



ASSESSMENT OF SERUM CALCIUM IN PATIENTS WITH HEMATOLOGICAL MALIGNANCIES AT THE NATIONAL CENTER OF HEMATOLOGY

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ABSTRACT

Objectives: Valuation of serum calcium in the patients of hematological malignancies, and correlation between serum calcium and absolute WBC count in those patients. **Methods:** Eighty eight patients of variable hematological malignancies referred to the national center of hematology treated with multiple drugs regarding the condition, each patient assessed with full name, age, gender, disease diagnosed and medications received, blood sample withdrawn and handled by EDTA tube and plain tube then processed in the laboratory to estimate complete blood count, serum calcium. **Results:** Eighty eight patients with mean age is 43.14 ± 15.73 (15-79 years). Male gender mildly more than female. There are many hematological malignancy cases but the most predominant one (68% of cases) is chronic myeloid leukemia (CML). There is positive correlation between serum calcium and absolute WBC count. **Conclusion:** There is positive correlation between serum calcium and absolute WBC count. Most of cases (53 cases) had received imatinib and present with a mean serum calcium value at 1.94 mmol/l which is less than normal range. In our study more than fifty cases (more than 60%) present with decreased serum calcium.

Keywords:

INTRODUCTION

Increased serum calcium is stated to happen in 10-20% of patients with tumors. Cancer is one of the greatest mutual reasons of increased serum calcium. Some tumors are further expected than others lead to increased serum calcium. The record shared malignancies that are related with the progress of increased serum calcium are squamous cell lung tumor, squamous cell head and neck malignancies, breast malignancy, multiple myeloma, T-cell lymphoma, renal cell tumor, and ovarian malignancy. Increased serum calcium can be related to bone metastasis in patients with solid malignant tumor e.g. metastatic breast cancer. Augmented bone resorption by osteoclast leads to increased serum calcium. The greater than before bone resorption in this situation may be facilitated by prostaglandins or other factors. In count, cancer cells can be capable to resorb bone straightly. Increased serum calcium is as well accompanying with hematological malignancies like multiple myeloma or T-cell lymphomas. Again, increased serum calcium in these circumstances results from increased bone resorption by osteoclast, arbitrated by lymphokines. Increased serum calcium in these conditions is due to a systemic humeral factor(s) that is formed by the malignant tumor, which is called humeral hypercalcemia of malignancy (HHM). Latest studies have identified parathyroid hormone-related protein (PTH-rP) as a possible mediator of HHM. PTH-rP can turn in combination with additional factors (e.g. TGF- α , TNF, IL-1) to result in the special effects realized in HHM. The universal cause of increased serum calcium in all of these states is augmented bone resorption. Though, the kidneys service to preserve calcium homeostasis by rising urinary calcium excretion when bone resorption upsurges. Variations in renal handling of calcium, then, are vital in precipitating increased serum calcium in patients with amplified bone resorption. Usual calcium reabsorption in the proximal tubule is related with sodium reabsorption and with volume status. Increased serum calcium is concomitant with a declined influence of ADH on the renal tubules, result in dehydration. Dehydration tips to a fall in GFR, high sodium and thus calcium reabsorption, and getting worse the increased serum calcium. Additional factors like vomiting can also give to precipitating or keeping increased serum calcium. [1]

Normal total serum calcium is about 2.1-2.6 mm/l. About 40% is bound to proteins, mostly albumin. Fifteen percent is assembled to anions, and 45% is the free, ionized, active form. Formulations

are offered for adjusting calcium concentrations for changes in albumin. These are thought to evaluate ionized, active calcium, although the association with measured ionized calcium is uncertain. [1]

Decreased serum calcium can be asymptomatic or symptomatic. [2] Decreased serum calcium outcomes from increased serum phosphate and the precipitation of calcium phosphate crystals in the tubules (Wechsler et al, 1994). [3] There is a major hazard of calcium phosphate deposition in the renal tubules and other tissues that subsequently results in systemic decreased serum calcium (Frei et al, 1963; Zusman et al, 1973; O'Regan et al, 1977). [4,5,6] Seldom, a reduced albumin may possibly recommend decreased serum calcium and, in conditions of reduced albumin, an ionized calcium is essential to conclude if there is true decreased serum calcium (Wechsler et al, 1994; Vachvanichsanong et al, 1995). [3, 7]

Decreased serum calcium is a metabolic disorder that frequently occurs in link with increased serum phosphate and tissue precipitation of calcium phosphate in acute TLS. Severe decreased serum calcium is one of the greatest serious clinical expressions of TLS and may be concomitant with muscular, cardiovascular and/or neurological problems. Management of asymptomatic decreased serum calcium is usually not suggested. The hazard of causing metastatic calcification is great, particularly in the situation of increased serum phosphate, and then if patients are asymptomatic the decreased serum calcium will in general resolve without management as tumor lysis recovers (Jeha, 2001; Jones et al, 1995). [8, 9]

AIMS OF STUDY

- Valuation of serum calcium in the patients of hematological malignancies.
- Correlation between serum calcium and absolute WBC count in those patients.

PATIENTS & METHODS

Eighty eight patients of variable hematological malignancies referred to the national center of hematology treated with multiple drugs regarding the condition, each patient assessed with full name, age, gender, disease diagnosed and medications received, blood sample withdrawn and handled by EDTA tube and plain tube then processed in the laboratory to estimate complete blood

count, serum calcium (that normal range = 2.1-2.6). The results had analyzed with statistical programme (SPSS version 19).

RESULTS

Eighty eight patients with mean age is 43.14±15.73 (15-79 years). Male gender mildly more than female. There are many hematological malignancy cases but the most predominant one (68% of cases) is chronic myeloid leukemia (CML). There is positive correlation between serum calcium and absolute WBC count with r value=0.304, p value=0. .008.

Table 1: Mean age (in years) and frequency of patients according to 10 years intervals.

Age interval	Frequency	Percent
<20 years	7	7.95
20-29 years	13	14.77
30-39 years	14	15.91
40-49 years	24	27.27
50-59 years	14	15.91
60-69 years	11	12.50
≥70 years	5	5.68
Total	88	100
Mean age (Range)	43.14±15.73 (15-79 years)	

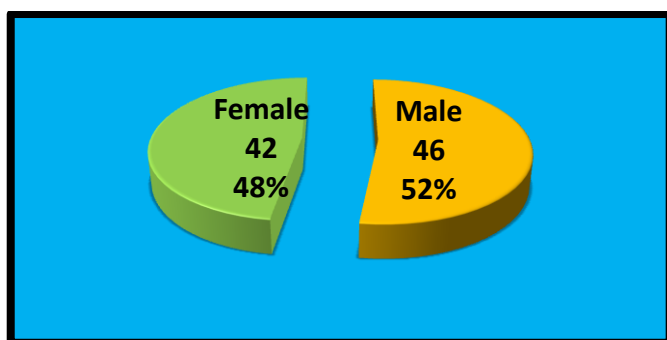


Fig. 1: Frequency of patients according to gender (M:F ratio= 1.09:1).

Table 2: Frequency of patients according to pathology

Pathology	Frequency	Percent
CML	60	68.97
MF	1	1.15
AML	4	4.60
CLL	10	11.49
AA	1	1.15
ALL	6	6.90
HD	1	1.15
NHL	4	4.60
Total	87	100

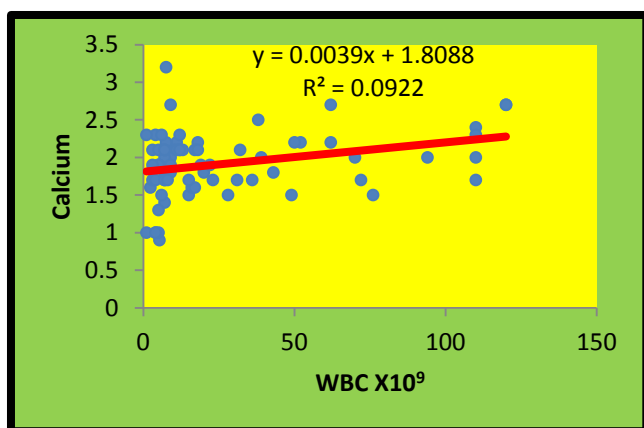


Fig. 2: Correlation between serum calcium and absolute WBC Count: r=0.304, p=0. .008.

Table 3: Mean hematologic parameters

Parameter	N	Mean	SE	SD	Minimum	Maximum
WBC x10 ⁹ /L	80	25.34	3.58	32.00	1.00	120.00
Lymphocytes	73	5.99	1.28	10.93	0.50	74.00
Mix	73	1.97	0.32	2.70	0.10	15.00
Neutrophils	73	10.51	1.60	13.70	0.50	57.00
RBC	81	4.56	0.24	2.19	3.00	23.00
Hb	78	11.41	0.22	1.98	7.00	19.00
PCV	81	35.81	0.64	5.74	22.00	46.00
MCV (fl)	81	86.02	1.76	15.85	57.00	199.00
MCH	81	26.36	0.34	3.04	18.00	32.00
MCHC	81	31.17	0.20	1.80	28.00	36.00
RDW	81	17.31	0.53	4.79	12.00	36.00
Platelets	81	255.23	24.45	220.05	14.00	1100.00
MPV	81	8.75	0.14	1.30	6.00	12.00

Table 4: Correlation between serum calcium levels and drugs used.

Drug	No.	Mean	SD	SE
IMATINIB	53	1.94	0.37	0.05
HYDROXYUREA	3	1.57	0.51	0.30
CYTOSAR	2	1.65	0.92	0.65
ENDOXAN	13	1.78	0.56	0.15
LUKORAN	1	2.10	.	.
METHOTREXATE	2	1.00	0.00	0.00
ALFAFETOPROTEIN	1	2.70	.	.
PREDNISOLONE	1	2.40	.	.

Table 5: Distribution of cases s. calcium with upper than normal range and lower than normal range, that normal serum calcium (2.1-2.6).

Calcium	No.	%
<2.1	51	60.71
2.1-2.6	27	32.14
>2.6	6	7.14
Total	84	100

Table 6: correlation between (s. calcium level) and pathology type(disease).

Pathology	N	Mean	SD	SE
CML	56	1.95	0.36	0.05
MF	1	1.00	.	.
AML	4	1.50	0.63	0.31
CLL	10	1.94	0.45	0.14
AA	1	1.60	.	.
ALL	6	2.05	0.66	0.27
HD	1	1.10	.	.
NHL	4	1.48	0.66	0.33

DISCUSSION

Eighty eight patients with mean age is 43.14±15.73 (15-79 years). Male gender mildly more than female. This may be due to randomly selected sample cases or may be attributed that most of our cases is chronic myeloid leukemia (CML) cases.

In our study as presented by table 2; the most frequent cases (60%) of sample volume is chronic myeloid leukemia (CML), because they have intending the national center of hematology regularly at fixed intervals to receive their treatments (imatinib) from that center more often than other cases. There is positive correlation between serum calcium and absolute WBC count(figure.2), which demonstrate that serum calcium levels proportionally correlated with white blood cell count (WBC) which is may be attributable by table 3 in which the mean value of WBC count in the sample size is 25.34 x10⁹/ml, where many cases have high WBC count, this point not presented by other studies.

Regarding the correlation between serum calcium levels and the drugs used by those patients as presented by table 4, most of

cases (53 cases) had received imatinib and present with a mean serum calcium value at 1.94 mmol/l which is less than normal range, while the most least mean value is 1.00 mmol/l linked with a two cases had received other drug (methotrexate). There is one case had received alfafetoprotein associated with a highest value of serum calcium (2.70 mmol/l). The above correlated data can be explained either due to undergoing disease that treated by that medicine or due to the drug itself.

There is six cases (7.14%) present with increased serum calcium; it is mildly less than documented by Bressler study and Flombaum study.[1,10] In our study more than fifty cases (more than 60%) present with decreased serum calcium this is near to the result of Cairo and Bishop study.[2]While twenty seven (32.14%) cases is within the normal range as presented by table 5.

As shown by table six the correlation between serum calcium levels and the underlying disease is more significant statistically with CML cases as mentioned previously where fifty six cases of sample size presents with a mean serum calcium value is 1.95 mmol/l which is below normal range ,nearby this value (1.94 mmol/l) associated with chronic lymphocytic leukemia (CLL) ,nevertheless to mention that highest mean value ;which is also lower than normal range(2.05 mmol/l), is related to acute lymphoblastic leukemia (ALL) six cases of our total sample cases. while the most least mean value is 1.00 mmol/l linked with a one case of myelofibrosis (MF). Excluding other types of diseases that present with fewer cases number, and regarding the mean value of serum calcium level of each pathology type almost all cases present with reduced serum calcium levels.

Decreased serum calcium can be a consequence of tumour lysis syndrome and may be due to decreased calcitriol levels which also cause decreased serum calcium .[11]

CONCLUSION

There is positive correlation between serum calcium and absolute WBC count. Most of cases (53 cases) had received imatinib and present with a mean serum calcium value at 1.94 mmol/l which is less than normal range. In our study more than fifty cases (more than 60%) present with decreased serum calcium. Excluding other types of diseases that present with fewer cases number, and regarding the mean value of serum calcium level of each

pathology type almost all cases present with reduced serum calcium levels.

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