Pelvic hypoplastic kidney in a patient with Williams-Beuren syndrome

Abstract

Renal and renovascular abnormalities constitute features of the Williams-Beuren syndrome (WBS), one multisystem genetic disorder in childhood, caused by a microdeletion of chromosome 7. We report a 12 years old boy who was diagnosed with WBS and had an ectopic pelvic hypoplastic left kidney, detected by ultrasonography and renal scintigraphy. Dystopic hypoplastic kidney is an infrequent finding in patients with WBS and our report showed the importance of a complete clinical and laboratory study of renal function in WBS.

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Introduction

Williams-Beuren syndrome (WBS) is a genetic disorder described independently by Williams et al (1961), and Beuren et al (1962) [1-3]. It is the result of a hemizygous deletion on the long arm of chromosome 7 (7q11.23) encompassing the elastin gene (ELN) [3] and is detectable by fluorescent in situ hybridization (FISH) [4, 5]. This syndrome is estimated to occur in approximately 1 in 10,000 live births [5] and is characterized by typical dysmorphic face, characteristic behavior, cardiovascular defects, growth and mental retardation, musculoskeletal anomalies and abnormal calcium homeostasis [3, 4, 6-8]. Renal anomalies in WBS have an estimated incidence of approximately 20% [4, 9, 10] and include malformations in size, shape and position of the kidneys, renal artery stenosis, hydronephrosis, megaureter, stenosis of ureteropelvic junction, bladder diverticulum, recurrent urinary infections and vesicoureteral reflux [5, 7-10]. We here describe an uncommon finding in patients with WBS, a dystopic hypoplastic kidney detected by ultrasound and radionuclide renal scan.

Case report

A 12 years old Albanian boy was referred to our department for evaluation of his renal function. The patient was born with a birth weight of 1800gr at 40 weeks' gestation (small for his gestational age). At early infancy he had inadequate weight gain and also feeding problems. When he was 6 years old he was hospitalized because of growth retardation, mild psychomotor delay and the presence of a systolic cardiac murmur (3/6). A heart ultrasound at that time revealed supravalvular aortic stenosis. This finding in association with patient's characteristic facial appearance led to the possible diagnosis of WBS. The FISH test confirmed the existence of this genetic syndrome by showing a deletion of the elastic allele located within chromosome subunit 7q11.23.

In the current evaluation, the patient had a typical WBS facies characterized by supraorbital fullness, blue eyes with stellate pattern in the iris, long philtrum, prominent lips with open mouth and malocclusion (Fig. 1). He had growth retardation and microcephaly. His weight was 28kg (5^{th} centile), height 138cm (5^{th} centile), and his head circumference 49cm ($<3^{rd}$ centile). He also had orthopedic problems like kyphosis, pectus excavatum and joint laxity. Based on the size of genitalia and the development of pubic hair, the patient was stage III according to Tanner scale that was compatible with his age [11]. The patient also had a borderline physical retardation and learning difficulties. He attended public school, assisted by private tutoring. Ear tests were normal and blood pressure was normal. He had mild constipation. There was no history of hypercalcemia, urinary tract infections or renal stones and his renal function was normal, with absence of hypercalcemia or hypercalciuria. After 24h urine collection the glomerular filtration rate was normal (165mL/min/1.73m^2). Thyroid hormones were also within normal limits.

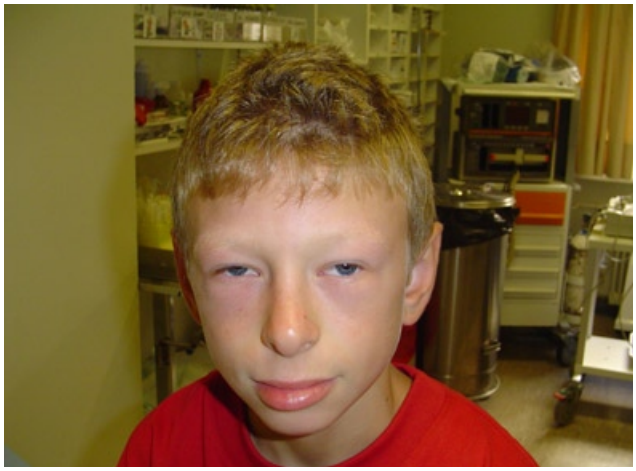

Figure 1. The 12 years old boy with typical facies features of Williams-Beuren syndrome.

Abdominal ultrasound was performed with a Logiq 7 scanner (GE, Milwaukee, WI, USA) so that any renal congenital anomaly would be excluded. The patient was lying supine while coupling gel was applied to the skin to facilitate the transmission of the sound waves. Longitudinal and transverse views were obtained. Renal ultrasonography revealed a left ectopic kidney, located at the left of the urinary bladder. This kidney had a longitudinal axis of 7.5cm, obviously smaller compared to that of normal right kidney. There was no lithiasis or dilatation of renal pelvis. Radionuclide renal scan followed in order to image renal cortex, detect any cortical defects and determine the contribution of each kidney to the overall renal function. The scintigram was performed 3h post administration of 55.5MBq of technetium-99m dimercaptosuccinic acid (^{99m}Tc-DMSA). A double-headed gamma-camera (Philips, Forte Jetstream AZ) equipped with a low energy high-resolution collimator was used. The planar posterior and anterior views were obtained with the patient in the supine position and well hydrated. Before scanning, he was asked to void his bladder in order to avoid any false results in the quantification of the differential renal function. The posterior view showed a eutopic right kidney, with normal contour and uptake of the tracer in the renal cortex. The anterior view showed an ectopic left kidney, smaller than the right kidney,

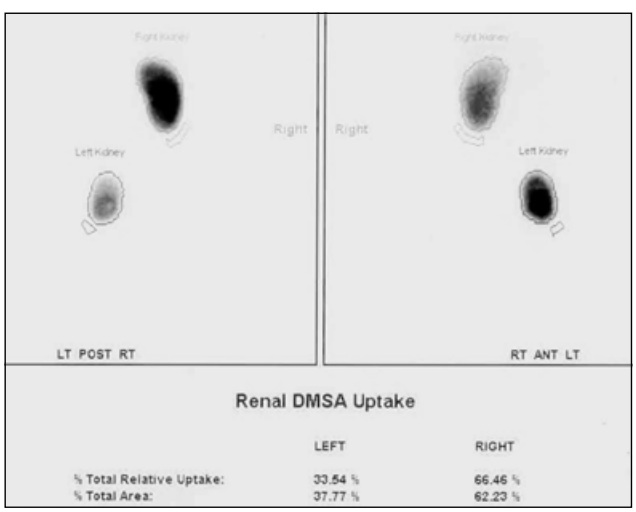

Figure 2. Posterior (**a**) and anterior (**b**) views of the radionuclide renal scan show the eutopic right kidney and the pelvic hypoplastic left kidney.

with homogenous distribution of the tracer and normal cortical uptake. Depth correction was applied by determining the geometric mean of the anterior and posterior views. The pelvic hypoplastic left kidney contributed 33.5% to overall function while the eutopic right kidney, 66.5% (Fig. 2).

Discussion

Renal involvement seems to be part of WBS with an estimated frequency for renal artery stenosis 45%, structural renal abnormalities 20%, enuresis 50%, nephrocalcinosis less than 5%, and recurrent urinary tract infections 30% [4]. However the incidence of structural renal abnormalities in a more recent study was higher (30%) [8].

In this report we presented a patient with WBS and a left dystopic pelvic and hypoplastic kidney. The deleted portion of chromosome 7 includes the ELN gene, which encodes the structural protein elastin. It has been suggested that the defect of elastic fibers found in the connective tissue of many organs is the main cause of WBS malformations [3-5, 8], and probably associated with our patient's kidney ectopia and hypoplasia.

Although renal involvement is relatively common in WBS, there are only a few reports in the literature regarding pelvic kidney dystopia and renal hypoplasia. It has been demonstrated that the risk of structural abnormalities of the kidney and the urinary tract is increased 12 to 36 fold in WBS compared to normal population [10]. A review of the literature since 1980, regarding renal and urinary tract abnormalities in WBS, reported only two patients with renal hypoplasia and five with kidney dystopia from among 320 patients [10]. Another research group evaluated, among 57 patients with WBS, the frequency of renal tract abnormalities detectable by ultrasound scan [7]. Renal tract ultrasonography was normal in 37 patients (65%). Although the remaining 20 patients (35%) presented with various renal abnormalities, hypoplasia was found only in 5 patients (8.7%) and kidney dystopia in the pelvis in only 1 patient (1.7%) [7].

In most cases, pelvic kidney is asymptomatic, as was in our patient. Usually the ectopic kidney is diagnosed after complications occur, such as urinary tract infection, kidney stones or hydronephrosis [12]. Moreover, pelvic kidney may complicate pregnancy because of outflow obstruction [13]. Ultrasonography and radionuclide renal scan among other procedures can detect renal abnormalities in WBS. Furthermore, renal cortical scintigraphy can indicate renal function and the contribution of each kidney to the overall renal function.

In conclusion, a pelvic hypoplastic kidney was diagnosed as an uncommon renal malformation in a WBS asymptomatic patient. Renal function and structure were studied by renal scintigraphy.

The authors declare that they have no conflicts of interest

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