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Correlation between 25-hydroxy-Vitamin-D and senile diabetic peripheral neuropathy in type 2 diabetes.

Lanlan Yang[1#], Xu Zhang[2#], Xiaoli Ma[3], Fanghong Dong[1], Rui Tian[2], Man Xu[4*]

[1]School of Nursing, Hebei University, Baoding, Hebei, 071000, PR China

[2]School of Medicine, Hebei University, Baoding, Hebei, 071000, PR China

[3]Department of Chinese Medicine, Hebei University, Baoding, Hebei, 071000, PR China

[4]Department of Intensive Care Unit, Baoding First Central Hospital, Baoding, Hebei, 071000, PR China

[#]These authors contributed equally to the work

Abstract

Objective: This study aims to explore correlation between 25-Hydroxy-Vitamin-D and senile diabetic peripheral neuropathy (DPN) in type 2 diabetes.
Methods: From January, 2015 to January, 2017, 80 patients with DPN in type 2 diabetes (DPN group) and 80 patients with non-DPN in type 2 diabetes (NDPN group) were collected in Baoding First Central Hospital as the study objects. Glycosylated hemoglobin, blood pressure, plasma lipids, general clinical data and 25-Hydroxy-Vitamin-D level of the patients were tested and serum 25-Hydroxy-Vitamin-D deficiency status was statistically analyzed.
Results: 25-Hydroxy-Vitamin-D level of DNP group was significantly lower than that of NDNP group while the incidence of 25-Hydroxy-Vitamin-D deficiency of DNP group was obviously higher than that of NDNP group. A negative correlation between 25-Hydroxy-Vitamin-D level and disease course, HbA1c, LDL-C as well as TC was found (P<0.05). With the single factor, logistic regression of the patients, disease course and HbA1c had positive correlation with DPN while 25-Hydroxy-Vitamin-D level had negative correlation with DPN.
Conclusion: 25-Hydroxy-Vitamin-D is negatively correlated with DPN.

Keywords: 25-Hydroxy-Vitamin-D, Senile diabetic peripheral neuropathy, Type 2 diabetes, Correlation.

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Introduction

Diabetes, occurring more often among elderly patients, can be divided into type 1 and type 2 diabetes in clinical practices [1-7]. Due to the influence of current aging population, bad living habits, environmental and genetic factors, the prevalence of type 2 diabetes has increased [8]. In the process of treatment, the patients with long-term disease, are highly vulnerable to a variety of external factors hindering blood sugar control effect, thus leading to various complications [9,10].

Diabetic peripheral neuropathy is a condition caused by long-term high blood sugar levels, which causes nerve damage [11]. Currently there are more and more clinical studies about the relationship between diabetes and vitamin D as well as between vitamin D and the peripheral neuropathy, For example, Xiaogong [12] and other researchers confirmed that vitamin D can improve insulin resistance and control effect of blood sugar; and in related study by Yajing [13], their data shows vitamin D treatment performs a better role in terms of the prognosis of patients and security. But the research on correlation between vitamin D and diabetic peripheral neuropathy remain to be seen. On such situation, clinical data of 80 patients with DPN of type 2 diabetes and 80 patients with non-DPN of type 2 diabetes were compared retrospectively to study the correlation between vitamin D and diabetic peripheral neuropathy. The specific research process was retrospectively analysed.

Materials and Methods

General data

From January, 2015 to January, 2017, 80 patients with DPN of type 2 diabetes (DPN group) and 80 patients with non-DPN of type 2 diabetes (NDPN group) were selected from Baoding First Central Hospital as the study objects. Inclusion criteria: Elderly patients with type 2 diabetes; Patients with diabetes diagnosis according with the relevant diagnostic criteria established by the WHO. Patients, by comprehensive

detections of peripheral neuropathy diagnosis and neural electromyography, diagnosed to have peripheral neuropathy according to clinical manifestation that the patients had any one of following four responses: pain perception, pressure sense, vibration sensation or ankle jerk appear to be abnormal or the fact that the result of neural electromyography is lower than the standard 2s; patients and voluntary to take a part in the research and subject to consent by the hospital ethics society. Exclusion criteria: Patients with peripheral neuropathy caused by other factors; Patients with serious illness in such important organs as heart, lung, spleen and kidney; Patients with other serious complications; Patients treated with vitamin D; Patients with metabolic bone disease; Patients with malignant tumor and infectious diseases; Patients with pregnancy or lactation; Patients difficult to cooperate in study [3-4]. General data of the patients in two groups were shown as the table below in which the course of the disease of patients, SBP, HbA1c, TC and LDL-C level in DPN group were obviously higher than that in NDPN group and the difference has statistical significance (P<0.05, Table 1).

Table 1. *Statistical analysis of the patients' general data.*

Group	DPN group	NDPN group	t/χ^2	P
Disease course (year)	11.3 ± 2.6*	8.9 ± 1.4	16.356	<0.05
Age (year-old)	62.1 ± 8.2	61.3 ± 7.6	0.640	>0.05
Gender (male/female)	45/35	44/36	0.025	>0.05
DBP (mmHg)	78.9 ± 12.3	78.8 ± 12.6	0.051	>0.05
SBP (mmHg)	139.2 ± 11.3*	131.2 ± 12.5	4.246	<0.05
BMI (kg/m^2)	26.8 ± 4.5	26.9 ± 5.2	0.130	>0.05
HbA1c (%)	8.7 ± 1.2*	7.2 ± 1.5	6.984	<0.05
TG (mM)	2.41 ± 0.98	2.40 ± 0.87	0.069	>0.05
TC (mM)	4.85 ± 0.58*	3.85 ± 0.68	10.008	<0.05
LDL-C (mM)	3.12 ± 0.51*	2.48 ± 0.35	9.254	<0.05
HDL-C (mM)	1.13 ± 0.17	1.14 ± 0.21	0.331	>0.05

Note: Compared with NDNP group *P<0.05

Methods

Glycosylated hemoglobinblood pressure, plasma lipidsgeneral clinical data and 25-Hydroxy-Vitamin-D level of the patients were tested. All the patients were subject to a fasting and water - deprivation for 8 h, and 3 ml elbow venous blood of the patients was collected from the patients at their fasting state in the early morning to perform the detection. The 25-Hydroxy-Vitamin-D detection of all patients were performed with automatic luminescence immune analyzer of Beckman coulter UniCel DxI800 and examinations of items like glycosylated hemoglobin as well as blood lipids were conducted through automatic biochemical analyzer of Beckman AU680 implementation.

Observation index

1) 25-Hydroxy-Vitamin-D levels and low 25-Hydroxy-Vitamin-D status in the two groups; Serum 25-Hydroxy-Vitamin-D <50 nmol/L signals deficiency [5]; correlation between 25-Hydroxy-Vitamin-D status and the patients' clinical data of DPN group; logistic regression analysis of DPN factor.

Statistical approach

Detection results of the two groups and single factor analysis were described as mean ± SD and percentage (%). T test and χ^2 test were applied with statistical significance of P<0.05. Pearson analysis and logistic regression analysis were used to respectively study variable correlation and factors correlation. Statistical software: SPSS 19.0 and Microsoft office excel.

Result

Analysis of 25-Hydroxy-Vitamin-D examination results in two groups

25-Hydroxy-Vitamin-D levels of DPN group (40.8 ± 21.3 nmol/L) was significantly lower to the NDPN group (55.3 ± 18.6 nmol/L), t=4.586, P<0.05. According to the results, there were 60 cases with low 25-Hydroxy-Vitamin-D level in DPN group and 18 in NDPN group. The incidence of 25-Hydroxy-Vitamin-D deficiency in DNP group was strikingly higher than that of NDPN group of statistical significance, χ^2=44.128 (P<0.05).

Correlation between 25-Hydroxy-Vitamin-D status and the patients' clinical data of DPN group

A negative correlation between 25-Hydroxy-Vitamin-D level and disease course, HbA1c, LDL-C as well as TC was found (P<0.05). There was no correlation between 25-Hydroxy-Vitamin-D level and age, gender, DBP, SBP, BMI, FPG, TG as well as HDL-C of statistical significance (P>0.05) as shown in Table 2.

Table 2. *Correlation between 25-Hydroxy-Vitamin-D status and the patients' clinical data of DPN group.*

Group	r	P
Disease course	-0.51	0.01*
Age	0.09	0.68
Gender	0.05	0.58
DBP	0.07	0.41*
SBP	-0.08	0.39*
BMI	-0.35	0.07*
HbA1c	-0.49	0.03*
TG	-0.05	0.94
TC	-0.51	0.03*

LDL-C	-0.41	0.03*
HDL-C	0.08	0.79

Logistic regression analysis of DPN factor

The single factor logistic regression analysis of the DPN patients shows that DPN has a positive correlation with disease course and HbA1c while a negative correlation with 25-Hydroxy-Vitamin-D levels (Table 3).

Table 3. *Logistic regression analysis of DPN factor.*

Single factor	Regression coefficients	P	OR value
Disease course	0.157	0.012*	1.085
SBP	0.318	0.641	1.264
HbA1c	0.094	0.032*	1.192
TC	0.325	0.625	1.214
LDL-C	-3.254	0.512	1.285
25-Hydroxy-Vitamin-D	-0.005	0.001*	0.862

*P<0.05

Discussion

Diabetes is currently one of the most common chronic diseases with increasingly high mortality and disability rate in clinical practice and has become a global chronic disease threatening the safety and quality of patients' life. Diabetic peripheral neuropathy, the most common chronic complications of diabetes, is an important cause contributing to disability and death of patients [11]. Prevention of diabetic peripheral neuropathy is the key to improve the prognosis of patients with diabetes.

Based on the above work, a study of relationship between vitamin D and elderly diabetes peripheral neuropathy of type 2 was carried out in our hospital. 25-Hydroxy-Vitamin-D is produced endogenously by vitamin D which by itself is inactive. When the 25-Hydroxy-Vitamin-D is generated in the body, it enters intestinal mucosa and bone to promote calcium formation and absorption. In addition, the 25-Hydroxy-Vitamin-D also can promote the phosphorus metabolism and immune response, inhibit adipocyte differentiation and facilitate insulin secretion. Decrease of 25-Hydroxy-Vitamin-D will cause the decline of body's immune function, causing an increase of the body's inflammatory response and then leading to the aggravation of cardiovascular damage which will be further worsened when the increase of adipocyte differentiation causes the rising of body fat. Besides, the reduction of 25-Hydroxy-Vitamin-D will affect insulin secretion, leading to poor blood sugar control and cardiovascular damage, which will further result in peripheral vascular neuropathy [14-19].

In conclusion, 25-Hydroxy-Vitamin-D is an independent risk factor for senile diabetes peripheral neuropathy of type 2 and it requires to a timely manner supplement for the patients with APN of type 2 diabetes to improve the patient's condition in clinical practices.

The present study adds to the limited data on the potential benefits of vitamin D therapy on DPN. This is the good study that describes an overview of factors that could explain the increase in prevalence of type 2 diabetes. It used a population based analysis to measure almost all those factors. This study suggests that effective detection and treatment of inadequate vitamin D concentrations in persons with diabetes or those at risk for diabetes may be an easy and cost-effective therapy which could improve their long-term health outcomes as well as their quality of life.

Conclusion

Based on our data, it shows that disease course, SBP, HbA1c, TC, LDL-C and 25-Hydroxy-Vitamin-D turn out to be the single factor of senile DPN of type 2. Among these factors, the course of disease as well as HbA1c are positively correlated with DPN while 25-Hydroxy-Vitamin-D is negatively correlated with DPN, which indicates that 25-Hydroxy-Vitamin-D is an independent risk factor of DPN.

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***Correspondence to**

Man Xu

Department of Intensive Care Unit

Baoding First Central Hospital

PR China