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Original article

Effect of vitamin D on the variability of blood pressure in premenopausal and menopausal hypertensive women in the area of Blida (Algeria)

Effet de la vitamine D sur la variabilité de la pression artérielle chez les femmes hypertendues en préménopause et ménopausées dans la région de Blida (Algérie)

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Abstract

Objective. – To evaluate the effect of 25 (OH) vitamin D supplementation on blood pressure (BP) variability in hypertensive women in the pre-menopausal and post-menopausal periods.

Materials and methods. – 881 hypertensive women prospectively followed for an interventional study between January 2016 and September 2017, in specialized consultation at the department of internal medicine at the Blida University Hospital (Algeria). Four hundred and thirty nine premenopausal women (group I) and 442 menopausal women (group II). The initial serum 25 (OH) D level for each group was determined by the enzyme immunoassay. In groups I and II, we identified 2 subgroups, A: insufficiency (vit D between 29 and 20 ng/ml) and B: deficiency (vit D less than 20 ng/L). Antihypertensive therapy was supplemented with an additional 200000 IU/month cholecalciferol for the two B subgroups. The variability in BP was calculated as the ratio of mean systolic and diastolic BP during daytime and nighttime, with performing ambulatory BP measurement at baseline, 3, 6, and 12 months of follow-up.

Results. – At inclusion, the level of 25 (OH) D was lower ($P < 0.05$) in subgroups IB (19.3 ± 8.5 ng/ml) and IIB (18.2 ± 9.5 ng/ml) compared to subgroups IA (28.1 ± 10.7 ng/ml) and IIA (25.2 ± 10.1 ng/ml). After supplementation, the level of 25 (OH) D increased in subgroup IB (38.3 ± 11.9 ng/ml) and in subgroup IIB (37.3 ± 10.5 ng/ml) and became higher ($P < 0.001$) than in subgroups IA and IIA. Between subgroups IA and IB, at inclusion, there is no difference ($P > 0.05$) in the SBP and DBP variability during the day and at night. After treatment, the variability of the SBP at night became lower ($P < 0.02$) in group IB compared to group IA. In subgroup IIB, daytime variability indices were higher ($P = 0.04$) at inclusion than in group IIA. After treatment, the variability of SBP during the day decreased but remained the highest ($P < 0.05$) in subgroup IIB (14.8 ± 10.8 mmHg) compared to subgroup IB (12.0 ± 8.1 mmHg), as well as to subgroups IIA (10.9 ± 9.8 mmHg) and IA (10 ± 8.1 mmHg). We found a significant correlation of cholecalciferol with the variability of SBP during the day.

Conclusions. – Vitamin D deficiency appears to be a factor of BP variability. Although the variability of the postmenopausal group remains higher than that of the other groups, the correction of the level of 25 (OH) D by the supply of cholecalciferol 200000 IU per month leads to a reduction in the variability of BP in the studied hypertensive women could help to prevent morbimortal complications.

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Keywords: Vitamin D; Deficiency; Insufficiency; Variability; Blood pressure; Premenopausal; Menopausal

Résumé

Objectif. – Évaluer l'effet de la supplémentation en 25 (OH) vitamine D sur la variabilité de la pression artérielle (PA) chez les femmes hypertendues dans les périodes de préménopause et de post-ménopause.

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Matériels et méthodes. – Nous avons étudié prospectivement 881 femmes hypertendues entre janvier 2016 et janvier 2017, suivies en consultation d'HTA au service de médecine interne et cardiologie du centre hospitalo-universitaire de Blida (Algérie). Quarante cent trente neuf femmes en période de préménopause (groupe I) et 442 femmes ménopausées (groupe II). Le taux initial du sérum 25 (OH) D pour chaque groupe a été déterminé par le dosage immunoenzymatique. Dans les groupes I et II, nous avons identifié 2 sous-groupes, A : insuffisance (vit D entre 29 et 20 ng/ml) et B : carence (vit D inférieure à 20 ng/ml). Le traitement antihypertenseur a été complété par un ajout de cholécalciférol 200 000 UI/mois pour les sous-groupes B. La variabilité de la PA a été calculée par le rapport entre la moyenne des PA systoliques et diastoliques pendant le jour et la nuit tout en effectuant une mesure ambulatoire de la PA à l'inclusion, 3, 6 et à 12 mois de suivi.

Résultats. – À l'inclusion, le taux de 25 (OH) D était inférieur ($p < 0,05$) dans les sous-groupes IB ($19,3 \pm 8,5$ ng/ml) et IIB ($18,2 \pm 9,5$ ng/ml) par rapport aux sous-groupes IA ($28,1 \pm 10,7$ ng/ml) et IIA ($25,2 \pm 10,1$ ng/ml). Après supplémentation, le niveau de 25 (OH) D a augmenté dans le sous-groupe IB ($38,3 \pm 11,9$ ng/ml) et dans le sous-groupe IIB ($37,3 \pm 10,5$ ng/ml) et est devenu plus élevé ($p < 0,001$) que dans les sous-groupes IA et IIA. Entre les sous-groupes IA et IB, à l'inclusion, il n'existe pas de différence ($p > 0,05$) de la variabilité PAS/PAD pendant le jour et la nuit. Après traitement, la variabilité de la PAS la nuit est devenue inférieure ($p < 0,02$) dans le groupe IB par rapport au groupe IA. Dans le sous-groupe IIB, les indices de variabilité PAS le jour étaient plus élevés ($p = 0,04$) à l'inclusion que dans le groupe IIA. Après traitement, la variabilité de la PAS au cours de la journée a diminué mais restait la plus élevée ($p < 0,05$) dans le sous-groupe IIB ($14,8 \pm 10,8$ mmHg) par rapport au sous-groupe IB ($12,0 \pm 8,1$ mmHg), ainsi qu'aux sous-groupes IIA ($10,9 \pm 9,8$ mmHg) et IA ($10 \pm 8,1$ mmHg). Nous avons retrouvé une corrélation significative du cholécalciférol avec la variabilité de la PAS au cours de la journée.

Conclusions. – La carence en vitamine D semble être un facteur de variabilité tensionnelle. Bien que la variabilité du groupe des femmes ménopausées reste supérieure à celles des autres groupes, la correction du niveau de 25 (OH) D par l'apport de cholécalciférol 200000 UI par mois conduit à une réduction de la variabilité de la PA chez les femmes hypertendues étudiées et peut permettre d'éviter des complications morbimortelles.

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Mots clés : Vitamine D ; Carence ; Insuffisance ; Variabilité ; Pression artérielle ; Préménopausée ; Ménopausée

1. Introduction

The variability of blood pressure (BP) is a physiological phenomenon influenced by many intrinsic and extrinsic factors. This variability is modified in several pathological conditions including hypertension (HT). An exaggerated variability in BP is associated with deleterious effects on the target organs of the cardiovascular system and should therefore be considered as a new independent cardiovascular (CV) risk factor (RFs). The variability of BP is greater in women than in men with no racial difference [1–3]. The effect of drugs on this variability has been little studied.

Vitamin D deficiency (vit D) is a worldwide medical concern [4] because it is associated with an increased risk of cardiovascular disorders [5,6]. Vitamin D treatment in premenopausal and postmenopausal hypertensive women may reduce the mean BP level over 24 hours, and may also reduce the magnitude and frequency of cardiovascular risk.

This study is the first in Algeria concerning the effect of vitamin D on the BP variability of premenopausal and menopausal hypertensive women.

2. Objectives

Our objective was to evaluate the effect of 25 (OH) D supplementation on BP variability in hypertensive women in the premenopausal and postmenopausal periods.

3. Materials and methods

From January 2016 to September 2017, 914 women were recruited for the present study. Thirty three of them were excluded because they did not participate in one or more of the planned follow up examination.

Finally, 881 consecutive treated hypertensive women, 439 premenopausal (group I) and 442 postmenopausal (group II) were kept as outpatient in a specialized consultation of hypertension in the department of internal medicine and cardiology of the Blida University Hospital Center (Algeria).

From January 2016 to September 2017, we included 881 premenopausal and menopausal women (439 premenopausal (group I) and 442 postmenopausal (group II)).

The study consisted of completing a questionnaire on basic demographic variables, medical history and medication use, supplemented by a clinical examination including:

- epidemiological parameters (age, occupation, home);
- weight, height and waist circumference were also measured on the same day. The height and weight were measured using a scale with a manual manipulation fence. The body mass index (BMI) was calculated by the equation: $\text{weight (kg)/height}^2$ (m^2);
- the measurement of BP was measured three times at two minutes intervals after five minutes of rest using an electronic BP monitor (Omron705 CP). The average of the last two measures was used for the statistical analysis [7].

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