Predicting the Probability of Abnormal Stimulated Growth Hormone Response in Children After Radiotherapy for Brain Tumors.

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Abstract

PURPOSE: To develop a mathematical model utilizing more readily available measures than stimulation tests that identifies brain tumor survivors with high likelihood of abnormal growth hormone secretion after radiotherapy (RT), to avoid late recognition and a consequent delay in growth hormone replacement therapy.

METHODS AND MATERIALS: We analyzed 191 prospectively collected post-RT evaluations of peak growth hormone level (arginine tolerance/levodopa stimulation test), serum insulin-like growth factor 1 (IGF-1), IGF-binding protein 3, height, weight, growth velocity, and body mass index in 106 children and adolescents treated for ependymoma (n = 72), low-grade glioma (n = 28) or craniopharyngioma (n = 6), who had normal growth hormone levels before RT. Normal level in this study was defined as the peak growth hormone response to the stimulation test ≥7 ng/mL.

RESULTS: Independent predictor variables identified by multivariate logistic regression with high statistical significance (p < 0.0001) included IGF-1 z score, weight z score, and hypothalamic dose. The developed predictive model demonstrated a strong discriminatory power with an area under the receiver operating characteristic curve of 0.883. At a potential cutoff point of probability of 0.3 the sensitivity was 80% and specificity 78%.

CONCLUSIONS: Without unpleasant and expensive frequent stimulation tests, our model provides a quantitative approach to closely follow the growth hormone secretory capacity of brain tumor survivors. It allows identification of high-risk children for subsequent confirmatory tests and in-depth workup for diagnosis of growth hormone deficiency.

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