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Sacrum Index in Children Suffering from Different Grades of Vesicoureteral Reflux

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Abstract: This study aimed at evaluating the sacrum index in children suffering from different grades of vesicoureteral reflux. In this case-control study, according to VCUG results, children with grade III, IV and V refluxes entered the study. There were 76 children with history of urinary canal infection and normal VCUG. Sacrum index was measured in both groups and compared. There was a meaningful relationship between these two groups considering abnormality rate of the index ($p = 0.001$). The factor can be used as a predictive factor in determining prognosis of medical treatment and selecting those children candidate to surgery.

Key words: Urinary reflux, sacrum index, urinary canal infection

INTRODUCTION

Vesicoureteral reflux is an in-birth deficiency resulted from congenital inadequacy of the point where vesica is connected to ureter and is developed with less secondary prevalence to inflammatory processes, increase of inter-vesica pressure or in association with other anomalies (Aydogdu *et al.*, 2012; Canning 2012; Goldust *et al.*, 2012; Yeoh *et al.*, 2012). Long-term reflux result in renal scars known as nephropathy reflux (Merrikhi *et al.*, 2012; Mohebbipour *et al.*, 2012; Goldust *et al.*, 2012). The treatment aims at preventing from pyelonephritis, renal damage and other reflux complications (Goldust *et al.*, 2013a, b; Kojima *et al.*, 2012; Oktar *et al.*, 2012). Sacrum disorders, varying from incomplete formation of sacrum to its lack, results in urinary-excretory disorders (Torre *et al.*, 2011). Sacral Ratio (SR) was used as a valuable evaluation in predicting sacrum disorders in previous studies (Braga *et al.*, 2007). Lower SR (less than 0.74) indicates to different degrees of deficiency in the bone evolution and may be associated with bad urinary-excretory system function (Goldust *et al.*, 2012; Nejat *et al.*, 2008). The present study was aimed at evaluating the relationship found between sacrum index and reflux so that it can use SR as a factor in determining prognosis of medical treatment and selecting those children candidate to surgery, if any.

MATERIALS AND METHODS

This is an case-control study conducted on 76 children younger than 9 years old referring with urinary

infection to the clinic of Amirkabir and Valiasr hospitals of Arak from July 2011 to July, 2012. Following confirmation of urinary infection, VCUG (imaging from urinating vesica and ureter) was requested for the patients. Children with grade III, IV and V refluxes and without calculus, ureterocele, displaced ureter and neurogenic vesica, history of pelvis fractures and pelvis trauma entered the study based on characterization, examination, sonography and tests. SR was measured the conducted VCUG and higher grade was regarded for bilateral reflux. SR was measured for the control group consisting of 76 children younger than 9 years old and with history of urinary canal infection and normal VCUG. The results of the study were statistically analyzed using SPSS, version 16. To account for statistical differences in two groups, a chi-square test or Fisher's exact test was used, as appropriate. A $p < 0.05$ was considered significant.

RESULTS

Totally, SR was evaluated in 152 subjects including 76 members of the case as well as 76 members of the control group. There were 24 boys and 52 girls in the case and 23 boys and 53 girls in the control group. Mean age of the case and control groups was 3.26 ± 0.64 and 2.74 ± 0.56 years, respectively. There was a meaningful relationship between two groups considering abnormality rate of SR ($p = 0.001$) such that it was higher in the case group. There was not any statistically meaningful relation between these two groups considering mean SR ($p = 0.12$). Also, there was not statistically meaningful difference between the case and control group

Table 1: Frequency and mean of sacral ratio in children with grade III, IV and V refluxes and healthy children

	Frequency	Mean	Minimum SR	Maximum SR
Grade III	49	0.79	0.54	1.08
Grade IV	19	0.82	0.62	1.08
Grade V	8	0.87	0.70	1.03
Grade III, IV, V	76	0.80	0.54	1.08
Healthy children	76	0.84	0.55	1.11

considering distribution of SR amounts ($p = 0.065$) (Table 1). There were 41 and 35 cases of one-sided and bilateral reflux. There was not any meaningful difference between the group with 81% one-sided reflux the group with 80% bilateral reflux considering mean SR ($p = 0.87$).

DISCUSSION

In this study, sacrum index was measured in 152 children consisting of 76 members of the case group with grade III, IV, V refluxes and 76 members of the control group. Although mean sacrum index was the same in both groups, abnormality rate of the index in the case group was almost two times more than the control one. Pena introduced SR in ARM, based on the fact that bone abnormalities would almost always be accompanied by changes in lumbosacral spine innervation (Pirouzmand *et al.*, 1997; Sadighi *et al.*, 2011; Goldust *et al.*, 2011). Patients who had short sacrum on radiological view would be those most likely to have a neurological disorder capable of irremediably comprising the sphincter activity (Capitanucci *et al.*, 1997; Goldust *et al.*, 2011). There are other studies that discussed SR values in ARM (Valansky *et al.*, 1994). There are limited reports in children with vesicoureteral reflux and persistent primary enuresis that have shown SR as a cardinal index in the prognosis of children with urinary and/or faecal abnormalities (Gotoh *et al.*, 1991). SR is regarded as a valuable evaluation to predict sacrum disorders. Low SR indicates to different degrees of deficiency in sacrum evolution and can be associated with function on urinary-excretory system (Pippi Salle *et al.*, 1998). Limited number of the sample population is regarded as one of the limitations of our study. Although there was a significant difference between both groups considering abnormality rate of SR, there was not seen any difference in mean of two groups.

CONCLUSION

Considering the meaningful relation can be found between normality rate of sacrum index and urinary reflux, it can be used as a predictive factor in determining medical treatment prognosis and selecting the children candidate to surgery. It is recommended to conduct a study with higher sample volume in order to detect the difference found between SR mean.

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