immunosorbent assay(ELISA).

The sclerostin levels in healthy women were measured with the interval of 10 years and the sclerostin levels in immobilized patients with the interval of rest month.

1.2.3. Statistical analysis

Descriptive statistics was performed according to interval of 10 years in healthy women. And descriptive statistics was also performed according to interval of 1 month in bed rest patients. The relationship between serum sclerostin and several data of subjects are considered using multiple regression correlation analysis.

2. Results and Conclusions

2.1. The serum sclerostin levels in healthy women

2.1.1. The serum sclerostin levels in healthy women according to age

Table 3. Serum sclerostin levels according to age(pmol/L)

Age	*n*	Serum sclerostin level		*p*	Age	*n*	Serum sclerostin level		*p*
		Mean	Range				Mean	Range	
20～29	14	14.87	13.54～16.20	－	50～59	15	38.29	37.41～40.17	<0.001
30～39	13	23.04	22.68～23.40	<0.01	60～69	15	49.01	47.48～51.54	<0.001
40～49	16	29.80	29.15～30.45	<0.001	70<	12	58.14	58.11～58.18	<0.001

p: the comparison with the value of 20～29 years old

Table 3 shows the significant increase of serum sclerostin levels with age up.

2.1.2. The correlation between serum sclerostin level and other data

Table 4. The correlation between serum sclerostin level and other data

Division	Age	*BMI*	*WHR*	*BMD*	E_2
Coefficient of correlation	0.879	0.223	0.131	－0.168	－0.519
Credit interval	<0.001	<0.000 1	<0.05	<0.000 1	<0.000 1

Table 4 shows that sclerostin has positive correlation with age, *BMI* and *WHR* and negative correlation with *BMD*, E_2 in healthy women.

2.2. The serum sclerostin levels in bed rest postmenopausal

Table 5. The serum sclerostin levels in bed rest postmenopausal women (pmol/L)

Date	Sclerostin	p_1	Normal value	p_2
1 month	52.92±2.95	—	49.01±1.45	<0.05
2 months	81.18±7.15	<0.05		<0.001
3 months	106.97±9.62	<0.001		<0.000 1
4 months	126.22±10.50	<0.001		<0.000 1
5 months	170.61±10.76	<0.001		<0.000 1
6 months	203.86±11.59	<0.001		<0.000 1

Normal values: serum sclerostin level in healthy women with age from 60 to 69 years, p_1: comparison with first month, p_2: comparison between monthly serum sclerostin and normal value.

Table 5 shows the serum sclerostin level increased with rest month up and significant increase more than normal value in each month.

Conclusion

Serum sclerostin levels increase continuously with age. Serum sclerostin levels have positive correlation with age, BMI and WHR and negative correlation with BMD, E_2 in healthy women. Serum sclerostin levels are increased in bed rest patients with month up and higher than normal value.

This research can be used as basic data for the studies on treatment and prediction of bone related diseases such as fracture and osteoporosis.

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