

Construction of new formula for estimating corrected Ca concentration the modified bromocresol purple method

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In this issue of Laboratory Medicine International, Ishigaki et al.'s paper: "A new equation for estimating iCa over a wide range of serum albumin concentrations measured by the modified bromocresol purple method", has been published. Construction of a new formula for estimating the corrected Ca (cCa) concentration using a modified bromocresol purple (BCP) method is an interesting and clinically important development.

Ionized Ca (iCa) is 50% of the total serum, 40% exists as protein-bound forms, mainly albumin (Alb), and 10% exists as chemically bound forms¹⁾. Therefore, serum Ca concentration measurements must be corrected by the serum Alb concentration.

Since the amount of protein-bound Ca decreases in hypoalbuminemia, the serum Ca concentration may not reflect the actual Ca concentration. For this reason, Payne's formula ($cCa \text{ (mg/dL)} = tCa \text{ (mg/dL)} + 4 - Alb \text{ (g/dL)}$) is most commonly used in patients with hypoalbuminemia in Japan²⁻⁴⁾. However, because the cCa concentration is only an estimated value of the Ca concentration, it does not reflect the true Ca concentration. A characteristic of iCa is that as the pH decreases, the number of Alb-binding sites in iCa decreases and the ionization rate of Ca in serum increases⁵⁾.

Ishigaki et al. point out three problems with Payne's formula: 1) the bromocresol green (BCG) method has

cross-reactivity with proteins other than Alb (globulin, C-reactive protein, etc.), 2) iCa is not considered an index, and 3) it is applicable only when Alb concentrations are low.

In this study, a new formula was constructed to estimate the cCa concentration over a wide range of serum Alb concentrations using a modified BCP method corrected to pH 7.4 ($cCa \text{ (mg/dL)} = tCa \text{ (mg/dL)} + 0.4 (4.6 - Alb \text{ (g/dL)})$).

Reference

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