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Vitamin D and Consequences for Phospho calcium Metabolism in Dnid

VITAMINE D ET CONSEQUENCES SUR LE METABOLISME PHOSPHOCALCIQUE CHEZ LES DNID

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Summary

Introduction: Vitamin D deficiency appears to have significant metabolic, vascular, immunological and bone consequences in diabetics. We evaluated its prevalence and its consequences on phosphocalcic metabolism in a sample of diabetics.

Materials and Methods: Study carried out between October 2020 and January 2021 on 123 patients (94 women and 29 men) sex-ratio of F/H= 3.24, all type II diabetics with a mean age of 52 years. Vitamin D (25 OH-D3) was measured on a VidasBiomérieux automated system and the determination of calcemia, phosphoremia and albumin (corrected calcemia) were carried out on an ADVIA 1800 SIEMENS automated system with 2 levels of control.

Results: Of the 123 patients who participated in the study, 93% were vitamin D deficient (< 30 nb/ml) and 40% were severely deficient (< 10 nb/ml). Similarly, the calcium/TIV D ratio was low in only 33% of patients P = 0.04, and the phosphorus/TIV D ratio was low in only 36% of patients P = 0.06. The calcium/phosphate ratio was not significant. In logistic regression, low vitamin D (< 20 nb/ml) was only associated with the duration of diabetes, with no relation to age or sex, and the impact on the phosphocalcic balance was more metabolic than cardioactive.Our work is in line with the literature and our study is consistent with the new study published in the European Journal of Endocrinology published in 2017.

Conclusion: Vitamin D is an essential element in the fight against disease. It acts on the bones and prevents osteoporosis, activates the immune system and prevents all types of infection. Its deficiency is frequent in NIDDM without disturbing the phosphocalcic balance according to our results and according to certain randomized studies on large cohorts. Nevertheless, the monitoring of the phosphocalcic balance and the vitamin capital in the DNID must be well codified and carried out regularly in order to avoid certain complications.

Key words: vitamin D, type 2 diabetes, phosphocalcic balance, insulin resistance, hypovitaminosis

Résumé :

Introduction : La carence en vitamine D semble avoir des conséquences significatives chez diabétiques aussi bien sur le plan métabolique, vasculaire, immunologique et osseux. Nous avons évalué sa prévalence et ses conséquences sur le métabolisme phosphocalcique sur un echantionnage de diabétiques.

Matériels et Méthodes : Etude réalisée entre octobre 2020 et janvier 2021 sur 123 patients (94 femmes et 29 hommes) sex-ratio de F/H= 3.24, tous diabétiques de type II avec un âge moyen de 52 ans. La vitamine D (25 OH-D3) a été dosée sur automate Vidas Biomérieux et le dosage de calcémie, phosphorémie et d'albumine (calcémie corrigée) ont été réalisé sur automate ADVIA 1800 SIEMENS avec 2 niveaux de control.

Résultats : Sur les 123 patients ayant participé à l'étude 93 % avaient une carence en vitamine D (< 30 nb/ml) sévère chez 40 % (< 10 nb/ml). De même, le ratio calcium / VIT D n'était bas que chez 33 % des patients P = 0,04, et le ratio phosphore / VIT D n'était bas que chez 36 % des patients P = 0,06. Le ratio calcium / phosphate e tait non significatif. En régression logistique, la vitamine D basse (< 20 nb/ml) n'était associée qu'à la durée du diabète, sans rapport avec l'âge ou le sexe, et les répercussions sur le bilan phosphocalcique étaient plus d'ordre métabolique que carentiel.Notre travail rejoint la littérature et notre étude va dans le sens de la nouvelle étude publiée dans l' *European Journal of Endocrinology* publiée en 2017.

Conclusion : La vitamine D est un élément essentiel pour lutter contre les maladies. Elle agit sur les os et prévient l'ostéoporose, active le système immunitaire et permet d'éviter toute type d'infection. Sa carence est fréquente lors du DNID sans pour autant perturbé le bilan phosphocalcique d'après nos résultats et selon certaines études randomisées sur de grandes cohortes néanmoins la surveillance du bilan phosphocalcique et le capital vitaminique chez le DNID doit être bien codifiée et réalisée de façon régulière afin d'éviter certaines complications.

Mots clefs:vitamine D, diabète type 2, bilanphosphocalcique, insulinoresistance, hypovitaminose.

I. Introduction

Vitamin D deficiency appears to have significant metabolic, vascular, immunological and bone consequences in diabetics. We evaluated its prevalence and its consequences on phosphocalcic metabolism in a sample of diabetics. The importance of vitamin D in bone metabolism is long established but recent publications have reported the potential extraosseous effects of vitamin D. The area of bone and muscle fragility has been explored in randomised trials.

Vitamin D is increasingly seen as one of the main environmental factors that can limit the risk of occurrence and progression of certain chronic diseases, particularly cardiovascular and metabolic diseases. For example, a link has been suggested between vitamin D and type 2 diabetes

In many international studies it has been shown that vitamin D deficiency is associated with a high risk of developing insulin resistance and type 2 diabetes. Indeed, this vitamin could interact with the various physiopathological mechanisms governing insulin secretion, insulin resistance and the parameters of carbohydrate homeostasis. It could also be involved in the complications of type 2 diabetes.

II. Materials and Methods

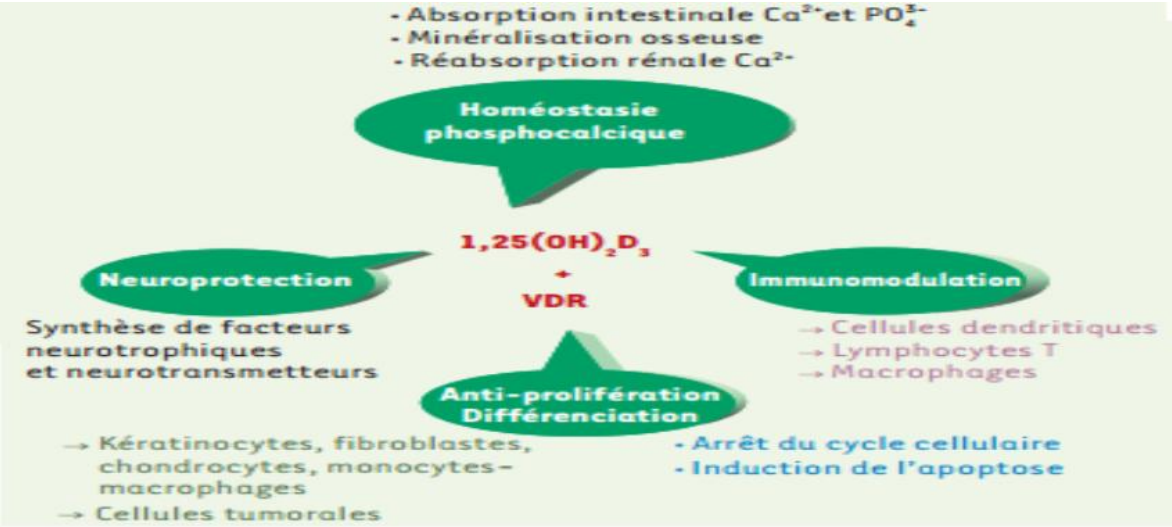
Study conducted between October 2020 and January 2021 on 123 patients (94 women and 29 men) sex-ratio of F/H= 3.24, all type II diabetics with a mean age of 52 years (28-76 Years). Vitamin D (25 OH-D3) was measured on a VidasBiomérieux automated system and the measurement of blood

calcium, phosphorus and albumin (corrected blood calcium) was carried out on an ADVIA 1800 SIEMENS automated system with 2 levels of control.

III. Results and Discussion

Vitamin D of cutaneous origin is transported in the blood, by a carrier protein (vitamin D-binding protein , DBP) and dietary vitamin D is transported by DBP and lipoproteins, to the liver where it is hydroxylated to 25OHD (calcidiol, a biologically inactive form), and then to the kidney for a 2nd hydroxylation, by 1α hydroxylase to 1,25(OH)2 D. The resulting 1,25dihydroxyvitamin D (or calcitriol) is the biologically active form of vitamin D responsible for bone and extra-bone effects

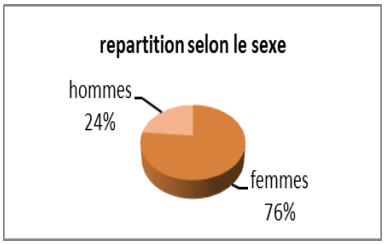
1,25(OH)2 D has a major role in the regulation of phosphocalcic metabolism and calcium homeostasis, acting on the parathyroid, kidney and intestine. 1,25(OH)2 D maintains physiological calcium levels by increasing intestinal calcium absorption, and by acting directly on bone, via an action on the vitamin D receptor (VDR) located in osteoblasts. The vitamin D-bound VDR activates the RANK/RANKL system, which increases osteoclastogenesis and thus promotes the release of calcium and phosphorus.



Physiological and biochemical role of vitamin D

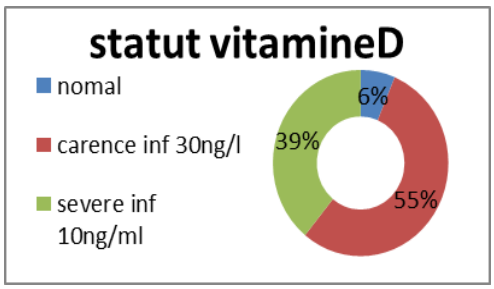
Our study shows that 64% of the patients were over 50 years of age and only 36% were under 50 years of age and that 65% of the patients had diabetes for more than 5 years and 35% for less than 5 years.

Our work shows that the prevalence of vitamin D deficiency and deficiency in type 2 diabetic patients is high and alarming, and that it predominates in women (76.42%), whereas it represents only 23.58% in men.



Of the 123 patients who participated in the study 93% were vitamin D deficient (< 30 ng/ml) and 40% were severely deficient (< 10 ng/ml). Similarly, the calcium/TIV D ratio was low in only 33% of patients P = 0.04, and the phosphorus/TIV D ratio was low in only 36% of patients P = 0.06. The calcium/phosphate ratio was not significant. In logistic regression, low vitamin D (< 20 ng/ml) was only associated with the duration of diabetes, not with age, and the impact on calcium and phosphorus status was more metabolic than deficiency-related. There is an important link between vit D and insulin secretion, especially in people with a non-functional VDR. There is an alteration in glucose tolerance and a decrease in the

maximum capacity for insulin secretion independently of changes in blood calcium levels. Our work is in line with the literature and our study is in line with the new study published in the European Journal of Endocrinology in 2017 and Quebec researchers have shown that this vitamin D could slow the progression of the disease in patients diagnosed with pre-diabetes or early type 2 diabetes.



The levels of vitamin D in our population are in agreement with other results found in other studies. In line with our study an American team from Washington University in St Louis, Missouri has just published a study on the possible role of vitamin D in diabetic patients. Some data had already shown that diabetics have a 20% deficiency in vitamin D levels, and that this doubles the risk of developing cardiovascular disease. People with diabetes have inflammation of the blood vessels, as diabetes turns some white blood cells into macrophages that stick to the vessel walls. In diabetics with vitamin D deficiency, this process is accelerated and the macrophages bind with cholesterol, resulting in clogged arteries. Researchers have shown that adding vitamin D to isolated macrophages suppresses their adhesion.

In addition, numerous clinical studies with vitamin D supplementation in a population with type 2 diabetes have shown inconsistent effects of the pancreas. These variations in results could be explained by many factors such as

- The ethnic and geographical origin of the populations, the small sample size of the participants in the clinical trials;
- The level of glucose tolerance of the participants and their initial serum vitamin D status;
- -The different methods of measuring vitamin D;
- The duration of the clinical trial with vitamin D supplementation.

In the same setting a cross-sectional study of 488 subjects with PreDM and 25 (OH) D deficiency therefore appeared to be more likely to develop T2DM due to a higher degree of insulin resistance associated with impaired and uncompensated insulin secretory function. The fact that in this study the prevalence of insulin resistance is increased in preDM is not surprising as they have a higher body mass index. The question arises as to the value of 25(OH)D supplementation in deficient and pre-modernised patients, or even obese patients. Epidemiological studies have shown that vitamin D supplementation in childhood reduces the risk of developing type 1 diabetes. A Finnish study showed that the administration of 2000 IU of vitamin D/d to 10,366 children in the first year of life was associated with an 80% reduction in the risk of type 1 diabetes (30 year follow-up) (RR=0.22; 95% CI 0.05-0.89).

Hypovitaminosis D is associated with increased insulin resistance, decreased insulin production, and the development of metabolic syndrome. The mechanism of these associations is still poorly understood. Administration of 1200mg of calcium and 800IU of vitamin D reduces the risk of developing type 2 diabetes by 33% (RR=0.67, 95% CI 0.49-0.90) compared to subjects taking 600mg of calcium and less than 400IU of vitamin D.

IV. Conclusion

Vitamin D is an essential element in the fight against disease. It acts on the bones and prevents osteoporosis, activates the immune system and prevents all types of infection. Its deficiency is frequent in NIDDM without disturbing the phosphocalcic balance according to our results and according to certain randomized studies on large cohorts. Nevertheless, the monitoring of the

phosphocalcic balance and the vitamin capital in NIDDM must be well codified and carried out regularly in order to avoid certain complications.

Vitamin D is considered a good marker of health status. However, vitamin D deficiency or sub-deficiency appears to be increasingly common in the general population. Consistent epidemiological evidence has established a relationship between vitamin D deficiency and the increased prevalence of type 2 diabetes

The resulting analysis concludes that the prevalence of vitamin D deficiency and deficiency in type 2 diabetic patients is alarmingly high and predominantly in women (76.42%),

This work indicates that vitamin D supplementation is a way to reduce the risk of developing cardiovascular disease in people with diabetes

"Vitamin D protects the arteries of diabetics"

Conflicts of interest: the authors declare no conflicts of interest

References

[1.] Diabète de type 2 : et si la vitamine D freinait sa progression ?Julie P.NEWSLETTER SANTEAug 8, 2019

[2.] UPDATE ON VITAMIN D AND EVALUATION OF VITAMIN D STATUS. J.-C. Souberbiell , D. Prié, M. Courbebaisse, G. Friedlander, P. Houillier, G. Maruani, E. Cavalier, C. Cormier . Annales d'Endocrinologie. Volume 69, n° 6. pages 501-510 (décembre 2018)

[3.] VITAMIN D: SKELETAL AND EXTRA SKELETAL EFFECTS; RECOMMENDATIONS FOR GOOD PRACTICE. Karine Briot, Maurice Audran, Bernard Cortet , Patrice Fardellone, Christian Marcelli, Philippe Orcel, Bruno Vellas, Thierry Thomas, Christian Roux. Volume 38, n° 1. pages 43-54 (janvier 2017).

[4.] VITAMIN D AND CALCIUM INTAKE IN RELATION TO TYPE 2 DIABETES IN WOMEN *DIABETES CARE* . Pittas A.G., Dawson-Hughes B., Li T., Van Dam R.M., Willett W.C., Manson J.E., and al. 2016 ; 29 : 650-656

[5.] Déficience en vitamine D: un risque accru de diabète de type 2. Abbasi et al. J Nutr. 2015;145:714–9.

[6.] HYPOVITAMINOSIS D IS ASSOCIATED WITH INSULIN RESISTANCE AND B CELL DYSFUNCTION. Chiu K.C., Chu A., Go V.L.W., Saad M.F. *Am J ClinNutr* 2014 ; 79 : 820-825

[7.] BIOCHIMIE CLINIQUE. PERRE VALDIGUE 2Éme edition1

[8.] *Journal of Biological Chemistry 9 Nov 2012; 287(46):38482-94*

[9.] Vitamine D : effet osseux et extra-osseux ; recommandations de bon usage. Karine Briot, Maurice Audran, Bernard Cortet, Patrice Fardellone, Christian Marcelli, Philippe Orcel, Bruno Vellas, Thierry Thomas, Christian Roux la Presse Médicale ; Volume 38, n° 1 pages 43-54 (janvier 2009)

[10.] Holick M.F. Vitamin D deficiency *N Engl J Med* 2007 ; 357 : 266-281 [cross-ref]

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