

Pediatric Pelvic Floor Dysfunction & Incontinence

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Normal Urinary Control in Infancy

- Bladder reflex organ responds to stretch receptors in bladder wall
- Receptors initiate detrusor contraction with low volume of urine
- No evidence of CNS awareness or voluntary control (Allen, Rushton)

Normal Urinary Control in Infancy

- Neurophysiologic mechanisms highly complex & incompletely understood integration of peripheral, sympathetic, parasympathetic, & somatic innervation
- System controlled by complex interaction between spinal cord micturition center, brain stem, midbrain & higher cortical centers

Normal Urinary Control in Infancy

- Voiding pattern is full continuous stream with complete emptying of bladder
- Contracting detrusor and relaxing sphincter coordination must exist
- Awareness of bladder sensation and control of bladder begins in 1st - 2nd year of life

Normal Urinary Control in Infancy

- Initial control by contraction of external sphincter to relax detrusor
- Relaxation of sphincter results in voiding
- Sphincter remains relaxed until voiding is complete

Development of Unconscious Inhibition of the Voiding Reflex

- With maturity bladder volume increases, detrusor hyperactivity decreases, & involuntary voiding is prevented secondary to actively contracted sphincter & central inhibition of the detrusor itself at 6 months of age.
- Voluntary voiding control begins 2-3 years old
- Adult pattern of urinary control by age 4 -5

Constipation

- #1 cause of detrusor instability
- Decreased tone of the levators allows for increased accommodation
- Full rectum- diminished urgency
- During storage-increasing amounts of fluids are absorbed therefore longer delays & harder stools
- Should be able to defer 15 minutes
- Constipation can result from PFM dysfunction.

Encopresis

- Fecal incontinence or soiling in the absence of underlying disease in a child who has learned voluntary control of bowels.
 - Fecal Plug
 - Diseases/conditions causing encopresis
 - Hirschsprung's disease
 - Myelomeningocele
 - CP
 - Hypothyroidism
 - Diabetes insipidus
 - Rectal prolapse
- Griffin, et al

Passive Soiling

P. Chiarelli

- Weak IAS – incomplete closure of the anal canal – soft stool remains after evacuation and oozes out
- Difficulty cleaning
- Can happen at any time
- Can be associated with physical activity like GSUI
- Urgency that cannot hold for 15 minutes is EAS problem
- Gas or liquid incontinence is IAS problem

Voiding Dysfunction

Clinical history of diurnal enuresis with or without nocturnal enuresis, urge incontinence, frequency of urination, hesitancy in voiding and squatting in association with recurrent urinary tract infection, constipation or soiling that usually starts at the time of toilet training, and a post-void residual that exceeds 5% of total bladder volume (Goldraich & Goldraich, 1992).

Dysfunctional Voiding

- DI most common cause
- Without treatment places child at risk for developing recurrent UTI's, VUR, hydronephrosis and progressive kidney damage
- Etiology of DI unknown – ascribed to
 - Delay of maturation
 - Prolongation of infantile bladder behavior
 - Aberrations of acquired toilet training habits
 - Hellerstein, Linebarger, 2003

The Squat Pelvic Withholding Maneuver

Development of Dysfunctional Elimination

- Voiding Pattern is vulnerable when control depends on isolated action of the external sphincter
- Forceful closure of external sphincter during detrusor contraction increases intravesical pressure leads to Vesicoureteral Reflux (VUR)
- Early sphincter contraction or poor coordination between bladder and sphincter leads to retention and PVR resulting in UTI or overflow incontinence
- Voiding occurs upon relaxation of the PFM
- Dyssynergia is failure to maintain relaxation with detrusor contraction - discoordination
- Electrical activity of the Levator Ani Muscles falls to zero during micturition, therefore the reverse can be true & PFM activity could stop micturition

Dysfunctional Elimination Pattern:

- Does not allow for regular filling and emptying of the bladder
- May cause urinary retention
- Children with VUR are unable to completely empty when voiding
- May result in a different pattern of bladder function with incontinence or nocturnal enuresis

Common Signs and Symptoms of Dysfunctional Elimination

- Dysfunctional voiding habits with VUR develop urinary retention with a possible enlarged detrusor muscle and thickness of the bladder wall.
- Recurrent UTI's, with possible scarring of the kidney secondary to reflux.
- Poor bladder habits with decreased frequency of urination may present with bowel dysfunction.

Psychological Factors

- “Voiding function could be grossly disturbed through psychological malfunction”
- Voiding dysfunctions might cause psychological disturbances rather than the reverse being true. Hinman (1986).
- Elevated psychological test scores returned to normal after the urologic problem was cured.

Vesicoureteric Reflux - VUR

- Abnormal flow of urine backward from the bladder to the ureter secondary to a congenital defect, bladder outlet obstruction, or lower urinary tract infection.
 - Mosby's Medical Dictionary (1994)
- There are 5 grades of reflux, Grade I is the most mild and Grade V is the most severe.
- Renal scarring associated with VUR
 - cause of both hypertension and diseases of the kidney (Lancet, 1992).
 - Bakshandeh, Lynne, and Carrion (1976) reported that 30% of 50 consecutive patients with end stage renal disease had VUR.

Children with VUR may develop

- Dysfunctional voiding patterns
- Urinary retention

Medical Management of VUR

- Goal of medical management:
 - Prevent UTI and kidney damage as the child's growth and development take place.
 - Children with VUR and voiding dysfunction should be managed with both antibacterial prophylaxis and Anticholinergics medication.

Surgical Management of VUR

- Goal is to cure the reflux to avoid the potential risk of kidney damage secondary to continued reflux (American Urological Association {AUA}, 1997).
- Congenital malformation of the urinary tract can lead to a tendency to develop bladder infections and VUR through abnormally placed ureteric orifices, an abnormal ureter or abnormal kidney.
- Surgical intervention usually involves reimplantation of the ureters or Deflux.
- Deflux - collagen injection used primarily in girls with refractory Grade II reflux

- Hinman (1986) stated that “Reparative operations will fail if done before the system is balanced”
- This supports the use of behavioral therapy to restore bladder homeostasis prior to operative interventions to allow an optimal postoperative outcome.
- The surgical approach corrects reflux in almost all children.
- Rushton (1995) reported a higher rate of reimplantation surgeries failed secondary to a previously untreated bladder.

Bladder Training

- Bladder retraining should remain the cornerstone of the medical management protocol. (Allen, 1997)
- Consists of:
 - scheduled voiding habits
 - education of proper wiping techniques
 - avoidance of constipation.
 - PFM retraining

Nocturnal Enuresis

- Urinary incontinence during sleep
- Primary
 - normal physical exam
 - negative UA
 - never experience a period of dryness(2-3 months) without treatment. 90%
- Secondary
 - child has stopped bedwetting for at least 6 months then resumes. 10%

Causes of Primary Enuresis

- Developmental disorder or maturational delay
- Decreased functional bladder capacity
 - how much the bladder can hold before 1st urge
 - look for daytime frequency indicating small capacity
 - Bladder capacity estimation - child’s age +2 x 30ml
- Uninhibited bladder contractions
- Bedwetters have stronger bladder contractions
- Genetic
 - 1 parent 40%, both parents 77%
- Sleep disorders
 - enuresis can occur at any stage of sleep
 - may be immature sleep pattern allowing uninhibited reflex contraction of bladder
 - arousal from sleep improves with CNS maturation

- ADHD
- Diet
 - food allergies to bladder irritants
- Nocturnal diuresis - increased excretion of urine
 - lower nocturnal secretion of antidiuretic hormone

Causes of Secondary Enuresis

- Diabetes
- Urinary tract abnormalities
- Anatomic abnormalities
- Psychologic factors
 - new baby
 - negative attention

Bedwetting is not an illness!

- **“In a sense, this condition is a normal variation of bladder control rather than a disease state” Dr. Barton Schmitt**

Treatment

- Night Waking
- Self-awakening - independent
- Parent awakening
- Dry bed training

Common Medications

- Imipramine - trade name Tofranil
- Desmopressin - DDAVP - antidiuretic hormone
- Oxybutinin - trade name Ditropan
- Tolterodine - trade name Detrol

Purpose of Behavioral Management

- To teach regular bowel and bladder habits with emphasis on complete emptying of the bladder to restore bladder homeostasis and reduce the risk of UTI and renal scarring.

Biofeedback

- Teach proper muscle;
 - Isolation
 - Discrimination
 - Relaxation
 - Toileting positions

Self Regulated Bladder Homeostasis

- Education
 - Anatomy
 - Bladder function
 - Bladder irritants
 - The voiding cycle
 - Relationship between the pelvic floor and the bladder
 - Book or picture child makes to assess their understanding of the problem

Pediatric References

- Abidari, JM., Shortliffe, LM., (2002) Urinary incontinence in girls. Urology Clinics of North America. Aug;29(3):661-75.
- Allen, T. D. (1980). Commentary on dysfunctional abnormalities of the urinary tract. Symposium on Pediatric Urology, 7(2), 357-359.
- Allen, T. D. (1977). The non-neurogenic neurogenic bladder. The Journal of Urology, 117, 232-238.
- Allen, T. D. & Bright, T. C. (1978). Urodynamic patterns in children with dysfunctional voiding problems. The Journal of Urology, 119, 247-249.
- American Urological Association, (1997). Caring for children with primary vesicoureteral reflux. p. 1-9.
- Bakshandeh, K., Lynne, C., & Carrion, H. (1976). Vesicoureteral reflux and end stage renal disease. The Journal of Urology, 116, 557-558.
- Bo, K., Kvarstein, B., Hagen, R., Larsen, S. (1990). Pelvic floor muscle exercise for the treatment of female stress urinary incontinence: i. Reliability of vaginal pressure measurements of pelvic floor muscle strength. Neurology and Urodynamics, 9, 471-477.
- Bo, K., & Stien, R. (1994). Needle EMG registration of striated urethral wall and pelvic floor muscle activity patterns during cough, valsalva, abdominal, hip adductor, and gluteal muscle contractions in nulliparous healthy females. Neurology and Urodynamics, 13, 35-41.
- Burgio, K. L., Engle, B. T., Quilter, R. E., & Arena, V. C. (1991). The relationship between external anal and external urethral sphincter activity in continent women. Neurourology and Urodynamics, 10, 555-562.
- Burgio, K. L., Robinson, J. C., & Engel, B. T. (1986). The role of biofeedback in Kegel exercise training for stress urinary incontinence. American Journal of Obstetrics and Gynecology, 154(1), 58-64.

- Christmas, T. J., Noble, J. G., Watson, G. M., & Turner-Warwick, R. T. (1991). Use of biofeedback in treatment of psychogenic voiding dysfunction. Urology, 37(1), 43-45.
- Crimmins, CR., Rathbun, SR., Husmann, DA. (2003). Management of urinary Incontinence and nocturnal enuresis in attention-deficit hyperactivity disorder. Journal of Urology. Oct;170(4 Pt 1):1347-50.
- Eldridge, M., Gerson, A. (2004). Real kids, real problems, realistic treatment options. Dysfunctional elimination syndrome in pediatric populations. Family Urology, 9-1. 11-13.
- Friedman, Arnold J. (1990). A Simplified Urogynecologic Workup. American Uro-Gynecologic Society. Vol. 8 No.4
- Glassman, S. (1998). Children and charge. Advance for Physical Therapists, 9(25), 25-27.
- Glazer, H., MacConkey-Sandalcidi, D. (1996). Functional rehabilitation of the pelvic floor muscles: A challenge to tradition. Urologic Nursing, 16, 68-69.
- Griffin, G., Roberts, SD., Graham, G. (1999). How to resolve stool retention in a child. Underwear soiling is not a behavior problem. Jan;105(1)159-61, 165-6, 172-3.
- Greydanus, DE., Patel, DR. (2002). The female athlete. Before and beyond puberty. Pediatric Clinics of North America. Jun;49(3):553-80.
- Goldraich, N. P., & Goldraich, I. H. (1992). Follow-up of conservatively treated children with high and low grade vesicoureteral reflux: A prospective study. The Journal of Urology, 148, 1688-1692.
- Hanson, E., Hellstrom, A. L., & Hjalmas, K. (1987). Non-neurogenic discoordinated voiding in children. The long-term effect of bladder retraining. Surgery in Infancy and Childhood, 42, 109-111.

- Hellerstein, S., Linebarger, J.S. (2003). Voiding dysfunction in pediatric patients. Clinical Pediatrics. Jan-Feb;(42):1:43-9.
- Hellstrom, A. L., Hjalmas, K., & Jodal, U., (1987). Rehabilitation of the dysfunctional bladder in children: Method and 3-year follow-up. The Journal of Urology, 138, 847-849.
- Hinman, F. (1986). Nonneurogenic neurogenic bladder (the Hinman Syndrome)-15 years later. The Journal of Urology, 136, 769-777.
- Hoebcke, P., Walle, J. V., Theunis, M., De Paepe, H., Oosterlinck, W., & Renson, C. (1996). Outpatient pelvic-floor therapy in girls with daytime incontinence and dysfunctional voiding. Urology, 48, 923-927.
- Jerkins, G. R., Noe, H. N., Vaughn, W. R., & Roberts, E. (1987). Biofeedback training for children with bladder sphincter incoordination. The Journal of Urology, 138, 1113-1115.
- Jones, C. L., Walker, R. G., & Powell, H. R. (1993). Recent advances in the management of vesico-ureteric reflux. Journal of Paediatrics and Child Health, 29, 325-327.
- Kegel. A. H. (1949) The physiologic treatment of poor tone and function of the genital muscles and of urinary stress incontinence. Western Journal of Surgical Obstetrics and Gynecology, 57, 527.
- Kline, N. J.,(2001) Management of primary nocturnal enuresis. Urologic Nursing. 21(2) 71-76.
- Klarskov, P., Heely, E., Nyholdt, I., Rottensten, K., & Nordenbo, A. (1994). Biofeedback treatment of bladder dysfunction in multiple sclerosis. a randomized trial. Scandinavian Journal of Urology and Nephrology, 157, 61-65.
- Kodman-Jones, C., Hawkins, L., Schulman, S.L. (2001). Behavioral characteristics of children with daytime wetting. Journal of Urology Dec(6):2392-5.

Lancet. (1992). Vesicoureteric reflux and nephropathy. (Editorial) Williams & Wilkins. Available: Health Reference Center, Denver Public Library. Electronic Collection: A11958788. The Lancet, 339(8790), 398-402.

Lettgen, B, von Gontard, A., Olbing, H., Heiken-Loweenau, C., Gaebel, E., Schmitz, I. (2002) Urge incontinence and voiding postponement in children: Somatic and psychosocial factors. Acta Paediatrica 91(9):978-84. Discussion 895-6.

Linsenmeyer, T., (2004). Urinary incontinence following spinal cord injury-facing special challenges. Quality Care Newsletter from the National Association for Continence. Vol.22, No.3, 1-2.

Mack, A., Dry All Night. Little, Brown and Company, Boston, New York, Toronto, London. 1989

Maizels, M., & Firlit, C.F., (1979). Pediatric urodynamics: a clinical comparison of surface versus needle pelvic floor/external sphincter electromyography. The Journal of Urology, 122, 518-522.

Maizels, M., King, L. R., & Firlit, C. F. (1979). Urodynamic feedback: a new approach to treat vesical sphincter dyssnergia. The Journal of Urology, 122, 205-209.

Mosby's Medical, Nursing, and Allied Health Dictionary (4th ed.). (1994). Available: Denver Public Library; Health Reference Center, X13400.

Nolan, T., Debelle, G., Oberklaid, F., & Coffey, C. (1991). Randomized trial of laxatives in treatment of childhood encopresis. The Lancet, 338(8766), 523-525.

Online Medical Dictionary. (1997/1998). [Online] Available: <http://www.graylab.ac.uk/cgi-bin/omd>. [1998, July 13].

Pappo, I., Meyer, S., Winter, S., & Nissan S. (1988). Treatment of faecal incontinence in children with spina bifida by biofeedback and behavioural modification. Surgery in Infancy and Childhood, 43, 36-37.

- Reddy, PP., Redman, JF. (2003). The management of childhood voiding dysfunction. J Ark Med Soc. Mar;99(9):295-8.
- Rhodes, C. (2000). Effective management of daytime wetting. Paediatric Nursing. Mar;12(2):14-7.
- Rushton, H. G. (1995). Wetting and functional voiding disorders. Urologic Clinics of North America, 22(1), 75-93.
- Scharf, M., Waking Uo Dry - How to End Bedwetting Forever. Writers Digest Books, Cincinnati, Ohio. 1986
- Scharf, M.B., Pravada, M.F., Jennings, S.W., Kauffman, R., & Ringel, J. (1987). Childhood Enuresis: A comprehensive treatment program. Psychiatric Clinics of North America, 10, 655-666.
- Schmidt, B.D. (1997). Nocturnal enuresis. Pediatrics in Review, 18(6), 183-190.
- Smellie, J. M., Poulton, A., & Prescod, N. P. (1994). Retrospective study of children with renal scarring associated with reflux and urinary infection. British Medical Journal, 308(6938), 1193-1194.
- Sureshkumar, P., Craig, JC., Roy, LM., Knight, JF. (2001). A reproducible pediatric daytime urinary incontinence questionnaire. Journal of Urology. Feb;165(2):569-73.
- Susset, J. G., Galea, G., & Read, L. (1990). Biofeedback therapy for female incontinence due to low urethral resistance. The Journal of Urology, 143, 1205-1208.
- Wall, L. L., & Davidson, T. G. (1992). The role of muscular re-education by physical therapy in the treatment of genuine stress urinary incontinence. Obstetrical and Gynecological Survey Review, 47(5), 322-331.
- Wennergren, H. M., Oberg, B. E., & Sandstedt, P. (1991). The importance of leg support for relaxation of the pelvic floor muscles. Scandinavian Journal of Urology, 25, 205-213.

- Wennergren, H., & Oberg, B. (1995). Pelvic floor exercises for children: a method of treating dysfunctional voiding. British Journal of Urology, 76, 9-15.
- Whitehead, W. E., Parker, L., Bosmajian, L., Morrill-Corbin, E.D., Middaugh, S., Garwood, M., Cataldo, M. F., & Freeman, J. (1986). Treatment of fecal incontinence in children with spina bifida: comparison of biofeedback and behavior modification. Archive of Physical and Medical Rehabilitation, 67, 218-224.
- Workman, D. E., Cassisi, J. E., & Dougherty, M. C. (1993). Validation of surface EMG as a measure of intravaginal and intra-abdominal activity: implications for biofeedback-assisted kegel exercises. Psychophysiology, 30, 120-125.
- Younoszai, M. K. (1992). Stooling problems in patients with myelomeningocele. Southern Medical Journal, 85(7), 718-724.