



Cardiac remodeling in patients with childhood-onset craniopharyngioma –

Results of HIT-Endo and KRANIOPHARYNGEOM 2000/2007

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Introduction

A 22% rate of long-term cardiovascular complications was reported in patients with craniopharyngioma (CP), associated with an almost threefold increased risk of mortality. Associations between echocardiographic findings and clinical and anthropometric parameters after CP are not yet analyzed. Cardiac remodeling is a term used to describe physiologic and pathologic changes that may affect size, mass, and function of the heart due to several etiologies. Myocardial remodeling caused by obesity leads to subsequent development of heart failure.

Background

In our study, we focused on pathological cardiac remodeling in CP patients. Direct correlations between the BMI and cardiac remodeling have been reported, observing an increased cardiac septum and left ventricular posterior wall thickness in patients with obesity. The aim of our research was to study structural cardiac abnormalities in patients with CP and hypothalamic obesity and its association with clinical and anthropometric parameters.

Patients and Methods

A cross-sectional study on transthoracic echocardiographic (TTE) parameters was performed to determine the associations with clinical and anthropometric parameters in 36 craniopharyngioma patients.

Multiple regression model

| Variable | B | SE B | β | t | P value | 95% CI | |
|---|--------|-------|-------|--------|---------|--------|--------|
| | | | | | | Upper | Lower |
| Patients with sex steroid replacement therapy (Reference group: Patients without sex steroid replacement therapy) | 4.599 | 1.863 | 0.366 | 2.469 | 0.022 | 0.725 | 8.472 |
| BMI SDS [20] | 0.705 | 0.230 | 0.455 | 3.068 | 0.006 | 0.227 | 1.183 |
| Male (Reference group: Female) | 4.785 | 1.744 | 0.381 | 2.744 | 0.012 | 1.158 | 8.412 |
| Constant | 42.006 | 1.574 | — | 26.683 | 0.000 | 38.732 | 45.280 |

Table 1: R²= 0.596, SEE=4.35166, F=10.323, Sig of F=0.000
B, unstandardized beta; β, standardized beta; BMI, body mass index; CI, confidence interval; LVIDd, left ventricular internal diameter in diastole; SDS, standard deviation score; SE B, standard error for the unstandardized beta; t, t test statistic

Transthoracic echocardiographic parameters

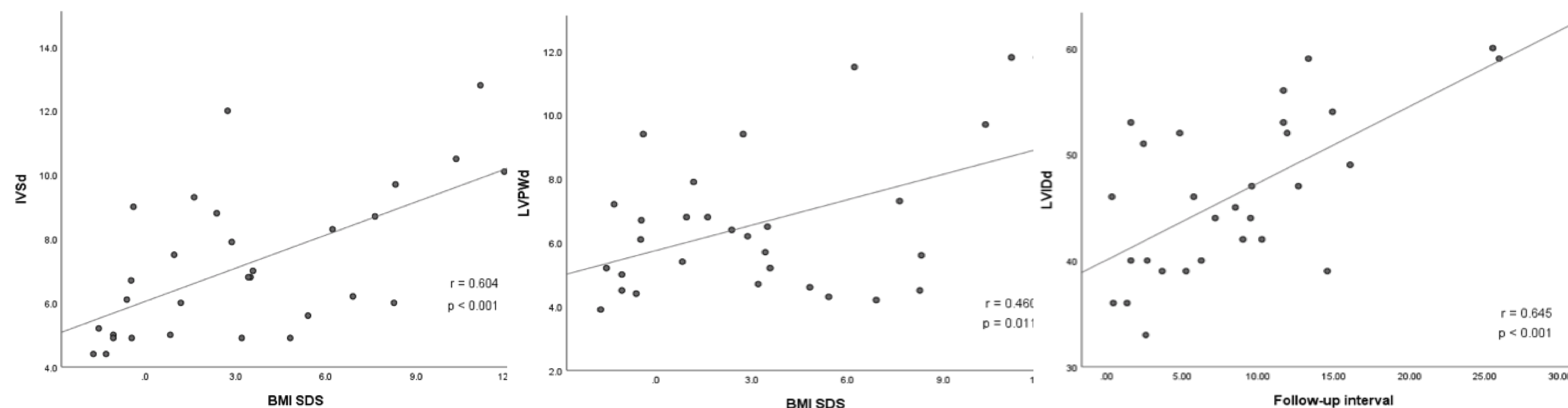


FIGURE 1 Correlation between the BMI SDS and interventricular septal thickness in diastole (IVSd) in 30 patients with childhood-onset, adamantinomatous CP and available data recruited in HIT-Endo and KRANIOPHARYNGEOM 2000/2007. BMI, body mass index; IVSd, interventricular septal thickness in diastole; SDS, standard deviation score; r, Pearson correlation coefficient.

FIGURE 2 The correlation between BMI SDS and left ventricular diastolic posterior wall thickness in diastole (LVPWd) in 30 CP patients and available data recruited in HIT-Endo and KRANIOPHARYNGEOM 2000/2007. BMI, body mass index; LVPWd, left ventricular diastolic posterior wall thickness in diastole; SDS, standard deviation score; r, Pearson correlation coefficient.

FIGURE 3 The correlation between follow-up interval and left ventricular internal diameter in diastole (LVIDd) in 29 patients with childhood-onset, adamantinomatous CP and available data recruited in HIT-Endo and KRANIOPHARYNGEOM 2000/2007. LVIDd, left ventricular internal diameter in diastole; r, Pearson correlation coefficient.

Results

BMI correlated with the thickness of interventricular septum in diastole (IVSd) ($r=0.604$, $p<0.001$) and left ventricular diastolic posterior wall in diastole (LVPWd) ($r=0.460$, $p=0.011$). In multivariate analyses on risk factors for cardiac remodeling, sex hormone replacement therapy, BMI and male gender were positively correlated with increased left ventricular internal diameter in diastole (LVIDd), $R^2=0.596$, $F=10.323$, $p<0.001$. BMI and insulin resistance were selected as significant independent determinants of IVSd, produced $R^2=0.655$, $F=29.441$, $p<0.001$. Due to wide range of disease duration, 17 pediatric and 19 adult patients were analyzed separately. In the adult subgroup (age at study ≥ 18 years), BMI correlated with IVSd ($r=0.707$, $p=0.003$), LVPWd ($r=0.592$, $p=0.020$) and LVIDd ($r=0.571$, $p=0.026$). In the pediatric subgroup (age at study <18 years), no correlation between TTE parameters and BMI was observed. Only LVIDd correlated with disease duration ($r=0.645$, $p<0.001$). All cardiac functions were within the normal range, indicating no association with functional impairments.

Conclusions

The limitations of our study include the low number of cases with severe obesity in our pediatric subgroup and the lack of data on other cardiac risk factors, such as smoking and family history of cardiac disease. We conclude that cardiac remodeling in patients with childhood-onset CP was correlated with the degree of hypothalamic obesity, disease duration, sex hormone replacement therapy, male gender and IR. Early identification of cardiac dysfunction is recommended. Due to restrictions of ultrasound condition caused by the severe obesity of patients with CP, we suggest that additional methods such as cardiac MRI should be considered in patients with poor ultrasound condition. However, further studies on the sensitivity and specificity of cardiac MRI are warranted after CP, which is part of our planned future study in context of the Craniopharyngioma Registry.

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