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Advances in Surgical Treatment of Urinary Incontinence

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Urinary incontinence is demonstrated by any involuntary loss of urine. Common types include stress incontinence, urge incontinence and overflow incontinence. It can affect both male and female patients, causing social and hygienic problems. Female stress incontinence has a prevalence of eight to 33 % [1]. Pathophysiological mechanisms include urethral hypermobility and intrinsic sphincter deficiency. Treatment of female stress incontinence ranges from conservative treatment e.g. pelvic floor muscle training, weight loss to invasive surgical treatment e.g. synthetic sling procedures, colposuspension, etc. Treatment success rates depend on various definitions e.g. validated questionnaires, pad tests and urodynamic studies.

Pelvic floor muscle training is non-invasive and best instructed by dedicated therapists for optimal outcomes. It can reduce severity of stress incontinence in up to 60% of patients but seldom cures[2]. Studies have shown that simultaneous biofeedback has no additional benefit. Weight reduction is another common recommendation to patients with stress incontinence. There is one randomized controlled trial (RCT) which shows that in patients with body mass index of greater than 36, eight per cent of body weight reduction leads to significant reduction (more than 70%) of incontinence episodes at six months[3]. However, it is very difficult to maintain weight reduction in the long run.

Duloxetine is a balanced serotonin and norepinephrine reuptake inhibitor. It stimulates the pudendal motor neurons and increases striated sphincter contractility. One RCT has shown that duloxetine causes a significant reduction in urinary incontinence episodes when compared with placebo (50% vs 27%).[4] Duloxetine is approved in Europe for the indication of female stress incontinence but it is not US FDA approved. The commonest side effect is nausea. Urethral bulking agents had been developed for the treatment of intrinsic sphincter deficiency (ISD). Collagen, approved in 1993, had been associated with allergy, reabsorption and became obsolete. Teflon had its own problem of migration.[1] Currently Macroplastique and Coaptite, both synthetic and durable, are still used in selective patients with ISD who cannot tolerate more invasive treatments. However, one RCT has shown a disappointing cure rate of Macroplastique when compared with pubovaginal sling (PVS) procedure in the treatment of ISD. The objective cure rate of Macroplastique and PVS at six months is nine per cent and 81% respectively[5].

Open retropubic suspension procedure has been developed as an effective treatment of urethral hypermobility.[6] Burch colposuspension involves the suturing of anterior vaginal wall to ileo-pectineal ligament. Marshall-Marchetti-Krantz procedure involves the suspension of bladder neck to pubic symphysis. The one year and five year success rate of open retropubic suspension procedure was 90% and 70% respectively. Burch colposuspension has fewer surgical failures and has since become the gold standard treatment of urethral hypermobility. Studies have shown slightly worse cure rates in laparoscopic Burch colposuspension group when compared with open approach.[7] However, the laparoscopic approach is associated with fewer complications and shorter hospital stay.

Anterior colporrhaphy is a vaginal approach to tackle urethral hypermobility and cystocele at the same time. However, it is associated with two times higher failure rate at five years when compared with retropubic suspension procedures.[8] Bladder neck needle suspension is a minimally invasive procedure which involves the passage of sutures from vagina to anterior abdominal wall, with an attempt to correct urethral hypermobility. It is also associated with a much higher failure rate (29%) at one year when compared with retropubic suspension procedures (16%). Both anterior colporrhaphy and bladder neck needle suspension are not recommended as primary treatment of female stress incontinence.

In 1990s, Petros and Ulmsten postulate the importance of mid-urethral support as the physiologic backboard in maintaining female urethral stability.[9] This subsequently evolves into the integral theory, which involves various pelvic fascia and ligamental support of pelvic organs. The importance of mid-urethral support has led to the development of various synthetic slings, which become the new gold standard in treatment of urethral hypermobility. There are two main approaches in the insertion of mid-urethral synthetic slings: retropubic and trans-obturator. The retropubic mid-urethral slings include two commonly used tension-free vaginal tapes, with different insertion approaches - bottom-up approach *(Fig. 1)* and top-down approach *(Fig. 2)*. Three RCTs have shown that the bottom-up approach has a slightly higher subjective and objective cure rates than the top-down approach at 12 months follow up.[10] Trans-obturator approach has been developed to minimize the complications of vascular or bowel injuries associated with retropubic approach. There are two kinds of trans-obturator mid-urethral slings with different insertion approaches - outside-in approach *(Fig. 3)* and inside-out approach *(Fig. 4)*. Both trans-obturator slings have similar subjective and objective cure rates but the inside-out approach is associated with less bladder injuries and voiding dysfunction.[11] In 2010, a multi-center trial showed equivalent objective successes at 12 months with both retropubic and trans-obturator mid-urethral slings. Trans-obturator approach is associated with more leg weakness or groin numbness. Retropubic approach is associated with more bladder injuries and de-novo voiding dysfunction.[12] However, a small trial in 2008 showed that while both trans-obturator and retropubic mid-urethral slings had similar outcomes in treatment of mild stress incontinence, only 66% of severe stress incontinence patients were cured by trans-obturator slings and all were cured by retropubic slings.[13] Mini-sling involves a single vaginal incision with self-fixating tips to obturator muscles. While mini-sling seems appealing as a more minimal-invasive approach, early result has shown a much higher rate of persistent stress incontinence when compared with retropubic mid-urethral slings.[14]

Pubovaginal sling, which involves the harvesting of autologous fascia e.g. anterior rectus sheath, has been developed to treat intrinsic sphincter deficiency - severe stress incontinence. When PVS is employed to treat urethral hypermobility, it is associated with a higher success rate but more voiding dysfunction and bladder outlet obstruction when compared with Burch colposuspension or mid-urethral sling procedures.[15,16]

Male stress urinary incontinence is mainly iatrogenic. The incidence of stress incontinence after radical prostatectomy ranges from two to 43%, post-radiotherapy one to 16% and post-transurethral resection of prostate one to three per cent.[17] There are limited conservative treatment options of male stress urinary incontinence e.g. penile clamps, urethral bulking agents or indwelling catheters. For those patients with persistent (at least six to 12 months after previous insult) significant urine leakage, surgical options are considered. Urethral and bladder pathologies have to be excluded. Mental capacity and hand function are other important consideration of surgical options.

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Male slings are less invasive surgical options, which do not require patients' manual control. There are three main types of male slings.[17] Bone-anchored slings directly compress on the bulbous urethra and have cure rates of 37 to 67% and improvement rates of 10 to 40%. However, it is associated with perineal pain in up to 73% of patients, which typically resolves in four months. Other common complications of male slings include infection or erosion which requires removal, and de-novo urgency. Retrourethral transobturator slings cause angulation of the bulbous urethra and have cure rates of 52 to 74% and improvement rates of 16-27%. It may lead to temporary urinary retention for up to two weeks. Adjustable retropubic slings have success rates of 54 to 79% but are associated with more complications e.g. erosion, bladder perforation and urinary retention.

Artificial urinary sphincter (AUS) has been popularized for male stress incontinence since its introduction in 1978. The most popular model *(Fig. 5)* is characterized by a pump with deactivation button, cuff size of 3.5 to 14cm and a reservoir with different pre-set pressures. The follow up of AUS is much longer than male slings with mean of three to 7.7 years.[17] The social continence rate (zero to one pad per day) is 59 to 91%. Common complications include urethral atrophy, erosion, infection and mechanical failure. Most revisions are performed within the first 36 to 48 months after implantation. Long-term mechanical failure rate is up to 36% at ten years. In recent years, a new AUS system *(Fig. 6)* has been introduced into the market.[18] The new device is simplified with a one-size-fit-all adjustable cuff. The pump and pressure-regulating tank (adjustable after implantation) are combined into a single unit. There is no abdominal reservoir. At a mean follow up of 15.4 months, the social continence rate is 73% at six months. Complications of erosion or infection have also been reported in early series.

There is no universally accepted standard of stratification for male stress incontinence treatment. Common considerations include degree of incontinence, ability to handle AUS, prior treatment, complication profiles, patient preference and surgical expertise. For patients with high volume of urine leakage, AUS is the gold standard of treatment. Male slings are surgical alternatives for patients with lower volume of urine leakage e.g. one to three pads per day. After all, it is uncommon to have complete resolution of urinary incontinence. Patient counseling on reasonable expectation and potential complication is the key to success.

Retropubic mid-urethral slings

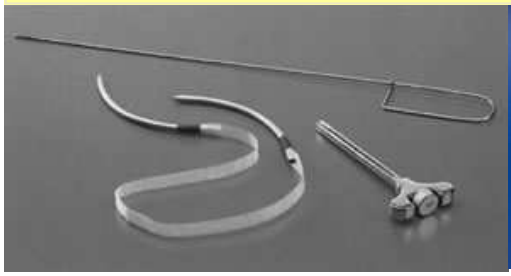

Fig. 1 Bottom-up approach

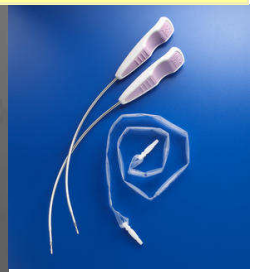

Fig.2 Top-down approach

Trans-obturator mid-urethral slings

Fig. 3 Outside-in approach

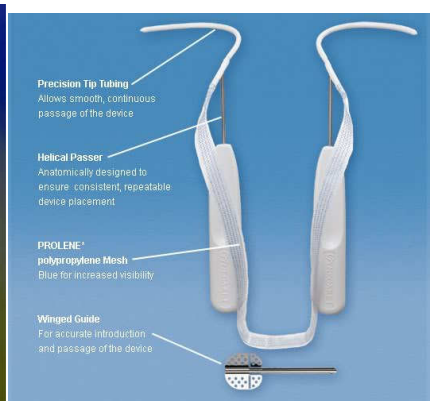

Fig.4 Inside-out approach

Artificial urinary sphincters (AUS)

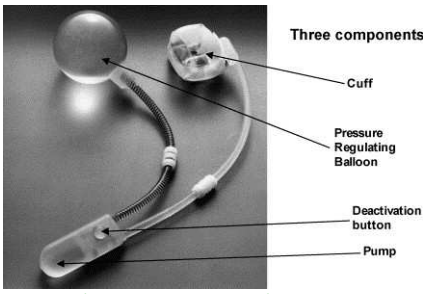

Fig.5 Three-component device

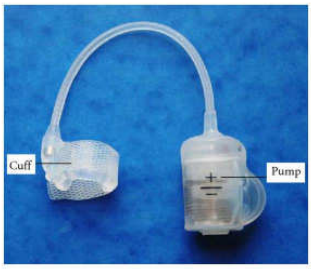

Fig.6 Two-component device

**Picture Source: From Internet **

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Nocturnal enuresis in children

by S K Chan Becky, Continence Nurse Consultant, Kowloon East Cluster

Introduction

Nocturnal enuresis is a lower urinary tract symptom (LUTS) and is defined as a compliant of loss of urine occurring during sleep. It can be classified as primary nocturnal enuresis and secondary nocturnal enuresis.

Primary nocturnal enuresis –this is the recurrent involuntary loss of urine during sleep by a child aged 5 years or older, who has never achieved consistent night –timed dryness .This may further be subdivided into children who has enuresis only at night and those who also have daytime symptoms (urgency , frequency ,or daytime wetting).

Secondary nocturnal enuresis –this is the involuntary loss of urine during sleep by a child who has previously been dry for at least 6 months.

Primary nocturnal enuresis most often represents development delay which resolves in time .In secondary nocturnal enuresis the patient regresses after a period of continence, which requires the exclusion of underlying pathology.

Epidemiology of Nocturnal Enuresis

The epidemiology of nocturnal enuresis is complicated by the variety of definitions used in studies. The prevalence of bedwetting decreases with age. The Avon Longitudinal Study found that infrequent bedwetting (defined in their study as bedwetting less than 2 nights per week) has a prevalence of 21% at 4 years and 6 months and 8% at 9 years and 7 months of age. Nocturnal enuresis (defined in their study as bedwetting more than 2 nights per week) has a prevalence of 8% at 4 years and 6 months and 1.5% at 9 years and 7 months of age 11.

An epidemiological study in Hong Kong defined bedwetting as ≥ 1 wet night over a 3 month period and reported a prevalence of 16.1% at age 5 years, 10.1% at 7 years and 2.2% at 19 years. The prevalence is greater for boys than girls at all ages.

Risk factors

There are many causes of bed wetting and others remain unclear. Usually people produce less urine when they are sleeping .However , some children produce large amount of urine during the night, which may explain why the bladder needs emptying then .There are a number of factors that predispose to persistent nocturnal enuresis.

Genetic factors
The risk of nocturnal enuresis is 15% if neither parent was affect, 40% if one parent was affected and 75% if both had the condition.

Disease
Urinary tract infection is very common associated with day time wetting ,particularly in girl but is less common in nocturnal enuresis .Even though the child with nocturnal enuresis may be five to six times more likely to have a urinary tract infection than the child who does not wet the bed.

Children with attention deficit hyperactive disorder (ADHD) have an increased risk of having a bedwetting problem.

Sleep apnoea (pauses in breathing whilst sleep) due to an obstructed airway and diabetes may cause bedwetting.

Medication
Some medicines prescribed for completely unrelated problem can change the way the urinary system work and cause less control than normal. These medications include common drugs for heart problem ,mental illness and anxiety.

Bowel problem
Constipation can cause bladder problems .Those with severe constipation, benefited from treatment of their constipation and their treatment cured about two third of their nocturnal enuresis .23% nocturnal enuresis is associated with encopresis and daytime incontinence.

Sleep patterns
Parents commonly allege that their bed-wetting child sleep particularly deeply .However ,sleep studies donot show the patterns of sleep are different in child who wet the bed compared who are dry .Wetting events are distributed randomly throughout the different sleep stages.

Psychological state
Although children with definite psychiatric illness have a high incidence of nocturnal enuresis , most children with nocturnal enuresis are not psychiatrically illness .Unhappiness and psychological stress in the family are common but are probably the result rather than the cause of bed –wetting.

Bladder capacity
A child with nocturnal enuresis trends to have small functional bladder capacity.
Some children have an “overactive bladder “which causes problems at night as well as during the day. Several studies have found a high incidence of detrusor instability with nocturnal enuresis . Detrusor over activity has been found in up to 70-80% of primary nocturnal enuresis.

Antidiuretic activity
Some children have been shown to have lower nocturnal vasopressin levels than non –bed wetting children and did not display the usual difference between antidiuretic level at day and night.

Drinking habits
Drinks containing caffeine and theophylline drinks (tea, coffee, cola and chocolate) can aggravate the situation by their diuretic action.

Assessment

Most children who wet the bed have an unexceptional medical history and are apparently healthy.

◊ Ask whether the bedwetting started in the last few days or weeks. If so, consider whether this is a presentation of a systemic illness.

◊ Ask if the child had previously been dry at night without assistance for 6 months. If so, enquire about any possible medical, emotional or physical triggers, and consider whether assessment and treatment is needed for any identified triggers.

◊ Ask about the pattern of bedwetting, including questions such as:
- How many nights a week does bedwetting occur? How many times a night does bedwetting occur?
- Does there seem to be a large amount of urine?
- At what times of night does the bedwetting occur?
- Does the child or young person wake up after bedwetting?

◊ Ask about the presence of daytime symptoms in a child with bedwetting, including:
- daytime frequency (passing urine more than seven times a day)
- daytime urgency
- daytime wetting
- passing urine infrequently (fewer than four times a day)
- abdominal straining or poor urinary stream
- pain passing urine.

◊ Ask about daytime toileting patterns in a child with bedwetting, including:
- whether daytime symptoms occur only in some situations
- avoidance of toilets at school or other settings
- whether the child or young person goes to the toilet more or less frequently than his or her peers.

◊ Ask about the child 's fluid intake throughout the day. In particular, ask whether the child or the parents or carers are restricting fluids.

◊ Ask to fill a record of the child 's fluid intake, daytime symptoms, bedwetting and toileting patterns would be useful in the assessment and management of bedwetting. If so, consider asking the child and parents or carers to record this information.

◊ Assess whether the child has any comorbidities or there are other factors to consider, in particular:
- constipation and/or soiling
- developmental, attention or learning difficulties
- diabetes mellitus
- behavioural or emotional problems
- family problems or a vulnerable child, young person or family
- overactive bladder

Investigation

◊ Investigate and treat children with suspected urinary tract Infection.

◊ Children with suspected type 1 diabetes should be offered immediate referral to a multidisciplinary paediatric diabetes care team that has the competencies needed to confirm diagnosis and to provide immediate care .

Management

Explaining to the child and parents
It needs the child 's cooperation to be dry at night .As soon as the child is old enough to understand ,a simple explanation can be helpful .It's important for the child to know that parents want and expect him to be dry and that wet beds are a nuisance for everyone.

Child responsibility
When the child is up to 6, encourage the child to change any wet sheets. It may be quicker for parents to do it but many children respond to being given responsibility .It might also give extra motivation for them to get out of bed and go to toilet to avoid to changing the sheets.

Lifting and awakening
Lifting is carrying or walking a child to toilet. Lifting without waking means that effort is not made to ensure the child is fully woken. Awakening means waking a child from sleep to take them to the toilet.

Some patients find that if they "lift" their child when they go to bed, the bed will be dry in the morning .this is a reasonable maneuver to lessen the amount of wet bedding but it does not train the child to be dry. The child has to get used to waking up when their bladder is fill. However, make sure the child goes to toilet just before bedtime.

Getting up
Make sure there are no hidden fears or problem about getting up at night, for example fear of dark or spiders .try leaving the toilet light on.

Fluid regime
Restricting drinks sound sensible but it does help to cure bed wetting .The bladder has to get used to filling up and holding on to urine .A sensible plan is restrict to give drinks to the child 2-3 hours before bedtime. Do not restrict drinks for the rest of the day .Also, caffeine in tea, coffee cola and chocolate may make bedwetting worse These are ideally avoided , especially in the few hours before bed time .

Adequate daily fluid intake is important in the management of bedwetting
Daily fluid intake varies according to ambient temperature, dietary intake and physical activity. A suggested intake of drinks for children is 1-1.5L/day .

Treat constipation
Treatment of constipation often cures bedwetting too. High roughage food and bowel training was advice.

Reward systems
Explain that reward systems with positive rewards for agreed behavior rather than dry nights should be used either alone or in conjunction with other treatments for bedwetting.

Daily record chart
The child must keep a chart to record fluid intake and frequency of micturition day &night, the total night urine output, wet and dry nights.

Enuresis alarms
It have become deservedly popular in many countries because they can achieve dryness for 50-80% of children if used correctly.

There are two main types of alarm, both of which depend on the completion of electrical circuit when urine is passed and then an alarm goes off. The child then has to get out of bed, switch off the alarm and go to toilet before setting up the system again ready for another wetting event.

Pad and bell-the sensor pad is usually a plastic mat imprinted with electrical circuit which is connected by wire, to an alarm which id placed out of reach of the child while he is lying in bed .The mat is placed in the centre of the bed where wetness will occur first .

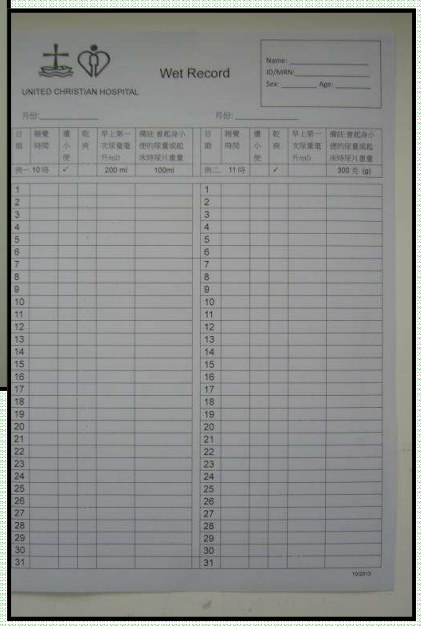
Body –wore alarm-a tiny electrical sensor is attached to the child's pants and is connected to a mini alarm worn on the shoulder or attach at the pyjama. Assess the response to an alarm by 4 weeks and continue with treatment if the child is showing early signs of response. Stop treatment only if there are no early signs of response.

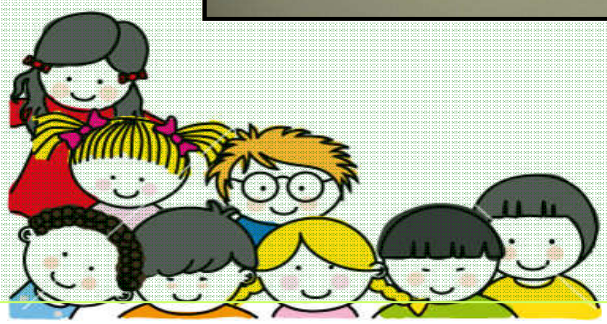
Drugs
A vast number if drugs have been given to children who wet the bed .Only few groups of drugs have been shown, in satisfactory controlled clinical trials, to lessen bed –wetting.

Antidiuretics-Desmopressin (DDAVP) produces temporary dryness for some children. Initially 120 microgram for DesmoMelt at bedtime .Restrict fluids from 1hour before dose to 8 hours after. If Desmopressinis being used long –term, withdraw for one week every 3 months to see if dryness has been achieved.

Anticholingeric drug –Oxybutynin .Do not use an anticholinergic alone for the management of bedwetting in children without daytime symptoms. Consider an anticholinergic combined with Desmopressin for bedwetting in children who also have daytime symptoms.

Tricyclic antidepressants –impramine.It is not known how imipramine cause temporary dryness. Imipramine can be used in an initial dose of 25mg at night and then increased to either 50mg or 75mg , depending on the size of the children. Consider imipramine for children with bedwetting who have not responded to all other treatments.





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