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Surgical Management of Stress Urinary Incontinence

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Introduction

Many operations have been developed for stress urinary incontinence (SUI) but only a few—retropubic colposuspension and sling procedures—have survived and evolved with enough supporting evidence to make recommendations. Contemporary, less invasive modifications of these operations are being done and studies assessing their efficacy are ongoing. This review analyzes the evidence, including response rates and complications, for the Burch colposuspension and sling procedures (both traditional and mid-urethral). We assess the use of periurethral bulking and address the issue of SUI (both symptomatic and "potential") in association with pelvic organ prolapse. Finally, based on our review, we will make surgical recommendations for gynecologists and urologists caring for women with SUI.

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Level of Evidence

Any discussion on the assessment of treatment options for SUI should start with a discussion of the level of evidence. Evidence in the medical literature required to generate recommendations is limited to data reported in controlled clinical trials and properly designed clinical series. Several national and international organizations have conducted thorough searches of the literature with the aim of providing guidelines to clinicians for management of urinary incontinence. In this regard, several documents have been released over the past decade: the Agency for Health Care Policy and Research (AHCPR) Clinical Practice Guideline Report on Urinary Incontinence in Adults, first published in 1992 and updated in 1996;[1] and the AUA Clinical Guideline Panel's Report on Surgical Management of Female Stress Urinary Incontinence.[2] In addition to these documents, several excellent comprehensive reviews are available.[3,4] The AHCPR Report addressed the issue of data quality by dividing the level of evidence into three levels:

high (A); intermediate (B); and low (C). Evidence is high-quality (A) when the recommendation is supported by scientific evidence from properly designed and implemented controlled trials providing statistical results that consistently support the panel's recommendation; intermediate (B) when the recommendations are supported by scientific evidence from properly designed and implemented clinical series that support the guideline statement; and low (C) when the recommendation is supported by expert opinion.[1] We will use these categories to summarize the best studies on the surgical treatment of SUI.

Preliminary Testing and Treatment

To diagnose SUI, clinical and urodynamic (simple or complex) tests must be performed to evaluate bladder filling, storage, and emptying. Clinically, the urethra is shown to be incompetent by visually observing transurethral loss of urine simultaneous with increased intra-abdominal pressure. Urodynamic or radiologic methods may also be used for diagnosis although this remains controversial. Abnormalities of bladder filling, such as detrusor overactivity, can coexist with SUI in up to 30% of patients, and may be associated with a lower cure rate after surgery for SUI.

Women with SUI generally should have a trial of conservative therapy before corrective surgery is offered. Conservative treatment includes pelvic muscle exercises, bladder retraining, pharmacologic therapy, functional electrical stimulation, and mechanical devices such as pessaries. Postmenopausal women with urogenital atrophy should receive vaginal estrogen if possible before surgery.

Retropubic Procedures

Since 1949, when Marshall et al[5] first described retropubic urethrovesical suspension to treat SUI, and since Burch's landmark paper in 1961,[6] retropubic procedures have emerged as consistently curative. Although numerous terms and variations of retropubic repairs have been described, the basic goal remains the same: to suspend and stabilize the anterior vagina, and thus the bladder neck and proximal urethra, in a retropubic position. This prevents their descent and allows for urethral compression against a stable suburethral layer. Selection of a retropubic versus a vaginal approach depends on many factors, such as the presence or absence of intrinsic sphincter deficiency (ISD), the need for laparotomy for other pelvic disease, the amount of pelvic organ prolapse and whether a vaginal or abdominal procedure will be used to suspend the vagina, the age and health status of the patient, and the preferences of the patient and surgeon.

Few data differentiate one retropubic procedure from another. The three most studied and popular retropubic procedures are the Burch colposuspension, the Marshall-Marchetti-Krantz (MMK) procedure, and the paravaginal defect repair. Most urogynecologists prefer the Burch colposuspension for SUI with bladder neck hypermobility and adequate resting urethral sphincter function. The Burch can be combined with paravaginal defect repair when concomitant anterior vaginal prolapse repair is required or when concurrent sacral colpopexy is to be done. Retropubic procedures can be done via open or laparoscopic access; laparoscopic techniques will be discussed briefly later in the article. We no longer perform MMK procedures, so this operation will not be discussed further. The surgical technique in most studies for the Burch colposuspension is a contemporary modification described by Tanagho in 1976.[7]

Retropubic colposuspension is indicated for women with the diagnosis of urodynamic SUI and hypermobility of the proximal urethra and bladder neck. These procedures yield the best results when the urethral sphincter is capable of maintaining a water-

tight seal at rest, but cannot withstand the unequal transmission of abdominal pressure to the urethra, relative to the bladder, with straining. Although retropubic procedures can be used for ISD with urethral hypermobility, sling operations probably yield better long-term results (although few data are available to support or refute this). We generally do not perform retropubic procedures for ISD.

Most studies are done with a colposuspension technique utilizing two or three permanent or delayed absorbable sutures on each side of the mid-urethra and bladder neck. The sutures are passed through the ipsilateral Cooper's ligament and tied with gentle tension, leaving a suture bridge so as not to over-elevate and distort the bladder neck. Studies of Burch colposuspension have generally not evaluated technique variations, although one randomized trial of patients undergoing laparoscopic Burch procedures for SUI showed that two sutures on each side of the urethra resulted in a significantly higher cure rate than one suture.[8]

CLINICAL RESULTS

Many studies have reported clinical experiences with retropubic colposuspension procedures for SUI. Although most of these studies are methodologically flawed, more high-quality studies, including randomized trials, have been or are being conducted. Currently, however, few prospective studies are available comparing the results of various procedures for urodynamic SUI.

The Burch colposuspension is the best studied of the retropubic procedures. From 1980 to 1990, 18 studies were reported using the Burch colposuspension in women with urodynamically-confirmed SUI and objective measures of cure.[9] Follow-up times in most studies ranged from 1 to 7 years. Three to 24 months after surgery, 59% to 100% of patients became continent, for an average cure rate of 84%. At 3 to 7 years, continence rates ranged from 63% to 89%, for an average rate of 77%. Although objectively incontinent, a small percentage of additional patients were improved and satisfied with their surgical results. The overall objective failure rate was 14% at 3 to 24 months, and 14% at 5 to 7 years.[9]

In an excellent study published in 1990, Eriksen et al[10] reported the results of 91 women with urodynamic stress incontinence, with or without detrusor overactivity, who had undergone Burch colposuspension. Urodynamic evaluation was performed on 76 patients after 5 years. Stress incontinence was cured in 71% of the patients with stable bladders preoperatively and in 57% of those with stress incontinence and detrusor overactivity. After 5 years, only 52% of the study group were completely dry and free of complications; about 30% needed further incontinence therapy.

Several studies have assessed women more than 10 years after undergoing Burch procedure. Alcalay et al[11] followed a cohort of 109 women (out of 366 eligible women) who underwent Burch colposuspension between 1974 and 1983. Both subjective and objective outcome measures were collected with mean follow-up of 13.8 years. SUI cure was time-dependent, with decline for 10 to 12 years, then plateau at 69%. Cure rates were significantly lower in woman who had previous bladder neck surgery. Approximately 10% of patients required at least one additional surgery for stress incontinence.[11]

Two review articles have been published summarizing the cure rates of retropubic procedures compared with other procedures for the treatment of urodynamic SUI. Black and Downs[3] published an excellent review in 1996 describing the effectiveness of surgery for SUI in women. The methodological quality of studies was assessed, including the only 2 randomized trials available at that time. Different methods of performing colposuspension (eg, Burch colposuspension versus MMK procedure) have not been shown to have significantly different outcomes. Colposuspension is more effective than anterior colporrhaphy and needle urethropexy procedures in curing and improving stress incontinence. About 85% of

women can expect to be stress continent 1 year after colposuspension, compared with 50% to 70% after anterior colporrhaphy and needle suspension. The benefit of Burch colposuspension is maintained for at least 5 years whereas the benefits from anterior colporrhaphy and needle suspension diminish quite rapidly. Primary procedures are generally more effective than repeat procedures. However, of the 4 prospective studies comparing Burch colposuspension and sling procedures, none has reported a difference in cure, however defined, regardless of whether the operations were primary or secondary.[3]

The American Urological Association convened the Female Stress Urinary Incontinence Clinical Guidelines Panel to analyze the literature up to 1993 regarding surgical procedures for SUI.[2] Based on 282 eligible articles reviewed by a select panel of experts, after 48 months, retropubic suspensions and sling procedures are more efficacious than transvaginal needle suspension procedures or anterior colporrhaphy. The panel's opinion also noted that retropubic suspensions and sling procedures are associated with slightly higher complication rates including longer convalescence and postoperative voiding dysfunction.[2]

In a recent multicenter randomized trial of Burch colposuspension and tension-free vaginal tape (TVT) procedure for urodynamic SUI, objective cure rates were similar in the 2 groups: 66% for TVT and 57% for colposuspension.[12] Bladder injury was more common during TVT; operating time, time to normal voiding, and return to normal activity were longer after colposuspension.[12]

Few studies have assessed the paravaginal defect repair for stress incontinence. Early studies using subjective outcome measures reported that over 90% of women were continent after this procedure. However, in a randomized trial, Columbo et al[13] found that only 61% of women were continent 3 years after paravaginal defect repair, compared with 100% after Burch colposuspension. We believe that paravaginal defect repair should be used for anatomic correction of anterior vaginal prolapse (cystocele), but not as primary treatment of urodynamic SUI.

Laparoscopic access can be used to perform Burch colposuspension and this technique has become popular with some physicians and patients. However, it remains to be proved whether laparoscopic colposuspension provides cure rates equal to open Burch colposuspension. Moehrer et al[4] recently summarized the literature on laparoscopic colposuspension using the Cochrane Incontinence Review Group's specialized registry of controlled trials. Eight studies met inclusion criteria, including 5 randomized controlled trials of laparoscopic versus open colposuspension. After excluding one poor-quality trial, cure was lower for laparoscopic colposuspension (relative risk 0.91; 95% confidence interval 0.82–1.01) with 8% more failures for laparoscopy compared with open. Subjective cure rates were not different between the groups. Trends were shown toward higher complication rates, less postoperative pain, shorter hospital stay, and less time to return to normal function for laparoscopic compared with open colposuspension. Further well-designed and adequately powered randomized trials are required to definitively compare outcomes between laparoscopic and open Burch.

RISK OF FAILURE AND COMPLICATIONS

Clinical conditions that increase the risk of surgical failure for retropubic colposuspension include obesity, menopause, prior hysterectomy, and prior anti-incontinence procedures. Advanced age does not appear to be associated with lower rates of cure after colposuspension. Urodynamic findings that predict increased risk of failure include signs of ISD, abnormal perineal electromyography, and concurrent detrusor overactivity. Patients with ISD are probably better treated with a sling procedure if the urethra

is hypermobile, or with periurethral injections of a bulking agent if the urethra is nonmobile.

Detrusor overactivity or urge incontinence coexists in up to 30% of patients with SUI. The term mixed incontinence has been used to describe this condition. The effect of retropubic repair on detrusor overactivity in patients with mixed incontinence is unpredictable. Interestingly, as many as 60% of patients with mixed incontinence are cured of detrusor overactivity by surgical support of the bladder neck. A much smaller percentage (5%–15%) have worsened detrusor overactivity, with the remaining (20%–30%) having persistent overactivity. Women with high-pressure detrusor overactivity or poor bladder compliance are probably more likely to have persistent urge incontinence after stress incontinence surgery. In general, women with mixed incontinence should initially receive nonsurgical therapy for detrusor overactivity.

Detrusor overactivity is a recognized postoperative complication of retropubic procedures, occurring in 7% to 27% of patients with SUI and stable bladders by preoperative cystometrogram. Postoperative detrusor overactivity is more common in patients with previous bladder neck surgery and in those with mixed detrusor overactivity and sphincteric incompetence preoperatively. In a study of 148 patients with urodynamic SUI and stable bladders preoperatively, Steel et al[15] reported that 24 (16.2%) patients had postoperative detrusor overactivity on cystometrogram 6 months after surgery. Ten of the 24 patients with detrusor overactivity were completely asymptomatic. Of the 14 symptomatic patients, 4 were improved with pharmacologic therapy. The remaining 10 patients (6.8%) remained symptomatic with detrusor overactivity 3 to 5 years after surgery.[15]

The occurrence of voiding dysfunction after colposuspension varies, although patients rarely have urinary retention after 30 days. On average, patients resume complete voiding 7 days after open Burch procedure.[16] Colposuspension can change the original micturition pattern and introduce an element of obstruction that can disturb the balance between voiding forces and outflow resistance, resulting in immediate postoperative as well as late voiding difficulties. Urodynamic findings that may occur after colposuspension include decreased flow rate, increased micturition pressure, and increased urethral resistance. Risk factors for prolonged voiding dysfunction after bladder neck suspension included advanced age, previous incontinence surgery, increased first sensation to void, high post-void residual volume, and postoperative cystitis.[16] Abdominal straining during voiding was not associated with prolonged voiding after surgery, although this has been shown in other studies.

Burch[6] first reported that enteroceles occurred in 7.6% of cases after the Burch procedure, but only two thirds of these patients required surgical correction. Langer et al[17] reported that 13.6% of patients, who had undergone Burch procedures without hysterectomy or cul-de-sac obliteration, developed enterocele 1 to 2 years postoperatively. Alcalay et al[11] noted that 26% of patients 10 to 20 years after Burch colposuspension underwent a rectocele repair and 5% underwent an enterocele repair. Whenever possible, a cul-de-sac obliteration in the form of uterosacral suspension interosacral suspension plication or McCall culdeplasty should be considered at the time of colposuspension to prevent enterocele formation, although the true efficacy of this prophylactic maneuver is unknown. Rectocele repair should be done as indicated for symptomatic or large rectoceles. The study by Langer et al[17] clearly showed that hysterectomy does not add to the efficacy of Burch colposuspension in curing SUI. In general, we perform hysterectomies only for specific uterine pathology or the treatment of uterovaginal prolapse.

Slings

The concept of supporting the bladder neck and urethra by a sling has been with urolo-

gists and gynecologists since the late 1800s. This procedure has undergone multiple revisions; however, it was not until 1942 that Aldridge[18] developed the fascial suburethral sling procedure, which is the forerunner of most modern sling procedures. He described the procedure as a salvage operation for women who had failed prior procedures. For the sling, he used rectus fascial strips that remained attached to the anterior abdominal wall.

In the majority of reported cases in the literature, the suburethral sling procedure has been used predominantly as a treatment of patients with recurrent SUI after previous bladder neck surgery. Used for such an indication, the objective cure rates recorded in the literature range between 61% and 100%, with a mean cure rate of 85%.[19,20] The literature relating to the use of a suburethral sling (other than TVT) as a first procedure is limited, but a mean continence rate of 94% is quoted.[19]

With the increasing popularity of sling procedures and escalating demand for minimally invasive techniques, numerous materials have become available for use in suburethral slings. The theoretical rationale for using allografts and xenografts for suburethral slings is reinforcement of inherently weak endopelvic fascia. Current materials can be categorized as autologous fascia, allograft fascia, xenograft fascia, and synthetic slings. Within these categories, different variants can be subgrouped by individual materials: autologous (rectus fascia, fascia lata, vaginal wall); allograft (freeze-dried irradiated cadaveric fascia lata, solvent-dehydrated cadaveric fascia lata, fresh-frozen cadaveric fascia lata, cadaveric dermis), xenograft (porcine dermis, porcine subintestinal mucosa, porcine pericardium); and synthetic materials (polypropylene, polyester, silastic, expanded polytetrafluoroethylene).

Autologous rectus fascia and fascia lata, probably the most common materials in use, are the gold standard to which the outcome of other materials should be compared. Allogenic grafts harvested from cadaveric donors are widely used, and do not seem to carry a significant risk of erosion or infection. The long-term durability of allograft fascia continues to be studied; there seems to be wide variability in the quality of tissue depending on its source and processing. The type of sling material probably does not significantly affect cure rates, if the characteristics of the chosen material are considered carefully.[20]

Two large cohort studies have assessed the results of pubovaginal fascial sling for SUI. Morgan et al[21] reported long-term follow-up of 247 women with type II and III incontinence after rectus fascia pubovaginal sling. Postoperative assessment included urodynamic testing and quality of life questionnaires. At mean follow-up of 51 months, continence rates were 88% overall, with 91% for type II and 84% for type III stress incontinence. Preoperative urge incontinence resolved in 74%, while de novo urgency developed in 7% of women. Fourteen patients had second procedures for incontinence and 5 required urethrolysis. Of the 95% of women who completed questionnaires, 92% reported a high degree of satisfaction with low symptom distress scores.[21] In another study by Chaikin et al,[22] 251 patients were followed for more than 1 year after fascial slings; 92% of patients were objectively cured or improved. Most postoperative incontinence was urge incontinence. Permanent urinary retention developed in 2% of patients.[22]

Synthetic materials are readily available, allow the patient to avoid a harvesting procedure, and appear effective, but have the disadvantage of potentially generating a foreign body inflammatory reaction. This may result in a slightly higher risk of erosion and fistula formation compared with autologous materials, although this has not been proved in a comparative trial. The most extensive experience has been obtained utilizing polyester and polypropylene mesh. Several authors have reported short-term objective cure rates of 73% to 93%.[20] Polypropylene

mesh is also used in the TVT procedure and this will be reviewed later in the chapter.

Intermediate and long-term results for suburethral slings suggest that the continence rate at 10 years is similar to that at 1 year.[19,20] In fact, it appears that if sling procedures are successful after 6 months, then they are likely to remain successful for many years.[20]

As with Burch colposuspension, most of the chronic complications after sling procedures relate to voiding dysfunction and urgency symptoms. Postoperative voiding disorders occur in an average of 12.8% (range 2%–37%).[19] Long-term self-catheterization has been reported in up to 7.8% of patients, although a figure of 2% may be more realistic.[19,20,22] Urge incontinence after slings, like colposuspension, occurs in 3% to 30%[20] and may represent persistence of preexisting urge symptoms or de novo development (about 7%).[2,20] Vaginal and urethral erosion occur in up to 5% of patients, mostly after synthetic slings. Sling revision or removal has been reported in 1.8% to 35% of patients after synthetic slings. Modifications designed to achieve greater stabilization, such as anchorage to the pubic bone, do not seem to result in improvement over existing techniques and carry a risk of osteomyelitis or osteitis pubis at the site of anchorage.

In the American Urological Association review by Leach et al,[2] the level of evidence for articles on sling procedures was B (intermediate) or C (low) by AHCPR guidelines. However, many surgeons in the United States are encouraged by the results of slings as primary and secondary procedures for SUI. This trend is illustrated in two surveys in which American urologists were asked what procedure they used for SUI related to urethral hypermobility. In the 1996 report, 71% of urologists used needle suspensions and 25% used retropubic suspensions.[23] In the 2001 report, 14% of urologists used needle suspensions, 17% used retropubic suspensions, and 68% used slings for type II SUI.[24]

Tension-Free Vaginal Tape

The increasing trend toward sling procedures has been affected by the introduction of the polypropylene tension-free vaginal tape (TVT). This procedure is based on a theory of SUI pathophysiology, presented by Petros and Ulmsten,[25] that proposes impairment of the pubourethral ligaments as one of the primary causes of SUI. Following this view, a narrow strip of polypropylene mesh is placed at the mid-urethra to compensate for the inefficiency of the pubourethral ligaments.

Long-term objective results of TVT procedure for primary SUI were shown in a Nordic multicenter trial by Nilsson et al;[26] at median follow-up of 56 months, 85% of patients were cured, 10.6% were improved, and 4.7% were failures.[26] In patients with mixed incontinence, 56% had resolution of their urge symptoms after TVT; and 6% developed new symptoms of urge incontinence, findings that are similar to other sling procedures. There were no cases of mesh erosion or permanent retention. Others have reported comparable statistics. The only randomized trial comparing the results of TVT versus Burch colposuspension showed similar objective and subjective cure rates from both procedures.[12] In this study, where TVT and colposuspension were employed as a primary procedure, complete continence was reported in 38% after TVT and 40% after Burch. Stress continence was reported in 66% and 68%, respectively. Strict definitions of cure and the fact that nonattenders and patients with missing data were recorded as treatment failures may explain the lower cure rates compared with other studies.[12]

The operating time of TVT is relatively short; most patients can undergo TVT without general anesthesia, as an outpatient or with an overnight stay. Complications appear to be less severe and possibly less common than with pubovaginal fascial slings. In a multicenter study, intra-operative bladder perforation was recognized in 9% of proce-

dures, but no long-term sequelae resulted.[12] Short-term voiding disorders occurred in 4.3% of women, and retention requiring transection of the tape in 1% to 2.8%.[27,28] Mesh erosion into the vagina or urinary tract, pelvic hematoma, and bowel perforation can occur, but are very rare.[27]

The success of TVT has encouraged the introduction of similar products with modified methods of midurethral sling placement (retropubic "top-down" and transobturator). As with pubovaginal slings, the true comparison between the outcome of these materials and modified methods compared with TVT can only be done in properly designed clinical trials.

Urethral Bulking Agents

A number of bulking agents have been used for the treatment of SUI in women. The rationale for use of bulking agents arises from the need for a "washer" effect on the tissues at the proximal urethra and the bladder neck. The bulking agents (eg, collagen, carbon-coated beads, and fat) are injected in a retrograde (more common) or antegrade fashion in the periurethral tissue at the bladder neck and proximal urethra.

The challenges with existing bulking agents continue to be their durability and long-term results. Most reports have studied glutaraldehyde cross-linked collagen as the bulking agent. Dmochowski and Appell[29] summarized the literature on cross-linked bovine collagen for the treatment of SUI and ISD. Most patients in the studies had failed other incontinence surgeries and had a supported non-mobile bladder neck. Seventeen studies were cited with cure rates ranging from 7% to 83%. The cure rate, defined in 15 articles as completely continent, averaged 48%. The average overall success rate (defined as continent or improved) was 76% (range 68%–90%).[29] Only 8 studies defined intrinsic sphincter deficiency, either as Valsalva leak point pressure < 60 cmH_2O or through stress video-urodynamics to assess bladder neck opening.

Durasphere uses pyrolytic carbon-coated zirconium beads in water-based carrier gel with beta-glucan. A randomized trial comparing bovine collagen and Durasphere for SUI due to ISD showed similar results for both agents.[30] Table 1 summarizes the results of that trial.

A number of new bulking agents and techniques are in various stages of development, including microballoons, human collagen, autologous cartilage, bioglass, calcium hydroxylapatite, cross-linked hyaluronic acid, hyaluronic acid and dextranomer microspheres, silicone, and ethylene vinyl alcohol copolymer.[29]

Surgical Treatment of SUI With Pelvic Organ Prolapse

Stress urinary incontinence frequently coexists with pelvic organ prolapse, especially of

TABLE 1. Summary of the Results of a Multicenter, Randomized, Controlled, Double-Blind Study of Bovine Collagen vs. Durasphere for the Treatment of SUI due to ISD

	Durasphere	**Collagen**
Improvement of 1 or more continence grade at the 12 month F/U	76 (66.1%) of 115 women	79 (65.8%) of 120 women
Improvement of 1 or more continence grade 1 year after the last injection	49 (80.3%) out of 61 women	47 (69.1%) out of 68 women
Mean number of injections	1.69	1.55
Mean volume injection (mL)	4.83 (range 0.5–9.1)	6.23 (range 2–12.5)
Mean total volume (mL)	7.55 (0.5–22)	9.58 (2.0–30)
Adverse events	24.7% urgency (resolved in 90%); 16.9% retention.	11.9% urgency (resolved in 65%); 3.4% retention.

From: Lightner D, et al. (30).

the anterior vagina. Symptoms of SUI can be overt, or the patient can be asymptomatic but at risk to develop SUI when the prolapse is reduced or repaired (potential, latent, or masked SUI). Patients with Stage II or III vaginal prolapse with coexistent symptomatic SUI have a number of treatment options. If the prolapse will be repaired abdominally, as with a sacral colpopexy, then a Burch colposuspension, with a paravaginal defect repair if needed, is appropriate. For vaginal prolapse repair, a sling should be placed to treat SUI. We generally use TVT or a comparable mid-urethral sling if the patient has SUI without ISD. If ISD coexists with prolapse, then a pubovaginal fascial sling is appropriate although alternative materials, including a mid-urethral polypropylene sling, may be equally effective. Although anterior colporrhaphy with suburethral plication is not as effective as colposuspension or sling for symptomatic SUI, it may be appropriate for selected elderly patients with mild SUI in whom surgical morbidity and risk of postoperative voiding impairment is best kept to a minimum.

Women who have severe prolapse with potential SUI present a unique challenge to the surgeon. Data supporting specific recommendations in these patients are unavailable and several opposing opinions exist among experts. In fact, even the correct method for making the diagnosis of potential SUI is controversial. In general, for women who have significant anterior vaginal prolapse even after the vaginal apex is suspended, repair of the residual cystocele is indicated. Suburethral plication of the bladder neck to stabilize urethral hypermobility is probably appropriate in most cases. One randomized trial showed that in the setting of prolapse repair and potential stress incontinence, needle suspension procedures did not result in less incontinence postoperatively than suburethral plication, but resulted in more short-term complications.[31] Whether placing a low-tension mid-urethral sling results in fewer postoperative symptoms of incontinence and voiding dysfunction compared with suburethral plication remains unresolved, but is an important area of future study.

Conclusions

Long-term data suggest that Burch colposuspension and sling procedures, using autologous or synthetic materials, produce similar objective cure rates of approximately 80% and improvement in an additional 10% of patients. These results are supported by a few randomized trials as well as a large number of case series (strength of evidence: A and B). Anterior colporrhaphy, needle urethropexy, and paravaginal defect repair have lower cure rates for SUI (Level A). Laparoscopic Burch may have lower cure rates but more studies with higher power are needed. For slings, in the presence of an increasing number of new (and unproven) materials, further study is needed to determine whether the choice of material influences the outcome.

Short-term data from a single randomized trial demonstrate a similar success rate of TVT and open Burch colposuspension (Level A). A relatively large number of TVT case series show cure rates of 80% to 85% and an overall cure plus improvement rate of 94% (Level B).

Long-term complications after Burch colposuspension, pubovaginal slings, and TVT are mostly related to voiding dysfunction and urgency. The TVT procedure seems to result in more rapid return to voiding although, as with other slings, a small number of cases still result in retention requiring sling transection.

Bulking agents provide a relatively noninvasive method of treatment of SUI. Short-term data suggest a cure rate of 48%, and an overall cure and improvement rate of 76% (Level B). Longer-term results suggest a continued decline in success rate necessitating repeat injections. It is not known whether non-absorbable bulking agents last longer; in the short term, there is no difference in results. Injection of bulking agents

often provides a more acceptable form of treatment of women with SUI and ISD who wish to avoid more invasive surgery.

The treatment of symptomatic SUI with Stage III or IV pelvic organ prolapse generally follows the route of the prolapse repair procedure: a Burch colposuspension is done if the prolapse repair is abdominal, and a pubovaginal or midurethral sling is done if the prolapse repair is transvaginal. Treatment of potential SUI in women with severe prolapse remains controversial and recommendations are based on few studies (Level C). We prefer to provide preferential support to the bladder neck at the time of prolapse repair but try not to over-elevate the bladder neck, which may cause more voiding dysfunction and urgency.

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