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Original Research Article

The Study of Serum Vitamin D Levels in Patients Diagnosed with Deep Vein Thrombosis Following Total Mastectomy

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ABSTRACT

Deep vein thrombosis (DVT) is a potentially fatal complication with numerous risk factors. Low vitamin D levels may also play a role in the development of this complication. As a result, the purpose of this study was to examine serum vitamin D levels in patients diagnosed with DVT following total mastectomy.This cross-sectional descriptive study was carried out on 122 mastectomy candidates who had postoperative DVT in hospitals affiliated with Tabriz University of Medical Sciences between 2017 and 2020. The chi square test was used to investigate the serum vitamin D level prior to surgery and its role in the occurrence of DVT.The findings suggested that low vitamin D levels were associated with the development of DVT, and that low vitamin D levels were lower in older people, those with a high BMI, and women with diabetes mellitus.DVT after mastectomy is caused by a low serum vitamin D level, and older age, high BMI, and diabetes can all contribute to the exacerbation of this complication.

Keywords: Deep Vein Thrombosis, Vitamin D, Mastectomy

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Introduction

DVT is recognized as a dangerous complication in patients as well as a public health problem that hospitalizes approximately 250,000 people in the United States each year [1]. It has a higher prevalence (3.9%) in the general Iranian population than the global average [2]. It should be noted that DVT is the leading cause of death among people hospitalized for benign and curable illnesses, and it imposes extremely high treatment costs on national healthcare systems [3]. Among the risk factors in the etiology of DVT are advanced age, immobility, the development of cancer, chemotherapy and radiotherapy, a history of heart disease including myocardial infarction, respiratory problems, major surgeries, trauma, high BMI, trauma and accidents, spinal cord amputation, smoking, and coagulation system problems. The greater the number of the risk factors mentioned, the more likely the occurrence of this complication [4-6]. Postoperative hospitalization, as well as spinal anesthesia, which can result in prolonged immobilization following surgery, are risk factors that increase the likelihood of developing DVT [7]; and if surgery and blood transfusion times are prolonged, as well as in older patients, there is a five-fold increase in the risk of developing DVT [8]. DVT development within the first 24 hours after surgery can result in severe complications and, ultimately, death. Because its true prevalence is much higher than that determined in clinical examinations, healthcare systems must implement timely diagnostic measures to detect this complication [9]. Therefore, it is preferable for doctors to incorporate clinical and paraclinical examinations into their routine check-ups in order to identify high-risk individuals [10]. Paraclinical diagnosis, in addition to clinical investigations and examinations, can aid in the early detection of DVT [11]. Researchers recently discovered that serum vitamin D levels are low in the majority of diseases. Vitamin D deficiency has been linked to an increased risk of autoimmune diseases such as type 1 diabetes and multiple sclerosis (MS). Researchers believe that vitamin D deficiency can pave the way for the development of many other diseases and their complications, but no research has been conducted in this regard [12]. Wu et al. reported in 2018 that low vitamin D levels in patients with cerebral ischemia could set the stage for the development of DVT [13]. Since the role of this vitamin in diseases-related complications such as DVT has not been adequately determined, and because previous research suggested vitamin D deficiency influenced the prevalence of DVT, and considering the increase in the number of mastectomies, this study was conducted to study serum levels of vitamin D in patients diagnosed with DVT after total mastectomy.

Methodology

Research design

This cross-sectional descriptive study was conducted on patients with DVT following total mastectomy from the beginning of 2017 until the end of 2020 in Imam Reza Hospital (affiliated to Tabriz University of Medical Sciences and the largest center for this surgery in northwestern Iran).

Sample size

This census study included all patients with confirmed DVT during the specified time period who met the inclusion criteria (n=102).

Inclusion and exclusion criteria

Candidates for mastectomy and willingness to participate in the research were among the inclusion criteria. Patients with thyroid problems, internal systemic diseases that interfere with vitamin D absorption or metabolism (such as digestive diseases that disrupt vitamin D absorption or skin, kidney, and liver diseases and disorders of the parathyroid glands that disrupt vitamin D metabolism) and/or used medications that interfere with vitamin D metabolism, or those who took vitamin D and/or calcium and vitamin D supplements were excluded from the study.

Research procedure

Each participant completed a checklist that included the following items. Age, gender, BMI, history of hypertension, smoking, diabetes mellitus, and hyperlipidemia, platelet count and hematocrit, fibrinogen, and vitamin D levels were among the questions asked. Following surgery, the checklist was completed for all patients. Paraclinical tests and doppler sonography were performed after a vascular surgeon confirmed the presence of DVT.

Ethical considerations

The Tabriz University of Medical Sciences Ethics Committee approved this study (IR. TBZMED. REC. 1397.1059). Informed consent was obtained from the participants after they were informed of the study's goals. The tests and sonography were free of charge, and the costs were not covered by insurance because the research was funded by Tabriz University of Medical Sciences.

Statistical analysis

The data were entered into SPSS and the means were compared using the chi square test at the significance level of $P<0.05$.

Results

During the time period specified, 102 patients who developed DVT after mastectomy and met the inclusion criteria entered the study. Their mean age and BMI were 42.02 ±5.55 years and 22.49 ± 2.41 (Table 1).

Table 1: Comparison of the base data on the participants after urology surgery

Variable		N = 102
Age (year)	< 30	10
	30-40	14
	40-50	18
	50-60	26
	> 60	38
Body mass index		22.49 ±2.41
Hypertension		28
Diabetes mellitus		16
Hyperlipidemia		62

Platelet counts and hematocrit levels were normal in preclinical studies, but serum fibrinogen and vitamin D levels were not. The results are listed in Table 2.

Table 2: Comparison of the paraclinical results for the participants after urology surgery

Variable	Mean ±SD
Platelet ($\times 10^9$/L)	267.41 ±44.36
Hematocrit (L/L)	39.03 ±3.22
Fibrinogen (g/L)	2.25 ±0.14
Vitamin D (nmol/L)	41.21 ±5.03

Assessment of the relationships between serum vitamin D levels and the demographic characteristics indicated that serum vitamin D levels in older age (p = 0.009), higher BMI (p= 0.009) and in diabetes patients were significantly lower than the normal range. Table 3 shows the relationships between the participants' demographic characteristics and their pathologies.

Table 3: Serum vitamin D levels in the participants based on their demographic characteristics

Variable		Vitamin D level
Age	< 30	52.41 ±5.15
	30-40	47.55 ±5.29
	40-50	38.41 ±4.29
	50-60	35.12 ±3.61
	>60	31.14 ±3.81
Body mass index	Normal	55.41 ±3.33
	Overweight	45.12 ±4.12
	Fat	28.12 ±3.25
Hypertension	Yes	38.41 +3.91
	No	41.52 ±4.25
Smoking	Yes	38.41 ±4.29
	No	40.59 ±4.79
Diabetes mellitus	Yes	36.01±3.41
	No	44.96 ±5.29
Hyperlipidemia	Yes	36.85 ±3.59
	No	41.59 ±3.99

Discussion

The purpose of this study was to examine vitamin D levels in patients diagnosed with DVT after mastectomy who visited Imam Reza Hospital in Tabriz between 2017 and 2020. The findings suggested that low vitamin D levels could be one of the risk factors for DVT, though other factors must also be considered. DVT is a risky postoperative complication that can sometimes result in the patient's death. Natural anticoagulants in the human body always prevent uncontrolled blood clot formation by restricting the clot to the site of injury. The body's natural coagulation and anticoagulation systems are in a delicate balance. Therefore, defects in any of the anticoagulant proteins can tip the balance in favor of increased

clotting chances. Defects in natural anticoagulant proteins increase the likelihood of superficial vein thrombosis progressing to deep vein thrombosis and, finally, pulmonary embolism. One of the factors that can contribute to anticoagulant protein defects is a lack of vitamin D. As a result, it appears that being aware of a low serum vitamin D level can be a risk factor for the development of DVT. Low vitamin D levels in patients with a definitive diagnosis of DVT in this study are consistent with the findings of other studies in which DVT was observed and it was reported that there was a significant relationship between low vitamin levels and the development of DVT [14, 15]. Moreover, a large study with a 30-year follow-up period discovered that people with thromboembolism had low vitamin D levels, and that a decrease in vitamin D level increased the risk of developing thromboembolism [16]. In another study with a similar design to this one, the effects of risk factors influencing DVT were controlled in two groups, and only the effects of vitamin D on the development of DVT were studied. According to the findings, vitamin D deficiency increased the risk of developing DVT by up to fivefold [17]. These findings are consistent with those of the current study. In comparison to other diseases, vitamin D was recently discovered to play an effective role in DVT pathogenesis in the secondary lower limbs. A relationship has also been found between low vitamin D levels and DVT in patients with spinal cord injury during the period of acute inpatient rehabilitation [18]. Low vitamin D levels have also been linked to primary antiphospholipid syndrome (one of the primary causes of DVT) [19]. Several clinical trials have also been conducted to demonstrate the beneficial effects of vitamin D in the prevention of DVT. All of these studies [13, 20, 21] found that low vitamin D levels had a negative impact on the development of DVT. These findings are consistent with the findings of this study. Some of the limitations of this study included the extent of bleeding, blood hemoglobin levels, the physical position of the patients during surgery, and the time after surgery when the patients resumed their activities, which were not studied. The researchers of this study recommend that larger sample sizes be used in future research to overcome the limitations of this study.

Conclusions

Vitamin D levels in the blood play a role in the development of DVT after mastectomy. Furthermore, advanced age, BMI, and diabetes mellitus can aggravate this complication.

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