Female stress urinary incontinence

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Introduction: *Stress urinary incontinence is a common and costly condition amongst community dwelling women. It can have a significant negative impact on the quality of life and yet less than half of women with urinary incontinence seek medical attention. It is important for primary care physicians to have a clear understanding of stress urinary incontinence in order to screen and manage patients who may have bothersome symptoms.*

Objective: *This article aims to outline the terminology, pathophysiology, clinical evaluation and treatment of female stress urinary incontinence.*

Conclusion: *Female stress urinary incontinence can be effectively evaluated and managed in the primary setting. Specialist referral is warranted when there is complex urinary symptomatology, hematuria on work-up or failure of conservative therapy.*

Key Words: stress urinary incontinence, family physician

Terminology

Urinary incontinence (UI) can be broadly divided into three types: stress, urge or mixed. Stress urinary incontinence (SUI) is defined as the complaint of involuntary leakage on effort or exertion, or on sneezing or coughing. Urge urinary incontinence (UUI) is the complaint of involuntary leakage accompanied by or immediately preceded by urgency. Urgency refers to a sudden compelling desire to pass urine, which is difficult to defer. Mixed urinary incontinence (MUI) is a combination of both SUI and UUI.[1]

Demographics

In a Canadian nation-wide telephone survey conducted in 2002, 5.4% of men and 28.8% of women had UUI, SUI or MUI. Of the women with UI, 68% had only SUI, 11% had only UUI and 21% had MUI. The peak prevalence of SUI was in those aged 41-64 years.[2] UUI and MUI

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become more prevalent in both men and women over 75 years of age.[3]

Impact of quality of life and costs

Like other chronic health conditions, UI significantly impacts on quality of life (QoL), both physically, psychosocially and furthermore, has major economic ramifications.[4-6] SUI can results in social embarrassment,[7] adversely affect social relationships,[8] restrict physical activity,[9] impair personal hygiene and lead to avoidance of sexual relationships. There is an individual direct cost for purchasing supplies, laundry and dry cleaning specific for incontinence.[10] Despite this, less than half of the women with symptoms initiated a conversation with a physician about urinary symptoms.[11] This is possibly due to the social stigma, belief that UI is a normal part of aging or ignorance regarding available treatments [12].

Continence mechanisms in women

Continence in women is maintained by a coordinated effort between the bladder, urethra, pelvic muscles and the surrounding connective tissue. The function of the lower urinary tract is to either store (storage phase) or to expel urine (voiding phase). This depends on a bladder that is able to expand while maintaining a low constant pressure, in the absence of involuntary detrusor contractions. The body of the bladder is innervated by parasympathetic nerves via M_3 muscarinic receptors and it is responsible for bladder contraction. The bladder neck receives sympathetic innervation. Normal storage of urine is dependent on spinal reflex mechanisms that activate sympathetic and somatic pathways to the bladder outlet and tonic inhibitory systems in the brain that suppress parasympathetic outflow to the bladder.[13]

The female urethra has skeletal muscle (rhabdosphincter) and smooth muscle. The rhabdosphincter consists of small, type I fibers located predominantly in the middle third of the urethra. The urethral smooth muscle is arranged in longitudinal and circular layers. Both contribute to the resting tone and the rhabdosphincter, in addition, responds to rises in intra-abdominal pressure. Muscles of the pelvic floor (levator ani complex) also contribute to continence by pulling the vagina forward to create a backstop for the urinary tract during rises in intra-abdominal pressure. Urethral mucosal factors are important for coaptation to achieve a watertight seal. Continence is maintained when the urethral pressure exceeds intravesical pressure.

The voiding phase starts with relaxation of the urethra followed by a sustained detrusor contraction caused by an increase in the parasympathetic transmission to the bladder. The micturition reflex is normally under voluntary control and is organized in the rostral brain stem (the pontine micturition center). It requires integration and modulation by the parasympathetic and somatic components of the sacral spinal cord (the sacral micturition center) and the thoracolumbar sympathetic components.[14] Intravesical pressure increases sufficiently during voiding to allow the bladder to empty.

Aetiology and risk factors of female SUI

SUI occurs when vesical pressure exceeds urethral pressure, in the setting of increases of intra-abdominal pressure. This can be due to an anatomical change such as a loss of backstop support at the bladder neck, or because of neuromuscular dysfunction of the sphincter. Loss of bladder neck support is referred to as bladder neck hypermobility and treatments target the restoration of that support. Sphincteric dysfunction is referred to as intrinsic sphincter deficiency (ISD). It is believed that most patients have elements of both disorders in varying degrees.

Risk factors for SUI include weak collagen, age, childbearing, obesity, constipation, advanced pelvic organ prolapse and chronic obstructive airways disease. Lifestyle factors such as heavy smoking (more than 20 cigarettes per day) and tea drinking were found to be associated with SUI.[15,16]

Evaluation of SUI

The Canadian Urological Association (CUA) guideline for incontinence (2005) recommends a basic evaluation consisting of history, physical examination, evaluation of post void residual (PVR) volume and urinalysis. Completion of a voiding diary and a quality of life questionnaire by the patient or caregiver is helpful in determining the severity of symptoms, impact on lifestyle and treatment efficacy.

History

History should include an assessment of urinary storage symptoms (frequency, nocturia, urgency and incontinence) and voiding symptoms (hesitancy, poor or interrupted stream, straining and terminal dribbling). Frequency of incontinence episodes, number of pads used, conditions of loss, relations to drug treatments (e.g. ACE inhibitors, diuretics, alpha blocker), voiding habits and fluid intake need to be evaluated. The degree of bother and impact on QoL are two important aspects to assess as it will determine the need to intervene. History of urinary tract infection

TABLE 1. **International Continence Society pelvic organ prolapse quantification and staging system[18]**

0	No prolapse is demonstrated
1	The most distal portion of the prolapse is greater than 1 cm above the level of the hymen
2	The most distal portion of the prolapse is less than 1 cm above or below the level of the hymen
3	The most distal portion of the prolapse is greater than 1 cm below the level of the hymen but protrudes no more than 2 cm less than the total vaginal length
4	There is complete eversion of the total length of the lower genital tract. The distal portion of the prolapse protrudes by at least 2 cm less than the total vaginal length

or poorly controlled diabetes mellitus or insipidus can impact on lower urinary tract function and need to be elicited. Patients should also be asked about fecal incontinence and pelvic organ prolapse (POP), which may accompany SUI.

Physical examination

Physical examination is focused on organ systems that could be implicated in UI. The initial assessment includes general observations for mobility, cognitive status, peripheral edema and body habitus; abdominal examination for pelvic masses or a distended bladder, and a focused neurological examination if appropriate. Pelvic examination is performed to assess the estrogen status, presence of POP, urethral hypermobility, pelvic floor muscle tone and leakage during coughing or valsalva. Atrophic vaginitis clinically manifests as pale vaginal epithelium, often with associated inflammation characterized by patchy erythema, petechiae and increased friability.[17] POP can be assessed by asking patient to strain in the dorsal lithotomy position, with the aid of a Sims speculum or the posterior blade of a bivalve speculum. It can be classified into stages, based on the relationship of the point of maximal protrusion to the hymenal ring, see Table 1.[18] Clinical stress test can be performed with patient in the dorsal lithotomy or supine position with a full bladder and ask her to cough or strain. If urinary leakage is not demonstrated, the test can be repeated in the upright position. Urethral hypermobility refers to the descent of the bladder neck and urethra during coughing or valsalva. It can be confirmed by a Q-tip test by inserting a well lubricated cotton-tipped applicator into the urethra and assess the change in the angle from the resting position to maximal strain. An angle greater than 30 degrees indicates hypermobility.[19] The strength of the pelvic floor muscles is assessed during bimanual examination by asking patients to contract muscles around fingers of the examining physician. The ability to voluntarily contract the pelvic floor muscle as well the strength of the contraction should be noted.

Investigations

Investigations such as PVR measurement can be done with a genitourinary (GU) ultrasound, bladder scanner or in-and-out catheterization. PVR can be falsely elevated with bladder over-distension e.g. large fluid intake prior to GU ultrasound and may need to be repeated. Urine analysis (UA) is performed to exclude a urinary tract infection and hematuria. Confirmatory urine microscopy and culture may be necessary if an abnormality is detected on UA. Similarly, if glucose is positive on the UA, further serum glucose testing is necessary to establish the diagnosis of diabetes.

Bladder diary

A 3-day bladder diary documenting the type and volume of fluid consumption, voiding frequency and volume as well as incontinence episodes is useful for assessment and advise behavioral changes.

In patients with complex symptomatology (MUI or suspected voiding dysfunction), refractory SUI with prior anti-incontinence surgery or those seeking surgical treatment, cystometry or a more comprehensive urodynamic study can be performed.[20,21] Urology referral will be appropriate for these patients. Those with hematuria on work-up also require a referral to exclude urological malignancies.

Management

Behavioral modification and pelvic floor muscle training

Weight loss and exercise in morbidly obese patients reduces SUI, and also to a certain extent UUI.[22] A lowering of fluid intake can reduce SUI[23] while smoking cessation decreases the contribution of a smoker's cough to SUI.[15,16]

Pelvic floor muscle training (PFMT) involves strengthening the pelvic floor muscles (levator ani). A meta-analysis has shown that women undergoing PFMT were seven times more likely to be cured and 23 times more likely to show improvement.[24] The

current practice is for women to be taught to contract in two ways: maximum short (1 second) contractions to encourage activation of the type 2 (fast) fibers and sustained contractions (1 to > 20 seconds) to activate the type 1 (slow) fibers.[25] There is no universally agreed number of voluntary levator contractions that should be performed as part of ongoing PFMT. Twenty-four to 36 daily contractions have been recommended based on the training principles of sports physiology.[26] In addition, women are taught to perform strong, precisely timed levator contractions just before physical stressors such as coughing, sneezing and lifting. It is useful to supplement oral instructions with coaching on how to perform exercises during a pelvic examination. Referral to a physical therapist may be beneficial for women who are unable to identify their pelvic floor musculature. PFMT can be combined with biofeedback equipments such as intravaginal resistance devices or weighted vaginal cones but these have not been shown to improve the efficacy of PFMT.[24]

Pharmacotherapy

Currently there is no approved pharmacotherapy for the treatment of female SUI in Canada. Serotonin and noradrenaline reuptake inhibitors (SNRIs) such as Duloxetine have been used in Europe for the treatment of SUI. Serotonin causes bladder relaxation and increases outlet resistance by inhibiting parasympathetic activity while increasing sympathetic and somatic activity. A recent systematic review found that Duloxetine treated group reports a higher subjective cure rate, greater reduction in incontinence episode frequency and better quality-of-life scores.[27] Adverse effects such as nausea is common.[27] Duloxetine is not approved in Canada for the treatment of SUI and therefore cannot be recommended for off-label clinical use in the primary care setting. Adrenergic agonists have been investigated for the treatment of SUI but there is not enough evidence to assess their efficacy either compared to or combined with other treatments.[28] Estrogen replacement therapy has been used in the past but the Heart and Estrogen/Progestin Replacement Study showed a significantly higher risk of SUI and UUI for women on estrogen replacement with or without progestin. Initiation of hormonal therapy for SUI is therefore not indicated.[29]

Devices

Intravaginal devices work by creating a 'backstop' at the level of the bladder neck. They include a short super tampon inserted just inside the introitus and a variety of modified pessaries with a knob placed at the bladder neck. These devices are not well studied and are not universally offered as a form of treatment for female SUI. Patients who desire non-surgical treatment for SUI and demonstrate continence after a device is fitted are appropriate candidates. Pessaries require upkeep, including the need to be removed and cleaned regularly. The disadvantages include a small amount of bother with insertion, need for continued use, rare vaginal excoriation/erosion and excessive or malodorous vaginal discharge. Postmenopausal women may benefit from vaginal estrogen in combination with pessary use.[30]

Surgical treatments

Injection of bulking agents is the least invasive surgical procedure and can be done under local anesthesia in an outpatient setting, with minimal recovery time. Autologous fat, bovine cross-linked collagen (Contigen), carbon beads (Durasphere), silicone (Macroplastique), crossed-linked hyaluronic acid and dextranomer microspheres (Zuidex), Ethylene vinyl alcohol copolymers (Tegress) and calcium hydroxylapatite (Coaptite) have been used.[31] Short-term cure rates (complete dryness) for collagen ranges from 30%-78%. Long-term results (up to 2 years) suggest a continuous decline in success rates and repeated injections are often required.[32] It may be a useful option for short-term symptomatic relief amongst selected women with co-morbidity that precludes anesthesia.[33] Bulking agents are not covered by most insurance companies in Canada and thus further limit their use in clinical practice.

Colposuspensions are surgical procedures aimed at correcting urethral hypermobility. The Burch colposuspension is the most commonly performed suspension procedure whereby periurethral fascia on both side are approximated to Cooper's ligaments on the superior aspect of the pubic bone. It restores the urethrovesical junction to a retropubic location. It can be performed through an open abdominal or laparoscopic approach. For open Burch colposuspension, the overall continence rate is approximately 85% to 90% within 5 years of treatment. Seventy percent of patients can be expected to be dry after 5 years.[34] In a recent meta-analysis, cure rates are similar for the open and laparoscopic procedures at 2 years.[35]

Pubovaginal sling was originally described as an autologous rectus fascial sling positioned at the bladder neck. Albo and Richter[36] conducted a randomized controlled trial of 655 women comparing open colposuspension and autologous rectus fascial pubovaginal sling. The success rates for SUI at 24 months were 66% for the sling group and 49% for the colposuspension group. However, more women in the sling group has urinary tract infection, difficulty voiding and postoperative urge incontinence.[36]

Midurethral slings have become the mainstay of treating SUI due to its minimally invasive nature and therapeutic efficacy. The newer slings are made of type 1 macroporous polypropyline and can be inserted through a retropubic or transobturator route. It sits underneath the middle third of the urethra to act as a backstop at times of sudden rises of intra-abdominal pressure. In a randomized controlled trial comparing tension-free vaginal tape (TVT) and Burch colposuspension, the success rates at 2 years were similar.[37] A recent meta-analysis showed that TVT outperformed colposuspension in terms of postoperative continence and is equivalent to pubovaginal slings. The retropubic and transobturator tapes have similar cure rates.[38]

All surgical procedures for SUI carry risks of voiding dysfunction, de novo detrusor overactivity (DO), increased risk of urinary tract infection and failure to adequately treat stress-incontinence symptoms. A meta-analysis showed similar complication rates after TVT and Burch colposuspension, with the exclusion of bladder perforation which was more common after TVT and reoperation rate which was significantly higher after Burch colposuspension. TVT and pubovaginal slings also have similar complication rates. Comparing retropubic and transobturator tapes, the occurrence of bladder perforation, pelvic hematoma and de novo DO was significantly less common in patients treated by transobturator tapes.[39]

Artificial urinary sphincter can be placed around the bladder neck for female SUI. It is uncommonly used in patients with refractory SUI and congenital genitourinary malformation.

Research

Injection of autologous myoblasts has been studied as a novel treatment for female SUI. In preclinical studies, autologous myoblasts obtained from skeletal muscle biopsy can aid in the regeneration of rhabdosphincter and fibroblasts in the reconstruction of urethral submucosa. Strasser et al reported their 12-month results comparing ultrasound guided autologous cells (myoblasts and fibroblasts) injection and collagen injection. The success rates (completely continent) were 90.5% (38 out of 42) and 9.5% (2 out of 21) respectively.[40] In a Canadian clinical trial pioneering muscle-derived stem cell injection in an outpatient setting, five out of eight patients reported improvement with a mean follow-up of 16.5 months.[41]

SUI summary

SUI is common in women but it is under-reported and under-treated. It negatively impacts on the QoL of those affected and patients may fail to initiate conversation regarding their urinary symptoms due to embarrassment. Most SUI can be evaluated in the primary care setting after careful history and simple clinical assessment. Treatment with behavioral modification and PFMT can be then initiated. Refractory SUI to these measures warrants specialist referral. Midurethral slings have become the mainstay of surgical treatment due to its minimally invasive nature and equivalence in outcome compared to other surgical treatment options.

Take-home messages

- Stress urinary incontinence (SUI) amongst community dwelling women is a common and often distressing condition. Over half of those affected will not seek medical attention so it is important for primary care physicians broach this subject to identify those who need help.
- Simple evaluations such as history, physical examination, assessment of postvoid residual, urine analysis and completion of a bladder diary are all that is required prior to initiating treatment.
- Behavioral modification such as limiting oral fluid intake, weight loss and smoking cessation as well as pelvic floor muscle training have been shown to be effective in the treatment of SUI.
- Specialist referral is appropriate in patients with complex symptomatology (significant urge component or suspected voiding dysfunction), failed conservative therapy and hematuria on work-up.
- Midurethral slings have become the mainstay of surgical therapy but other surgical options such as injection of bulking agents, various suspension procedures, pubovaginal sling and insertion of an artificial sphincter may be appropriate in selected patients.

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References

1. Abrams P, Cardozo L, Fall M et al. The standardisation of terminology of lower urinary tract function: report from the Standardisation Sub-committee of the International Continence Society. *Neurourol Urodyn* 2002;21(2):167-178.
2. Herschorn S, Gajewski J, Schulz J, Corcos J. A population-based study of urinary symptoms and incontinence: the Canadian Urinary Bladder Survey. *BJU Int* 2008;101(1):52-58.
3. Corcos J, Schick E. Prevalence of overactive bladder and incontinence in Canada. *Can J Urol* 2004;11(3):2278-2284.
4. Bogner HR, Gallo JJ, Sammel MD, Ford DE, Armenian HK, Eaton WW. Urinary incontinence and psychological distress in community-dwelling older adults. *J Am Geriatr Soc* 2002;50(3):489-495.
5. Fultz NH, Herzog AR. Self-reported social and emotional impact of urinary incontinence.[see comment]. *J Am Geriatr Soc* 2001;49(7):892-899.
6. Birnbaum HG, Leong SA, Oster EF, Kinchen K, Sun P. Cost of stress urinary incontinence: a claims data analysis. *Pharmacoeconomics* 2004;22(2):95-105.
7. Fultz NH, Burgio K, Diokno AC, Kinchen KS, Obenchain R, Bump RC. Burden of stress urinary incontinence for community-dwelling women. *Am J Obstet Gynecol* 2003;189(5):1275-1282.
8. Hannestad YS, Rortveit G, Sandvik H, Hunskaar S, Norwegian EsEoIitCoN-T. A community-based epidemiological survey of female urinary incontinence: the Norwegian EPINCONT study. Epidemiology of Incontinence in the County of Nord-Trondelag. *J Clin Epidemiol* 2000;53(11):1150-1157.
9. Nygaard I, Girts T, Fultz NH, Kinchen K, Pohl G, Sternfeld B. Is urinary incontinence a barrier to exercise in women? *Obstet Gynecol* 2005;106(2):307-314.
10. Subak LL, Brown JS, Kraus SR et al. The "costs" of urinary incontinence for women. *Obstet Gynecol* 2006;107(4):908-916.
11. Kinchen KS, Burgio K, Diokno AC, Fultz NH, Bump R, Obenchain R. Factors associated with women's decisions to seek treatment for urinary incontinence. *J Womens Health* 2003;12(7):687-698.
12. Holst K, Wilson PD. The prevalence of female urinary incontinence and reasons for not seeking treatment. *N Z Med J* 1988;101(857):756-758.
13. Morrison J BL, Craggs M. Incontinence. In: Abrams P CL, Khoury S, Wein A, ed. Third International Consultation on Incontinence. Plymouth UK: Health Publications Ltd.;2005:363-422.
14. Blaivas JG. The neurophysiology of micturition: a clinical study of 550 patients. *J Urol* 1982;127(5):958-963.
15. Hannestad YS, Rortveit G, Daltveit AK, Hunskaar S. Are smoking and other lifestyle factors associated with female urinary incontinence? The Norwegian EPINCONT Study. BJOG: An International *J Obstet Gynecol* 2003;110(3):247-54.
16. Bump RC, McClish DM. Cigarette smoking and pure genuine stress incontinence of urine: a comparison of risk factors and determinants between smokers and nonsmokers. *Am J Obstet Gynecol* 1994;170(2):579-582.
17. Backmann G, Nevadunsky N. Diagnosis and Treatment of Atrophic Vaginitis. *Am Fam Physician* 2000;61:3090-3096.
18. Bump RC, Mattiasson A, Bo K et al. The standardization of terminology of female pelvic organ prolapse and pelvic floor dysfunction. *Am J Obstet Gynecol* 1996;175(1):10-17.
19. Bergman A, McCarthy T, Ballard C, Yanai J. Role of the Q-tip test in evaluating stress urinary incontinence. *J Reprod Med* 1987(32):273.
20. Artibani W, Cerruto MA. The role of imaging in urinary incontinence. *BJU Int* 2005;95(5):699-703.
21. Homma Y. The clinical significance of the urodynamic investigation in incontinence. *BJU Int* 2002;90(5):489-497.
22. Subak LL, Johnson C, Whitcomb E, Boban D, Saxton J, Brown JS. Does weight loss improve incontinence in moderately obese women? *Int Urogynecol J* 2002;13(1):40-43.
23. Swithinbank L, Hashim H, Abrams P. The effect of fluid intake on urinary symptoms in women. *J Urology* 2005;174(1): 187-189.
24. Hay-Smith EJ, Bo Berghmans LC, Hendriks HJ, de Bie RA, van Waalwijk van Doorn ES. Pelvic floor muscle training for urinary incontinence in women. *Cochrane Database Syst Rev* 2001(1) CD001407.
25. Balmforth JR, Mantle J, Bidmead J, Cardozo L. A prospective observational trial of pelvic floor muscle training for female stress urinary incontinence. *BJU Int* 2006;98(4):811-817.
26. Bo K. Pelvic floor muscle strength and response to pelvic floor muscle training for stress urinary incontinence. *Neurourol Urodyn* 2003;22(7):654-658.
27. Mariappan P, Alhasso A, Ballantyne Z, Grant A, N'Dow J. Duloxetine, a serotonin and noradrenaline reuptake inhibitor (SNRI) for the treatment of stress urinary incontinence: a systematic review. *Eur Urol* 2007;51(1):67-74.
28. Alhasso A, Glazener CM, Pickard R, N'Dow J. Adrenergic drugs for urinary incontinence in adults.[update of Cochrane Database Syst Rev. 2003;(2):CD001842; PMID: 12804414]. *Cochrane Database Syst Rev* 2005(3):CD001842.
29. Grady D, Brown JS, Vittinghoff E et al. Postmenopausal hormones and incontinence: the Heart and Estrogen/Progestin Replacement Study. *Obstet Gynecol* 2001;97(1):116-120.
30. Norton P. Nonsurgical Treatment of Vaginal Prolapse: Devices for Prolapse and Incontinence. In: Raz S, Rodriguez LV, eds. Female Urology. 3rd ed. Los Angeles: Elsevier; 2008:603-608.
31. Appell RA, Dmochowski RR, Herschorn S. Urethral injections for female stress incontinence. *BJU Int* 2006;98(Suppl 1):27-30; discussion 1.
32. Pesce F. Current management of stress urinary incontinence. *BJU Int* 2004;94(Suppl 1):8-13.
33. Keegan PE, Atiemo K, Cody J, McClinton S, Pickard R. Periurethral injection therapy for urinary incontinence in women.[update of Cochrane Database Syst Rev 2003;(2):CD003881; PMID: 12804494]. *Cochrane Database Syst Rev* 2007(3):CD003881.
34. Lapitan MC, Cody DJ, Grant AM. Open retropubic colposuspension for urinary incontinence in women.[update of Cochrane Database Syst Rev. 2003;(1):CD002912; PMID: 12535443]. *Cochrane Database Syst Rev* 2005(3):CD002912.
35. Tan E, Tekkis PP, Cornish J, Teoh TG, Darzi AW, Khullar V. Laparoscopic versus open colposuspension for urodynamic stress incontinence. *Neurourol Urodyn* 2007;26(2):158-169.
36. Albo ME, Richter HE, Brubaker L et al. Burch colposuspension versus fascial sling to reduce urinary stress incontinence.[see comment]. *New Engl J Med* 2007;356(21):2143-2155.
37. Ward KL, Hilton P, Group UKaITT. A prospective multicenter randomized trial of tension-free vaginal tape and colposuspension for primary urodynamic stress incontinence: two-year follow-up.[see comment]. *Am J Obstet Gynecol* 2004;190(2):324-331.
38. Novara G, Ficarra V, Boscolo-Berto R, Secco S, Cavalleri S, Artibani W. Tension-free midurethral slings in the treatment of female stress urinary incontinence: a systematic review and meta-analysis of randomized controlled trials of effectiveness.[see comment][erratum appears in Eur Urol. 2007 Nov;52(5):1548]. *Eur Urology* 2007;52(3):663-678.
39. Novara GGA, Boscolo-Berto R, Secco S, Cavalleri S FV, Artibani W. Complication Rates of Tension-Free Midurethral Slings in the Treatment of Female Stress Urinary Incontinence: A Systematic Review and Meta-Analysis of Randomized Controlled Trials Comparing Tension-Free Midurethral Tapes to Other Surgical Procedures and Different Devices. *Eur Urology* 2008;53: 288-309.
40. Strasser H, Marksteiner R, Margreiter E et al. Transurethral ultrasonography-guided injection of adult autologous stem cells versus transurethral endoscopic injection of collagen in treatment of urinary incontinence. *World J Urol* 2007;25(4): 385-392.

41. Carr L SD, Steele S, Wagner D, Pruchnic R, Jankowski R, Erickson J, Huard J, Chancellor M. 1-year follow-up of autologous muscle-derived stem cell injection pilot sutdy to treat stress urinary incontinence. *Int Urogynecol J* 2008.

DISCUSSION

Question (Dr. Miner):
Most PCPs treat SUI as they would treat OAB, it is quite reasonable since most of these disorders are mixed. Please comment on treatment options (drugs/surgical/behavioral) of the urge component versus stress component of these mixed disorders.

Answer (Dr. Carr):
Mixed urge and stress incontinence in women commonly coexist. A specific history should attempt to elicit the predominate complaint between these two conditions and initial therapy should focus on this most problematic component. Fortunately, behavioral therapies (dietary, pelvic floor rehabilitation), as outlined above, may benefit both types of incontinence. When urge incontinence is the major contributor, anticholinergic medications are the treatment of choice. Even if the stress component is not remedied, the overall level of incontinence may lessen to a level that is manageable for the patient. When stress incontinence is the major component or anticholinergic medications have not brought the overall incontinence to an acceptable level, then it is reasonable to refer the patient to a specialist for consideration of surgical intervention for stress urinary incontinence.

Question (Dr. Rosenberg):
Please comment on how a PCP could assess urethral mobility, if at all, in his office.

Answer (Dr. Carr):
The assessment of urethral mobility is important in the context of choosing an appropriate surgical repair for stress incontinence. For example, a retropubic suspension or mid urethral tape are more appropriate choices when a degree of urethral hypermobility is present and a bladder neck sling may be more appropriate for women with a very rigid, scarred urethra. To this end, the assessment of urethral hypermobility by a PCP is really not as important as checking for contributing conditions such as postmenopausal atrophy, prolapse, and muscle tone. I would recommend that a PCP take the time to teach a properly executed pelvic floor muscle contraction (Kegel) rather than focus on assessing urethral hypermobility.

Question (Dr. Laroche):
What is your clinical experience when treating stress incontinence with Cymbalta: do you feel others SSRIs could be effective?

Answer (Dr. Carr):
I have no personal experience using SSRIs or SNRIs to manage stress incontinence. Clinical trials suggested that Duloxetine (Cymbalta), a SNRI, may significantly reduce the number of stress incontinence events likely due to potentiating the effect of the pudendal nerve on the striated sphincter. While Duloxetine has been approved for the use in depression, it has not been approved in North America for stress incontinence and at the moment the potential adverse effects associated with this drug mitigate against its use for stress incontinence.