INTRODUCTION

Hydronephrosis is the most common congenital condition that is detected by prenatal ultrasonography. Moreover, the widespread use of prenatal ultrasonography results in an increased recognition of fetal hydronephrosis. To determine clinical characteristics and postnatal outcome of fetal hydronephrosis, we performed a retrospective study in children diagnosed as having fetal hydronephrosis between 1990 and 2001. 341 children with 427 dilated kidneys were included. Dilatation of the renal pelvis was caused by primary ureteropelvic junction obstruction in 65.6%, multicystic kidney in 9.4%, vesicoureteral reflex in 7.0%, duplex system in 5.4%, ureterovesical junction obstruction in 4.0%, and posterior urethral valves in 3.0%. Hydronephrosis resolved spontaneously in 126 (29.5%) kidneys, with 52.7% of mild hydronephrosis, and 2.6% of severe hydronephrosis. Mean interval to spontaneous resolution was 1.39 (±1.41, SD) yr. Surgery was performed in 174 kidneys, including pyeloplasty in 105, ureteroneocystostomy in 23, transurethral incision in 11 and nephrectomy in 9. Most patients had initially high-grade hydronephrosis (p<0.05). Mild hydronephrosis appears to be relatively benign, and in most cases, dilatation improves with time, and thus surgical intervention is not required. On the other hand, moderate or severe hydronephrosis often results in a significantly poor outcome and requires surgical intervention, and therefore, requires closer follow-up both antenatally and postnatally.

Key Words: Hydronephrosis; Natural History; Ultrasonography, Prenatal

MATERIALS AND METHODS

The medical records and imaging studies of 393 children that registered between January 1990 and June 2001 were retrospectively evaluated. The children were diagnosed as fetal hydronephrosis after 17-40 weeks of gestation, and were further followed up by postnatal ultrasonography. Children not confirmed to have hydronephrosis by postnatal ultrasonography were excluded from the study.

Postnatal ultrasonography was followed up at one to four days, one month and at one year. If hydronephrosis persisted for a month, a 99mTc technetium-diethylene-triaminepentaacetic acid renal scan and additional ultrasonography was performed at three months postnatally. Voiding cystourethrogram was performed in selected cases with lower ureteral dilatation. Urinalysis, urine culture, serum creatinine, and leukocyte count were performed at the first visit, and repeated when necessary. All postnatal ultrasonography was graded according to the guidelines issued by the Society for Fetal Urology (5).
Surgery was performed in cases with symptoms or signs such as urinary tract infection, palpable mass and flank pain, and if there was evidence of obstructive injury, which was defined as a reduction in differential renal function to below 40%, ultrasonographic progression of hydronephrosis with renal cortical atrophy, and in cases with a half-time of more than 20 min by diuretic renography.

Clinical characteristics and outcome were evaluated and compared to the degree of hydronephrosis. Data were analyzed statistically using the chi square test where appropriate. A p value of <0.05 was considered significant.

RESULTS

Of 393 children that registered, 341 children (262 males and 79 females) with 427 dilated kidneys were included in this study. Fifty-two children were excluded because of lacking data or loss at follow up. The mean follow-up was 33.6 months (range, one month-14 yr).

The left kidney was more commonly involved (left 256, right 171). Grade 1 hydronephrosis was present in 93 (21.8%), and grades 2, 3, and 4 in 162 (37.9%), 96 (22.5%), and 76 (17.8%), respectively. Dilatation of the renal pelvis was caused by primary ureteropelvic junction obstruction in 280 (65.6%), multicystic kidney in 40 (9.4%), vesicoureteral reflux in 30 (7.0%), duplex system in 23 (5.4%), ureterovesical junction obstruction in 17 (4.0%), posterior urethral valves in 13 (3.0%), ureteroceles in 5 (1.2%), and primary megaureter in 2 (0.4%).

In 126 (29.5%) kidneys, the hydronephrosis resolved spontaneously during the follow-up period. Mean interval to spontaneous resolution was 16.5 months (range, one week to 10.1 months with a range of 3.9 to 20.5 months).

The purpose of prenatal ultrasonography has changed from the simple detection of hydronephrosis to selection for specific diagnosis-based management. It is important to determine which infants with hydronephrosis will deteriorate, and which will stabilize or improve. However, the significance of hydronephrosis in infants is often difficult to define, and current techniques cannot reliably diagnose obstruction without an observation period. Thus, the evaluation and management of hydronephrosis are issues that are rapidly evolving, which is generating enormous controversy.

Fig. 1. Management versus degree of hydronephrosis.

3.2 yr), 13 (11.9%) kidneys were operated upon within one month, 48 (44%) from one to three months, 37 (34%) within one year, and 11 (10.1%) from one to three years.

DISCUSSION

The purpose of prenatal ultrasonography has changed from the simple detection of hydronephrosis to selection for specific diagnosis-based management. It is important to determine which infants with hydronephrosis will deteriorate, and which will stabilize or improve. However, the significance of hydronephrosis in infants is often difficult to define, and current techniques cannot reliably diagnose obstruction without an observation period. Thus, the evaluation and management of hydronephrosis are issues that are rapidly evolving, which is generating enormous controversy.

Koff et al. (6, 7) have proposed plotting serial measurements on a renal growth chart to identify infants with obstruction as evidence by accelerated contralateral renal growth. Mallek et al. (8) and Palmer and DiSandro (9) suggested the use of diuretic Doppler ultrasonography to differentiate obstruction from dilatation. However, current techniques cannot reliably
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studies. This difference can be explained as follows. In our
rate of surgery (40.7%) higher than those reported by other
rate of spontaneous resolution (29.5%) may seem lower, and
surgical intervention.

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that parental concerns be addressed and minimized. Ransley
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Harding et al. (16) reported that in patients with mild hydro-
natalhydronephrosis was detected, proved to have transient,
and renal function then recovers to the level of the normal
ed after 1 month and graded according to the grading system
ultrasonography was performed at 1-4 days after birth, repeat-
hr and those that did not.
The management of prenatally detected hydronephrosis has
changed dramatically in the last decade, from early surgery
close observation until renal deterioration, or progression
of hydronephrosis occurs. This strategy is based on the obser-
vations that most mild hydronephrosis resolves spontaneously
and renal function then recovers to the level of the normal
kidney. Koff (15) reported that 85% of patients, in whom pre-
natal hydronephrosis was detected, proved to have transient,
physiologic dilatation of the renal pelvis, and these hydrone-
phroses resolved spontaneously without surgical intervention.
Harding et al. (16) reported that in patients with mild hydro-
nephrosis of the anteroposterior diameter of the renal pelvis
of less than 10 mm, 43.1% of the hydronephroses resolved
spontaneously postnatally, and they suggested the necessity
that parental concerns be addressed and minimized. Ransley
et al. (17) also reported that most hydronephroses, with a dif-
ferential renal function exceeding 40% and an anteroposterior
diameter of less than 1.2 cm, disappeared spontaneously on
the follow-up without surgical intervention. As many previ-
ous studies have indicated, mild fetal hydronephrosis is known
to be clinically insignificant, and to carry a low likelihood of
surgical intervention.

At a first glance, the results of our study suggest that the
rate of spontaneous resolution (29.5%) may seem lower, and
the rate of surgery (40.7%) higher than those reported by other
studies. This difference can be explained as follows. In our
study, many infants, who had an initial diagnosis of prenatal
hydronephrosis, but without evidence of hydronephrosis on
postnatal ultrasonography, were excluded. Most cases of mild
hydronephrosis are known to resolve spontaneously before
delivery (18). Sairam et al. (3) reported that hydronephrosis
resolved in the antenatal or early neonatal period in 88% of
fetuses. If this patient type has been included in our study, the
rate of spontaneous resolution would have been much higher.
Moreover, children with multicystic dysplastic kidney, poste-
rior urethral valve, duplication, or ureterocele were included
in our study, which led to an increased rate of surgical inter-
vention. Our institute is tertiary hospital to which the most
severe cases are referred nationwide for further management,
naturally, this also causes the selection bias. In addition, the
patients who were lost to follow-up were excluded from this
study, and most of these, we suppose, may be doing well with-
out any symptoms and with spontaneously resolved hydro-
nephrosis. And finally, ethnic differences may influence the
nature of prenatal hydronephrosis. This aspect requires fur-
ther investigation.

Regarding the duration of follow-up period, Ulman et al.
(10) recommended nonoperative treatment with a close follow-
up, especially during the first 2 yr, and that the follow-up pro-
tocol should maintain a maximum interval between diagnostic
tests of no longer than 3 months for the first 2 yr of life. In our
study, most surgeries (91%) except some nephrectomies per-
formed in multicystic dysplastic kidneys were performed be-
fore the age of one, and mean time to spontaneous resolution
was 16.5 months, which supports the recommendation made
by Ulman et al. (10).

The limitations of our study are that it was not a planned
prospective study. Many children were excluded because their
medical records were incomplete or because they had been lost
to follow-up. In addition, the study population included chil-
dren in whom the specific cause of hydronephrosis had been
verified, such as multicystic dysplastic kidney, vesicoureteral
reflux, and posterior urethral valve. This heterogeneity of the
study population may have led to the underestimation or the
overestimation of the rate of spontaneous resolution. However,
the overall data suggests that mild hydronephrosis is relative-
ly benign and does not require surgical intervention, which is
in-line with the report of previous studies (19-21).

In conclusion, our study demonstrates that mild fetal hy-
dronephrosis is relatively benign and does not require surgical
intervention in most cases. Moderate or severe fetal hydron-
ephrosis often results in a poor outcome requiring surgical inter-
vention. Fetal hydronephrosis needs closer follow-up both an-
tenatally and postnatally, and surgery should be performed if
renal compromise occurs.
The natural history of prenatally detected hydronephrosis
continues to be defined. Only the collaborative efforts of obste-
tricians, neonatologists, geneticists, radiologists, and pediatric
urologists can provide answers to the many questions regard-
ing prenatally diagnosed hydronephrosis.
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