Pediatrics

Is There Hope for Renal Growth on Imaging Studies Following Ureteral Reimplant for Boys With Fetal Hydronephrosis and Urinary Reflux?

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Abstract

Reflux nephropathy is thought to be the etiology for renal maldevelopment. We present two boys with fetal hydronephrosis and sterile vesicoureteral reflux (VUR). There was lack of renal growth of the refluxing renal units on surveillance renal ultrasound. Parents elected to undergo open ureteral reimplants. Post-surgical ultrasounds demonstrated improved renal growth.

Introduction

Children with febrile urinary tract infection (UTI) in the setting of vesicoureteral reflux (VUR) are at increased risk for renal scarring. Therefore, it is generally recommended that children with high grade VUR (grades IV and V) be placed on antimicrobial prophylaxis. Definitive surgery is recommended if VUR persists or the child develops breakthrough UTIs while on prophylactic antibiotics.

Postnatal renal maldevelopment that occurs in the setting of UTI and VUR is often felt to be an acquired consequence. These changes manifest as focal abnormalities that can be identified with renal scintigraphy, such as dimercaptosuccinic acid (DMSA) scans.

The etiology of prenatal congenital reflux nephropathy (CRN) is less well understood. It is hypothesized that sterile reflux of urine in utero may cause renal dysplasia. Studies of fetuses with VUR demonstrated that back pressure from sterile urine can lead to interstitial fibrosis in the fetal kidneys.

We report two boys diagnosed with grade III VUR following findings of mild hydronephrosis on prenatal USs. Both patients were born full term and healthy, with no other medical conditions. Both were started on low dose daily amoxicillin, and after 2 months, switched to once a day nitrofurantoin for prophylaxis. Neither boys had clinical signs or culture proven UTIs, nor were there history of fevers of unknown origin. Both boys had their postnatal imaging studies (USs, DMSAs, VCUGs) at our institution and all films were reviewed by a single pediatric radiologist. However, on routine surveillance USs, were noted to have diminished growth of the refluxing kidney. Follow up DMSA scan showed global hypotrophy of the refluxing kidney compared to the contralateral normal kidney. Parents elected to undergo surgical treatment, i.e., open ureteral reimplant. Both boys had an uneventful recovery, and on follow up serial USs demonstrated improved renal growth at 2 years after their reimplants.

Case 1

A full-term boy with prenatally diagnosed mild right hydronephrosis was found to have bilateral grade III VUR on postnatal voiding cystourethrogram (VCUG). Parents elected to have the baby circumcised, and placed on prophylactic amoxicillin. On routine 6 months follow up US, it was noted that both kidneys measured 5.2 cm with age appropriate corticomedullary differentiation. At 12 months of age, the right kidney showed a lack of renal growth (left = 6.2 cm, volume = 25 cc and right = 5.2 cm, volume = 14 cc). Repeat US 6 months later showed similar findings; DMSA scan revealed the left kidney functioning at 70% and the right at 30% with no evidence of focal scarring.

Repeat VCUG (Fig. 1) and US revealed improved left VUR (grade III to II) with a renal length of 6.7 cm and worsening right sided VUR (grade III to IV) with a renal length of 5.0 cm. Parents
elected to undergo open ureteral reimplant around 18 months of age. Postoperative VCUG and US showed resolution of VUR and improved renal growth with the left kidney measuring 7.0 cm, volume = 45 cc, and the right kidney measuring 6.0 cm, volume 18 cc with no evidence of hydronephrosis. Child continue to do well clinically, i.e., no fevers or UTIs at 2 years of follow up.

Case 2

A full-term boy with bilateral prenatal hydronephrosis was diagnosed with bilateral grade III VUR shortly after birth. The baby was circumcised and placed on prophylactic amoxicillin without clinical history of infection. An US at 3 months of age revealed persistent left calyceal dilation with normal corticomedullary differentiation, with both kidneys measuring 5.0 cm. At 6 months of age, follow up US showed discrepancies in the renal sizes, left measuring 3.4 cm, volume = 6.6 cc and right kidney measuring 6.8 cm, volume 43 cc. DMSA scan demonstrated a split function of 14% on the left kidney (no focal scarring) and 86% of the right kidneys (Fig. 2). Follow up VCUG demonstrated left grade III VUR with resolution of the right sided VUR. The family decided to proceed with open left ureteral reimplant around 18 months of age. Postoperative US and VCUG confirmed bilateral renal growth (left = 4.2 cm, volume = 10 cc from 3.4 cm, 6.6 cc and right = 7.0 cm, volume 45 cc from 6.8 cm, 43 cc) and resolution of VUR at 2 year follow up.

Discussion

Each child in this case series was diagnosed with moderate grade VUR after routine prenatal US. Neither had clinical signs or history of UTIs and both had negative urine cultures. However, both were noted to have asymmetric renal growth on surveillance USs. US findings were confirmed with functional study, i.e., DMSA scan, which demonstrated global decrease in function of the refluxing/smaller kidney.

In general, clinical indications for antireflux surgery/open ureteral reimplant include breakthrough UTIs, high grade VUR (grade IV and V). The goal is to minimize risk for upper tract damage. While neither patient in our case series had evidence of clinical UTIs, and both had moderate grade VUR; antireflux surgery resulted in improved growth of the affected kidneys on follow up imaging studies. Unfortunately, both families decline a follow up DMSA scan, as in our institution, the study requires sedation and parents were aware of the potential radiation associated with the nuclear scan (Wang et al in press). However, with improved renal length on follow up USs at 2 year follow up and both children being clinically well, i.e., no fever of unknown origin or signs of UTIs, we were reassured.

There is persistent controversy in the management of young children with febrile UTI. The American Academy of Pediatrics recently revised their guideline on the management of UTIs, indicating that VCUG may not be necessary after the first episode of febrile UTI and that prophylactic antibiotics may not be necessary in patients with VUR. While the relationship between VUR, pyelonephritic scarring, and long-term renal insufficiency is not well established, it is believed that individuals with high grade VUR, are at increased risk of renal insufficiency. Our case series demonstrates that routine imaging studies are warranted in children with moderate grade VUR, even without clinical signs of UTIs, and definitive surgical repair might prevent further renal compromise in young children. Furthermore, individuals with VUR may develop renal scarring prior to clinical evidence of UTI. Despite the lack of clear benefits of ureteral reimplant in children with moderate VUR, our study shows that it might be beneficial for selected cases.

Conclusions

Often times, antireflux procedures are delayed until children develop worsening VUR, breakthrough infections, or when evidence of scarring develops. Young infants diagnosed with VUR, regardless of grade, should be followed closely during early development; as potential for renal scar is higher with first infection. The role of invasive testing and surgical procedures have yet to be fully established in the treatment of VUR. It is important that we continue to develop strategies for proper surveillance and timely intervention for children at risk for renal insufficiency.

Conflict of interest

There are no financial disclosures or conflict of interest associated with any of the authors.

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