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Journal of Thyroid Disorders & Therapy

Opinion Article

Vitamin D's Function as a Predictive Marker in Papillary Thyroid Cancer

Lenote Cartwright*

Department of Biomedical Sciences, University of Turin, Turin, Italy

DESCRIPTION

With 3.2% of all new cancer diagnoses, thyroid carcinoma is the most prevalent endocrine malignancy in the United States. In 2021, there will likely be a diagnosis of about 45000 new thyroid cancer cases. 80% of these cases are papillary thyroid cancer, the most frequent subtype, and assuming little change in mortality since 2018, this will result in 360 fatalities. Thyroid cancer incidence has substantially grown over the past 30 years, growing from 5.5% per 100000 people in 1990 to 13.7% per 100000 people in 2017, with an estimated 85000 people living with thyroid cancer in 2017. According on these patterns, doctors predict that thyroid cancer could overtake lung cancer as the fourth most frequent disease in the United States within the next 10 years.

On the other hand, at 0.5% of 100,000 people, the mortality rate from thyroid cancer has remained largely constant. The disparity between rising incidence and stable mortality may be the result of greater screening and clinicians' more frequent use of imaging modalities, particularly ultrasound. With established prognostic markers such age, sex, tumor histology, tumor size, lymphovascular invasion and extra-capsular spread, nodal spread, TERTp mutation, and distant metastases, the expected 5-year survival of thyroid cancer patients remains excellent, at 98.3%. It is significant to note that the papillary sub-group, which has a 10-year cause-specific survival rate of 99%, is probably the primary driver of this encouraging prognosis and does not represent all histologic subtypes. Thyroid cancer can generally be divided into three main categories: Hurtle cell, follicular, and papillary.

The most typical subtype of thyroid cancer is papillary thyroid carcinoma (PTC). The BRAF *V600E* mutant has been identified as a key biomarker, and is present in about 45% of cases. It is more frequently found in women, with a peak incidence throughout the fourth and fifth decades of life. Establishing prognostic factors to hasten the workup of cases more likely to be aggressive and malignant has recently attracted scholarly interest. Particularly, vitamin D has become a possible prognostic assessment target. Previous studies have connected vitamin D levels to a variety of different malignancies, such as breast, colon, and prostate. We intended to analyze recent research on vitamin D levels as they relate to staging and prognosis in PTC because cancer stage is a recognized predictor of long-term survival. As a result of molecular research indicating that a number of vitamin D metabolites and pathway modulators may also contribute to the development of thyroid cancer, we also discuss the fundamental metabolic pathways of vitamin D here. This was done by searching for papers that mention "vitamin D" and "papillary thyroid carcinoma" or "stage of papillary thyroid carcinoma" in the National Institutes of Health's PubMed database. To further elaborate on these connections, the search criteria were expanded to look at the implications of enzymatic interactions and molecular markers such BRAF V600E and CYP24A1.

Sunlight is the main source of vitamin D for humans, with dietary sources and supplements contributing less. In the stratum basal of the epidermis, exposure to ultraviolet light at a wavelength of about 290-315 nm triggers a photolysis reaction that transforms 7-dehydrocholesterol into pre vitamin D3, which is then isomerized to vitamin D3. Vitamin D2, which comes from yeast ergo sterol, is frequently obtained from dietary sources. Vitamin D Binding Protein (DBP) transports eaten or produced vitamin D3 to target organs through the circulation. 25-hydroxyvitamin D (25OHD), which is produced when vitamin D is given to the liver, is subsequently transported to the kidneys by DBP.

The vitamin D receptor (VDR) was initially discovered in the nuclei of cells in numerous organs in 1979. 125OH2D, the active form of vitamin D, binds to VDR to create a nuclear complex, which then binds to the Vitamin D Response Element (VDRE) in the promoter regions of numerous genes to exert regulatory effects on gene transcription for a range of end-targets. Several targets in the vitamin D metabolism pathway, such as CYP24A1 and VDR, have been clearly linked to thyroid cancer in molecular investigations. The research on the utilization of vitamin D as a predictive factor and the relationship with respect to vitamin D levels is still debatable despite these plausible biochemical links between vitamin D and papillary thyroid cancer. To clarify these connections and use these indicators in the clinical treatment of PTC patients, more investigation is required.

Correspondence to: Lenote Cartwright, Department of Biomedical Sciences, University of Turin, Turin, Italy, E-mail: lenotecartwright@hotmail.com

Received: 05-May-2022; Manuscript No. JTDT-22-18301; **Editor assigned:** 09-May-2022; PreQc No. JTDT-22-18301 (PQ); **Reviewed:** 27-May-2022; QC No. JTDT-22-18301; **Revised:** 03-Jun-2022, Manuscript No. JTDT-22-18301 (R); **Published:** 13-Jun-2022, DOI: 10.35248/2167-7948.22.11.271.

Citation: Cartwright L (2022) Vitamin D's Function as a Predictive Marker in Papillary Thyroid Cancer. Thyroid Disorders Ther. 11: 271.