Unilateral Branchial Sinus with Unilateral Renal Agenesis: A Variant of BOR Syndrome? A Case Report

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Abstract Patient presented with a congenital discharging branchial sinus. Pre-operative work up including a CT scan of the abdomen-pelvis revealed absence of the left kidney. Branchio-Oto-Renal (BOR) syndrome, a rare autosomal dominant disorder is characterized by branchial arch anomalies, otological and renal anomalies. Clinical manifestations tend to have considerable variability, But no case with branchial and renal abnormality sans otological defects has been described yet in the spectrum of BOR syndrome variants.

Keywords BOR—syndrome · Renal agenesis · Branchial sinus

Introduction

Branchio-oto-renal spectrum disorders include Branchio-oto-renal (BOR) syndrome and Branchio-otic syndrome (BOS) [1]. The reported incidence for this syndrome is 1 in 40,000 [2]. BOR is characterized by malformations of the outer, middle, or inner ear associated with conductive, sensorineural, or mixed hearing impairment, branchial fistulae and/or cysts, and renal malformations ranging from mild renal hypoplasia to bilateral renal agenesis. BOS has the same features as BOR syndrome but without renal involvement. There is a wide phenotypic variability in an

individual and also among individuals in the same family and is observed in the presence, severity, and type of abnormality. In spite of such a large range of variabilities no phenotype with only branchial and renal abnormality without any otological defect has been described.

Case Report

Twenty-three years old male patient, presented to outpatient department with a history of congenital discharging sinus on the left lower side of the neck. The patient was otherwise apparently asymptomatic and gave no history suggestive of tuberculous lymphadenitis, discharging tubercular sinus or any secondary infection of the sinus or any chronic co-morbid condition like diabetes, hypertension etc.

Local examination revealed a sinus at the lower third of the left side of the neck in front of the sternocleidomastoid muscle above the sternal end of the clavicle. The opening of the sinus was puckered with hyperpigmentation of the surrounding skin indicating its chronicity. There were no signs of inflammation and there was no granulation tissue. The discharge was clear, serous in nature, seen only when the patient salivated. Routine hematological investigations, for liver and kidney functions, were reported to be normal. A CT scan with contrast to visualize the anatomy of the sinus showed only the lower end of the tract, which extended up to the thyroid cartilage. An excision of the tract was scheduled. On pre operative abdominal USG scanning the left kidney could not be visualized even in the pelvic cavity. The right kidney enlarged to 13.8 cm × 7.2 cm. There was a single ureter on the right side with no evidence of renal calculi or hydronephrosis. A CT scan of the abdomen/pelvis confirmed the absence of the left kidney

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Fig. 1 *Abdominal CT.* A picture of the abdominal CT Scan Showing an empty left renal fossa. The picture was taken a day prior to the surgery

with enlarged right kidney with further studies consistent with compensatory hypertrophy of the right kidney (Fig. 1). An additional diagnosis of unilateral renal agenesis was made. The patient was operated for the sinus and a 6 inch tract was excised by placing 3 parallel incisions on the neck the highest being 1 inch below the angle of mandible. The operation had no surgical or anesthetic complication and the patient was discharged after one day of observation. A consultation with a nephrologist and a genetic counselor had been arranged.

The only significant family history given was that of his mother having congenital pre—auricular tags. The patient gave no history of any otological abnormality (Fig. 2). An HRCT of the temporal bone to check for any inner ear deformity was declared normal and so were the BERA studies.

Discussion

Branchio-Oto-Renal (BOR) syndrome is an autosomal dominant disorder characterized by the clinical presentation of branchial arch anomalies, otological and renal anomalies, in the affected individual. Clinical manifestations tend to have considerable intrafamilial and interfamilial variability. The reported incidence for this syndrome is 1 in 40,000 [2].

The diagnosis in the absence of a family history is made in the presence of three or more major OR two major plus

Fig. 2 *External Ear.* The pictures of external ear showing no structural abnormality and the existence of any pre auricular tag. The Picture was taken a month after the surgery

two minor criteria OR 1 major criterion plus a family member fulfilling the criteria for BOR syndrome [3] .

The Major criteria include second branchial arch anomalies, deafness, preauricular pits, auricular deformity, and renal anomalies. *Minor criteria* comprising of external auditory canal anomalies, middle ear anomalies, inner ear anomalies, preauricular tags, Other : facial asymmetry, palate abnormalities.

Three genes are known to be associated with BOR syndrome: (a) EYA1 (BOR1), most common genetic abnormality, seen in approximately 40% of individuals [3], (b) SIX5 (BOR2) and (c) SIX1 with approximately 10% individuals with mutations in SIX5 and SIX1 genes [4, 5]. EYA1 gene plays a role in the development of all the components of the inner ear and also expressed in the metanephric cells of the developing kidney.

Common findings in a patient with BOR syndrome include:

Second branchial arch anomalies, such as a branchial sinus opening just anterior to the sternocleidomastoid muscle or a branchial cyst under the sternocleidomastoid muscle.

Otologic findings, found in more than 90% of individuals with BOR syndrome [3, 6], include deafness, dysmorphogenesis of pinnae, external auditory canal, ossicles etc. and inner ear abnormalities like cochlear hypoplasia, hypoplasia of lateral semi circular canal [7, 8].

In a study in which 21 affected individuals had one of these two tests, Renal anomalies were noted in 67% [3, 6] and included : renal agenesis (29%), hypoplasia (19%), dysplasia (14%), Uretero—pelvic junction obstruction (10%), Calyceal cyst/diverticulum (10%), Caliectasis, pelviectasis, hydronephrosis, and vesicoureteral reflux (5% each). Most patients progress to end stage renal disease as late complications.

Anomalies of the branchial arch and otologic abnormalities have been described in various other syndromes such as BOS (Branchiootic syndrome) [1]: branchial and otic anomalies, BOU (Branchiootoureteral) syndrome : comprising of branchial and otic anomalies with duplication of the urinary collecting system and bifid renal pelvis. BOS has been shown to be allelic to BOR with mutations in the same EYA1 gene. BOU syndrome is probably different from the BOR syndrome.

Our patient had history of a branchial sinus and studies consistent with unilateral renal agenesis (but asymptomatic for renal disease) however the patient did not present with any otological abnormalities or any hearing complaints except from the family history of the mother having preauricular tags and no other anomaly. An HRCT of the temporal bone and BERA studies confirmed the absence of any otological abnormality. This familial history gives a connecting link to associate its pathology to BOR syndrome. Taking into considerations the presence of two major criteria (branchial and renal anomaly) and the variety of different phenotypes of BOR syndrome, this case can be closely associated with the BOR syndrome but the absence of any otic abnormality (or minor criteria's) can speak for it to be either a new variant or a new entity in itself. To our

knowledge this is the first report of a patient with branchial and renal anomalies and we propose that this be included as a possibly new variant of BOR syndrome.

Conflict of Interest The authors declare that they have no conflict of interest.

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