Body Composition and Nuchal Skinfold Thickness in Pediatric Brain Tumor Patients

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Introduction

As obesity is a known risk factor for the development of cardiovascular disease, this might provide an explanation of the added cardiometabolic risk in survivors of pediatric brain tumors. However, when obesity rates are analyzed based on body mass index (BMI), pediatric brain tumor patients (BT) are observed to have BMI levels similar to the general population, which is not likely to explain the observed increased risk of cardiovascular disease in BT.

Patients and Methods

177 pediatric brain tumor patients (106 craniopharyngiomas, 40 WHO grade 1–2 brain tumors; 31 WHO grade 3–4 brain tumors), recruited and longitudinally evaluated in prospective multicenter trials of the German Pediatric Brain Tumor Network (SIOP low grade glioma study – LGG, SIOP high grade glioma study – HGG; SIOP germ cell tumor study – GCT; SIOP primitive neuroectodermal study – PNET; SIOP choroid plexus tumors study – CPT Registry; KRANIOPHARYNGEOM 2000/2007) were analyzed for body height, body weight, body mass index standard deviation score (SDS), and NST after a median follow-up of 2.4 years (range: 0.1–29.6 years)

Nuchal skinfold thickness (NST)

First a line was drawn crossing the two anatomically defined points: basion (anterior margin of the foramen magnum,) and opisthion (posterior margin of the foramen magnum). The diameter of subcutaneous nuchal fat was measured over this line to the nearest 0.01 cm using OsiriX® (Pixmeo SARL, Switzerland).

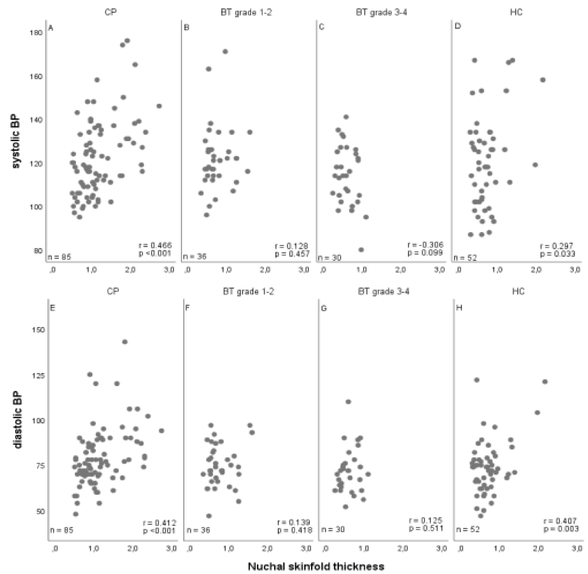

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FIGURE 4. Correlations between NSTand systolic (Fig. 4 A–D) and diastolic (Figure 4 E–H) blood pressure (mm Hg) in CP patients (Fig. 4 A, E), WHO grade 1–2 brain tumor (BT) patients (Fig. 4 B, F), WHO grade 3–4 BT patients (Fig. 4 C, G), and 43 healthy controls (HC) (Fig. 4 D, H).

Introduction

We could previously show that nuchal skinfold thickness (NST) – as assessed in MRI of craniopharyngioma patients – serves as a predictor of metabolic risk above and beyond waist circumference and body mass index in craniopharyngioma patients. In the present study, we analyzed NST as a new parameter for assessment of body composition and cardiovascular disease risk in long-term survivors of pediatric brain tumors.

Correlations between NST and auxiological parameters

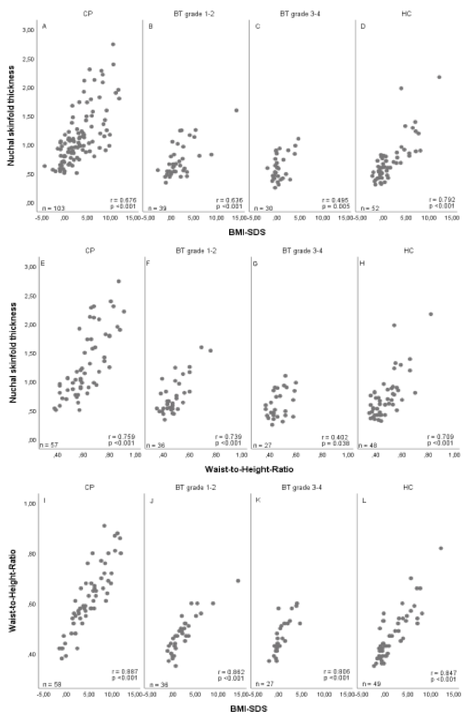
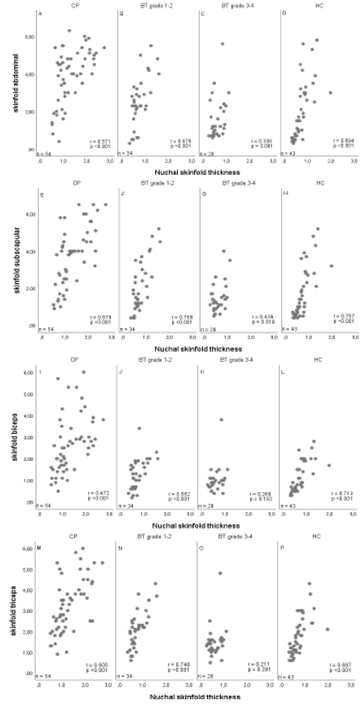


FIGURE 2. Correlations between NST and body mass index (BMI) SDS (Fig. 2 A–D), between NST and waist-to-height ratio (Fig. 2 E–H), and between BMI SDS and waist-to-height ratio (Fig. 2 I–L) in CP pat. (Fig. 2 A, E, I), WHO grade 1–2 brain tumor (BT) pat. (Fig. 2 B, F, J), WHO grade 3–4 BT pat. (Fig. 2 C, G, K), and healthy controls (HC) (Fig. 2 D, H, L).

FIGURE 3. Correlations between NST and caliper-measured skinfold thickness for abdominal (Fig. 3 A–D), subscapular (Fig. 3 E–H), biceps (Fig. 3 I–L) and triceps (Fig. 3 M–P) skinfold thickness in CP patients (Fig. 3 A, E, I, M), WHO grade 1–2 brain tumor (BT) pat. (Fig. 3 B, F, J, N), WHO grade 3–4 BT pat. (Fig. 3 C, G, K, O), and healthy cont-rols (HC) (Fig. 3 D, H, L, P).



Results

CP patients showed higher BMI, WHtR, NST and cSFT when compared with BT and HC. WHO grade 1–2 BT patients were observed with higher BMI, waist circumference and triceps cSFT when compared to WHO grade 3–4 BT patients. NST correlated with BMI, WHtR, and cSFT. NST, BMI and WHtR had predictive value for CVD in terms of increased BP. In multivariate analysis, only BMI was selected for the final model resulting in an odds ratio of 1.25 (1.14–1.379). In CP patients with hypothalamic involvement/lesion or gross-total resection, rate and degree of obesity were increased.

Conclusions: NST could serve as a novel useful parameter for assessment of BC and CVD risk in BT patients.

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