Acarboxy Prothrombin in Dried Blood Spots as a Marker for Vitamin K Deficiency in Young Infants

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We developed a mass-monitoring system for noncarboxylated prothrombin, which is a precursor of active prothrombin and converted to the active form by vitamin K and carboxylase, as an indicator of vitamin K deficiency in infants around 1 month of age. One aim of this study was to evaluate the subsequent effect of oral vitamin K administration in the neonatal period. Another was to detect patients with severe vitamin K deficiency before clinical symptoms appeared.

Noncarboxylated prothrombin levels in dried blood spots were determined in 22,450 infants aged approximately 1 month. Among them, we found 65 cases with high blood levels of acarboxy prothrombin, 11 of whom showed critically high levels of acarboxy prothrombin. To evaluate the subsequent effect of vitamin K prophylaxis in the early neonatal period, the infants were divided into three groups: G1, untreated; G2, 2 mg vitamin K orally at birth; G3, 2 mg orally at birth and 2 to 4 mg orally at 7 days. The incidence of acarboxy prothrombin-positive infants was significantly higher in the breast-fed group than in the other groups in G1. Among the breast-fed infants, the incidence of the critically high level of acarboxy prothrombin was 0.12%, 0.06%, and 0.03% in G1, G2, and G3, respectively.

This prophylactic schedule appeared insufficient to prevent completely late onset infantile bleeding due to vitamin K deficiency; however, the number of patients with the disease has decreased in this area of Japan. The decrease seemed to be due to the vitamin K prophylaxis undertaken for approximately 60% of the infants in this area and/or the selective administration of vitamin K to infants with high acarboxy prothrombin levels found by the reporting system, which covered approximately 90% of the breast-fed infants in this area.