

Commentary

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Sacral Ratio: Is it an Indicator for the Prediction of Vesicoureteral Reflux?

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See article on page 74, Is low sacral ratio associated primary vesicoureteral reflux in children?

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The normal bladder function depends on intact bladder innervations including sacral parasympathetic [S2 through S4], thoracolumbar sympathetic, and sacral somatic nerves. Since the bladder has a rich sacral nerve supply, it is not surprising that any kind of sacral bone abnormality from total absence to mild hypoplasia can lead to bladder dysfunction. Some patients come to medical attention at the neonatal period, but many escape detection and are diagnosed later during evaluation for urinary incontinence. There are different ways for the documentation of sacral deformity including anterior- posterior and lateral radiographs of the sacrum, CT scan, and MRI of the spine; however, the most popular method is plain radiography. One of the major pitfalls of the plain film is the absence of clear visualization of the whole sacrum; therefore, subtle abnormalities could be missed. About two decades ago, Pena proposed that the sacral ratio (SR) could be a good indicator for the assessment of the sacrum [1]; since then, several studies evaluated the sacral ratio in children with bowel and urinary problems but reported conflicting results [2,3,4,5,6,8]. Warne et al. showed that the sacral ratio was a poor marker of an abnormal

sacrum and should not be used as the only method of assessing the spinal status [2]. Levitt et al. found a marked overlap in the sacral ratio values for those patients with tethered or a normal spinal cord [3]. Torre et al. evaluated the reliability of the SR as a prognostic factor in patients with anorectal malformation, and demonstrated a wide range of normal values and the significant effect of age on normal values [4].

There are several studies in the literature, mostly done by Iranian researchers, regarding the association between the sacral ratio and anorectal malformations, urinary incontinence, and vesicoureteral reflux [5,6,8,9,10]. In contrast to previous studies, they reported that the sacral ratio had a practical value in identifying children with persistent nocturnal enuresis [6], vesicoureteral reflux [8], and urinary and fecal complaints [10].

In this issue of our journal, Mehdizadeh et al. measured the sacral ratio in 669 children with urinary tract infection who were referred for voiding cystoureterography (VCUG). They reported 76 children with low sacral ratios, 64.5% without VUR and 35.5% with VUR. The difference in the prevalence of VUR in patients with normal

and low sacral ratios was not significant (p value=0.217). They concluded that the sacral ratio could not differentiate the patients with and without VUR. Mehdizadeh et al. proposed interesting ideas as to why a low sacral ratio might be associated with VUR: "It is possible that sacral anomalies may produce voiding dysfunction and voiding dysfunction is associated with some cases of VUR" [7]. However, some issues about the patients are not clear. Urinary and fecal complaints, continence criteria, structural abnormalities, and sonographic findings should be mentioned in detail. From selection criteria, it is not obvious how many children have possible voiding dysfunction that might be attributed to VUR. The etiology of VUR is multifactorial and is divided into primary and secondary VUR with different mechanisms. The mechanism of primary VUR is shortening of the intravesical ureter, while secondary VUR is the result of high intravesical pressure associated with anatomic (posterior ureteral valve) or functional bladder obstruction (dysfunctional voiding and neurogenic bladder). It is not known whether the sacral ratio differs in patients with primary and secondary VUR. Other studies evaluating the association between VUR and the sacral ratio have the same limitations [8,9]. In contrast to Esfahani et al. Kajbafzadeh et al. [8] and Yousefi et al. [9] suggested a good correlation between an abnormal sacral ratio and VUR. The differences between these results might be attributed to the heterogeneous population enrolled in the mentioned studies.

In summary, as with many other markers, it is not still clear to what extent the sacral ratio can be considered as an indicator of VUR. It appears that the validity of the sacral ratio for the prediction of VUR should be assessed in larger studies with more defined selection criteria.

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