

Postnatal Management of Fetal Hydronephrosis

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Abstract : To differentiate neonates with hydronephrosis who will benefit from early surgical treatment from those who will not.

Patients and Methods : Twelve consecutive neonates with a history of fetal hydronephrosis in 19 renal units were treated conservatively. Investigations included urinalysis, serum creatinine, ultrasonography, diuretic radionuclide renography and intravenous pyelography. Surgery was indicated when there was evidence of recurrent urinary tract infection and deteriorating differential renal function of the involved kidneys.

Results : Postnatal ultrasound confirmed hydronephrosis in 17 out of 19 renal units. Based on drainage curve obtained on diuretic radionuclide renography, patients were classified into obstructive (9 units), non-obstructive (5 units) and equivocal group (3 units). Diagnoses in the first group were ureteropelvic junction obstruction in 8 and ectopic ureterocele in 1. Pyeloplasty was done in 7 renal units and heminephrectomy was performed for ectopic ureterocele. Average age at operation was 15 months. None of the non-obstructive group required surgery after an average of 24 months of follow up. There was one dropout in equivocal group. One neonate underwent ureteroneocystostomy for megaureter at 18 months of age, while the remaining neonate has been doing well on regular follow after 27 months.

Conclusions : Approximately half of neonates with history of fetal hydronephrosis ultimately required surgery. Diuretic radionuclide renography was useful in differentiating between neonates whose hydronephrosis ultimately required surgery and those with a benign outcome.

เรื่องย่อ : การรักษาหลังคลอดเด็กที่ตรวจพบไตบวมน้ำตั้งแต่ในครรภ์

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จุดประสงค์ : เพื่อแยกแยะระหว่างเด็กที่มีภาวะไตบวมน้ำ ซึ่งต้องการรักษาโดยการผ่าตัดจากเด็กกลุ่มที่ไม่จำเป็นต้องผ่าตัด

ผู้ป่วยและวิธีการ : ทำการศึกษาติดตามเด็กตั้งแต่แรกเกิด จำนวน 12 คน ที่ตรวจพบไตบวมน้ำตั้งแต่ในครรภ์ จำนวน 19

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ข้าง. ผู้ป่วยทุกรายได้รับการตรวจน้ำปัสสาวะ, ซีรัมครีอาตินิน, อัลตราซาวด์, ไคยูเรติก เรดิโอโนวโลยีรีโนแกรม และการถ่ายภาพรังสีไตโดยสารทึบแสงเป็นระยะ. การผ่าตัดกระทำต่อเมื่อมีการติดเชื้อระบบทางเดินปัสสาวะซ้ำ และอัตราร้อยละของการทำงานของไตข้างนั้นลดลง

ผล: การตรวจด้วยอัลตราซาวด์ยืนยันภาวะไตบวมน้ำ 17 ข้าง. จากผลการตรวจด้วยไคยูเรติก เรดิโอโนวโลยีรีโนแกรม สามารถแบ่งผู้ป่วยเป็น 3 กลุ่ม คือ กลุ่มที่มีการอุดตัน (9 ข้าง), ไม่มีการอุดตัน (5 ข้าง) และกลุ่มกำกวม (3 ข้าง) ผู้ป่วยกลุ่มแรกได้รับการวินิจฉัยเป็นการอุดตันระหว่างกรวยไตและหลอดไต 8 ข้าง, ยูเรทเทอร์โรซิลิโคนตำแหน่ง 1 ข้าง และได้รับการผ่าตัดตบแต่งกรวยไต 7 ข้าง ตัดเนื้อไตส่วนบนออก 1 ข้าง อายุโดยเฉลี่ยขณะรับการผ่าตัด คือ 15 เดือน ในกลุ่มที่ไม่มีการอุดตัน ซึ่งได้รับการติดตามโดยเฉลี่ยนาน 24 เดือน, ไม่มีรายใดต้องได้รับการผ่าตัด มีผู้ป่วย 1 ราย ในกลุ่มสุดท้ายขาดการติดตามการรักษา อีก 1 รายเป็นเมกาคูริเตอร์ ได้รับการผ่าตัดเอาหลอดไตเข้ากระเพาะปัสสาวะใหม่เมื่ออายุ 18 เดือน ในขณะที่ผู้ป่วยรายสุดท้ายยังมีสุขภาพแข็งแรงหลังการติดตามครั้งสุดท้ายเมื่ออายุ 27 เดือน

สรุป: ประมาณครึ่งหนึ่งของเด็กที่ตรวจพบไตบวมน้ำตั้งแต่ในครรภ์ จะต้องได้รับการผ่าตัด การศึกษาครั้งนี้พบว่าไคยูเรติก เรดิโอโนวโลยีรีโนแกรม เป็นตัวบ่งชี้ที่ดีในการแยกแยะระหว่างผู้ป่วยกลุ่มที่ต้องได้รับการรักษาโดยการผ่าตัดกับกลุ่มที่ไม่จำเป็นต้อง

INTRODUCTION

Fetal urinary tract abnormalities have been increasingly identified since maternal ultrasonography became popular nearly two decades ago. Among the identified abnormalities, fetal hydronephrosis is the most common and presents greatest challenge in postnatal management in this group of patients. Approximately half of all fetal hydronephrosis run a benign course, and spontaneously disappear shortly after birth^{1,2,3}. The remaining cases which persist after delivery may require surgical interventions. Koff reported less than 15% of persistent neonatal hydronephrosis subsequently required surgery⁴.

The initial approach was early pyeloplasty, a time-honoured procedure to correct any hydronephrosis caused by ureteropelvic junction obstruction.^{5,6,7} However, it has been observed on several occasions that spontaneous resolution of hydronephrosis occurred in many patients in which surgery was deferred. At the present time a consensus has been reached that routine early pyeloplasty is not advisable in asymptomatic neonates with prenatally diagnosed ureteropelvic junction obstruction.^{8,9,10,11} Because of these clinical data, we have adopted a conservative policy. The problem is how to differentiate between neonates who would benefit

from surgery to prevent subsequent renal function deterioration and those whose hydronephrosis does not present a problem to their well-being. Herein, we report our experience of adopting such a conservative approach.

MATERIALS AND METHODS

Twelve neonates (9 males and 3 females) who presented to the Division of Urology, Department of Surgery, Siriraj Hospital from January 1993 to November 1998 with fetal hydronephrosis were enrolled in this prospective study. These patients included neonates who were born in Siriraj Hospital as well as those referred here within 3 months of birth. The total number of hydronephrotic renal units were 19 (8 right and 11 left).

Initial assessment included serum creatinine, urine analysis, ultrasonography, diuretic radionuclide renography (^{99m}Tc-diethylenetriaminepentaacetic acid; DTPA), and voiding cystourethrography in selected cases. Intravenous pyelography was deferred until the infants were at least 1 month old. Usually, ultrasonography was carried out within a few days after delivery to confirm the hydronephrosis. If the result was normal, ultrasonography was repeated after one week,

because dehydration in the first few days after birth can obscure the presence of hydronephrosis. Differential relative renal function was assessed from estimated glomerular filtration rate in DTPA. Obstruction was diagnosed when the excretory limb did not fall or a fall of less than half after 15 minutes of furosemide administration. Voiding cystourethrography was advised when lower urinary tract obstruction or reflux was suspected.

Early conservative management of these patients was adopted. The neonates were closely observed, hydrated and antibiotics were instituted when there were any clinical signs indicating sepsis. If there were no problems after complete initial assessment, patients were discharged. Parents were instructed to bring the infant back for follow up at 1,3,6 and then every 3 months. Urine analysis was performed on every visit to detect any pyuria or bacteriuria. Serum creatinine, ultrasonography and DTPA were repeated at 3 months of age and then every 6 months. If the infants became unwell for any reason, parents were advised to bring the infant back earlier than appointment date for investigation and treatment.

Operative interventions were indicated when infants had clinical symptoms and signs of recurrent urinary tract infection and deteriorating differential renal function.

RESULTS

Of the 19 prenatally diagnosed hydronephrotic renal units, ultrasonography after delivery confirmed the diagnosis in 17 (7 right and 10 left). The remaining 2 units, one each on right and left side, were found to be multicystic kidneys which were clinically palpable for a few months after birth and spontaneously atrophied within 1 year. One neonate had a solitary hydronephrotic kidney on the right side. Levels of serum creatinine were between 0.3-0.6 mg. per deciliter except in one patient whose creatinine was 1.8 mg per deciliter. This patient had a right solitary hydronephrosis which turned out to be megaureter. Diuretic renogram confirmed obstructive type in 9 units (3 right and 6 left) or 53%, equivocal type in 3 units (1 right and 2 left) or 17% and non-obstructive type in 5 units (2 right and 3

left) or 30% (Figure 1). The nine obstructive hydronephrotic renal units comprised 2 neonates with bilateral diseases and 5 with unilateral hydronephrosis. In the unilateral hydronephrosis group, differential relative renal function of the affected kidneys were 21,57,41,77 and 53% in the five patients. The contralateral sides were functioning normally except in the fourth case which was multicystic. This explains why the relative renal function in this particular case was so high (77%) despite being obstructive hydronephrosis. The final diagnoses of the nine obstructive hydronephrosis were ureteropelvicjunction obstruction (UPJ) in 8 and ectopic ureterocele in 1. Of the three renal units with an equivocal drainage curve, only one unit was found to be right obstructive megaureter. This patient had right uretero-neocystostomy at 18 months due to decreasing renal function.

Pyeloplasty was carried out in 7 cases of UPJ because of recurrent urinary tract infection and deteriorating differential renal function. The average age at operation was 15 months. There was one infant with bilateral obstructive hydronephrosis whose left kidney improved spontaneously after right pyeloplasty at 14 months and diuretic renography showed a non-obstructive curve at 17 months of age. An infant with ectopic ureterocele had severely impaired function of the upper moiety and difficult voiding, necessitating upper pole nephrectomy when she was 5 months old.

All infants whose kidneys were labelled non-obstructive were doing well at their last examination. The follow up period in this group ranged from 13 to 49 months with an average of 24 months. Progressive hydronephrosis was not detected in follow up ultrasonography nor was deteriorating differential renal function documented in subsequent DTPA. No patients showed evidence of urinary tract infection.

Follow up of all cases ranged from 13 to 49 months with a mean of 23.2 months. There was only one dropout at 3 and a half years old. This patient had unilateral hydronephrosis and equivocal renogram done shortly after birth but a non-obstructive curve was obtained when the renogram was repeated 1 year later.

The pre-operative and post-operative differential renal function of 5 infants with unilateral hydronephrosis are shown in Table 1.

Table 1. Differential renal function (GFR) of infants with unilateral hydronephrosis.

Patients' initials	GFR (%)	
	Pre-	Post-
AP	45%	53%
NP	57%	59%
RB	41%	43%
AV*	77%	86%
NS	53%	50%

* contralateral multicystic kidney

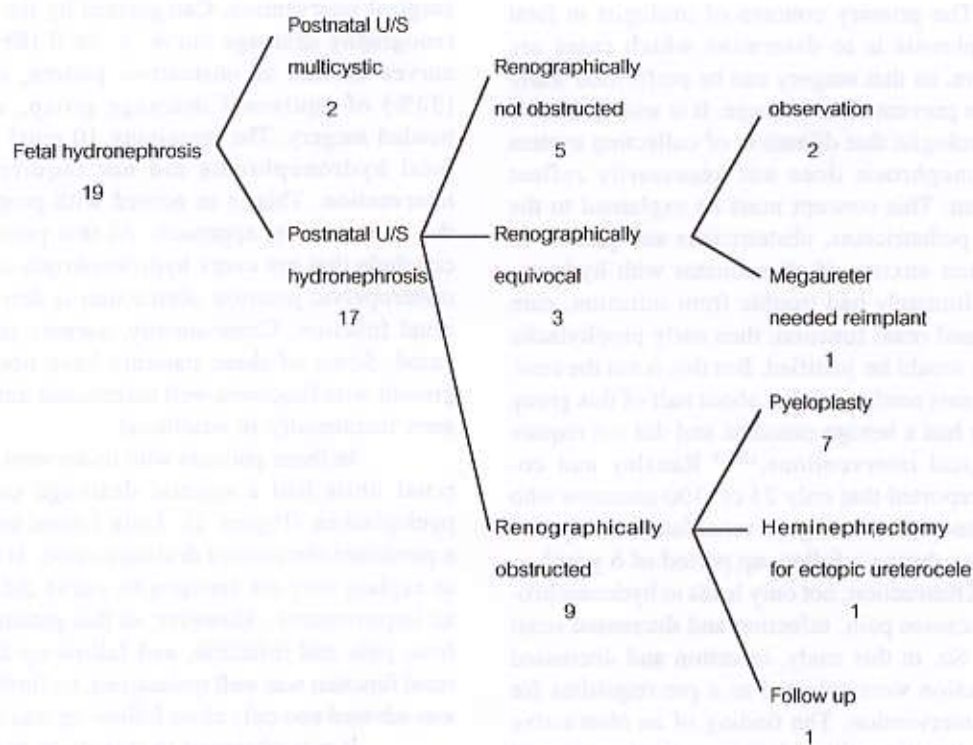


Figure 1. Clinical fate of fetal hydronephrosis.

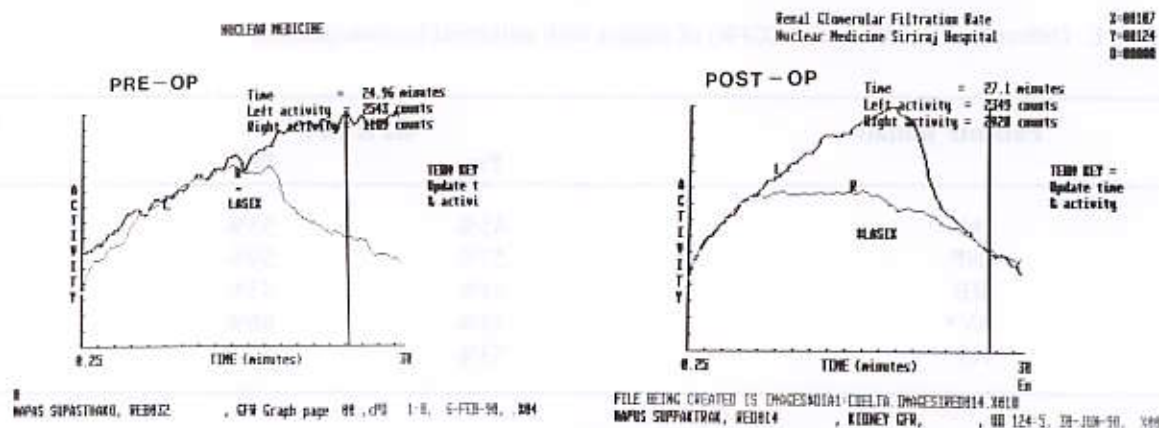


Figure 2. Example of pre- and postoperative renography drainage curve.

DISCUSSION

The primary concern of urologist in fetal hydronephrosis is to determine which cases are obstructive, so that surgery can be performed early enough to prevent renal damage. It is widely known among urologist that dilatation of collecting system or hydronephrosis does not necessarily reflect obstruction. This concept must be explained to the involved pediatricians, obstetricians and parents to relieve their anxiety. If all neonates with hydronephrosis ultimately had trouble from infection, pain or decreased renal function, then early prophylactic operation would be justified. But this is not the case. Many reports confirmed that about half of this group of patient had a benign outcome and did not require any surgical interventions.^{1,2,3,4} Ransley and co-workers reported that only 23 of 100 neonates who had hydronephrosis and good renal function required pyeloplasty during a follow up period of 6 year.³

Obstruction, not only leads to hydronephrosis, also causes pain, infection and decreased renal function. So, in this study, infection and decreased renal function were selected as a pre-requisites for surgical intervention. The finding of an obstructive curve in diuretic radionuclide renography was not used since many factors influence the result of this procedure. State of hydration, bladder emptying and renal function are three variables which affect the drainage curve.^{4,8,12}

In this study, 9 of 19 renal units (47%) with prenatally diagnosed hydronephrosis had to undergo surgical intervention. Categorized by the pattern of renography drainage curve, 8 of 9 (88%) whose curves showed an obstructive pattern, and 1 of 3 (33%) of equivocal drainage group, ultimately needed surgery. The remaining 10 renal units with fetal hydronephrosis did not require surgical intervention. This is in accord with proponents of the conservative approach. At this point, we can conclude that not every hydronephrosis or apparent ureteropelvic junction obstruction is detrimental to renal function. Consequently, surgery is not indicated. Some of these patients have normal renal growth with functions well maintained until they are seen incidentally in adulthood.

In those patients who underwent surgery, 7 renal units had a normal drainage curve after pyeloplasties (Figure 2). Only 1 renal unit showed a persistent obstructive drainage curve. It is difficult to explain why the renography curve did not show an improvement. However, as this patient was free from pain and infection, and follow-up differential renal function was well maintained, no further surgery was advised and only close follow-up was warranted.

It was observed in this study that of the 9 renal units with an obstructive curve pattern on renography, 7 subsequently developed infection and deteriorating differential renal function, and required surgical corrections. It can be concluded that the

finding of an obstructive curve on renography is a reliable indicator that surgery should be considered before damage occurs to the involved kidneys. This finding agrees with Chung and co-workers on reliability of diuretic renogram in the evaluation of neonatal hydronephrosis¹³.

Finally, as only 9 (53%) of 17 confirmed neonate hydronephrosis had urinary tract infection and functional deterioration, it would have been inappropriate and unwise to perform any surgery on all patients with asymptomatic hydronephrosis. Otherwise, unnecessary operation would have been carried out on 8 (47%) of 17 renal units. Thus the

natural history of persistent neonatal hydronephrosis is relatively benign. From the data presented here, a certain group of patients will benefit from surgery. Identifying these patients is not easy because no diagnostic test has 100% accuracy. Clearly, there is a need to identify indicators that prove obstruction really exists before embarking on surgery. At the present time, diuretic renography showing an obstructive curve pattern, urinary tract infection and deterioration in differential renal function, are useful clinical parameters to justify surgical intervention in fetal hydronephrosis.

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