

# Research on the influence of bilateral oophorectomy on the BMD, body components and sex hormone of women during the perimenopause

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**Abstract:** To investigate the effect of bilateral oophorectomy on bone mineral density, body composition and sex hormone of peri-menopause women. 33 cases of peri-menopause women patients performed bilateral oophorectomy were chosen from xxx gynaecology and obstetrics department of xxx hospital from January 1<sup>st</sup>, 2014 to Dec 31<sup>st</sup>, 2014. And the 33 cases were taken as ovariectomy group. 35 women who were the naturally postmenopausal after menopause collected in clinic and in the same period with the patients of ovariectomy group were taken in control group. American GE-Lunar-Prodigy dual energy X-ray absorptiometry and chemiluminescence method were employed to detect the bone mineral density, fat content, muscle content and sex hormone of the patients in both groups at the 6<sup>th</sup> and 12<sup>th</sup> month after menostasis. There was no statistical significance on the comparative difference of bone mineral density, fat content and muscle content at the 6<sup>th</sup> and 12<sup>th</sup> month after menostasis between both groups,  $P > 0.05$ . At the 6<sup>th</sup> month after menostasis, the estradiol ( $E_2$ ) level in ovariectomy group was significantly lower than that of control group [(14.79±22.17)U/L vs (32.74±31.02U/L)],  $P < 0.05$ ; at the 12<sup>th</sup> month after menostasis, it had the statistical significance for the comparative difference between the level of  $E_2$  and and follicle-stimulating hormone (FSH) in ovariectomy group and that in control group,  $E_2$ : (8.09±4.38)U/L vs (25.92±3.53)U/L; FSH: (64.88±18.39)U/L vs (40.69±31.63)U/L],  $P < 0.05$ . the change of  $E_2$  and FSH were the main symptom of peri-menopausal women within 12 months after bilateral oophorectomy, the decrease of  $E_2$  level had no effect on bone mineral density, fat content and muscle content.

**Keywords:** Bilateral oophorectomy, peri-menopause, estrogen, body content.

## INSTRUCTION

Bilateral oophorectomy is the common surgery treatment for gynaecological disease. It is taken as preventive surgery, as the recessive ovarian function is taken into consideration for the gynaecological disease surgery treatment in peri-menopausal women. Study (Minfang *et al.*, 2009) in recent years found that the peri-menopausal syndrome incidence rate was significantly increased and its symptom was obviously more serious for peri-menopausal women with bilateral oophorectomy. Estrogen affected the change of bone turnover and other body components. Therefore, the change of estrogen level could cause the change of body components for postmenopausal women after peri-menopausal surgery. While, it was seldom studied for the difference of that between natural postmenopausal women. This research studied the estrogen, body component (fat content and muscle content) and bone mineral density parameters before and after ovariectomy for peri-menopausal women, comparatively studied with natural postmenopausal women, and discussed the effect of bilateral oophorectomy on the change of peri-menopausal women body components and their postmenopausal osteoporosis, in order to provide evidence for effective clinical

prevention and treatment measures and to reduce the incidence of osteoporosis after ovariectomy.

## MATERIALS AND METHODS

### Study object

#### Ovariectomy group

The object in ovariectomy group were from Gynaecology and Obstetrics Department of XXX Hospital from 1<sup>st</sup> January, 2014 to 31<sup>st</sup> December, 2014. The patients had performed bilateral oophorectomy during the surgery treatment for benign gynaecological disease. Inclusion criteria: Age was not less than 45 years old; patients had menstrual disorders, and (or) clinical symptoms of menopause, and (or) menopause more than 1 year; no vitals serious complications; no endocrine disease; and no preoperative hormone usage history within 6 months. There were a total of 38 patients with bilateral oophorectomy. Among the 38 cases of patients, there were 5 cases which was excluded due to the postoperative hormone treatment. The rest 33 cases were measured related indicators at the 6<sup>th</sup> month and 12<sup>th</sup> month after surgery.

#### Control group

The women who were in perimenopausal period after menopause collected in clinic and in the same period with the patients of ovariectomy group were taken in control

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group. Collecting conditions: (1) women with fitness and the age of them should be greater than or equal to 45; (2) The amenorrhea time should be greater than or equal to three months. People who occurred to following situations would be excluded during the research: (1) occurring colporrhagia 12 months after the menelipsis (2) Taking or having to take the hormone because of the climacteric. 68 women agreed to be taken into the control group. 15 women required to arrange the hormone therapy during the follow-up visits. 18 women occurring the menses were excluded during one year. 35 women were arranged the measurement for the related indexes the sixth and twelfth month after the amenorrhea.

**Research for the indexes**

*Clinical features*

Two people were specially assigned to measure the stature (rounded to 0.5cm) and body mass (rounded to 0.5kg) of women of two groups and calculate the body mass index (BMI). BMI equals to The square of stature divided by the body mass is BMI.

**The measurement for the bone mineral density(BMD) and body compositions**

The measurement was taken by means of adopting the dual-energy X-ray absorptiometry detector of American GE-Lunar-Prodigy. The measurement for BMD included the BMD in the first to fourth lumbar vertebra and the whole left part of the hip. The variable coefficient (CV) of BMD of the first to fourth lumbar vertebra, neck of femur, trochanter and whole parts of the hip were respectively 0.97%, 1.93%, 1.48% and 0.8%. The anlysis on the body compositions included the fat content and muscle content of the whole body. The CV of fat content was 1.69%, and the CV of muscle content was 0.53%.

**The measurement for the sex hormone**

The chemiluminescence was adopted to measure the estradiol (E<sub>2</sub>) and follicle stimulating Hormone (FSH).

**STATISTICAL ANALYSIS**

The software SPSS17.0 was used to proceed the statistical analysis. The measurement data were showed by  $\bar{x} \pm s$ . The comparison among groups was measured by *t*. P<0.05 meant that the differences had statistical significance.

**RESULTS**

**Comparison on the general clinical features between two groups.**

The comparison of age and BMI between the women in ovariectomy group and control group. P>0.05 meant that the differences had no statistical significance (table 1).

**The comparison between the observation indexes of two groups**

The comparison on the BMI, fat content, muscle content and hormonal level between preoperative records of patients in ovariectomy group and records taken in the early time of selecting the patients in control group. The differences had no statistical significance (P>0.05).

**Table 1:** Comparison of age and BMI between two groups ( $\bar{x} \pm s$ )

Groups	Age	BMI (kg/m <sup>2</sup> )
Control group (n=35)	51.62 ±3.41	23.80 ±3.02
Ovariectomy group (n=33)	48.36 ±2.41	24.43 ±2.59

The follow-up visits arranged in the sixth months after amenorrhea showed that the comparison on the BMI, fat content, muscle content and FSH between two groups, and the differences had no statistical significance (P>0.05); However, the level of E<sub>2</sub> in ovariectomy group was obviously inferior to the level of control group. So the differences had statistical significance (P<0.05). The follow-up visits arranged in the twelfth months after amenorrhea showed the comparison of BMI, fat content and muscle content between two groups and the differences had no statistical significance (P>0.05); However, the level of E<sub>2</sub> in ovariectomy group was obviously inferior to the level of control group, the level of FSH was obviously superior to the level of control group. So the differences had statistical significance (P<0.05) (table 2).

**DISCUSSION**

The estrogen excreted by ovary gave play to the physiological effect by means of the specific estrogen receptor of the target cells. The estrogen receptors consisted in several organs of body. With the consuming of the estrogen after the menopause, the organs of women accordingly appeared various changes. Among those changes, the skeletal changes caused by low estrogen had developed rules that the bone mass of postmenopausal women progressively decreased at the rate of 2% to 3% each year. The probabilities of developing the osteoporosis significantly increased to women passing through the menopause for more than five years; Otherwise, the fat content in postmenopausal women increased but the muscle content discreased (Poehlman *et al.*, 1995; Mc Innes *et al.*, 2006). And the fat was transferred to the truncus, viscera and the upper arm and was distributed in the male pattern (Pansini *et al.*, 2008). Although the estrogen secretion level of ovarian in the women during the perimenopause declined, the low-level estrogen still played the effective role in the physiological action, especially the significant role in preventing the postmenopausal osteoporosis. After analyzing on the

**Table 2:** Comparison of parameters at different time between two groups ( $\bar{x} \pm s$ )

Groups	BMI(g/cm <sup>2</sup> )		Body compositions(kg)		Level of hormone(U/L)	
	The first to fourth lumbar vertebra	Whole part of Hip	Fat content	Muscle content	E <sub>2</sub>	FSH
Control group (n=35)						
the early time of selecting the patients	1.11 ±0.12	0.97 ±0.13	20.03 ±4.80	36.75±3.48	35.80 ±28.11	34.75 ±31.64
Six months after amenorrhea	1.11 ±0.14	0.97 ±0.11	20.45 ±6.05	36.56±3.92	32.74 ±31.02	40.69 ±31.91
Twelve months after amenorrhea	1.08 ±0.12	0.95 ±0.11	20.58 ±6.06	36.65±3.87	25.92 ±3.53	40.69 ±31.63
Ovariectomy group (n=33)						
Pre-operation	1.11 ±0.18	0.99 ±0.20	21.39 ±3.54	36.05±3.39	36.74 ±29.14	23.66 ±24.17
Six months after amenorrhea	1.08 ±0.15	0.95 ±0.11	21.06 ±3.86	35.91±3.59	14.79 ±22.17 <sup>①</sup>	47.01 ±23.53
Twelve months after amenorrhea	1.02 ±0.13	0.93 ±0.10	21.41 ±3.51	35.92±3.57	8.09 ±4.38 <sup>①</sup>	64.88 ±18.39 <sup>①</sup>

Compared with the control group at the same time (P<0.05)

BMD of women which were respectively during the perimenopause and within five years after the menopause, it was found that the BMD of the first to fourth lumbar vertebra and the neck of femur of the early menopausal women was obviously inferior to the women during the perimenopause. And the BMD of the first to fourth lumbar vertebra of the women that were within one to five years after the menopause fell down about 8%, the BMD of the neck of femur fell down about 5%, which showed that the value of the low-level estrogenic of the women which were during the perimenopause (Minfang *et al.*, 2009).

The bilateral oophorectomy during the perimenopause was the common treatment in gynecology. Compared with the menostasis, the oophorectomy caused the estrogen levels sharply decreased. This observation showed that the changes of hormone before and after the surgery of women that had passed through the surgical menopause exceeded the changes of hormone of women that had gone through the natural menopause. The level of E<sub>2</sub> of six months after the surgical menopause was obviously inferior to the level of E<sub>2</sub> of menostasis group, but the rising of the level of FSH revealed the statistical differences in Dec. The changes of the indexes of bone metabolism caused by the declining of estrogen level revealed that the activity of osteoblast lowered and the bone formation reduced; On the contrary, the changes also revealed that the activity of osteoclast enhanced and the bone resorption accelerated (Xianghui *et al.*, 2009). Compared with the natural menopause group, the average vertebral loss rate in women underwent the surgical menopause was 5% each year, and the rate was 9% in women of natural menopause (Chunmei *et al.*, 2005). The research (Yincheng *et al.*, 2009) hinted that the influence of bilateral oophorectomy on the pre-menopausal patients mainly performed in the symptoms of anglokinosis, neuropsychiatric and the changes in sexual life in the early time, but there was no statistic differences in early symptom of skeleton.

## CONCLUSION

Through the prospective study, it is found that similar with the discover of Morita (Morita *et al.*, 2006), there are no statistic differences in the comparison on the BMI, muscle content and fat content measured in the sixth and twelfth month after the bilateral oophorectomy of women during the perimenopause and measured in the natural menopause group. And the reasons could be that the reflecting of muscle and fat to the post-menopause sex hormone is slow. The retrospective study (Huilin *et al.*, 2007) shows that the possibilities of developing the osteoporosis obviously increase a long-dated time [(8.6±5.6) years] after the bilateral oophorectomy. Therefore, the time of the occurring of the changes of BMD, muscle content and fat content provides the basis for preventing the osteoporosis for those women during the perimenopause who have been underwent the bilateral oophorectomy. This study will continue to follow up the women of ovariectomy group. It is suggested that the gynecologists be cautious in choosing bilateral oophorectomy to treat women during the perimenopause. If the bilateral oophorectomy is a must, the gynecologists should clearly warn the patients to take precautionary measures. A survey on the observation for women have underwent the gynecological operation (Phipps *et al.*, 2009) shows that most women are aware of the hysterectomy but they usually have no idea if the ovariectomy has been underwent. Therefore, the postoperative prevention aiming to the bilateral oophorectomy is hard to carry out. Consequently, the clinical doctors should clearly inform the patients in details after undergoing the ovariectomy so that the regular follow-up visits could be arranged. The safe and effect prevention and treatment aiming to individuals can improve the living quality for women during the perimenopause.

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