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Effects of simple hysterectomy on bone loss

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Lumbar spine and proximal femoral bone densities of Caucasian women, aged 35-45, were measured by dual photon densitometry model DPX. The measurement sites were assessed at the lumbar spine (vertebrae L2 to L4) and at the proximal femur (trochanter, femoral neck and Ward's triangle). After exclusion of women with climacteric symptoms, sterilized patients or those with menopausal concentrations of gonadotrophins, the study included 22 subjects: 11 menstruant (control group) and 11 hysterectomized. The hysterectomies were without oophorectomy and had been performed during the previous five years. The bone densities of the hysterectomized women were lower than those of the normal ones, but significantly lower at the Ward's triangle.

UNITERMS: Premenopausal hysterectomy. Postmenopausal osteoporosis. Photon absorptiometry.

INTRODUCTION

The effects of hysterectomy on the ovaries is still a controversial subject and has received special attention from gynecologists. There are many studies about the endocrine activity of the ovaries after hysterectomy (13).

The relationship between ovarian insufficiency and osteoporosis was first noticed by ALBRIGHT et al.(1). Since then, the occasional causal relationship between ovarian insufficiency and osteoporosis has been discussed.

In an attempt to prevent osteoporosis, there are several studies which try to detect other risk factors, including simple hysterectomy (15).

This paper contains the analysis of the bone mass of women without climacteric symptoms or elevated levels of seric gonadotropins, with ages varying from 35 to 45 years, who previously underwent hysterectomy, and did not have any currently-known risk factors for the development of osteoporosis.

CASES AND METHODOLOGY

A total of 22 women were studied by the Department of Gynecology at Escola Paulista de Medicina between the years 1985 and 1990. They were divided into groups I and II. The first group was composed of patients who had undergone simple hysterectomy, and in the second control group were those with intact uteri. In order to make both groups as homogeneous as possible, we included only Caucasian women and excluded those with any of the following characteristics: a body-weight over 90 kg; the presence of either climacteric symptoms or high levels of

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seric gonadotropins (compatible with the climacteric syndrome); uni- or bilateral oophorectomy; undue habits such as heavy smoking or alcoholism; the use of drugs such as corticosteroids, antacids, anticonvulsants, diuretics, or estrogen; the presence of either endocrine disease (mellitus diabetes, hyperthyroidism, glucocorticoid excess, hyperprolactinemia) or rheumatic diseases.

Women belonging to group I had been submitted previously to a simple hysterectomy (without oophorectomy) uterine myoma as the main characteristic. Those belonging to group II did not show the previously mentioned risk factors and, furthermore, had taken hormonal contraceptives or undergone tubal sterilization.

Bone density was measured by dual X-ray absorptiometry, Lunar radiation model DPX, at the lumbar spine (L2-L4) and at the proximal femur (femoral neck,

trochanter and Ward's triangle), with a level of precision error around 2%.

Appropriate nonparametric analyses, which included analyses of variables according to Friedman's and Mann-Whitney tests, were performed (5,14).

RESULTS

Table I shows the measurements of individual densities in both groups, on the lumbar spine (L2 and L4) and on the proximal femur (femoral neck, Ward's triangle and trochanter).

Analysis of the bone densities revealed a statistically significant reduction at the Ward's triangle in

TABLE I
Comparison of lumbar spine and proximal femoral bone densities between groups of hysterectomized subjects without uterus (Group I) and with intact uterus (Group II).

LUMBAR SPINE		FEMORAL NECK		WARD'S TRIANGLE		TROCHANTER	
GROUP I	GROUP II	GROUP I	GROUP II	GROUP I	GROUP II	GROUP I	GROUP II
1,089	1,239	0,972	1,006	0,877	0,922	0,753	0,854
1,196	1,145	0,810	0,939	0,675	0,800	0,725	0,764
1,085	1,063	0,919	0,955	0,798	0,822	0,655	0,818
1,023	1,352	0,880	0,965	0,716	0,842	0,760	0,900
1,024	1,264	0,966	0,885	0,888	0,879	0,899	0,731
1,273	1,245	1,026	0,996	0,878	0,946	0,790	0,780
1,342	1,039	1,045	0,972	0,873	0,937	0,864	0,737
1,150	0,980	0,883	1,106	0,743	1,022	0,748	0,757
0,995	1,275	0,783	0,995	0,649	1,015	0,635	0,968
1,206	1,231	0,951	1,107	0,959	1,008	0,738	0,881
1,179	1,318	0,942	0,940	0,762	0,919	0,813	0,832
X 1,142	1,195	0,923	0,988	0,802	0,919	0,762	0,820

X = AVERAGE

Friedman's Test: Group I : X calc = 28,09*

Group II: Xcalc = 27,33*

Mann-Whitney's Test: (group I x group II)

LUMBAR SPINE

FEMORAL NECK

WARD'S TRIANGLE

TROCHANTER

U calc=40,0

U calc=33,5

U calc=21,0*

Ucalc=31,0

(group I < group II)

1 - The average values of lumbar spine and proximal femur neck, Ward's triangle and trochanter bone densities of hysterectomized women (I) and control group (II).

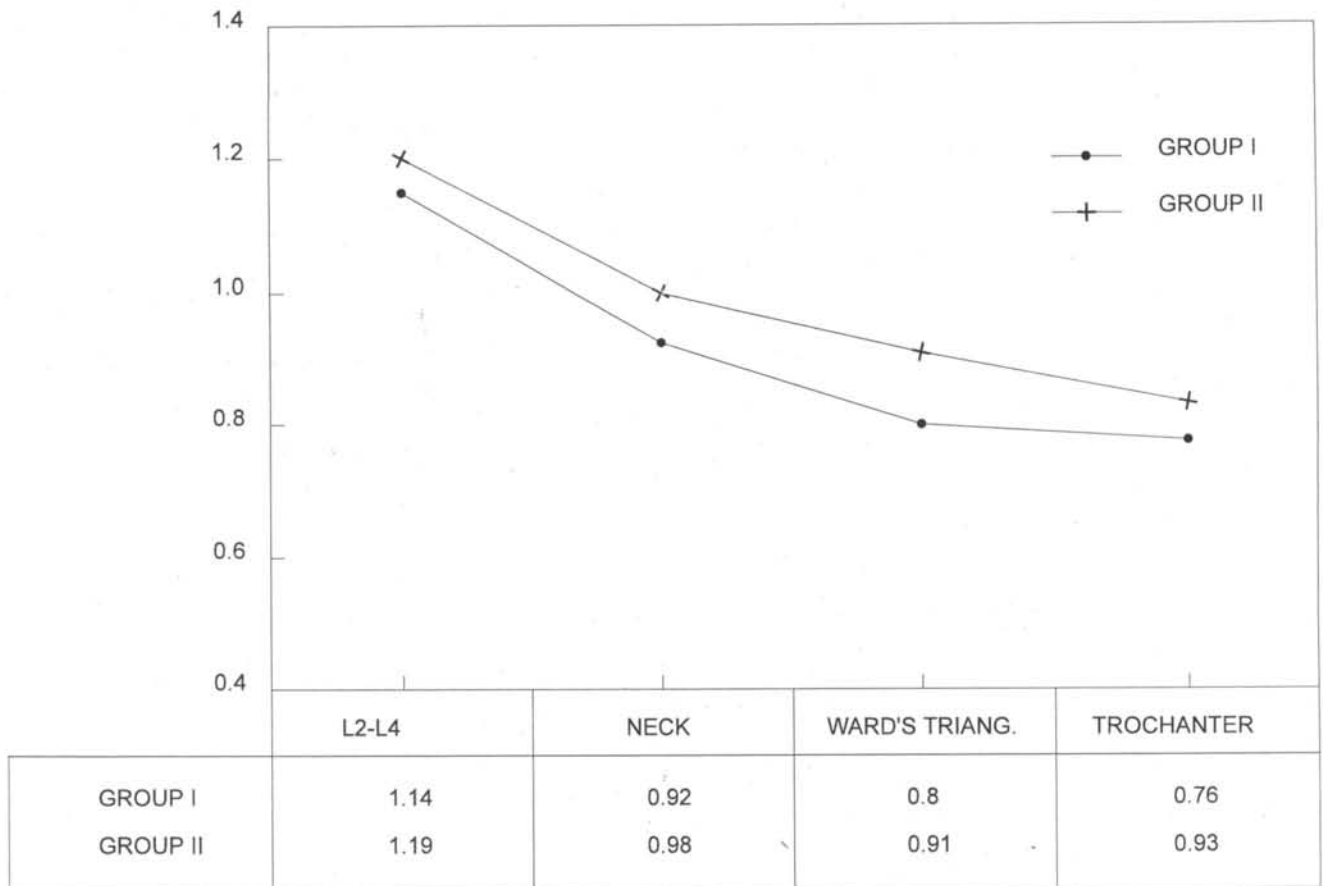
average value of bone density (g/cm²)

FIGURE 1 - The average values of lumbar spine and proximal femur neck, Ward's triangle and trochanter bone densities of hysterectomized women (I) and control group (II).

hysterectomized women in comparison with those whose uteri were intact. The influence that hysterectomy had on bone density is illustrated in Figure 1. There was a statistically significant reduction of bone mass at the Ward's triangle in hysterectomized women in comparison with those whose uteri were intact.

DISCUSSION

Our study showed a lower bone density in the lumbar spine and proximal femur in hysterectomized women when compared to women with intact uteri. However, a

statistically significant difference was correlated only at the Ward's triangle. Hysterectomy could lead to hypoestrogenism, undetected by seric sampling of the gonadotropins, yet sufficient enough to lead to bone loss.

Bone mineral density of the lumbar spine and proximal femur were not compared, because the measurements of the density of a bone may not always predict the behavior of other bones in the same patients and these are the sites most often associated with osteoporosis.

Identification of the precise time of ovarian failure can be difficult if hysterectomy has been performed. Ovarian failure is a gradual process associated with fluctuations in steroidogenesis and, therefore, gonadotropin levels (13).

Bilateral oophorectomy is related to the acceleration of bone loss, and already demonstrated in radiological and densitometric studies (9).

The possibility of hysterectomy as a risk factor for the development of osteoporosis was taken into consideration.

SIDDLE et al. (13), stated that one-third of hysterectomized women lose their ovarian function one to two years after operation. RIEDDLE et al. (12), estimated rates of between 30 and 50%.

Total or partial removal of the uterus in animals induces structural and functional alterations of the ovaries. In 25 hysterectomized women ZECCHI DE SOUZA et al. (16) found, after ovarian biopsy, a stromal hyperplasia of 87%, with no changes detected in serum estradiol and estrone levels, thus confirming previous results from CORSON et al. (4).

Blood circulation to the ovary may be supplied entirely by the ovarian artery or (in extreme cases) by the uterine artery. In most cases, both arteries contribute to the blood supply to the ovary, with their respective shares varying considerably (12).

Hysterectomy could affect the blood supply to the ovaries, or even of the uterus itself, through interaction with ovarian function (7,8,12,13). Uterine tissue homogenates can produce prostaglandins: and uterine venous drainage contains high prostaglandin metabolite levels. The uterus is thus considered an endocrine organ.

In a series of 60 women who had undergone simple hysterectomy without oophorectomy, 28 women (47% of the total) had normal gonadotropins and estradiol concentrations although they complained of hot flushes (10). These flushes, however, did have a significantly diminished bone mineral index (single photon absorptiometry of the radius). These data show that although the menopausal concentrations of gonadotropins and estradiol were similar to those in women of comparable

age with natural menopause, a subtle reduction in estrogenization is frequent.

HRESHCHYSHYN et al. (6) using dual photon absorptiometry for density measurements of the lumbar spine and femoral neck, observed that the bone densities of 37 hysterectomized women without bilateral oophorectomy were significantly lower than those of 60 menstruant women.

In addition, some epidemiological evidence suggests that hysterectomy may also increase the risk of coronary heart disease (3).

The uterus may be a hormonal organ important in the production of a prostaglandin identified as prostacyclin, which is a potent vasodilator that also prevents platelet aggregation (2,3).

Prostaglandins were the first substances to be identified as possible local regulators of physiological and pathological responses in the bone. Prostaglandin E2 is the principal product of arachidonic acid metabolism in the bone, and was initially shown to be a potent stimulator of bone reabsorption. Prostaglandin I2 and prostaglandin F2 alpha have also been identified in bone-cell and organ cultures and can affect bone reabsorption (2,8,11).

In conclusion, one subgroup of hysterectomized women showed lower bone densities only at the Ward's triangle when compared to women with intact uterus in the absence of alterations of gonadotropins.

However the measurements of bone densities at other sites did not show significant reduction of bone mass.

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RESUMO

Introdução: Os autores propuseram-se a avaliar a densidade óssea de mulheres submetidas à histerectomia. Esta cirurgia é, na atualidade, procedimento corriqueiro na prática ginecológica. A histerectomia poderia, eventualmente, alterar a função ovariana e, por consequência, determinar queda da massa óssea. **Material e Métodos:** Para tanto, estudaram-se 22 mulheres, entre 35 e 45 anos, que foram divididas em dois grupos: grupo I, constituído por mulheres submetidas à histerectomia total prévia e, grupo II, formado por aquelas com útero intacto. Avaliou-se a densidade óssea por meio de densitômetro de dupla emissão, com fontes de raio X (DPX), em coluna lombar (L2-L4), colo do fêmur, triângulo de Ward e trocânter. Para a análise dos resultados utilizou-se o teste de Mann-Whitney e o teste de Friedman ($p < 0,05$). **Resultados:** Verificou-se que houve diminuição significativa da massa óssea no triângulo de Ward nas mulheres histerectomizadas, quando comparadas às com útero intacto. Ademais, a densidade óssea foi menor na coluna lombar e colo do fêmur das mulheres histerectomizadas.

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