

RESEARCH ARTICLE

Hypocalcemia study In paraclinical Training And Biochemistry Research unit of the Joseph Ravoahangy Andrianavalona University Hospital Center

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ABSTRACT

The prescription of calcemia dosing is very frequently used to check the existence or not of both hypocalcemia or hypercalcemia. This study has been realized in order to identify the patients ratio having true hypocalcemia after comparing the total unadjusted calcemia and the total adjusted calcemia. Results show that during the study period 329 files were kept. The patients average age is 42

KEYWORDS :

albuminemia, total adjusted calcemia, hypocalcemia, biochemistry

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INTRODUCTION

The calcium is an important mineral nutrient in the organism [1].The total calcemia is composed of a little more than 50% of ionic calcium, a little less than 10% of complexed calcium, the remaining being carried by proteins, essentially the albumin [2]. The diagnosis of hypocalcemia is complicated by limitations in the interpretation of the total plasma calcium concentration. These limitations are principally the result of the effects of hypoalbuminemia [3]. The interpretation of the total calcemia must consider the concentration of the serum albumin to get rid of false hypocalcemia or hypercalcemia. A hypoalbuminemia may lead to a total calcemia reduction without modifying the ionic calcemia which is the only physiologically active [4]. The hypocalcemia is defined by an inferior calcemia at 2.12 mmol/l [5]. It is a frequent biochemical deficiency which differs in severity, from the lack of benign case symptoms to an acute and dangerous crisis for life [6]. It is present in primary and secondary cares, its prevalence reaches 18% for the hospital patients including 85% in the unit of intensive care [6-8]. The calcemia dosing ordonnance is very frequent in common practice to check most of the time the existence or the non-existence of hypocalcemia. However, in the case of only total calcemia analysis you must beware of the false hypocalcemia by hypoalbuminemia [9]. Our study aims at the identification of the patients rate presenting true hypocalcemia and assessing the interest of adjusting the total calcemia in terms of albuminemia.

MATERIALS AND METHODS

It is a retrospective study with descriptive type within three months from October to December 2013 at the laboratory of Paraclinical Unit of Training and of Biochemical Research at the Joseph RavoahangyAndrianavalona University Hospital Center. All the registers of the patients results during this period were exploited. All the files including a request of total calcemia were included. The files including calcemia irregular values without dosing of albuminemia were excluded from this study. The studied parameters were the age, the gender, the clinical inquiries, the results of unadjusted total calcemia, the albuminemia values and the adjusted calcemia values depending on albuminemia according to the formula: Adjusted calcemia (mmol/L) = [Measured calcemia (mmol/L) + 0.020 (40 - Albuminemia (g/L))], if the albuminemia is <40g/L [10]. The dose of the total calcemia and the albuminemia were performed and carried out on the automat analyzer BS 300 Mindray. For the calcemia, ArsenazoIII was used as a reagent, and the green of Bromocresol for the albuminemia. The data entry was done in an anonymous way in order to preserve privacy. The entry and data processing were carried on the Excel software and Stata 11. The Pearson's Chi2 test was used for the comparisons. The level of significance was set at $p < 0.05$

RESULTS

During the study period, among the 3042 recorded files, 329 (10.82%) had a total calcemia request. The patients average age is 42 ± 20 years old. 78% (n= 258) were ≥ 25 years old, 8% (n=26) from 18 to 24 years old and 14% (n= 45) <18 years old. A feminine predominance was observed, and the sex-ratio is 0.7. Among the 329 records

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included in the study there are 122 (37.3%) cases of unadjusted hypocalcemia; 198 (59.9%) cases of normocalcemia and 9 (2.8%) of unadjusted hypercalcemia. The albuminemia dosing were set for patients having an unadjusted dyscalcemia. Among 131 doses 58 cases (44.3%) had a hypoalbuminemia and 73 cases (55.72) had a normoalbuminemia. Among these 58 cases 56 (96.6%) were hypocalcemic and 2 (3.4%) were hypercalcemic before the adjustment of total calcemia. After the total calcemia adjustment, 29 cases (50%) of hypocalcemia, 28 cases (48.3%) of normocalcemia and 1 case (1.7%) of hypercalcemia were registered. After comparing the results, 29 cases (51.8%) of real hypocalcemia were observed with a statistically significant result ($p < 0.05$). 27 cases (48.2%) of hypocalcemia became normal after the adjustment. And one case of real hypercalcemia was found (Table 1) Hypocalcemia was more frequent among the women (65.52%) with a significant difference ($p < 0.05$) (Table 2). Among hypocalcemic patients under 18, only 4 people had albuminemia dose : 2 people having a hypocalcemia and 2 people having a normocalcemia after an adjustment . Similarly, for the 18 to 24 age group. For the ≥ 25 age group, there were 50 cases with a dose of albuminemia, including 50% ($n=25$) of true hypocalcemia, 48% ($n= 24$) of normocalcemia and 2% ($n=1$) of hypercalcemia (Table3). About clinical inquiries, among the 329 total calcemia analysis demands, 95 (28.9%) were prescribed for calcic problems and 234 (71.1%) for other reasons

Table 1: Distribution of total hypocalcemia values with or without adjustment.

Calcemia after adjustment	Hypocalcemia	Normocalcemia	Hypercalcemia	Total	P
Calcemia Without adjustment					
Hypocalcemia	29	27	0	56	0,00
Hypercalcemia	0	1	1	2	0,00
Total	29	28	1	58	0,00

Table 2 : Distribution of adjusted calcemia results according to the gender.

Genre	Adjusted calcemia				
	Hypocalcemia	Normocalcemia	Hypercalcemia	Total	P
Masculine	10	18	1	29	0.04
Féminine	19	9	1	29	0.04
Total	29	27	2	58	0.04

Table 3 : Distribution of total adjusted calcemia results according to the age.

Age (years)	Adjusted calcemia				
	Hypocalcemia	Normocalcemia	Hypercalcemia	Total	P
<18	2	2	0	4	Non significant
18-24	2	2	0	4	Non significant
> 25	25	24	1	50	Non significant
Total	29	28	1	58	Non significant

DISCUSSION

In this study, the calcemia demand represents 10.82% of all requests for examinations. Calcemia was part of the most required parameters on routine at the JRA-UHC biochemical laboratory after glycaemia, creatinine, azotemia, and serum electrolytes. According to different circulatory forms of the total calcemia [2], the value of total calcemia must always consider the albuminemia value [4, 11]. According to the literature, only the ionized fraction is physiologically active and has been the subject of close regulation. This ionized fraction depends on blood pH requiring joint measurement of ionized calcium and serum pH [11, 12]. Its dose requires strict compliance of preanalytical requirements [13]. According to some authors, total calcemia stays the first-line parameter [4]. The dose of ionized calcium is not yet available at our laboratory.

In this study, among the 329 calcemia total requests, 131 dyscalcemia cases were registered including 122 hypocalcemia and 9 hypercalcemia. The albuminemia dosing of these 131 cases revealed 58 hypoalbuminemia (44.27 %) and 73 normoalbuminemia (55.73%). The correction proposed by the literature [10] was done for the 58 hypoalbuminemia cases.

After the total calcemia adjustment by means of the formula we proposed [10], the hypocalcemia was only found in 50% cases, and only 1.7% of hypercalcemia. Another study had also found the predominance of the hypocalcemia compared to hypercalcemia [7].

Comparing the results of unadjusted total calcemia and those of the adjusted total calcemia, the study showed 51.79%

of true hypocalcemia and 48.21% of false hypocalcemia (the hypocalcemia becomes normal after the adjustment of total calcemia). This difference is statistically significant ($p < 0.001$). This study confirms the advantage of the adjustment of the total calcemia to settle a true hypocalcemia. Therefore, it is useful to remind regularly biologists and clinicians that in the absence of an ionized calcemia dosing, the total calcemia interpretation should always take into consideration the concentration of the serum albumin [4,11].

The feminine predominance of hypocalcemia (65.52%) was found in this study. The difference is significant with $p < 0.05$. A feminine predominance was also found in another study [14]. This feminine predominance may reflect the increased need of calcium for pregnant and postmenopausal women. An advisable contribution [12] of 1200mg a day for pregnant women and from 1200 to 1500mg a day for menopausal women prevents the deficit.

Calcium is brought by food, either milk or cheese [7]. For most of Malagasy people calcium intake is far from being sufficient to cover calcium needs. According to a study led by Hercberg and al. [15], a daily calcium intake of about 800mg a day was necessary, 35% of women who are more than 65 years old did not cover their theoretical calcium needs by food.

Patients ≥ 25 are often the most affected by hypocalcemia. It may reflect that the synthesis of vitamin D3 is less important for the elder patients than for the younger ones [16].

About clinical inquiries, hypocalcemia is a frequent biochemical deficiency, it may cause serious symptoms needing hospitalization [6].

The most common hypocalcemia symptoms are paraesthesia, muscles spasms, cramps, tetany, perioral numbness, and convulsions [6]. In our study, among the 329 total calcemia requests, 95 (28.88%) had clinical informations associated with calcic problems : convulsion crisis , cramps , post thyroidectomy balances , tetany and swarmings . According to the literature, hypocalcemia was often asymptomatic [6]. It could explain the reason for systematic request of calcemia.

CONCLUSION

The total calcemia is part of the most requested parameters at JRA-UHC PUF Biochemistry. The total calcemia should take into account the albuminemia before attesting a hypocalcemia diagnostic. In this study, a real hypocalcemia has been found in 29 cases (51.8%) and it is statistically significant ($p < 0.05$). We have also noticed a clear dominance of hypocalcemia among the women.

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