The Aging Lower Urinary Tract

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Purpose: Age related changes in continence and the GU system, and how they affect the management of LUT dysfunction are discussed. Guidelines are offered regarding the diagnosis and management of incontinence in the elderly population.
Materials and Methods: Published literature and current treatment practice specific to elderly patients with LUT dysfunction were reviewed.
Results: LUT symptoms in the elderly population are affected by the high prevalence of comorbidity and polypharmacy. In addition, the GU system undergoes age related changes that increase the risk of LUT dysfunction.
Conclusions: Incontinence in older persons is almost always caused by multiple factors, of which not all are directly related to the GU system. Issues such as polypharmacy, comorbidity, and the increased risk of medication side effects must be considered in planning treatment. The primary care physician and urologist or gynecologist should establish a partnership to co-manage the broad spectrum of factors affecting continence in elderly patients.

Key Words: bladder, urinary incontinence, aged, urination disorders, polypharmacy

Aging is a true growth industry, not only in the United States, but also globally. By 2020 half of the United States adult population will be older than 45 years; approximately 20% of the labor force will be 65 years or older.[1] Even in this subgroup, the most rapidly growing population is persons older than 85 years. Therefore, there is a growing need for clinicians who are skilled in treating illnesses and conditions particular to the elderly population. The variability in older patient mobility, cognitive skills, comorbidity, and activity levels should be considered when evaluating these patients. With the aging of the population, clinicians are likely to see an "epidemic" of older persons with LUTS.

AGE AND GENITOURINARY FUNCTION

LUTS increase with age, especially those of overactive bladder syndrome (fig. 1).[2] Age associated changes occur continually in this population, and age associated comorbidity has an increasingly important role in LUTS. In discussing LUTS in older persons, it is necessary to consider a broader definition of continence and the domains that determine it.

A precise characterization of the effects of the aging process on LUT function is difficult to quantify, partly because of the challenges of performing long-term studies in this population with a high mortality rate. In addition, the confounding effects of multiple comorbidities make it difficult to determine which changes are related to aging alone and which are related to disease. The heterogeneity of the elderly population adds to the challenge of determining the definition of what is "normal" in older persons.

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LUT dysfunction in the elderly population is almost always a multifactorial condition, with broad determinants of continence. These domains include mobility, manual dexterity, environment and access to toilets, mentation, and medical conditions and medications. Mobility affects the ability to get to the bathroom in time to void. It is important to realize that mobility problems are not immutable and often are treatable. Manual dexterity affects the ability to undress in time to void, as may occur in persons with conditions such as severe arthritis. The environment in which the patient is situated also becomes important. If bathrooms are not easily accessible, either inside or outside of the home, the patient may not be able to find a toilet in time to prevent urinary leakage. In patients with cognitive impairment, delirium, or severe psychiatric disease, mentation and motivation may impair voiding and toileting. For example, patients with Alzheimer's disease may not recognize the urge to void as a cue to head toward the bathroom.

NonGU factors. Many nonGU factors common in elderly persons may cause or exacerbate UI (see Appendix). For example, diabetes is prevalent in up to 20% of this population. The associated osmotic diuresis can lead to polyuria, while neuropathic changes may cause detrusor overactivity and, in more advanced stages, diabetic cystopathy. CHF, arthritis, sleep apnea, and severe constipation may also lead to UI. Many clinicians believe that persons with dementia are doomed to UI because of cortical dysfunction, but multivariate studies in this population have shown that impaired mobility is a stronger determinant of UI than cognitive impairment. Many patients with dementia can still walk or be assisted in walking to the bathroom and, therefore, they have a good chance of remaining continent. Medications have a major role in causing or exacerbating UI. For example, angiotensin-converting enzyme inhibitors may cause a cough and, therefore, precipitate stress incontinence. Potent diuretics can overwhelm the ability to fore-

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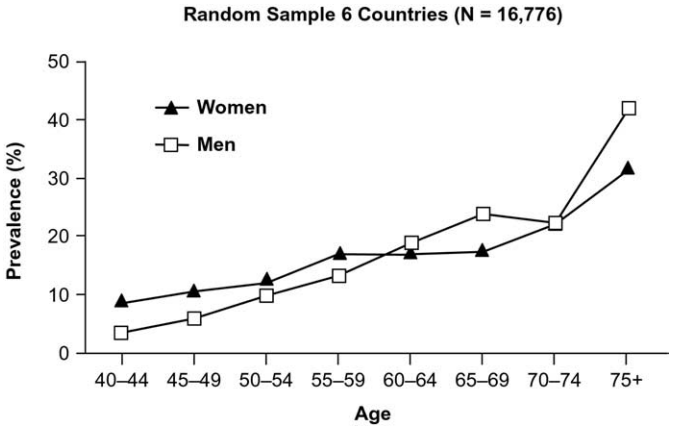

FIG. 1. Prevalence of OAB symptoms by age[2]

stall voiding. Calcium blockers, opiates, and anticholinergics can impair bladder emptying. Lack of caregiver support may be an important factor, particularly among elderly women who live alone and lack the appropriate assistance to help them remain continent.

All of these factors are important to consider when evaluating elderly patients, because LUT dysfunction is almost always a multifactorial condition. UI in older persons is frequently related to nonGU comorbidities, in addition to impaired mobility. This presents an opportunity for the PCP and urologist/gynecologist to work together for optimal management of these symptoms.

LUT function itself is one of the domains to consider when evaluating an elderly patient. In the aging detrusor, there is a slight widening of the spaces between the smooth muscle cells, and within the smooth muscle sarcolemma there is elongation of the dense band components and depletion of caveolae (small invaginations in the sarcolemma involved in transport and signaling processes).[3] In older persons with involuntary detrusor contractions during urodynamics, there may be novel changes at the cell junctions.[4] It should be noted that 42% of continent, healthy women older than 65 years will exhibit detrusor overactivity in urodynamic testing, and yet a third will be asymptomatic.[5] While detrusor overactivity is a significant finding, it does not necessarily mean that the patient will be incontinent.

Older persons also may experience impaired bladder contractility. It is not known whether this is related to a myogenic or neurogenic origin or to ischemia. The result is decreased urinary flow rates (even in women) and increased PVR, although it is generally 50 ml or less.[6] In frail older persons, the bladder may be both overactive and have weak contractions, a condition called DHIC.[7] Patients with DHIC have detrusor overactivity and increased PVR due to poor detrusor contractility (the diagnosis requires exclusion of outlet obstruction).[7] DHIC is the second leading cause of UI in institutionalized elderly persons. The coexistence of urge UI and high PVR may affect the management strategy, particularly with regard to antimuscarinic treatment, which could potentially worsen the already high PVR, thereby, lowering functional bladder capacity and worsening UI.

Age related changes related to the urethra are also seen in older patients. Most studies pertain to women, with the primary focus being decreased urethral closure pressure and urogenital atrophy. Related to lower levels of estrogen following menopause, these changes include thinning of the urethral epithelium, decreased volume and vascularity of the urethral submucosa, decreased proteoglycans, and possibly also decreased nerve density.[8–10]

Change has also been noted in the morphology of the urethra. In comparing the urethras of a 15-year-old and a 69-year-old patient, Perucchini et al documented a pronounced change in the striated smooth muscle, particularly along the vaginal surface in the older patient (fig. 2).[11] Although limited, these results suggest significant age related changes. It is not known whether these changes are related to the aging process itself or to other phenomena (eg childbirth, vascular changes, and other comorbidity), but they may predispose women to stress UI.

Men also experience age related changes affecting the LUT, particularly related to prostate disease. BPH is seen in 80% of men 80 years or older.[12] BPH is discussed in detail elsewhere in this supplement, but it is important to understand the potential for prostatic infarction and ischemia, which can lead to urinary retention in older male patients, particularly those with extensive cardiovascular disease.

Nocturia. A very common LUT symptom in older persons is nocturia, defined as the need to void more than 1 time during sleeping hours.[13] The prevalence of nocturia increases with age, such that up to 90% of individuals experience this condition by age 80 years. It is important to realize that nocturia is a multifactorial condition caused by nocturnal polyuria and primary sleep disorders, as well as by LUT dysfunction.

Patients may not be awakened by the urge to void but may void when awakened by issues related to a primary sleep disorder. Primary sleep disorders are common in older persons and may be related to pain (eg from arthritis or spinal stenosis), depression, restless leg syndrome, and medications. Nocturnal polyuria has a major role in causing noctu-

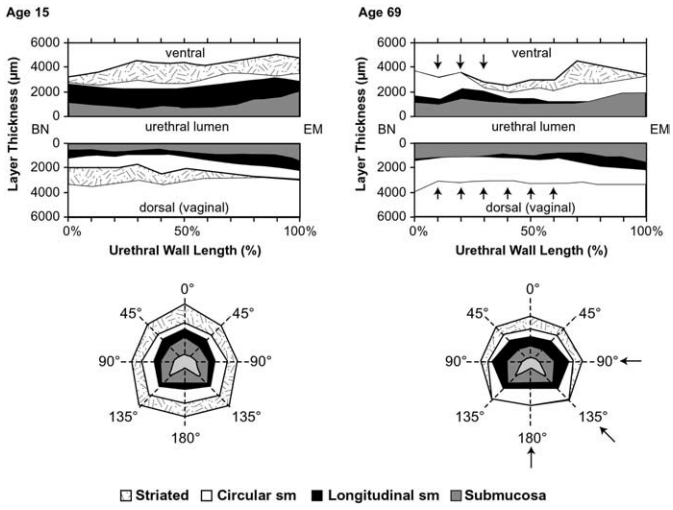

FIG. 2. Age related change in urethra. Comparison of layer thicknesses in 15-year-old and 69-year-old urethras. Upper plots, layer thickness in median sagittal section, oriented with bladder neck end (*BN*) of urethra at left and external meatus (*EM*) at right. Lower plots, corresponding mid urethral cross sections show proximal loss (arrows) of thickness of striated muscle (*sm*) in dorsal wall and mid urethral cross-sections with age. Reprinted with permission from Elsevier.[11]