Clinical review

Managing nocturia
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Introduction

Nocturia, or frequent urination at night time, is a common but poorly reported and largely misunderstood urological disorder in adults. Although many people awaken during the night to urinate, the condition has received little attention in the medical literature, and definitions vary widely. The International Continence Society defines nocturia as two or more night time voids. In its simplest terms, nocturia refers to urination at night and entails some degree of impairment, with urinary frequency often considered excessive and disruptive. However, excessive urination may refer to either the volume of urine voided or the number of trips to the toilet, as normal frequency and volume for nocturnal urination have been poorly defined among all age groups. With no accepted distinction between normal and abnormal urination, doctors tend to overlook nocturia as a possible source of medical problems associated with the resultant loss of sleep, and patients tend not to report the condition to their doctors until it becomes unbearable or their quality of life during daytime hours is severely compromised. Nocturia has a role in numerous aspects of people's health and wellbeing, contributing to fatigue, memory deficits, depression, increased risk of heart disease, gastrointestinal disorders, and, at times, traumatic injury through falls. Adequate, restful sleep is important to everyone, regardless of age. Our entire way of life, our health, happiness, and ability to function at home and at work suffer from inadequate rest. Evidently nocturia is more complex and important a condition than recognised so far. Identifying nocturia, determining its causes, and treating it effectively are keys to improving patients' quality of life.

Sources

We searched Medline for 1980-2003 by using the key words “nocturia” and “nocturnal polyuria.” We selected 22 references for this review.

Causes

In general nocturia affects older people more than younger adults, and those aged 65 or greater are more likely to experience a need to urinate at night. Many people with nocturia, especially elderly men, also experience concomitant lower urinary tract problems, such as frequency, urgency, weak stream, and incontinence—symptoms often attributed to benign prostatic obstruction. Age, childbirth, and menopause are often suggested contributors to nocturia in women. Multiple factors may cause nocturia in both men and women; these include behavioural patterns, diuretic medications, caffeine, alcohol, or excessive fluids before bedtime, and pathological conditions, such as prostatic disease, diabetes mellitus or diabetes insipidus, obstruction of the lower urinary tract, anxiety, or sleep disorders. The condition may also result from stroke, cardiovascular disease, peripheral oedema, and myeloneuropathy.

Effects

Regardless of aetiology, nocturia is a condition demanding further study, since one primary effect is sleep disturbance, which is bothersome and far reaching, affecting physical health and mental wellbeing. It is
Nocturnal polyuria was first defined by Asplund in 1995 as increased nocturnal output of urine, yet parameters to quantify urinary overproduction have been established only recently, with some researchers characterising the condition as night time urine volume in excess of 6.4 ml/kg. Others define it as nocturnal output exceeding one third of one's total daily urine output; and still others consider nocturnal urine overproduction as a function of bladder capacity, determined via a recently developed nocturia index, which is defined as nocturnal urine volume divided by functional bladder capacity.

**Nocturnal polyuria**

Nocturnal polyuria can be a debilitating problem for many sufferers, and initial attempts at self management through fluid restriction are often futile and increase the patient's risk of dehydration. Recognising the disorder and determining its causes are therefore crucial to treating it effectively. A treatment algorithm serves as a valuable tool by which the doctor can make an accurate diagnosis of the condition (fig 1). Patients often present to the doctor with indirect symptoms, such as insomnia, excessive sleepiness during daytime, depression, and mood changes resulting from insufficient sleep. A complete history and physical examination must be conducted, taking into consideration various aspects of the patient's health, such as presence of sleep disorders, urinary problems, fluid intake, medications, and heart disease. Most important is a 24 hour voiding diary, in which each urinary void is entered with corresponding time and amounts voided (ml), and degree of urgency (1 = mild to 5 = severe). The patient may then be categorised as having one of three general categories of nocturia: nocturnal polyuria, low nocturnal bladder capacity, or mixed nocturia (a combination of the preceding two categories).

**Assessment**

Nocturia can be a debilitating problem for many sufferers, and initial attempts at self management through...
having obstructive sleep apnoea, especially those with obesity, asthma, hypertension, and adult onset diabetes mellitus. Nocturnal polyuria may also result from third spacing of fluid in the lower extremities caused by right congestive heart failure and venous stasis in the lower extremities. Detailed diagnostic tests such as an echocardiogram and nuclear testing should be completed in conjunction with a comprehensive history and physical examination for patients at risk of cardiac disease.

Low nocturnal bladder capacity

Many patients with nocturia have a combination of nocturnal polyuria and low nocturnal bladder capacity. Notably low bladder capacity (nocturnal bladder capacity index > 2) may result from bladder obstruction, bladder overactivity, sensory urgency, or primary bladder conditions such as infection, inflammation, interstitial cystitis, or malignancy. Recognising and treating the underlying disorder would be expected to alleviate or at least ameliorate symptoms of nocturia.

Treatment options

Depending on the diagnosis and underlying cause(s), treatment options for nocturnal polyuria may include restriction of fluids in the evening, time release diuretics, afternoon naps, elevation of the legs, compression stockings, and treatment with antidiuretic hormone. Accumulation of fluid in the lower extremities in some patients may eliminate simple fluid restriction as an effective alternative. However, compression stockings and late afternoon naps with the legs elevated may reduce fluid build up and help alleviate nocturnal polyuria. Swelling in the legs or presacral area may also improve with diuretics, although this treatment must be administered well before bedtime. Because diuretics act within two hours of administration, medications taken later in the evening may actually exacerbate the problem. Bumetanide, furosemide, and, recently, imipramine have all proved effective in reducing polyuria. Desmopressin has also reduced or eliminated nocturia in patients with diabetes insipidus, autonomic dysfunction, and Parkinson’s disease. For patients with benign prostatic enlargement, treatment with melatonin, a pinnael gland hormone, which is a prime physiological determinant of circadian rhythms, may be an effective option. Because nocturnal production of the hormone is impaired in older adults, administration of melatonin can restore a normal circadian rhythm of micturition and improve sleep. In fact, men treated with 2 mg of melatonin generally experience a 10% reduction in episodes of nocturia. For patients in whom pharmacotherapy has failed and non-surgical or surgical interventions have proved unsuccessful, a new, innovative, and minimally invasive surgical technique for urgency, urge incontinence, and nocturia is sacral neuromodulation. Although evidence of its efficacy is preliminary, the procedure has been used successfully in several patients, notably reducing the degree of urgency and total number of voids. In the recent past only experimental or low yielding surgical alternatives were available, with success rates below 30%. But now a lightweight (50 g), implantable device, InterStim (fig 2), which stimulates the third sacral nerve, has achieved one year success rates approaching 85% for controlling urgency, urge incontinence, and nocturia. This is quite promising as these patients tend to be those in whom all traditional medical treatments have failed, and, typically, successful treatment has been difficult to obtain or sustain. Sacral neuromodulation is performed as a day

**Fig 2** InterStim sacral neuromodulation device

Additional educational resources

**Websites for patients**

British United Provident Association. Incontinence in women (http://hcd2.bupa.co.uk/fact_sheets/html/Urinary_incontinence_women.html)—provides basic, simple to read information for women, regarding symptoms and causes of incontinence, descriptions of various types of incontinence, and options for treatment.

50+Health, Incontinence (www.50plushealth.co.uk/index.cfm?articleid = 2079)—presents a wealth of information regarding incontinence, statistics of the condition among men and women, options for management and treatment, and links to detailed pages on urgency and the various types of incontinence. Colourful sketches and bulleted lists make the site attractive and easy to understand. A discussion forum allows visitors to share their experiences with others.

eMedicine Consumer Health, bladder control problems (www.bladdercontrol.e-medicinehealth.com/nocturia.htm)—offers information about incontinence, resultant health conditions, causes (in both men and women), tests to determine the presence of incontinence, treatment options, self care suggestions, and addresses/phone numbers of support groups and counselling agencies.

Pharmacia. Who has nocturia? (www.bladderinfo.com/problems/nocturia.htm)—describes the prevalence of bladder conditions and offers information about normal bladder function and causes, symptoms, risk factors, and treatment options for various bladder disorders. An interactive quiz helps visitors determine whether they have a bladder condition that requires medical intervention.

Medtronic. InterStim therapy (www.interstim.com)—provides doctors’ indications for treatment, information about clinical trials, and education and certification opportunities.

**Websites for doctors**

Pharmacia. Dretol LA (www.detroitla.com/hcp/index.asp)—provides guidance for the screening and diagnosis of overactive bladder and information on treatment using the drug. Pages describing clinical effectiveness and patient assessment tools are most helpful.

Medtronic. InterStim therapy (www.interstim.com)—provides doctors’ indications for treatment, information about clinical trials, and education and certification opportunities.

National Association for Continence (www.nafc.org/site2/index.html)—offers information about causes, methods of prevention, and treatment options for incontinence and provides updates about the latest publications and conferences on the topic.
A patient's success story

Janet Murray, a guard in a correctional facility, is a 42 year old white woman with an 8 year history of frequency, urgency, and nocturia. Before treatment, she voided up to 25 times in a 24 hour period; four to six times per night. Janet could remember experiencing only one normal night's rest after the age of 40. She was concerned that her impaired sleep was placing her at risk because of drowsiness during the day shift and urinary frequency (aggravated by a lack of readily available lavatory access) during the night shift. She had failed bladder training, timed voiding, biofeedback, and maximum doses of anticholinergic medications, including Ditropan XL, Detrol LA, and imipramine. Urodynamics showed an unstable bladder.

Luckily, Janet was deemed a candidate for a new method of neuromodulation with an implantable device called InterStim. Similar to a cardiac pacemaker but stimulating the third sacral nerve, InterStim has achieved remarkable results, with a reduction in episodes of nocturia of more than 60%. One year after implantation, Janet reports having had an immediate and sustained improvement in her frequency and nocturia. She now voids a total of six to eight times in 24 hours, with no episodes of nocturia. Her job is no longer at risk, and her quality of life has improved substantially.

procedure, entailing the implantation of a temporary device with a neuromodulation unit only slightly larger than a pager attached to the patient's regular pant belt. This stage 1 procedure is performed under local anaesthesia and takes less than 45 minutes. If the patient's symptoms improve by more than 50%, a permanent device is implanted in either buttock with a 6 cm incision. The device can be programmed via an extracorporeal handheld device for increases or decreases in power magnitude. The effects on nocturia have been remarkable, with a reduction of more than 60% in episodes of nocturia, even in patients taking diuretic medication. Adverse events such as pain at the implant site, lead migration, infection or skin irritation, or technical or device related problems are possible in up to one third of patients, and contraindications such as benign prostatic hypertrophy, cancer, or urethral stricture may exclude some patients from candidacy for the procedure; in general, however, sacral neuromodulation is an effective, safe, and reversible treatment and offers an important new option 6 for patients with symptoms of urgency, urge incontinence, and nocturia.

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Corrections and clarifications

Minimally invasive parathyroidectomy

Late insertion of authors' affiliations in this editorial led to some confusion over authorship, which resulted in us adding a third, non-existent, author, T S Reeve (10 April, pp 849-50). The article had only two authors, F Fausto Palazzo and Gregory P Sadler, both of whom worked at John Radcliffe Hospital in Oxford (as specialist registrar in endocrine surgery and consultant endocrine surgeon respectively) at the time of writing the editorial. F Fausto Palazzo is now T S Reeve fellow in endocrine surgery, Royal North Shore Hospital, Sydney, Australia. The authorship has been amended on bmj.com.

Why do doctors use treatments that do not work?

The authors of this editorial, Jenny Doust and Chris Del Mar, prompted by a rapid response, have alerted us to an error in their editorial (28 February, pp 474-5). In the fourth paragraph, they misquoted reference 9. The authors had written that flecainide for the treatment of supraventricular tachycardia makes the electrocardiogram look normal, whereas the trial cited investigated use of flecainide for ventricular tachycardia.

This week in the BMJ: Three days of amoxicillin are enough for non-severe pneumonia

We inadvertently omitted the word “excess” in this summary paragraph for the paper by the ISCAP Study Group (“Three day versus five day treatment with amoxicillin for non-severe pneumonia in young children: a multicentre randomised controlled trial,” 5 April, pp 791-4). The fourth sentence should read: “Clinical failure was more likely with non-adherence to treatment at day 5, an excess respiratory rate of > 10 breaths/minute, and excess respiratory rate of > 10 breaths/minute, and infection with respiratory syncytial virus.” Although the reader who alerted us to this error claimed that the slip prompted him to read the whole article, introducing errors to attract readers is not a strategy that we are planning to adopt.