

Introduction

MMC is the leading cause of neurogenic bladder in pediatrics. It is strongly associated with multiple complications with the most affected urinary, nervous and skeletal systems. The most dangerous nephrological consequence of neurogenic bladder is deterioration of renal function and consequent chronic kidney disease. The currently available renal parameters are unreliable to detect subclinical changes. Therefore, new early markers of renal damage are needed. NGAL and KIM-1 are well-known biomarkers of acute kidney injury. However, it is now increasingly recognized that they may play a role in the pathogenesis of chronic processes. Endocrine disturbances influencing nutritional status in MMC patients are unexplored but interesting subject in which ghrelin and leptin may play a significant role.

Aims

1. Evaluation of usefulness of KIM-1 and NGAL as potential early predictors of renal injury in pediatric neurogenic bladder.
2. Determining the role of appetite regulating hormones: ghrelin and leptin in the assessment of nutritional status in children with neurogenic bladder.
3. The relationship between KIM-1, NGAL, leptin, ghrelin and physical activity of children with neurogenic bladder.

Material and methods

The first study was conducted on 67 children with neurogenic bladder and 20 in reference group. The median age was 9 (min.–max.;0,75–17,7). The nutritional status was assessed by measuring anthropometric parameters and Z-score according to WHO standards. Ghrelin and leptin levels were measured using the ELISA method.

The second study was conducted on 58 children with neurogenic bladder and 25 in reference group. The median age was 10 (min.–max.;0,58–17,7) years. KIM-1 and NGAL were measured in urine sample using the ELISA method and were expressed as KIM-1/creatinine and NGAL/creatinine. The results were correlated with anthropometric measurements and renal function parameters.

In both studies the ambulatory function of MMC patients was defined according to Hoffer's scale and nonparametric tests were used for statistical analysis.

Results

In the first study the median concentrations of leptin and ghrelin in MMC

patients were significantly increased in comparison with reference group. The elevated leptin levels were observed in wheelchair - dependent children and in girls. Leptin was positively correlated with age and Z-score height, weight and BMI.

In the second study the median NGAL/creatinine ratio in MMC patients was significantly increased in comparison with reference group and in girls. The increase of KIM-1/creatinine ratio was recorded but it was not statistically significant. History of recurrent urinary tract infections, bladder trabeculation, wall thickening, physical activity were important factors influencing increase of NGAL/creatinine ratio. The negative correlation was observed between NGAL/creatinine ratio and bladder compliance.

Conclusions

1. Children with neurogenic bladder after MMC have elevated levels of appetite regulating hormones: leptin and ghrelin.
2. NGAL could be considered an early biomarker of renal damage in children with neurogenic bladder in contrast to KIM-1.
3. Physical activity may be the factor influencing leptin and NGAL concentrations.