

Review Article

Treatment of Stress Urinary Incontinence - An Overview

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Abstract:

The plethora of treatment modalities available for the treatment of female stress urinary incontinence reflects the uncertainty in the pathophysiology of this condition and the mechanism of cure. No single treatment method is suitable for all patients. For best results, many factors must be considered before choosing the treatment method most suited to the particular patient. This review examines the various treatment options available and attempts to set out criteria for choice of treatment. The role of conservative treatment has been deliberately highlighted especially for young and well motivated women with mild to moderate urinary stress incontinence before surgical treatment is used. The role and limitations of well established surgical procedures like Burch colposuspension and urethroplasty and the most recently introduced procedures like TVT/TOT, collagen implants, laparoscopic colposuspension and the role of artificial urinary sphincter are also examined.

Introduction:

Urinary incontinence is a common condition that may affect women of all ages, with a wide range of severity and nature. Although rarely life-threatening, this bothersome symptom is experienced by a significant number of women and has a detrimental effect on quality of life. Stress urinary incontinence (SUI) is variably estimated to affect between 4% and 35% of adult women¹⁻³. Data from several studies confirm that SUI is the most common type of urinary incontinence. Around 50% of women reporting urine leakage are diagnosed with pure SUI⁴.

A clear and logical clinical definition of SUI is essential both for delivering patient care and effectively performing outcomes research. In 2001, the International Continence Society committee on terminology put forth a well-considered set of definitions for lower urinary tract symptoms (LUTS), including SUI.⁴ The International Continence Society's committee on terminology define SUI, as "the involuntary leakage of urine during increased abdominal pressure, in the absence of a detrusor contraction."

The reported incidence of urinary incontinence varies widely, ranging from 8-41% in women over 65 years. Incontinence becomes more common in women with advancing age, particularly after menopause. As the percentage of postmenopausal women expected to be increasing from 23% in 1995 to 33% in 2050, it is apparent that urinary incontinence will be a major health hazard and quality of life issue well into the future⁷.

A postal survey in 2004, conducted in four European countries (UK, France, Germany and Spain) involving over 17 000 participants found that 35% of women questioned admitted urinary incontinence.⁵ In a review of all relevant studies published in English on Medline, Minassian *et al.* 2003 reported a median (range) prevalence of urinary incontinence of 27.6% (4.8–58.4).⁶

Mechanism of urinary incontinence

The normal continence of urine during stress is thought to be achieved by three mechanisms: (a) intrinsic urethral tone contributed by muscular action of the

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urethra, vascular turgor, elasticity of the urethral connective tissue and the urothelium, (b) transmission of abdominal pressure onto the proximal part of the urethra and the urethrovesical junction (bladder neck), and, (c) kinking of the urethrovesical junction at the time of stress which requires a well supported bladder neck. The second mechanism requires the bladder neck to be within the abdominal cavity and the absence of tissue rigidity around the proximal urethra so that pressure can be transmitted during stress.

Parturition causes damage to the neurological supply of the pelvic fascia, support ligaments and muscles. These cause decrease in urethral tone as well as prolapse of the bladder neck below the urogenital diaphragm and subsequent failure of pressure transmission. The bladder neck also becomes hypermobile, preventing the kinking mechanism at the time of stress. As the integrity of urogenital tissues are dependant on estrogen, menopause aggravates the problem by further weakening the tissue.

Diagnosis of SUI

Urodynamic observations represent a more precise and more invasive form of evaluation of incontinence and voiding dysfunction. Often, patients' symptoms and signs observed during basic examination allow the clinician to establish a working diagnosis and initiate conservative, non surgical care. Women considering surgical intervention and those in whom a diagnosis is difficult to clarify based on basic evaluation, benefit from the added precision afforded by urodynamic studies. Holding et al found that 15% of incontinent women had normal gynaecological examination findings.⁷

A preliminary diagnosis of urinary incontinence can be made on the basis of a history, physical examination and a few simple office and laboratory tests. Physical examination must include both neurological and pelvic examinations with an attempt to reproduce the incontinence. Pelvic examination should include Q-tip cotton swab test and stress provocation tests. Women who demonstrate urine leakage in the supine position with the bladder relatively empty (i.e., soon after determining post-void residual volume) are at increased risk of having a severe form of stress incontinence known as intrinsic sphincter deficiency⁸. The Bonney test and the pessary test have been advocated as an adjunct to the stress provocation test to assess the benefits from surgery. Urine analysis and culture should be done.

A urodynamic study is any test that provides objective dynamic information about lower urinary tract function. Most urogynaecologists would consider urodynamic investigations mandatory before embarking on treatment, particularly surgical treatment, as presence of bladder dysfunction will compromise success. The diagnostic studies may include urodynamics and cystoscopy. Uroflowmetry measures the urine flow rate. Reduced flow rate in a women would suggest that there is chance of developing voiding difficulties post-operatively if she undergoes surgery for incontinence. Cystometry measures the pressure volume relationship within the bladder and differentiate stress incontinence and detrusor overactivity. Video cystourethrography combines cystometry, uroflowmetry and radiological screening of the bladder & urethra, is the single most informative investigation. Cystourethroscopy is particularly important to exclude any internal lesion and frequently used during certain surgeries of SUI.

The principles of stress incontinence treatment

The main aim for treatment of stress incontinence are: 1. to restore the position of the bladder neck and proximal urethra within the abdominal cavity 2. to increase the internal urethral resistance, 3. to prevent funnelling of the bladder neck by strengthening the support tissue around the bladder neck, and 4. fixation of the bladder neck so that stress will cause kinking of the urethrovesical junction. Not all the objectives can be achieved by a single operation or procedure.

Treatment:

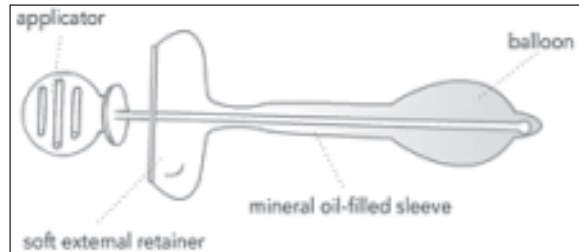
Conservative treatment:

The role of conservative treatment has been grossly underestimated. However recently, an increasing attention has been paid to this modality of treatment. Although the cure rates for conservative methods are generally lower than that for surgical treatment, there are certain advantages. The success rate of conservative treatment is reasonable, it is free from complications, cheap and non invasive. The patient still has surgical options should conservative treatment fail. Physicians generally pursue non-invasive therapeutic interventions before attempting to treat SUI with surgery. This section provides an overview of some of these interventions.

Urethral Inserts

FemSoft, is a female urinary device that provides immediate control over unwanted urine loss, odor, and

wetness. This single-use, disposable product is only worn when protection from bladder leakage is needed. FemSoft can be used in conjunction with behavioral and non-invasive treatment .



Loss of Excess Weight

Overweight women have a greater risk of being incontinent than women with an ideal body weight. It has been shown that significantly overweight women with incontinence who lose excess weight can actually reduce episodes of unwanted urine loss. One study demonstrated that obese women who did exercise and lost about 10% of their body weight reduced their leakage by half and maintained these results for six months⁷. To improve continence, consistent moderate exercise in each week is recommended

Pelvic Muscle Exercises(PME)

In 1948 Arnold Kegel described pelvic muscle exercise(PME) as a treatment of stress incontinence⁹.This is an essential part of the behavioral treatment techniques that help to increase bladder control and decrease bladder leakage. These techniques require conscious effort, consistent discipline, and needs a lifetime commitment.

With the regimen of 300 contractions a day, Kegel reported a cure rate of 80%¹⁰. More recently ,some authors reported cure rates of 8%¹¹ to 27%¹².However, about 60% of patients reported cure or significant improvement in symptoms with pelvic floor exercise^{12,13}.The effect of pelvic floor exercises seems to have a good long term result .A long term study with a median follow up of 6 years showed that at 12 months,42% of patients were satisfied and the beneficial effect seemed to continue years after the initial formal pelvic floor exercise programme.¹⁴

Several good prognostic factors have been identified for predicting the likelihood of benefit from pelvic floor exercises.Shorter duration of symptoms,less severe symptoms,better urethral function (maximal urethral pressure of greater than 9.4 cm of water and

good functional urethral length),a motivated patient, youth and ability to contract pelvic floor muscles at initial assessment have been recognized as positive factors for successful treatment.^{9,15} Chronic cough ,uterovaginal prolapsed and previos surgery were noted to be unfavourable factors for success with such therapy.

Biofeedback

These are special computerized biofeedback devices, which help to learn the technique of PHE. By placing small sensors close to the muscles being monitored, biofeedback devices detect and record this electrical activity and the patient knows immediately which muscles she is using. Studies demonstrate a 54-95% cure or improvement in SUI¹⁶



Pelvic Floor Stimulation

In addition to biofeedback, pelvic floor stimulation (PFS) can help women with SUI to contract and therefore strengthen their pelvic floor. Pelvic floor stimulation is based on the principles of treating nerves which supply the pelvic floor muscles. 73% of the patients showed objective improvement 6 months after this therapy.¹⁷

Pessaries

Pessaries are silicone devices which are available in varieties of shapes and sizes and are placed in the vagina to provide support to the pelvic organs. Most are used as a non-surgical means of managing prolapse. However, a few are used successfully for managing SUI by partially compressing the urethra .Pessaries of different shapes known as the "Dish," "Hodge," and "Marland." are used for managing SUI.

Vaginal or urethral devices: Various intravaginal devices like perineal vaginal cone have been used to treat SUI. Weighted vaginal cones were introduced by Plevnik to improve levator muscle tone¹⁸. Cones of increasing weight from 20g to 100g are placed in the vagina and held in place by the levator ani muscle with the larger end uppermost. An objective improvement rate of 68% was reported at 6 weeks in 34 women¹⁹.



Medication

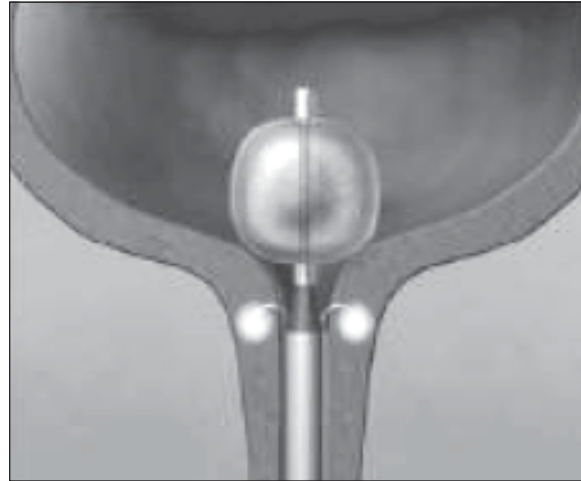
Loss of estrogen after menopause contributes to a thinning of the tissues lining the vagina, which can contribute to episodes of stress incontinence. Studies show that in postmenopausal women, application of topical estrogen vaginally improves the symptoms of SUI in many women¹⁸. Still, topical estrogen alone is not a curative remedy and research on its benefits remains mixed. The combination of estrogen and the alpha adrenoceptor agonist, phenylpropanolamine, seems to have a synergistic effect on the urethra. A controlled study by Klinn & Lindskog reported a cure rate of 28% and an improvement rate of 53%.²⁰

Radiofrequency Energy Treatment—Renessa®

The Renessa Treatment is a non-surgical approach to treat SUI, typically performed in a physician's office. During treatment, a small catheter-like device is passed into the urethra. The device generates temperature in small areas at the base of the bladder. Once treatment is complete, the device is removed. The heat causes the natural collagen in the tissue to become firmer, increasing the bladder's ability to resist leaks during activity. Only a local anesthetic

is needed. Recovery is rapid; many women return to normal activities the same day.

Clinical studies have shown that about three out of four women are dry or improved following the Renessa treatment, and nearly 60% eliminate use of pads. The Renessa treatment can be an option for women before surgery.



Surgical Treatments

If the bladder neck is hypermobile, abdominal elevation of the bladder neck like Burch colposuspension will most likely be successful. When the bladder neck is rigid, scarred, or immobile, urethroplasty or colposuspension is unlikely to be successful because of poor elevation of the bladder neck and poor transmission of pressure to the bladder neck due to rigid scar tissue. This group of patients will require urethrolisis to free the bladder neck and a sling operation. More recently, collagen implant either transurethrally or paraurethrally has become available with promising short-term results. However, longer-term results are still uncertain.

1. Colposuspension

Bladder neck suspension is traditionally carried out for SUI secondary to urethral hypermobility and several procedures have been described. The most extensively studied procedures include the Marshall-Marchetti-Krantz (MMK) procedure and Burch colposuspension. The principle of open retro pubic colposuspension is fixation of the bladder neck and proximal urethra to a retro pubic position in order to reduce urethral hypermobility. The MMK procedure was initially described in the late 1940s and many studies have identified that this procedure has excellent short-term success

rates. In a literature review published by Jarvis in 1994 the subjective continence rate following the MMK procedure in over 6800 patients was 92.7%.²¹ Czaplicki in 1998 identified a sharp decrease in continence rates with time following the MMK procedure.²² A study by Clemens *et al.*, examined the long-term success of the MMK procedure in 36 women.²³ With a median follow-up time of 16.8 years only 33% remained dry. It is apparent that, the success rate of the MMK procedure decreases with time. The Burch colposuspension was introduced in the early 1960s and has been described as the most effective surgical procedure for stress incontinence in a recent set of guidelines from the Royal College of Obstetricians and Gynecologists (RCOG)²⁴. It has largely replaced the MMK operation in most part of the world because (1) Ileopectineal ligament is a more secure structure for the placement of suture in Burch colposuspension compared with the periosteum in MMK procedure., and (2) the complication of osteitis pubis associated with MMK operation is avoided. In the meta analysis by Jarvis the subjective and objective early continence rates following the Burch procedure are described as 89.6% and 84.3%, respectively.²⁵ Many reports exist regarding long-term outcome from this procedure and most describe a durable outcome superior to that of the MMK procedure. However, perhaps due to over enthusiastic elevation of the bladder neck, high incidence of voiding dysfunction, ie. delayed voiding has been reported for this operation.²⁶

laparoscopic colposuspension

Recently laparoscopic colposuspension procedures have been developed and investigated. These use similar techniques to open colposuspension and carry all of the advantages of laparoscopic surgery. A Cochrane review published by Moehrer in 2002 concluded that the longterm performance of laparoscopic colposuspension is uncertain.²⁷

2. Sub urethral sling procedures

Perhaps the predominant use of slings in the modern era has been in women who have failed previous surgical treatments for SUI. Despite this, many authorities advocate the use of sling procedures as a primary procedure. The material used for pubovaginal slings ranges from autologous fascia (most commonly rectus or fascia lata), to allograft fascia. A wide range of biological (porcine small intestine submucosa and porcine xenograft acellular matrix), and synthetic

materials (Marlex, Mersilene, Goretex) are also widely used. In the literature review published by Jarvis in 1994, subjective and objective cure rates were 82.4% and 85.3%, respectively.²⁸ These data were taken from over 1700 women and indicate success at around 12 months but the material used is not specified.

3. Needle Suspension

Multiple bladder neck needle suspension procedures have been described dating back to the 1950s and include Raz, Stamey and Peyrera techniques. The long-term results of this type of surgery are poor with a failure rate of over 80% reported by Tebyani *et al.* at a median follow-up of 29 months.²⁹ Furthermore in a randomized controlled trial comparing needle suspension with open colposuspension a significantly higher continence rate at one year was found in the group undergoing open surgery.³⁰ Needle suspension procedures are no longer recommended for the treatment of SUI.³¹

4. Anterior colporrhaphy/urethroplasty

The anterior colporrhaphy is achieved by a transvaginal opening of the anterior vaginal wall below the bladder and urethra. Kelly plication stitches are then placed periurethrally and tied in the midline. There are a variety of modifications of this procedure including the Bologna procedure, Kelly-Kennedy, Marion-Kelly, and cystocele repair.

Anterior colporrhaphy should generally not be offered to women as a treatment for isolated primary stress urinary incontinence because of higher failure rates (I-A).

5. Peri Urethral bulking agent

The principle underlying the technique of peri-urethral bulking injections is to create sub mucosal cushions ensuring apposition of the urethral wall, which aids continence. There is a range of injectable materials from autologous fat, through collagen to manufactured polymers (Teflon, Durasphere, Macroplastique). Corcos compared the outcome of injecting bulking agent with those of different open surgical procedure. Out come after 12 months were 53% cure rate with injection group compared to 72% in open surgery. In a series of 25 women with genuine stress incontinence, paraurethral injection of gluteraldehyde cross linked collagen resulted in 80% cure or improvement at 3 months followup³². The main drawback is perhaps the cost of collagen and the need for repeat injections in some cases.

TVT

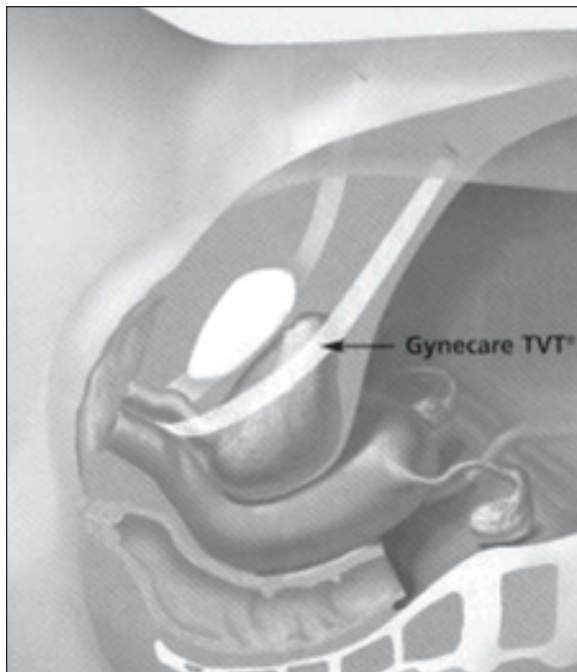
Development of the tension free vaginal tape (TVT) has occurred in the last 10 years. A

manufactured tape is placed sub urethrally at the mid urethral point, to create a pubo urethral 'neoligament' that is anchored suprapubically. The tape tightens around the urethra on increased abdominal pressure.³³ The procedure can be carried out as a day case and without general anesthesia. Early reports suggested excellent rates of improvement from the symptoms of SUI with a low rate of complications. This led to

a multicentre randomized controlled trial comparing TVT insertion with a gold standard treatment, colposuspension. Three hundred and forty-four women were studied and Ward 2002 reported on success both at 6 months.³⁴ 73% of patients in the TVT group had a negative 1-h pad test compared to 64% in the colposuspension group. TVT was associated with decreased operative time, analgesia requirement and hospital stay. There was however, a higher rate of intraoperative complications, most often bladder perforation and voiding difficulties with no long-term effects.

TOT

Trans Obturator Tape (TOT) insertion is newer option in treating SUI and is a slight modification of the technique of TVT. Some short-term studies have been carried out on relatively large numbers and show



encouraging results. In a prospective randomized trial of TVT vs TOT, involving 88 women followed up for 12 months, Darai *et al.*³⁵, reported similar high cure rates (89% vs 88%) within the two groups. Ignjatovic *et al.* reported promising results from 40 women with 1 year follow up

A new artificial urinary sphincter (AUS)

In 2005 Hussain *et al.* published details of a patented new design of AUS.³⁶ The periurethral cuff was molded on a curved rather than flat template producing a single curved compression cushion when activated.. The design allows for lower pressures to be exerted on the urethra with the theoretical advantage of lower urethral erosion. The technique is currently in the early stages but initial reports are encouraging

Summary and conclusion

With improved awareness and research, new conservative and surgical management are being developed. Conservative measures should be considered before surgical treatment. There is continuing research activities to improve the efficacy of the management options, especially in the field of surgery. There are many modifications in the surgical techniques to improve the quality of life of the patient, as well as to reduce the degree of invasiveness and hospital stay. Pharmacological agents are also under continuous research activities to obtain the most accurate result, without any adverse effect. Management should therefore be individualized according to the facilities available or affordable. At all the levels, management should be multidisciplinary and protocols should be set to provide maximum benefit to the patients.

References:

1. Thom D. Variations in estimates of urinary incontinence prevalence in the community: effects of differences in definition, population characteristics, and study type. *J Am Geriatr Soc.* 1998;46:473–480.
2. Hampel C, Weinhold N, Eggersmann C, Thuroff JW. Definition of overactive bladder and epidemiology of urinary incontinence. *Urology.* 1997;50(suppl 6A):4–14.
3. Rortveit G, Daltveit AK, Hannestad YS, Hunskaar S. Urinary incontinence after vaginal delivery or cesarean section. *N Engl J Med.* 2003;348:900–907. References
4. Abrams P, Cardozo L, Fall M, et al. The standardization of terminology in lower urinary tract function: report from the standardization sub-committee of the International Continence Society. *Urology.* 2003;61:37–49.
5. Luber KM, Boero S, Choe JY. The demographics of pelvic floor disorders: current observations and future projections. *Am J Obstet Gynecol.* 2001;184:1496–1501.
6. Chiaffarino F, Parazzini F, Lavezzari M, Giambanco V. Impact of urinary incontinence and overactive bladder on quality of life. *Eur Urol.* 2003;43:535–538.
7. Hannestad YS, Rortveit G, Daltveit AK, Hunskaar S. Are smoking and other lifestyle factors associated with female urinary incontinence? The Norwegian EPINCONT Study. *Br J Obstet Gynaecol.* 2003;110:247–254.
8. Bai SW, Kang JY, Rha KH, et al. Relationship of urodynamic parameters and obesity in women with stress urinary incontinence. *J Reprod Med.* 2002;47:559–563. 1. Subak LL, Wing R, West DS, Franklin F, Vittinghoff E, Creasman JM, Richter HE, Myers D, Burgio KL, Gorin AA, Macer J, Kusek JW, and Grady D for the PRIDE Investigators: Weight loss to treat urinary incontinence in overweight and obese women. *N Engl J Med* 360: 481-490, 2009.
9. Bump RC, McClish DK. Cigarette smoking and urinary incontinence in women. *Am J Obstet Gynecol.* 1992;167:1213–1218.
10. Kegel AH. Progressive resistance exercise in the functional restoration of the perineal muscle. *Am J Obstet Gynecol* 1948;56:238-48
11. Wilson PD, Farager B, Butler B, bullock D, Robinson EL, Brown AG. Treatment with piperazine estrone sulphate for genuine stress incontinence in post menopausal women. *Br J Obstet Gynecol* 1987;94:568-74
12. Hanella SM, Kirwan P, Castledon CM, Hutchin CJ, Bresson AJ. The effect of pelvic floor exercises in the treatment of genuine stress incontinence in women at two hospitals. *Br J Obstet Gynecol* 1988;95:602-6
13. McIntosh LJ, Frahm JD, Mallet VT, Richardson DA, Pelvic floor rehabilitation in the treatment of incontinence *J Reprod Med* 1993;38:662-6;
14. Klarskov P, Neilson KK, Kromann-Anderson B, Macgaard E. Long term results of pelvic floor training and surgery of female genuine stress incontinence. *Int Urogynecol J* 1992:132-5
15. Mantle J, Versi E, Physiotherapy for stress incontinence: a national survey. *Br Med J* 1991;2:132-5
16. Christopher M. Tarnay, MD. & Narender N. Bhatia, MD. Urinary incontinence. In: Alan H. DeCherney, *Gynaecologic Diagnosis & Treatment.* 10th ed. McGraw – Hill; 2007. p. 735-51.
17. Hording U, et. al. Urinary incontinence in 45 year old women. An epidemiology survey. *Scand J Urol Nephrol.* 1986;20:1836.
18. Plevniik s, New method for testing and strengthening of pelvic floor muscles. In proceedings of the international continence society. London 1987;267-8
19. Wilson PD, Borland M. A preliminary study of vaginal cones for the treatment of genuine stress incontinence. *Proc Univ Otago Med Sch* 1998 66:37
20. Kim AC, Lindskog M, Estrogens and phenylpropanolamine in combination for stress urinary incontinence in post menopausal women. *Urology* 1988;32:273-80
21. Jarvis GJ. Surgery for genuine stress incontinence. *BJOG* 1994; **101**:
22. Czaplicki M, Dobronski P, Torz C, Borkowski A. Long-term subjective results of Marshall-Marchetti-Krantz procedure. *Eur. Urol.* 1998; **34**: 118–23

23. Clemens JQ, Stern JA, Bushman WA, Schaeffer AJ. Long term results of the Stamey bladder neck suspension: direct comparison with the Marshall-Marchetti-Krantz procedure. *J. Urol.* 1998; 160: 372–6.
24. Adams EJ, Barrington JW, Brown K, Smith ARB. Surgical treatment of urodynamic stress incontinence. Royal College of Obstetricians and Gynaecologists Guideline no. 35; October 2003. [Cited October 2003.] Available from URL: <http://www.rcog.org.uk>
25. Jarvis GJ. Surgery for genuine stress incontinence. *BJOG* 1994; 101: 371–4.
26. Erikson BC, Hagen B, Eik Nes SH, Molne K, Mjølnerod OK, Romslo I. Long term effectiveness of the Burch colposuspension in female urinary stress incontinence. *Acta Obstet Gynecol Scand* 1993; 72: 866–9.
27. Moehrer B, Ellis G, Carey M, Wilson PD. Laparoscopic colposuspension for urinary incontinence in women. *Cochrane Database Syst. Rev.* 2002; 1: CD00223
28. Jarvis GJ. Surgery for genuine stress incontinence. *BJOG* 1994; 101: 371–4.
29. Tebyani N, Patel H, Yamaguchi R, Aboseif SR. Percutaneous needle bladder neck suspension for the treatment of stress urinary incontinence in women: long-term results. *J. Urol.* 2000; 163: 1510–12
30. Karram MM, Angel O, Koonings P, Tabor B, Bergman A, Bhatia N. The modified Peyrera procedure; a clinical and urodynamic review. *Br. J. Obstet. Gynaecol.* 1992; 99: 655–8
31. Corcos J, Collet JP, Shapiro S *et al.* Surgery vs collagen for the treatment of female stress urinary incontinence (SUI): results of a multicentric randomized trial (Abstract). *J. Urol.* 2001; 165: 198.
32. Eckford SD, Abrams P, Para urethral collagen implantation for female stress incontinence. *Br J Urol* 1991; 68: 586–9
33. Ward K, Hilton P. Prospective multicentre randomised trial of tension-free vaginal tape and colposuspension as primary treatment for stress incontinence. *BMJ* 2002; 325: 67–70.
34. Atherton MJ, Stanton SL. The tension-free vaginal tape reviewed: an evidence based review from inception to current status. *BJOG* 2005; 112: 534–46
35. Darai E, Frobert JL, Grisard AM *et al.* Functional results after the suburethral sling procedure for urinary stress incontinence: a prospective randomised Multicentre study comparing the Retropubic and Transobturator routes. *Eur. Urol.* 2007; 51: 795–802
36. Hussain M, Greenwell TJ, Venn SN, Mundy AR. The current role of the artificial urinary sphincter for the treatment of urinary incontinence. *J. Urol.* 2005; 174: 418–24.