Assessment of the Impact of a High Dose, Fat-Soluble Vitamin Supplementation Protocol to Treat Vitamin Deficiencies in Children with Chronic Liver Diseases

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Introduction: Chronic cholestatic liver diseases lead to maldigestion of fat and fat soluble vitamins (FSV) D,E, A and K. At Cincinnati Children's Hospital Medical Center (CCHMC) there is a protocol to supplement cholestatic patients with high doses of vitamins D, E, and A.

Hypothesis: The CCHMC protocol is associated with normalization of FSV levels in cholestatic patients.

Methods: Retrospective chart review. Inclusion criteria: ages 0-19 years, cholestatic liver disease, high dose supplementation from 12/30/2016-7/22/2019. Exclusion criteria: intestinal failure, parenteral nutrition support. FSV supplementation courses lasting ≤4 weeks were considered a single supplementation event. Descriptive statistics were used. Multivariable modeling was used to predict outcomes of interest.

Results: Vitamin D: 20 patients (22 supplementation events) were identified; 40% with biliary atresia (BA), median age 7.5 years. The median cumulative dose of ergocalciferol was 424,000 IU, with 82% dosed >1 week and 55% prescribed BID dosing. 59% of patients normalized and 18% reached levels >80 ng/ml. Higher log-transformed cumulative dose and higher frequency of dosing was associated with normalization (Odds ratio >1). Baseline total bilirubin was not predictive of response.
Vitamin E: 7 patients were identified; 57% with BA, median age 0.83 years. The median cumulative dose given was 2,992 IU with the average duration of dose being 6 days and the frequency of dosing being BID. 86% of patients normalized and 29% reached levels greater than their age-matched reference level.
Vitamin A: 7 patients were identified; 43% with BA, median age 1 year. The median cumulative dose was 80,000 IU; average duration of dosing 4 days, and average frequency 1.5 times/day. 86% of patients normalized and 14% reached levels greater than their age-matched reference level.

Conclusions: High dosage supplementation is effective in correcting deficiencies even in severely cholestatic patients. Larger studies are needed to determine predictors of efficacy and toxicity.

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