

Assessment of Biochemical Profile in Head and Neck Cancer Patients Receiving Concurrent Cisplatin Chemotherapy

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Abstract: Electrolyte imbalance specifically hypomagnesaemia and hypocalcemia are known events in patients on chemo therapy. We studied thirty- one patients with head and neck cancer who underwent concurrent chemoradiation. Our study has shown that monitoring of calcium and magnesium are equally important and one needs to keep a close watch to avoid morbidity.

Objectives: To study and follow the serum magnesium and calcium levels at onset, at different dosage levels of cisplatin and after completion of cisplatin therapy for head and neck cancer patients receiving concurrent radiation.

Materials and Method: Serum Calcium and Magnesium levels for thirty-one patients receiving cisplatin based chemotherapy and concurrent radiation were studied. The range of radiation dose was from 56-66 GY/week/30 hrs and cisplatin dose was 40 mg/m²/week. The evaluation was carried out for six consecutive cycles.

There was death of one patient during the study.

Results: The results showed a reduction in serum calcium and magnesium levels over the treatment period (P = 0.005) with significant error being < 10⁻⁸.

INTRODUCTION

Head and neck cancers treatment is always multimodal in nature with combination of radiation and chemotherapy as standard of care in majority. Electrolyte imbalance specifically hypomagnesaemia and hypocalcemia are known events in patients on chemotherapy. There is significant number of studies documenting the evidence of hypomagnesaemia and hypocalcemia after chemotherapy but there are very few studies done on the electrolyte imbalance when both chemotherapy and radiotherapy is going on concurrently for head and neck cancer patients. The idea of radiation alone causing electrolyte imbalance is debatable and not addressed in the present study.

A reduced level of magnesium can manifest as symptoms ranging from fatigue, muscle weakness, muscle cramps, to nystagmus hallucinations, depression and convulsions [2].

A reduced level of calcium on the other hand can cause life threatening complications such as laryngospasm, arrhythmias and others such as oral, perioral parasthesias, positive chronotropic and negative inotropic effect.

These effects may adversely affect the progress of treatment leading to interruptions and eventual poorer outcomes.

MATERIALS AND METHODS

Study Sample

Patients being treated for head and neck carcinoma with concurrent cisplatin therapy at M.S. Ramaiah hospitals.

Study Design

Prospective study.

Sample Size

30.

Study Period

6 months.

Inclusion Criteria

Head and neck cancer patients receiving radical chemoradiation therapy.

Exclusion Criteria

Post-operative cases and palliative cases as in palliative cases only one modality is used and dose of radiation is different.

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Patients with hypo magnesium and hypocalcemia at the start of the study

Study Methods

Patients were informed about the research and their consent taken. Serum calcium and serum magnesium levels were measured prior to the commencement of the treatment by collecting sample through venipuncture. The test was repeated weekly during treatment. Along with that data on patient demographics, diagnosis with stage and weekly dose of cisplatin and radiation was collected.

Statistical Analysis

All the quantitative variables such as magnesium levels, body weight, hemoglobin levels etc. will be summarized using descriptive statistics such as mean and standard deviation. All the quantitative parameters will be summarized in terms of proportion. The change in mean serum magnesium level before, during and after chemoradiation will be compared for statistical significance using repeated measure of Anova/Friedman's test.

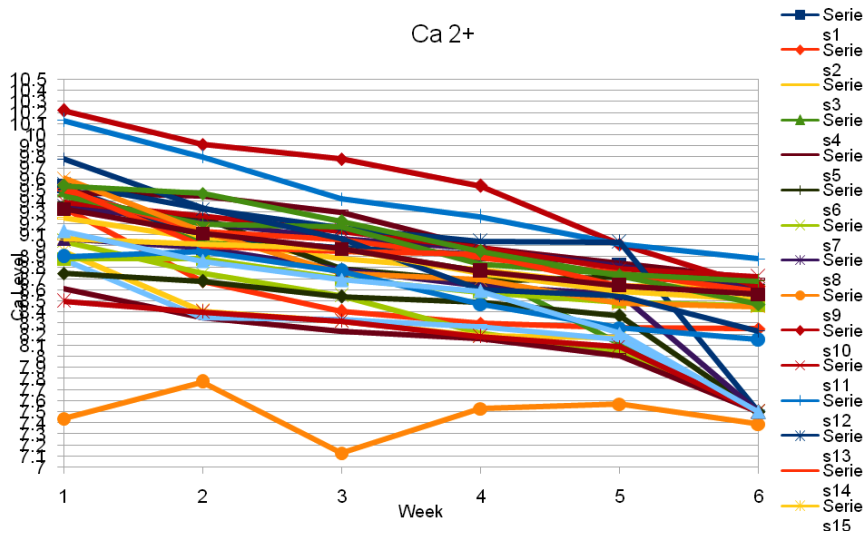
RESULTS

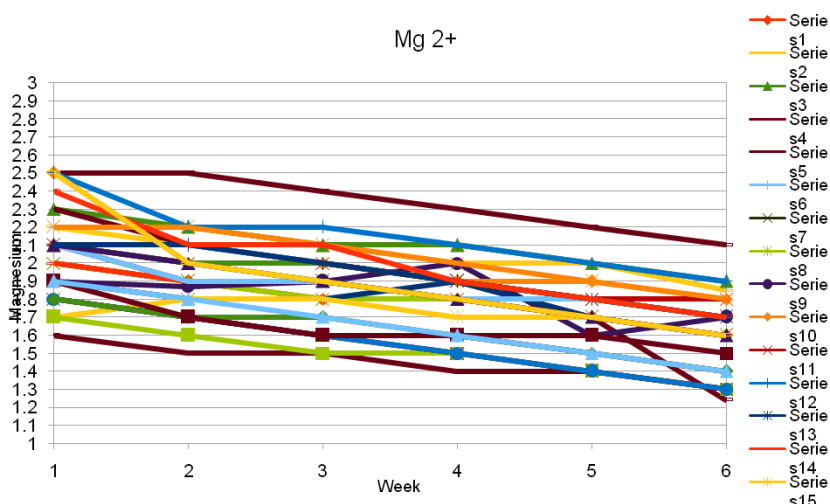
Calcium

Week	Mean	Standard Deviation
1	9.24	0.52
2	8.99	0.45
3	8.81	0.48
4	8.66	0.39
5	8.50	0.35
6	8.16	0.53

Magnesium

Week	Mean	Standard Deviation
1	2.06	0.26
2	1.93	0.21
3	1.88	0.22
4	1.81	0.21
5	1.72	0.20
6	1.61	0.21





DISCUSSION

Calcium

Serum calcium is maintained within a narrow range of 8.5mg/dl to 10.5mg/dl in the body. The value is influenced by level of Vitamin D3, parathyroid and calcitonin hormone in the body. Vitamin D3 is essential for the intestinal absorption of Calcium. Parathyroid senses the level of calcium and releases more parathyroid which induces increased formation of calcitriol, bone resorption and subsequent release of calcium from the bones. Calcitonin on the other hand is released when there is excess calcium in the serum and it causes increased deposition of calcium in the bone.

Functions of calcium include nerve conduction, neuromuscular and synaptic transmission, muscle contraction, blood coagulation, bone and teeth formation, activation of enzymes, membrane excitability and action as second messenger. Hypocalcemia can manifest in myriad ways such as muscle spasms, carpopedal spasm, facial grimacing, laryngospasm, respiratory arrest, increased intra cranial pressure. There could be mental changes such as irritability, depression and psychosis. Cardiovascular changes can be increased QT interval on ECG, arrhythmias and reduced efficacy of digitalis. Some of the problems are life threatening and can prove fatal.

Magnesium

Serum Magnesium is regulated within a range of 1.7 mg/dl to 2.4mg/dl in the body. The value is influenced by renal magnesium reabsorption. Vitamin D3 (Calcitriol) stimulates the intestinal absorption of

magnesium. Parathyroid influences the magnesium absorption in the thick ascending limb.

Magnesium participates in many biochemical reactions in the body. It helps maintain normal nerve and muscle function, helps bones remain strong, keeps heart beat steady, regulates blood glucose levels and aid in the production of energy and protein. Hypomagnesemia can cause changes in the neuromuscular junction leading to tetany, tremor, seizures, muscle weakness, ataxia, nystagmus, vertigo, depression, apathy, delirium, psychosis. Cardiac arrhythmias, ECG alterations such as QT or PR interval prolongation, T wave flattening or inversion can be seen. Some of the problems are life threatening and can prove fatal.

CONCLUSION

Our study has shown that calcium and magnesium are equally important in Cisplatin chemotherapy with concurrent radiation and one needs to keep a close watch to avoid morbidity.

RECOMMENDATION

Serum Magnesium and Calcium levels should be measured routinely in patients receiving concurrent chemoradiation (Cisplatin and Radiation). We recommend that a further study to evaluate the dosage of calcium and magnesium supplementation be undertaken.

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Received on 17-03-2019

Accepted on 29-04-2019

Published on 20-06-2019

<https://doi.org/10.30683/1927-7229.2019.08.01>

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