Section A-Research paper

Nocturnal Enuresis Overview among Pediatrics

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Abstract

Enuresis is defined as the voluntary or involuntary repeated discharge of urine into clothes or bed after a developmental age when bladder control should be established. Most children with a mental age of 5 yr have obtained bladder control during the day and night. The diagnosis of enuresis is made when urine is voided twice a week or more for at least 3 consecutive months or when clinically significant distress occurs in areas of the child's life as a result of the wetting. Primary nocturnal enuresis (NE): refers to involuntary loss of urine during sleep in patients who have never achieved a sustained period of dryness. Secondary NE is enuresis that develops after a patient has achieved a sustained period of bladder control. The pathogenesis of NE has centered on three hypotheses; children who wet at night sleep deeply, have small bladder capacity and/or have nocturnal polyuria secondary to lack of the physiological nocturnal peak of vasopressin.

Keywords: Pediatrics, Nocturnal Enuresis

Introduction

Enuresis is defined as the voluntary or involuntary repeated discharge of urine into clothes or bed after a developmental age when bladder control should be established. Most children with a mental age of 5 yr have obtained bladder control during the day and night. The diagnosis of enuresis is made when urine is voided **twice** a week or more for at **least 3 consecutive months** or when clinically significant distress occurs in areas of the child's life as a result of the wetting **(1).**

Primary nocturnal enuresis (NE): refers to **involuntary** loss of urine during sleep in patients who have **never** achieved a sustained period of dryness. **Secondary** NE is enuresis that develops after a patient has achieved a sustained period of bladder control **(2).**

A) **Monosymptomatic Enuresis** (uncomplicated enuresis) involves **mere** voiding at night with no associated uro–genital nor gastero-intestinal manifestations including UTI or bladder dysfunctions **(3).**

B) **Non-monosymptomat** enuresis (poly-symptomatic, complicated enuresis)is associated with day- time symptoms i.e :severe urgency, day-time incontinence, increased or decreased voiding frequency, chronic constipation or encopresis **(3).**

It is worth noting that becoming dry at night is a developmental maturational process i.e: children with primary enuresis typically fail to wake from sleep in response to bladder sensation or fail to inhibit bladder contractions during sleep **(3).**

Epidemiology

Primary enuresis steadily decreases with age , with spontaneous remission rate of about 15% annually. It is experienced by about 30% of 4 years old, 10% of 6 years old, 7% of 7 years old, 5%of 10-years old,33% of12-year old and1-2% of 18-year old. Boys are 1.5-2 times more likely to experience enuresis than girls than girls. Secondary enuresis accounts for less than 25% of cases. Cross cultural studies indicate quite consistent findings **(3).**

Infrequent bedwetting (ranging from < twice a week to < once a month) is even more frequent. The more severe the bed wetting, in terms of frequency, the more likely it is to persist **(3).**

Pathogenesis

The pathogenesis of NE has centered on three hypotheses; children who wet at night sleep deeply, have small bladder capacity and/or have nocturnal polyuria secondary to lack of the physiological nocturnal peak of vasopressin.

By combining all the three theories it is likely to understand why children are likely to wet at night **(4).**

Etiology and Risk Factors of Nocturnal Enuresis

1) Sleep arousal disorder:

Parents are the first to suggest that this factor is fundamental to the wetting in their children and clinical studies support this perspective **(5).**

The longer a child sleeps and the smaller the functional bladder capacity, the more likely that the nocturnal urine production will exceed the bladder capacity. A six-year old child sleeps an average of about 10.75 h and has an expected functional bladder capacity of only 7 oz **(6).**

In lieu of the long sleep duration, small nocturnal bladder capacity, and propensity of kindergarten and elementary school-aged children to drink and snack in the evenings; it is remarkable that nocturnal enuresis is not even more prevalent. **(6).**

2) Reduced nocturnal bladder capacity:

The expected functional nocturnal bladder capacity increases from 6 oz at the age of 5 years to 11 oz at the age of 10 years **(7)**

Even a normal functional bladder capacity is therefore a limitation to dryness in kindergarten and early elementary-aged children. Any condition that further reduces bladder capacity would appreciably enhance the prevalence of bedwetting. The two most common conditions that reduce the expected functional bladder capacity are cystitis and constipation **(8)**

Cystitis is more common in girls and relatively straight forward to identify with a urinalysis and urine culture.Constipation, however, is subtle and appreciably under recognized as a factor. Many children with nocturnal enuresis have a bowel pattern that places them at risk for nocturnal enuresis but that does not conform to current definitions of constipation. When a liberal definition was used, abnormal bowel health was present in 75% of children with PNE and 58% of children with SNE **(6).**

O'Regan et al, (9) reported the association of constipation with bedwetting. Studies have not clarified precisely how constipation causes nocturnal enuresis. Presumably the physical presence of stool has a direct impact on the bladder capacity The pelvic bones form a funnel and the bladder is located in the narrowest dependant portion. The volume of a child pelvis is small and the bladder cannot escape the impact of stool.

Another theoretical possibility is that nocturnal colonic movement might stimulate a detrusor contraction **(6).**

Once a child leaves home in the morning to attend kindergarten or elementary school, a parent often loses touch with the bowel health of their child **(10).**

3) Reduced vasopressin production during sleep

A low nocturnal secretion of ADH is recognized as a possible cause of nocturnal polyuria **(**resulting in high urinary volume that exceeds age –related bladder capacity. **(6).**

Nocturnal polyuria the four factors that might contribute to nocturnal polyuria include the evening fluid intake, the evening solute intake, the daytime fluid and solute intake, and the nocturnal secretion of antidiuretic hormone (ADH)**, (6).**

The evening fluid intake of a child is a basic and often poorly controlled factor. Many parents experiment with fluid restriction and when the wetting does not resolve, these parents presume fluid intake is not a factor, and allow surprisingly large fluid intakes in their child **(10).**

The evening solute intake is another factor. Many elementary aged children eat dinner within a few hours of an early bed time. Many children have a bedtime snack. Overnight, the kidney is obliged to process the evening solute intake and the excess solute will result in urine production. Children with nocturnal enuresis

might have an abnormal circadian rhythm with increased water and solute retention during the day and the reverse by night **(2)**.

Many children with nocturnal enuresis do not drink appreciable amounts of fluid during the morning and afternoon, especially on school days.

Presence of positive family history is a strong etiological factor, as there is a genetic component in NE, studies indicate 74% prevalence rate if both parents were enuretic during childhood and 44% if one parent had enuresis as a child in comparison to 15% if neither parent had a history of enuresis Genetic linkage of sleep enuresis is **autosomal dominant** and has been noted for chromosome 22-q,13-q and 12-q. **(3).**

Other Contributing Factors:

- Nocturnal Enuresis found to be more common in children with attention deficit hyperactivity disorder (ADHA) by almost 3 folds supporting that psychological and neuro developmental factors are issues to be considered when dealing wih children having such complaint **(11).**
- Primary Nocturnal Enuresis (PNE) is commonly associated with breathing, fragmentated sleep or other manifestation as in partial arousal parasomnia (sleepwalking) (**12).**
- Secondry Enuresis is usually attributed to the presence of diseases that cause inability to concentrate urine, as in DM, DI or SCD., ingestion of caffeine or diuretics that eventually causes increased urine production, presence of urinary tract pathology eg, UTI, irritable bladder or malformation of urinary tract **(3).**
- Primary obstructive sleep apnea syndrome (OSA) has been associated with PNE and SNE in more than 47% of children with OSA. Mechanism postulated is disruption of physiological pattern of nocturnal m Moreover, resolution of EN following adenotosillectomy occurs in 55-77% (**12).**
- Neurologic pathology, e.g: nocturnal epilepsy. and psychosocial stressor such as parental divorce or death such as parental divorce or death are sometimes underlying factors. **(3).**
- **Maturatinal delay c**an be considered as a contributing factor it refers to the enuretic child's inability to send, perceive or respond to information about a filled bladder during the night. Support for this theory comes from the **spontaneous** cure rate**. (3).**

Management of nocturnal enuresis

The goals of treatment are to control or eliminate the underlying cause of the condition and to reduce the social and psychological impact. To further develop and preserve self-esteem,

I. Making-up The Diagnosis: -

1) **Detailed history** with a particular focus on the family history of enuresis, child's pattern of wetting and the previous interventions and whether the child has ever been dry at night to clarify the type of NE whether primary or secondary **(13).**

The diurnal enuresis and the constipation should be treated prior to more invasive investigations, unless history or physical examination suggests otherwise.

A positive family history may make the family more sympathetic to the child's feelings .It may be helpful to elicit the parent's own experience with enuresis and how it affects the response to their child **(14).**

The positive and the negative interventions previously taken should be evaluated if they were appropriately implemented and their secondary effects (e.g, on the child's self esteem).The child must be motivated to be cured if treatment to be successful **(13).**

2) **Physical Examination:**

Careful examination should be done to detect signs of renal impairment - abnormality of external genitalia, spinal abnormalities and to do good assessment of kidney and bladder size and abdominal examination for masses. Lower limb neurological deficits should be judged **(13).**

II. Investigations of Nocturnal Enuresis:

History (enuresis-specific):

- Age at onset of enuresis, duration and severity of enuresis, duration of continence (enuresis is not diagnosed in children younger than five years; recurrence after at least six months of urinary continence suggests secondary enuresis) **(15).**
- Presence of lower urinary tract symptoms (symptoms other than nocturia suggest nonmonosymptomatic and secondary enuresis) **(16).**
- History of medical illness (e.g., diabetes mellitus, sleep apnea) may suggest nonmonosymptomatic enuresis **(17).**
- Psychosocial history (psychological disturbances are present in one third of patients with secondary enuresis) **(18).**
- Family history of enuresis (the condition is more common in patients with a family history; in the case of twins, both children are usually affected) **(18)**
- Fluid-intake diary, bladder and stooling diary, frequency/volume chart (records help assess constipation, enuresis severity, and treatment response) **(15).**

Physical examination:

- Ears, nose, and throat examination to detect adenotonsillar hypertrophy **(15).**
- Abdominal examination to detect enlarged bladder or kidneys and fecal masses indicating encopresis **(17).**
- Genital examination to detect hypospadias or epispadias, meatal stenosis, ectopic ureter, and labial adhesions **(18).**
- Rectal examination to evaluate perianal and perineal sensation and rectal sphincter tone and to detect perianal excoriation and vulvovaginitis **(15).**
- Focused neurologic evaluation, including gait, muscle tone, strength, and perineal sensation **(18).**

Urinalysis, urine culture:

Detection of urinary tract infection, diabetes mellitus, diabetes insipidus **(17).**

Blood count, serum chemistry:

Blood urea nitrogen and serum creatinine levels to detect chronic renal failure, serum glucose levels to detect diabetes, hemoglobin electrophoresis to detect sickle cell disease, serum thyroid-stimulating hormone level to detect hyperthyroidism **(10).**

Imaging studies:

Renal and bladder ultrasonography and voiding cystourethrography for a suspected structural abnormality, significant daytime wetting, or recurrent urinary infections to detect vesicoureteral reflux **(10).**

Magnetic resonance imaging of the lumbosacral spine for suspected spinal dysraphism or abnormal neurologic examination findings **(15).**

Urodynamic studies:

Measurement of residual urine and cystometry to evaluate bladder dysfunction (dysfunctional voiding) **(18).**

III. Treatment of Nocturnal Enuresis:

The most important reason to treat enuresis is to minimize the embarrassment and anxiety of the child and the frustration experienced by the parents. Most children with enuresis feel very much alone with their problem. Family members with a history of enuresis should be encouraged to share their experiences and offer moral support to the child. The knowledge that another family member had and outgrew the problem can be therapeutic **(11).**

There is no one universally successful treatment for nocturnal enuresis. Successful treatment of nocturnal enuresis requires therapy directed simultaneously at each of the three pathophysiological causes of bedwetting **(6, 16).**

The most specified modalities to treat NE include:

1. Good bladder health recommendations:

Children with nocturnal enuresis benefit from counseling on good bladder health **(6).** Children should be counseled to void regularly enough to avoid urgency and urgency incontinence. Children who void infrequently should be counseled to void at least once every 1.5–2 h. Many children do not void at all during school hours. A good rule is that children should void two or three times during school hours. Girls and boys who prefer to sit to void should be counseled on the optimal posture to relax the pelvic floor muscles to facilitate good emptying. Boys who stand to void should be counseled to pull their zipper or their pants down such that the penis is not bent during voiding **(10).**

2. Interventions used to treat nocturnal enuresis

A) Behavioral interventions

- Lifting: involves taking the child to the toilet during the night usually before the time that bedwetting is expected, without necessarily waking the child.
- Waking: involves waking the child to allow him/her to get up and urinate.
- Reward systems (e.g. star charts): the child might receive a star for every dry night, and a reward after a preset number of stars have been earned.
- Retention control training: attempting to increase the functional bladder capacity by delaying urination for extended periods of time during the day.
- Stop-start training: teaching children to interrupt their stream of urine in order to strengthen their pelvic floor muscles.
- Dry bed training: can include enuresis alarms, waking routines, positive practice, cleanliness training, bladder training, and rewards **(11).**

B) Enuresis alarms

- Enuresis alarms wake the child in the night at the onset of wetting i.e when a child begins to urinate, a sensor (either a bed pad or one worn inside pajamas) is moistened, and the alarm is triggered
- **Over-learning:** may be initiated after successful alarm treatment e.g. achievement of 14 consecutive dry nights). Extra drinks are given at bed-time to cause additional stress to the detrusor muscles in the bladder. Alarm treatment is then continued until 14 consecutive dry nights are once again achieved **(11).**

3. Pharmacological treatment

Drugs: include desmopressin and, less commonly, tricyclic drugs such as imipramine, amitriptyline and nortriptyline Desmopressin acetate is available in a new lyophylisate preparation as well as a tablet and an intranasal spray **(19)**.

The new lyophylisate preparation is ideal for children who have difficulties swallowing a tablet and in a study by **Lottmann et al, (20)** was favored over the tablet by children under the age of 12 years. The only serious reported adverse event with desmopressin is water intoxication **(6).**

Pharmacological options to improve bladder capacity include antimuscarinic medications such as oxybutynin and tolteridine **(21).**

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