A Protocol for the Management of Neurogenic Bladder for Children in Developing Countries

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Introduction
The kidney is especially vulnerable to damage from pressure and recurrent infection within the first year of life. 10% of children with myelomeningocele (MM) will develop a dilatation deformity within the first year of life, and 35% by the 4th year of life (Ref 1). Furthermore, it has been reported that over 50% of MM children have a dangerous bladder (having an active sphincter with or without an active detrusor) (Ref.1). Therefore, a management protocol to protect renal function in these children is of vital importance. The milieu of a developing country necessitates an innovative approach to the management of these children, since practicality and compliance are essential to its success.

Detection of infections
Recurrent infection must be detected and avoided. Mothers will be instructed to check the child’s urine for cloudiness in the event of any fever. If the urine is cloudy, they are instructed to begin cotrimoxazole (5mg TMP/kg/dose BID), which will be provided in advance. Furthermore, given the prevalence of malaria as the etiology of febrile illness and the gravity of missing the diagnosis, mothers are instructed to also have the child evaluated with a blood smear at the closest facility whenever fever arises. With these two measures, if the fever is not resolving within 3 days, the mother is instructed to come to the spina bifida clinic for further evaluation. Any child who is within 3 months of a shunt operation should report to the spina bifida clinic in the event of a fever as soon as evaluation and treatment for malaria is initiated. Two episodes of fever with cloudy urine or one proven episode of pyelonephritis are sufficient for consideration of initiation of clean intermittent catheterization (CIC), if this has not already been instituted. If CIC has already been instituted, then the mother’s technique must be evaluated to insure complete bladder emptying with each catheterization. At times circumcision in boys may be necessary. If this is deemed sufficient, then the frequency of CIC should be increased. If the child is already on cotrimoxazole prophylaxis, then the UTI should be treated with nitrofurantoin (5mg/kg/day divided BID or TID), or vice versa.
**0-3 months**

This age group is particularly vulnerable, and is given special consideration since a threat to the kidneys may not be detected by ultrasound in the first months of life. If distended bladder is palpated in the infant, or it is more than 2 hours between voiding, then a simple cystometric study is performed to measure the leak point pressure (LPP) and bladder volume. (See appendix 1.) If the bladder-volume at leak point is above the 75th percentile of children with a non-neurogenic bladder (Ref.2) (Table I) or LPP > 40cmH2O, then CIC is recommended, initially three times a day to learn the technique. The safe bladder volume is defined as the bladder capacity at <40 cm H2O pressure (Ref.3). It must be emphasized that CIC three times per day will not produce continence, nor is this the goal, and this must be understood by the mother. It only helps to empty the bladder and prevent infection. All infants on CIC protocol must be on antibiotic prophylaxis (cotrimoxazole 20sx+4tmp mg/kg/d divided BID).

In time, the frequency of CIC is increased as the mother achieves proficiency in the technique. If LPP and bladder volume are found to be within normal limits, then the child should be observed closely and the 3-month renal ultrasound should be reviewed.

**3 months and above**

In this age group, the first renal U/S and a routine urinalysis are recommended. If both studies are normal, then the present management (either CIC already established, or no CIC) is continued. Those on CIC should increase its frequency up to 5X/day if feasible. If the renal U/S shows upper tract dilatation, begin CIC and add oxybutinine if already on CIC. Oxybutinine is an anticholinergic agent that can be given orally or intravesical at a dose of 0.2mg/kg/dose BID or TID (Ref.4). The U/S should be repeated in 3 months. If this demonstrates worsening, review compliance and technique of the mother and begin oxybutinine (if not on oxybutinine). All children who show worsening on renal ultrasound under treatment should get a cystourethrogram to study reflux (see appendix 2).

Mothers are instructed to measure all catheterized urine volumes one day per week and keep a record. If the volumes are repeatedly small and there are recurrent infections, oxybutinine, if not already begun, is instituted.

With continued worsening of hydronephrosis/reflux despite adequate doses of oxybutinine and insuring that the mother is compliant with the program, consideration should be given to referral for a urology consult. Surgical intervention for reflux does not exempt the child from the need for continued CIC. If CIC is technically difficult, anti-reflux-surgery can be combined with surgery providing a high compliance reservoir and an easy access conduit for catheterization such as appendicovesicostomy (Ref.1).

**Schedule for routine clinical review**

The children will be evaluated at 3, 6, and 12 months. If there have been no concerns, the child is reviewed annually after 1 year of age. A renal ultrasound and urinalysis are obtained at each review.

In a child with no prior evidence of an unsafe bladder who presents with upper tract dilatation on the annual ultrasound, consideration should be given to documentation of cystometric studies as outlined above and to a cystourethrogram, after insuring that the CIC protocol is being correctly followed. This situation is highly suspicious
for symptomatic spinal cord tethering, and the neurosurgeon should be notified on an urgent basis.

Achieving social continence in the older child (3 years and above)
For those children not previously on a CIC program, this is instituted at a frequency of 5 times per day. If acceptable continence is not achieved, then consideration is given to beginning oxybutinine. Those children already on a CIC program because of an unsafe bladder will most likely require the addition of oxybutinine to achieve social continence. Those not achieving continence on CIC and oxybutinine might benefit from urology consultation for a continence procedure.

Appendix 1: simple cystometric study
A simple technique for measurement of LPP is suggested. Insert 5/6 NG tube and clamp after emptying bladder. Open when urine begins leaking around the catheter and measure column height in cmH2O. Then measure bladder volume. Review with the mother whether the child was crying or quiet when leaking began, since the child should be quiet if a valid LPP is to be determined.

Appendix 2: cystourethrogram
Cystourethrogram is necessary for detecting and grading vesicoureteral reflux. A simple method for obtaining a cystourethrogram safely in a child with a neurogenic bladder is as follows: The child is catheterized and the bladder is completely emptied. The bladder is then filled via the catheter with a contrast agent appropriate for urological investigation at a rate of 10% of the age-related bladder volume (75th percentile) per minute (Table I). The drip chamber for the infusion is set at 40cm above the catheter entry point and the infusion is stopped either when leakage occurs around the catheter or when the infusion stops (i.e. when filling pressure reaches 40 cm H2O). Infusion should also be terminated in the event of patient discomfort. Immediately upon cessation of the infusion, the x-ray is taken. If infusion had been halted for discomfort alone, and no reflux is detected on the x-ray, then filling is resumed according to the criteria above.

References