

Different Chemical Forms of Calcium Supplementation in Perimenopausal Patients of Differentiated Thyroid Cancer with Normal Parathormone Levels

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Studies addressing the effects of two forms of calcium supplementation i.e. Calcium Carbonate with cholecalciferol (Vitamin D3) and Calcium Orotate in total thyroidectomized patients treated with radioactive iodine ablation are scarce. The therapeutic effects of two forms of calcium in registered differentiated thyroid cancer patients of perimenopausal age having normal parathormone (PTH) levels were assessed at National Institute of Nuclear Medicine & Allied Sciences (NINMAS) during September 2018 to February 2019.

A total of forty two women patients (mean age 41.6 ± 11.3 years) were treated with two forms of calcium tablets in different doses to supplement hypocalcemia as well as maintenance doses after estimation of serum calcium (8.0 ± 1.3 mg/dl) and PTH levels. Only the patients with normal PTH levels were included in this study. Organic Calcium Orotate (CO) containing 400 mg CO per tablet was prescribed in 15 (35.7%) patients (3 tablets, 1200mg/day) and inorganic Calcium Carbonate (CC) of 1.25gm, equivalent to 500mg elemental calcium and 200 IU vitamin D as cholecalciferol in 27 (64.3%) with a treatment duration of about 4.1 ± 1.5 months.

The median serum calcium concentrations were found normal (CO group = 8.7 ± 1.3 mg/dl, CC group = 8.8 ± 0.5 mg/dl) in both the groups after the supplementation therapy without significant variations. Mean serum PTH levels measured in CO group was 31.52 ± 15.9 pg/ml and 32.5 ± 21.9 pg/ml in CC group. At a fair interval of 3-4 months, only few hypocalcemic patients were

identified with history of irregular intake, but sustained hypocalcemia was not found.

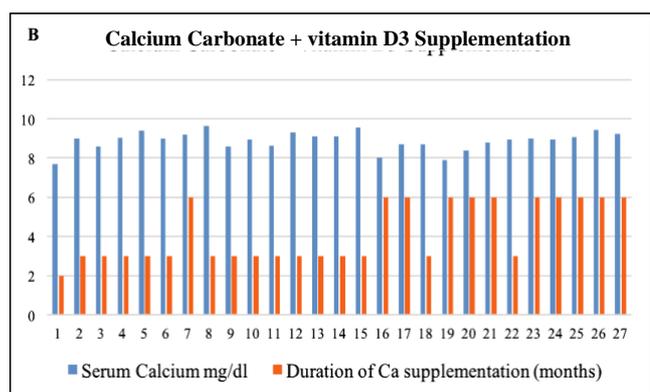
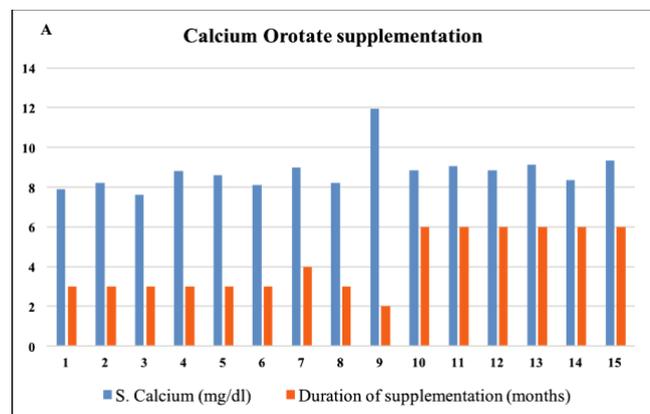


Figure1: Bar charts showing the levels of serum calcium and parathormone in-A. 15 patients treated with Calcium Orotate for 3 ± 0.5 months. B. 27 patients treated with Calcium Carbonate + vitamin D3 for 3.7 ± 1.4 months.

After thyroidectomy, there remains a risk of hypocalcaemia due to injury to parathyroid glands and it has been a long practice to carefully monitor the levels of

serum calcium during follow up of DTC patients. In recent years, there has been much interest in the published work about the use of intact parathyroid hormone (PTH) to better predict hypocalcaemia after thyroidectomy. PTH acts directly on bone and kidney and indirectly on the intestine to maintain or restore the serum calcium level. A decrease in the serum ionized calcium concentration induces the signal for increased PTH synthesis and secretion. Usually a decrease in serum levels of 1, 25(OH)₂-D(Calcitriol) is also associated in this intricate regulatory network (1). Protocols based on PTH and the routine use of oral calcium supplements can lead to improved patient outcomes after thyroidectomy.

CO (a calcium molecule bonded to two molecules of Orotic acid) is the most highly absorbed organic calcium supplement. Researchers observed that Orotate molecules are the most efficient carriers of calcium, magnesium, lithium, and other ions in the body (2). As it can cross the cell membrane, delivery of the mineral ions to the mitochondria and nucleus is easier. Other calcium supplements, such as Calcium Carbonate, Citrate, Gluconate, Lactate, Malate, and Phosphate cannot penetrate the membranes as Orotate can, or are broken up in the digestive tract (3).

CC is a common form of inorganic alkaline-based salt compound which is found in rocks, limestone, marine animal shells, pearls, eggshells and snails. It is also the type of calcium found in coral calcium, which has received much attention for exaggerated health claims. Even though, there is no research to confirm that coral calcium is a better form of calcium than other forms. CC provides one of the highest concentrations of elemental calcium (35-40%) and better absorption in the normal or acidic pH of the stomach (4). However, poor solubility in water and requirement of extra stomach acid production for absorption has been reported (5). Bioavailability in humans has been measured as high as 40% but low solubility and inconsistent absorption rate listed CC as one of the least bioavailable forms of calcium (as low as 15%) (6).

Asian populations tend to have low calcium intake and the Bangladesh are no exception. Islam et al. reported

that majority of perimenopausal aged women consume less than the lowest level (400–500 mg/day) of WHO recommended dietary allowances of calcium (7) and they have a tendency to expose less in sunlight causing the skin to produce less cholecalciferol. Increased bone turnover in postmenopausal women can be reduced by adequate calcium supplementation (8). However, the safety of calcium supplements regarding increased risk of myocardial infarction appears to be a recent debate and the possible mechanism is thought to be acute elevation of serum calcium levels with eventual acceleration of vascular calcification which increases cardiovascular risk (9). None of the 42 study subjects had recent or past history of cardiac events and majority was regular with both forms of calcium intake in full stomach. In theory, CO group had no extra vitamin D₃ added in the tablets but should show better absorption and results but practically no significant variation between the serum calcium and PTH levels of the group of patients treated with CC+ vitamin D₃ was observed ($p=0.679$). Small sample size, not measuring vitamin D levels and inclusion of elderly women patients of DTC are the limitations of this work. Further studies including vitamin D measurement along with PTH and serum calcium are ongoing research in this institute.

CONCLUSION

Serum calcium deficiency significantly improved after approximately 3 months supplementation with both forms proven to be effective and equally safe. Further studies of vitamin D₃ effects on bone metabolism in this group of patients are under evaluation.

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