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An alternative grading system to refine the criteria for severity of hydronephrosis and optimal treatment guidelines in neonates with primary UPJ-type hydronephrosis

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Abstract *Objective:* We present our alternative hydronephrosis grading system (AGS) in an attempt to establish optimal treatment guidelines, and clarify and refine the criteria for severity of hydronephrosis in neonates.
Patients and methods: A total of 162 newborns (228 affected kidneys) with antenatally diagnosed primary ureteropelvic junction-type hydronephrosis were prospectively followed and treated by the same surgeon for a mean of 46 (6—65) months. Ultrasonography and diuretic renogram were used for diagnosis and follow up. Society for Fetal Urology (SFU) grading system, anteroposterior diameter of renal pelvis (APDRP) and our AGS were used to determine the degree of hydronephrosis. AGS: 0, no hydronephrosis; 1, dilatation of renal pelvis alone; 2, plus caliceal dilatation; 3, plus $<1/2$ (mild-to-moderate) renal parenchymal loss; 4, plus $>1/2$ (severe) renal parenchymal loss (cyst-like kidney with no visually significant renal parenchyma).
Results: On the first postnatal ultrasound, the severity of hydronephrosis was SFU ≤ 2 in 152 kidneys (surgery, 0%), SFU-3 in 41 kidneys (surgery, 19.5%) and SFU-4 in 35 kidneys (surgery, 68.6%). The follow up, treatment and outcome of SFU-1 and SFU-2 patients were similar; all resolved spontaneously without renal deterioration (renal function $>40\%$). Renal function ranged between 7% and 39% in SFU-4 patients. Intrarenal pelvis was found in one patient with an APDRP of <15 mm, seven patients of 16—30 mm, and five patients of >30 mm. Overall, 201 hydronephrotic kidneys (88.2%) resolved spontaneously while 27 (11.8%) required pyeloplasty.
Conclusion: Neither an SFU grading system nor measurement of APDRP is the gold standard in determining the severity of hydronephrosis. Both methods may fail, particularly in children with intrarenal pelvis configuration or SFU-4 hydronephrosis. Our AGS promises easier follow up and more timely treatment.

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Introduction

Early diagnosis and thus timely treatment and follow up of patients with hydronephrosis are now available because of increased technical improvements in prenatal diagnosis. The distinction between urinary tract obstruction and urinary dilatation remains a challenging problem [1—4]. There is a significant correlation between the severity of hydronephrosis and prognosis [2,5—10]. The indications for and timing of surgery for severe newborn hydronephrosis are still debated, and disagreement exists over the ability of different diagnostic tests to define obstruction accurately or predict which kidney will benefit from surgical intervention. It is crucial to determine the exact level of severity of hydronephrosis for timely and appropriate follow up and prompt treatment of patients with primary UPJ-type hydronephrosis. The anteroposterior diameter of the renal pelvis (APDRP) and Society for Fetal Urology (SFU) grading systems based on ultrasound are the most commonly used methods in the literature for determining the severity of hydronephrosis [2,5—8,11,12]. Both of these methods may fail in their level of accuracy in some patients [8]. These findings encouraged us to share our experience of neonates with antenatally diagnosed hydronephrosis, and to present our alternative hydronephrosis grading system (AGS) in an attempt to establish optimal treatment guidelines, and clarify and refine the criteria for severity of hydronephrosis.

Patients and methods

The study population consisted of 162 neonates (228 hydronephrotic kidneys) with primary UPJ-type hydronephrosis initially diagnosed in utero who were prospectively followed by the same surgeon in 2001—2005 for a mean of 46 months (range: 6—65). Patients were excluded from the study if they had ipsilateral or contralateral reflux, duplex system, fused kidney, solitary kidney, ureteral dilatation, or anatomical or neuropathic abnormality of the lower urinary tract.

All patients underwent initial and periodic assessment of hydronephrosis using ultrasound and diuretic renography. Because the hydronephrosis increased during bladder filling and voiding, ultrasounds were performed when the bladder was empty. Ultrasound was used to evaluate the degree of hydronephrosis which was graded according to the SFU guidelines [11], APDRP and Onen's AGS (Fig. 1). The Onen's AGS was as follows: 0, no hydronephrosis; 1, dilatation of renal pelvis alone; 2, plus caliceal dilatation; 3, plus $<1/2$ (mild-to-moderate) renal parenchymal loss; 4, plus $>1/2$ (severe) renal parenchymal loss (cyst-like kidney with no visually significant renal parenchyma). Technetium-99m DPTA or MAG 3 was used as diuretic renogram. Renography was performed 4—6 weeks after birth to establish baseline differential renal function. A bladder catheter was used in all patients and individual differential renal function measurements were obtained with assessment of isotope washout after diuresis. Half-time was not used as a tool in the treatment of these patients because of its inaccuracy in assessing obstruction in neonatal hydronephrosis [2,5].

Surgical intervention was performed only if urinary obstruction developed and produced evidence of renal deterioration. This was defined as a decrease in individual kidney differential function (greater than 10%), progression of hydronephrosis on ultrasound, and/or presence of symptoms (UTI, pain). Our surgical indications based on ultrasonographic findings were progression of hydronephrosis from grade 1 to 3, grade 2 to 3 with some degree of renal function deterioration, and grade 3 to 4, and persistence of grade 3 until 3 years of age and persistent of grade 4 for more than 1 month. Dismembered pyeloplasty was undertaken using the same technique by the same surgeon in all patients when indicated.

We attempted to follow a protocol during the first 3 years of life that based the interval between initial and

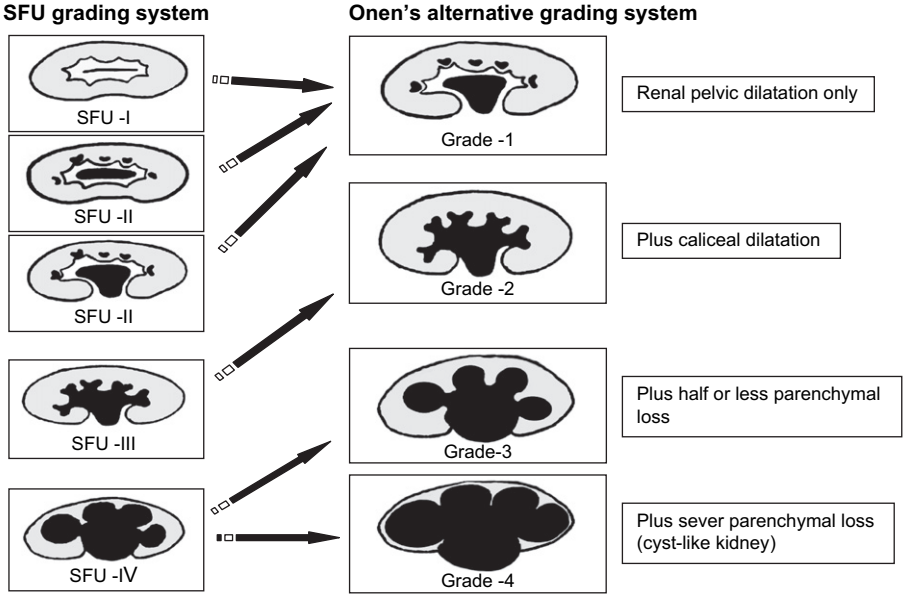

Figure 1 Comparison of SFU hydronephrosis grading system and Onen's AGS.