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Effect of cholecalciferol recommended daily allowances on vitamin d status and fabroblast growth factor- 23, in Acute burn patients

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***Abstract*---**People who have had burns may get vitamin D insufficiency. Vitamin D intakes are not recommended in the dietary guidelines for burn victims, and the majority of studies solely include ergocalciferol as a source of vitamin D. (VD2). Providing children with burns with nutritional support. The objectives of this study were to: (1) describe the VD status of adult burns; (2) examine the impact of (VD3) supplementation on VD metabolism during acute burn treatment; and (3) look into the relationship between FGF23 and (CRP). Epidemiology study was created. Methods: Adults (18 years and older) who were hospitalized within 24 hours of a burn incident and had a burn surface area participated between March 2012 and January 2013. (BSA). Along with VD3 (400-600 IU) either orally or

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intravenously each day, patients also received a multivitamin complex (200–220 IU). After admission (Day 0), calcium, phosphate, albumin, and CRP levels were checked once a week for four weeks. Third-generation (PTH), 25(OH)-D, and 1-25(OH)2-D blood concentrations, as well as (FGF23) and PTH, were also measured. You may get the data as a ratio or as the midpoint value (min–max). The Wilcoxon test was used in order to compare two sets of data in a meaningful way. Using the Spearman test, the relationship between CRP and FGF23 was looked at (a nonparametric correlation analysis). The consequence threshold was set at 0.05. Results: Twenty-four patients were initially enrolled. Age ranged from 19 to 86 years, with a median age of 46, and a 15% body mass index (BSI) (range, 10-85). At D0, 75% of participants had a VD shortage (25(OH)-D 20 ng/ml), while 17% had an excess (25(OH)-D 21-29 ng/ml). For 28 days, we monitored 12 patients in this study: 25(OH)-D levels were constant, although 1-25(OH)2-D and FGF23 both showed a little decline. According to a statistically significant connection between FGF23 and CRP (r = 0.59, 95% CI). CI: 0.22–0.82, p=0.0032 Conclusions: In our hospital, the majority of the adults with burns had insufficient vitamin D levels. With feed supplements containing a modest amount of VD3, it was not able to reduce the 25(OH)-D option to a level that was satisfactory (intakes approaching recommended daily allowances). In addition, an intriguing link between CRP and FGF23 was found. abstract here. Use single spacing and don't exceed 200 words.

***Keywords*---**supplements containing,intriguing,cholecalciferol.

Introduction

Vitamin D deficit is a universal epidemic that affects individuals of all ages, not only those who have passed menopause. The best indicator of total vitamin D levels, 25-hydroxyvitamin D (25(OH)-D, calcidiol), declines as a result of decreased consumption of milk and other vitamin D-rich foods, increased use of sun protection and avoidance practices, and increased body mass index.

It is well known [2] that the skin contributes to providing proper levels of vitamin D in the blood. Although little is known about this, patients who have burns (such as those from fires or scalds) are more likely to acquire hypovitaminosis D. Due to their extended hospital stays, sterile gauze, and constrictive garments, patients are unable to get much light.

It is generally known that following a burn, both the scar and the surrounding healthy skin exhibit reduced biosynthetic activity. Due to anomalies in the Ca-PTH axis, the maintence of the PT calcium-sensing receptor that comes from the systemic inflammatory response may also restrict vitamin D metabolism after a burn. Misguided suppression happens when the blood calcium threshold that inhibits circulating PTH is reduced. Both the body's PTH level and kidney 1-alpha hydroxylase activity are declining. Finally, vitamin D insufficiency may be exacerbated by renal vitamin D waste brought on by reduced carrier proteins.

More research is shown that vitamin D helps much more than only maintain proper blood calcium levels. This is consistent with research on the VD receptor in many cell categories, the synthesis of 1,25-dihydroxyvitamin D, calcitriol), via autocrine or paracrine processes in various extrarenal organs, and the endocrine production of 1,25(OH)2D by the kidneys. The pleiotropic qualities may have an impact on immunological response, muscular strength, bone density, and cell proliferation in addition to calcium absorption.

Patients with burns (with a burn surface area of more than 20%) may have metabolic issues, such as those that cause bone loss and immunosuppression. Furthermore, there seems to be a connection between hypovitaminosis D and worse outcomes in individuals with severe illnesses. When paired with problems in mineral metabolism brought on by the burn itself, patients with burns may benefit from good vitamin D status. However, at the moment, dietary guidelines do not contain the required daily supply of vitamin D. Our clinic's vitamin D supplementation follows ASPEN guidelines for all therapeutic situations.

According to these recommendations, patients who receive enteral nutrition should take 600 international units (IU) of vitamin D daily. It so satisfies the RDA for... Dietary recommendations that satisfy the needs of 97% of the typical population have been developed.

In the case of burn sufferers, there seems to be a dearth of data about vitamin D. Low dosages of ergocalciferol (vitamin D2) were shown to be ineffective for restoring normal 25(OH)-D levels in two supplementation trials carried out in a juvenile population in the US [17,18]. Despite few effective therapy, hypovitaminosis D in burn sufferers is urgent [19,20]. FGF23 has been overlooked despite its importance in burns. Osteoclasts create this major phosphaturic component [21]. Recent research has shown that FGF23 decreases the activity of 1-alpha hydroxylase, leading to a decrease in 1,25(OH)2D synthesis, and increases 24-hydroxylase, leading to an increase in the catabolism of 1,25(OH)2D and 25(OH)-D. Because of this, FGF23 is an essential factor in controlling vitamin D metabolism. Severe CKD outcomes have been associated with FGF23. [23,24]. Recent research, however, has shown that individuals with CKD who have raised FGF23 levels also have increased inflammation.

This study examined adult burn patients' vitamin D levels upon admission and their changes after 28 days of multivitamin treatment with cholecalciferol (vitamin D3). The major regulatory mechanisms of vitamin D metabolism were also investigated (PTH, Ca, phosphate, and FGF23). Finally, the relationship between inflammation and FGF23 was examined.

Subject and methods:

This demographic research, which was carried out in a 6-bed burn unit at our university hospital with the approval of the local Ethics Committee (Ref ———, chairperson ———-), was authorized to take place from ——— to ——. 2012-000488-26 is the study's identifying number in the EudraCT registry. Before enrolling in the research, participants or their families provided their informed

permission. Being older than 18, Caucasian, having a burn surface area (BSA) of more than 10%, and hospitalization within the first 24 hours after an accident were all significant risk factors. The selection method took into account factors such as pregnancy, decreased liver function, renal impairment, and past vitamin D administration.

Study protocol:

All patients benefitted from treatment and supervision in accordance with local norms. According to the extent of the burns and the patient's clinical condition, either oral or enteral feeding using the Toronto formula was given. The recommended daily intake of protein was one and a half to two grams per kilogram of body weight. Patients using oral nutritional supplements (Fresubin1 2 kcal or Resource1 2.0 fibres) had vitamin D intakes > 400 IU D3 day. The enteral nutrition (Fresubin1 HP Energy, Fresenius-————) included around 600 IU of vitamin D3 on a daily average. A multivitamin formulation was administered to the food once daily in per os (Supradyn1 Energy, ———-) or intravenously (BSA > 20%) dosages, respectively. (———). the 200 IU of vitamin D3 that each Supradyn1 Energy tablet contains. Indicators of calcium-phosphate metabolism include parathyroid hormone (PTH), fibroblast growth factor (FGF23), 25(OH)-D, 1, 25(OH)2-D, and 25(OH)-D2 (serum and urine total calcium, serum and urine overall phosphate) At the time of admission (Day 0), and at weekly and monthly intervals throughout in-hospital monitoring, patients' levels of phosphate, albumin, serum creatinine, and (CRP) were measured.

Laboratory measurements:

It was common practice in the medical field to use a central or peripheral venous catheter while collecting blood samples. Sera was collected in serum gel and EDTA (Venosafe Plastic Tubes, Inc.). Before, centrifugation was needed (3500 rpm, 15 min, 4 8C). The supernatant was frozen at -80 degrees Celsius for future scientific use.

Liaison1 (——) was used to assess the serum levels of 25OH-D and third-generation PTH. The usual range was between 30 and 100 ng/ml and 4 and 26 pg/ml. In our laboratory, the Liaison1 25OH-D test had a 6% coefficient of variance. The average concentration of 1,25(OH)2-D was determined to be 85 pg/ml using the iSYS1 automation (——). An ELISA with a typical range of 30-176 RU/ml is used to quantify the quantities of c-terminal FGF23.

The levels of C-reactive protein (CRP), albumin (alb), magnesium (Mg), calcium (Ca), and phosphate (P) were measured using the Cobas1 automation (————-). (CRP). Simultaneous blood and urine collection. The Cobas1 equipment measured calcium, phosphate, and creatinine in urine.

Data examination

After adjusting for albumin concentration, we were able to calculate the blood's total calcium (Ca Tot) level as follows: You may get the total body calcium concentration (mmol/l) by multiplying the serum albumin concentration (mg/dl)

by the whole body calcium concentration (mg/dl). Calcium and phosphate partial output (FE) formula: Plasma creatinine minus urine creatinine divided by the ratio = 100 FE ion.

Statistical investigation:

Graphpad Prism examined statistics (version 6.0 for Mac OSX, Graphpad Inc., San Diego, CA, USA).

Percentages, medians, and ranges of the outcomes are provided (min–max). When analyzing paired data, the Wilcoxon test was applied.

The association between CRP and FGF23 was analyzed using the Spearman test, which is a nonparametric method. For statistical significance, a p value of 0.05 was used.

Table 1 shows the results of a clinical chemistry examination, including reference ranges and a comparison of data from admission (Day 0) and 28 days (D28) of vitamin D3 supplementation (n = 12 patients).

parameters	Normal Ranges	D0 (n=12)	D289 (n=12)	P value
20(OH)-D	30-100ng/ml	12 [10-20]	12.0[8-20]	0.78
1,25(OH)2-D	<80 pg/ml	40[20-80]	34.0[19-63]	0.12
PTH	4-25 pg/ml	90.25[50.0-135.3]	19.5[9-12.0]	0.15
FGF23	30-175 RU/ml	30[20-40]	308.10[94.5-1259]	0.20
Albumin	35-50 g/l	2.22[2.05-2.50]	25.0[18-35]	0.09
Corr Ca Tot	2.15-2.5 mmol/l	1.16[0.5-1.65]	2.46[2.17-2.50]	0.02
P	0.75-1.51 mmol/l	0.71[0.55-1.00]	1.04[0.47-1.65]	0.10
Mg	0.75-1 mmol/l	9.0[7-11.8]	0.88[0.69-0.100]	0.015
Creatinine	7.1-11.8 mg/l	0.66[0.1-1.2]	6.5[4.10-11]	0.002
FE Ca	%	16.70[2.1-31.9]	0.55[0.1-1.8]	0.82
FE P	%	2[0.2-30.3]	6.45[0.5-16.5]	0.01
CRP	0-5 mg/l	40[10-10.5]	84.5[9.5-200.5]	0.0005

P value: statistically significant

Results:

In all, twenty-four people, including twenty-two males and four women, took part in the study. While the median ABSI score was 5%, the median BSA was 15% (range: 7-85%). (range: 4–12). 46 was the median age (range: 19–86). I received

vitamin D when I was hospitalised. 17 percent (4/24) of the patients were found to have a shortage (25(OH)-D 20 ng/ml), whereas 75% (18/24) of the patients were found to have an insufficiency (25(OH)-D 21-29 ng/ml). After 11 individuals were moved out of the burn facility before the experiment was finished, 12 participants were able to complete it. During the study, one patient passed away.

A timeline illustrating the evolution of PTH, FGF23, 1,25(OH)2-D, and 25(OH)-D.

After receiving vitamin D3 for 28 days, none of the 12 subjects who finished the research observed an increase in 25(OH)-D levels. Table 1 displays the alterations for the additional parameters. On day zero (D0), PTH levels were somewhat increased, but by day 28, they had returned to normal levels (D28). At day 28, FGF23 levels were higher than they had been. At both Day 0 and Day 28, albumin levels were lower than usual. By D28, the corr Ca Tot and corr Mg levels had both dramatically risen while remaining below normal limits. By Day 28, the creatinine level had significantly decreased. By day 28, there was a notable decrease in how much P was being eliminated via feces and urine. For all of the studied variables, there was no statistically significant difference between patients with a BSA of 20% and those with a BSA of 20% at D28. Only three of the twelve individuals had BSA 40% present. Corr Ca Tot or FGF23 levels did not change significantly from the nine individuals with less damage.

Patients with severe burns (BSA 40%) showed higher PTH levels than controls ($p = 0.04$) FGF23 and CRP had a 0.59 nonparametric Spearman correlation (CI = 0.22-0.82, $p = 0.0032$). Vitamin D3 supplementation recommendations Despite the small cohort size (a problem in burn research) and modest severity of the burns, our data shows that oral food or enteral feeding with low vitamin D3 or D2 doses is inadequate to boost 25(OH)-D levels. A 25(OH)D level that inhibits PTH and boosts calcium absorption is ideal for bone health, say researchers.

More than 30 ng/ml is considered a healthy amount of vitamin D [26]. Vitamin D deficiency is defined as a 25(OH)-D level of 20 ng/ml or less, while vitamin D insufficiency is defined as a 25(OH)-D level of 21 to 29 ng/ml [27]. It revealed that 97.5 percent of the population was OK with a 25(OH)-D level of 20 ng/ml or less [15]. However, the Endocrine Society and other specialists agree that 30 ng/ml is the appropriate 25(OH)-D level for bone health [28,29]. The results of the prevalence research are consistent with those found in the literature. When compared to the general population, the prevalence of among hospitalized patients who have ——- is much higher (70-100%).

Hypovitaminosis D is more common in patients who have had serious burns. Even after the wound has healed, the risk of skin injury persists. Given the most recent research on the skeletal and non-skeletal effects of vitamin D, optimal vitamin D levels in burn victims make sense. However, there aren't any suggestions for managing burn-related hypovitaminosis D at the moment, such as doses, delivery methods, or therapy lengths. In relation to this, we sought to assess the vitamin D3 supplementation being used at our burn center. According to a recent meta-analysis, vitamin D3 seems to be more effective than vitamin D2 in increasing blood 25(OH)-D concentrations; as a consequence, vitamin D3 is the preferred supplement. Low dosages of vitamin D2 and the recommended daily

amount (RDA) for vitamin D3 in a prior study both failed to increase 25(OH)-D levels. In our investigation, we administered 25(OH)-D intravenously (IV) and orally (PO), and we discovered no discernible change in 25(OH)-D concentrations. It's likely that incorrect dose is to blame for our vitamins' low efficacy. Although further study is required, it seems that the recommended daily allowances (RDAs) for burn sufferers are greater than those for the general population. Without a loading dose, our dosing strategy may be called into doubt.

Discussion:

While citing the Endocrine Society's guidelines for best practice. Nonetheless, data from the elderly suggest that after a month of supplementation, a single daily dosage regimen is equally as efficient as a loading dose program for increasing blood 25(OH)-D levels. Taking a vitamin D test early in a life-threatening condition might be harmful. Vitamin D is mostly linked to VDBP and albumin. In the early stages of burn therapy, when patients are undergoing fluid resuscitation and experiencing systemic inflammation, changes in these two proteins may interfere with current 25(OH)-D tests (fluid shifts, reduced binding protein synthesis). Scientists use LC-MS/MS and immunoassays for precise findings. Total 25(OH)-D concentration is estimated by adding free and bound concentrations. A drop in blood VDBP and albumin concentrations will cause discrepancies in the measuring procedure, which includes extracting 25(OH)-D from binding proteins. The connected matrix effect complicates immunoassays. False positives and negatives may occur if the serum matrix (primarily serum protein concentration) differs from the calibrant matrix. Despite the disadvantages, vitamin D studies in critically ill or burn patients have relied on total 25(OH)-D immunoassays. This study measured blood VDBP levels. Albumin levels dropped from D0 to D28, although 25(OH)-D stayed the same (D28). It's unlikely that post-admission vitamin D levels were low owing to dilution or measurement interferences. Future study on burn survivors may not utilize total 25(OH)-D levels as much as free levels. This finding may lead to a more tailored treatment to vitamin D deficiency in burn patients.

Our results raise the intriguing possibility that FGF23 is linked to CRP. Previous research has shown a correlation between CKD and burns, but the reverse has never been seen. It is not yet understood whether inflammation causes a rise in FGF23 or if FGF23 causes inflammation. However, in the instance of burns, it is evident that skin damage, and not FGF23, initiates inflammation, signaling that inflammation increases FGF23 production. In severe burn cases, when systemic inflammation and stress reactions are likely to have led to osteopenia, it would be interesting to see whether or not this stimulation remains. As an added bonus, FGF23 in conjunction with exudative losses may account for the often reported hypophosphatemia in burn victims. Phosphate-mia, however, was found to be within normal limits in the current study, and no evidence of increased phosphate excretion was seen.

In this study, corrected calcemia was still within normal limits even in subjects with BSAs of 40%. These badly burnt patients have significantly elevated levels of PTH. These results are at odds with those from acute treatment of severely burnt youngsters, when hypocalcemic hyperparathyroidism was seen. This study's ion

results should be interpreted with care since it did not account for the effects of diuretic medicine or other exogenous inputs designed to raise blood ion levels. PTH level interpretation might be risky in this situation. Additionally, calcium status was assessed using adjusted calcium concentration rather than ionized calcium since ionized calcium was not always readily accessible for our patients. The latter is not a suitable replacement for ionized calcium, as should be made clear. Corrected calcium may mask hypocalcemia in the intensive care unit.

Finally, this study is the first to examine the benefits of vitamin D3 supplementation for burn victims. We discovered that increasing 25(OH)-D levels in these people with dietary reference intakes of cholecalciferol (vitamin D3) was ineffective. The majority of our burn patients had hypovitaminosis D, according to the overall 25(OH)-D values, according to the current study.

No conclusions can be drawn about vitamin D levels without measuring VDBP and free 25(OH)-D. On the other hand, our research is the first to show a connection between CRP and FGF23 in people who have survived burns. More extensive research is required immediately to determine the ideal requirements for this population, the benefits of supplements, and the metabolism of vitamin D and minerals. Results from recent tests are now being analyzed. Quantifying binding proteins and free hormones seems to be essential for any future technique. This should allow for a more precise measurement of vitamin D levels during the first stages of burn recovery.

Conflict of interest: No conflict of interest has been declared.

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