

Burch Colposuspension



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KEYWORDS

• Burch • Colposuspension • Urethropexy

KEY POINTS

- Stress urinary incontinence is a prevalent condition for which surgical treatment continues to evolve.
- The Burch colposuspension has a 50-plus year history demonstrating strong long-term outcomes with few complications.
- Laparoscopic and open Burch colposuspension approaches have been shown to have equal efficacy.
- Other minimally invasive options, such as the mini-incisional Burch and robotic Burch, have less comparison data, although likely have similar outcomes.
- Although the use of the Burch colposuspension has waned in recent years secondary to a shift toward urethral sling operations, the Burch procedure still has an important role in the treatment of stress incontinence; specifically, a Burch should be considered when vaginal access is limited, intra-abdominal concurrent surgery is planned, or mesh is contraindicated.

INTRODUCTION

Stress urinary incontinence (SUI) is a prevalent condition affecting 25% to 35% of the US female population.^{1–3} The current lifetime risk of surgery for SUI in the United States is approximately 13.5% with an estimated 200,000 women undergoing surgical repair annually.^{4,5} These rates are predicted to increase in the coming years secondary to an aging population.⁶

SUI is generally attributable to urethral hypermobility as a result of diminished urethral support, although there can also be a component of urethral sphincter weakness. In women with incontinence secondary to urethral hypermobility, retropubic colposuspension surgery (or urethropexy) is a traditional repair that surgically elevates and reinforces periurethral tissue. Although once considered the “gold standard” in SUI treatment, the number of colposuspension procedures has waned since the turn of the twenty-first century following the introduction of the midurethral sling.

In fact, over the past 2 decades, minimally invasive urethral sling procedures have become the dominant form of SUI treatment in the United States, accounting for nearly 90% of all surgical corrections in 2009.^{7,8} However, following the 2011 Food and Drug Administration notification on serious complications associated with transvaginal mesh, the negative publicity associated with vaginal synthetic mesh products has extended to urethral slings.^{9,10} Subsequently, the interest in colposuspension procedures has been rekindled as both women and practitioners alike seek alternative SUI treatment options. As a result, the Burch procedure continues to have a place in the operative armamentarium of the gynecologist and urologist.

THE COLPOSUSPENSION PROCEDURE: ORIGINS

The Burch procedure was first described by Dr John C. Burch in 1961.¹¹ Initially, he advocated for attaching the paravaginal fascia to the

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tendinous arch of the fascia pelvis. This point of attachment was later changed to Cooper ligament in order to provide a more secure fixation. The procedure was further modified by Tanagho¹² in 1978 to its current state, where the paravaginal sutures are placed further lateral from the urethra, and a looser approximation of tissues is undertaken.

There are several other colposuspension variants, although none as commonly performed as the Burch procedure. One well-known urethropexy, the Marshall-Marchetti-Krantz (MMK) procedure, fixes the bladder neck to the periosteum of the symphysis pubis. The MMK historically has similar rates of short-term cure compared with the Burch procedure; however, it carries a risk of osteitis pubis (0.7%) that is not present with the Burch variant.¹³ Because of the small but increased risk of potentially devastating infection, the International Consultation on Incontinence Committee determined in 2009 that there is no evidence for the continued use of the MMK cystourethropexy.^{14,15}

BURCH MECHANISM OF ACTION

The Burch colposuspension procedure addresses SUI secondary to urethral hypermobility, but does not alleviate incontinence secondary to intrinsic sphincter deficiency. Interestingly, the precise mechanism of colposuspension surgery remains incompletely understood, although it is thought to restore anatomic support to the bladder neck and prevent urethral mobility with Valsalva.¹⁶ This is borne out in imaging studies of women before and after Burch procedures, which demonstrate that postoperative cure rates are associated with a shorter distance between the bladder neck and levator ani muscle (Fig. 1).¹⁷

LONG-TERM EFFICACY AND PERIOPERATIVE COMPLICATIONS

Because of its use for 50-plus years, the Burch procedure has ample long-term outcomes data, with cure rates in small series up to 82% to 90% at 5- to 10-year follow-up.^{18–20} Similarly, in a large review of 55 publications, the continence rates for open Burch procedures were noted to be 85% to 90% at 1 year postoperatively and approximately 70% at 5 years.²¹

As with any surgery, the Burch procedure carries its own set of complications. In a large review, the risk of significant bleeding resulting in postoperative hematoma or transfusion events was around 2%²² and is consistent with small single-institution reports describing transfusion rates

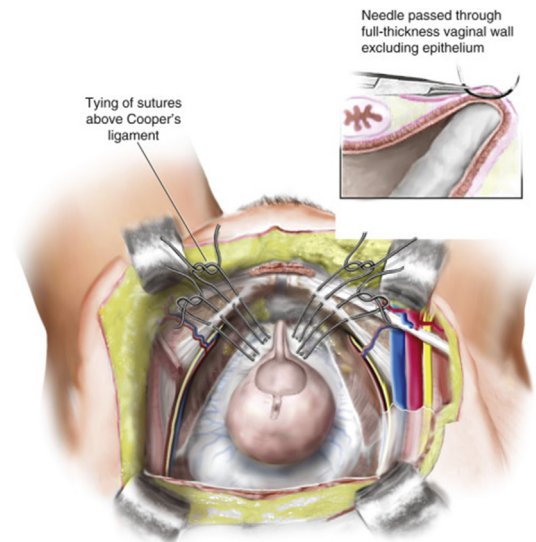


Fig. 1. Burch colposuspension suture placement. (From Karram MM. Retropubic urethropexy for stress incontinence. In: Baggish MS, Karram MM, editors. Atlas of pelvic anatomy and gynecology surgery. 3rd edition. St Louis (MO): Saunders; 2011. p. 406; with permission.)

ranging from 0.7% to 3%.^{23,24} Bleeding as a result of the Burch colposuspension occurs largely from injury to paravaginal veins when the surrounding fat pad is not fully cleared before suture placement. It is suggested that postoperative bleeding can be reduced with increased surgical exposure of the area.

Bladder injury may also occur at the time of Burch procedures, with an incidence of 0.4% to 9.6% (being more common in patients who have undergone prior pelvic surgery). Ureteral kinking or ureteral injury is even rarer, cited in 0.2% to 2%. Given the possibility of genitourinary harm, it is recommended that cystoscopy be performed at the end of a Burch procedure to ensure ureteral efflux and to rule out bladder injury. Among other postoperative complications, the rate of urinary tract infections ranges from 4% to 40% depending on the specific definition used and wound infections range from 4% to 10.8%.^{22–24}

In addition to the above complications, immediate postoperative voiding dysfunction has been reported in up to 25% of patients following their Burch procedure.^{22,25,26} The true profile of postoperative voiding symptoms is difficult to determine, however, because patients with frequency/urgency storage symptoms are often combined into the same category with those developing urinary retention. Furthermore, many publications define voiding dysfunction differently, making comparison difficult. Overall, the risk of urinary

retention requiring long-term catheterization beyond 1 month is low, ranging from 0.7% to 7% (with most studies showing an incidence <3%). De novo detrusor instability may also occur (3%–8% of patients) and has been shown to be largely impacted by preoperative voiding function.^{22,25–27} Interestingly, however, the Burch procedure may also improve bladder storage. Specifically, in a study of women undergoing preoperative urodynamics, a similar proportion of women had postoperative resolution of their detrusor overactivity compared with those who developed de novo detrusor overactivity (~8% each).²³

Similar to other vaginal procedures, dyspareunia and pelvic pain may arise after Burch colposuspension. Long-term dyspareunia has been noted in 2% to 4% of women, whereas groin or suprapubic pain is reported by 2% to 6%.^{26–30} Last, it has been theorized that by elevating the anterior vaginal wall, the Burch procedure may promote posterior vaginal wall weakness and resultant enterocele formation. This risk of developing a postoperative enterocele is reported to occur in 12% to 17% of women. It is noteworthy, however, that attempts to prevent enterocele formation with a concurrent culdoplasty have failed to decrease future enterocele rates.^{27,31,32} As a result, it is not clear if the Burch colposuspension is the true cause of developing vaginal prolapse in certain compartments, or if it is simply the natural history of pelvic organ prolapse.

BURCH VERSUS SLING

As noted above, the urethral sling has largely taken the place of the Burch colposuspension as the current “gold standard” in female SUI surgery. The shift to sling based procedures is a result of several factors, which include but are not limited to decreased patient morbidity and increased rates of success in those undergoing sling procedures. In a recent meta-analysis comparing the results of 15,855 female patients enrolled in 28 randomized controlled trials, women who underwent sling placement had higher postoperative objective continence rates (based on a negative postoperative stress test) than those receiving a Burch colposuspension (79% vs 68%, respectively).³³ The superior cure rate for slings also holds true in the setting of concomitant surgery for pelvic organ prolapse. In a randomized controlled trial of women undergoing sacrocolpopexy randomized to Burch versus midurethral sling surgery, although the continence outcomes were similar at 6-month follow-up, those receiving a sling had superior continence rates at the 1- and 2-year follow-up timepoints.³⁴ In addition

to increased continence outcomes, slings are also noted to have shorter operative times, shorter length of hospital stay, and decreased intraoperative blood loss as compared with open Burch urethropexy^{35,36} (although similar rates of dyspareunia and pelvic pain occur with each).³⁷

Despite the increased cure rates (both objective and subjective) provided by sling procedures, the improved efficacy may come at a cost. In the SIS-TeR trial, a randomized controlled trial comparing pubovaginal fascial slings to open Burch procedures, the higher success rates in the sling group were offset by increased rates of urinary tract infections, postoperative de novo urge incontinence, voiding dysfunction, and reoperation.³⁸ Specifically, more patients with a sling had urinary retention issues (defined as either the requirement for catheterization after 6 weeks or repeat surgery to facilitate bladder emptying) when compared with the Burch group (14% vs 2%), and treatment of postoperative urge incontinence was also increased in the sling group (27 vs 20%). The increased risk of adverse events in women undergoing sling surgery as compared with Burch colposuspension was further reiterated in a systematic review demonstrating colposuspension to have decreased risks of postoperative voiding dysfunction.²¹ Taking these tradeoffs into account, Weber and Walters³⁹ published a decision analysis showing that the Burch procedure should be considered if the risk of urinary retention or detrusor instability is higher than 10% in women undergoing slings.

LAPAROSCOPIC BURCH COLPOSUSPENSION

The laparoscopic colposuspension was introduced in 1991 as a minimally invasive modification to the open Burch procedure.⁴⁰ Initial studies in the early 2000s showed that the laparoscopic colposuspension had a steep learning curve with a trend toward higher complication rates and longer operative times compared with the open approach. The increased learning curve and operative times were tempered, however, by similar objective cure rates, decreases in blood loss, improvements in postoperative pain, and shorter hospital stays using the laparoscopic approach.^{41,42}

The early laparoscopic Burch series also described several modifications that affect postoperative continence. The first was the use of clips (rather than traditional sutures) to approximate Cooper ligament to the periurethral tissue. Although the clip technique made laparoscopy more accessible to many surgeons,⁴² it was found over time to result in inferior postoperative continence outcomes compared with suture-based repairs.^{43–45} Similarly, another means to decrease the surgery

learning curve, stapled mesh as a fixation method, had objective cure rates that were inferior to that of suture-based repairs.^{43–45} Likewise, the placement of only one laparoscopic suture per side was noted to be less effective than 2 sutures per side.⁴⁶

As with most procedures, the outcomes of the laparoscopic Burch approach have improved with time. There have been 2 recent large randomized controlled trials comparing open and laparoscopic Burch surgeries. Carey and colleagues⁴⁷ evaluated a cohort of 200 women with SUI randomized to open or laparoscopic Burch and demonstrated that with up to 5 years of follow-up, there were no significant differences in either anatomic success or subjective perception of cure between the groups. In addition, it was noted that although the mean operating time was actually longer in the laparoscopic group, there was decreased blood loss and less postoperative pain in those undergoing laparoscopic surgery. Kitchener and colleagues⁴⁸ similarly evaluated 291 women randomized to a laparoscopic or open Burch procedure and found no difference in objective or subjective outcomes, although fewer patients in the laparoscopic group experienced significant pain (23 vs 60%, respectively). A systematic review of laparoscopic versus open approaches to the Burch colposuspension further supports the conclusion that there are no significant differences in postoperative continence rates between the approaches.²¹ Given that the subjective and objective cure rates are equivalent between the laparoscopic and open methods, the consensus is that surgeons should undertake the approach with which they are most comfortable.^{49,50}

ROBOTIC BURCH COLPOSUSPENSION

The robotic Burch urethropexy was first reported by Francis and colleagues⁵¹ in 2015 and Bora and colleagues⁵² in 2017. Their technique requires the use of 3 robotic ports and an assistant port. Although the cost of robotic surgery to perform a Burch colposuspension procedure alone is significant, the authors propose that a robotic approach to Burch colposuspension is particularly useful in patients undergoing other concurrent robotic surgeries.⁵² In addition to the 2 case reports, there has since been a small study of 20 women randomized to robotic-assisted hysterectomy with robotic Burch versus open abdominal hysterectomy with open Burch. Although the concurrent hysterectomy is a potential confounding factor for several potential outcomes, the study demonstrated no difference in incontinence rates between the 2 groups and support the use of robotic Burch urethropexy at the time of a

concurrent robotic surgery in the appropriate patient population with the appropriate surgeon.⁵³

MINI-BURCH PROCEDURE

Another proposed minimally invasive variant of the Burch colposuspension is the “Mini-Incisional Burch.” This procedure modification was proposed by Lind and colleagues⁵⁴ in 2004, with the goal of providing the same surgical correction through a smaller incision. The modified procedure was performed in 40 women under spinal anesthesia using a 1.5- to 2.5-cm horizontal skin incision above the pubic bone, as compared with the classic 5-cm open Burch incision. Using a suturing device that allows suture passage and retrieval in one motion, they were able to place sutures with a combination of visualization and proprioception via a hand in the vagina. The study authors reported a complete cure (cough stress test and questionnaire) in 97% of patients at short-term follow-up (9 months), and 85% of the procedures were performed on an outpatient basis.

OPERATIVE PEARLS

The critical aspects of the Burch procedure, regardless of surgical approach, are to obtain adequate exposure and to avoid reapproximating tissue under undue tension. The surgical goal is to loosely approximate the Cooper ligament to the periurethral tissue in order to allow postoperative adhesion formation that provides broad support for the urethra and bladder neck. To date, there are no randomized trials to suggest superiority of one suture type over another; however, most surgeons use absorbable suture. In addition, reviews have shown no difference in outcomes whether placing 2, 3, or 4 sutures per side, although as mentioned above it has been demonstrated that one suture per side is insufficient.⁴² It is also critical to understand that although the Burch colposuspension does suspend the bladder neck and may repair small cystoceles, it is insufficient for repairing significant anterior pelvic organ prolapse. Hence, women with significant prolapse defects with concomitant SUI undergoing colposuspension should additionally have a dedicated cystocele repair.⁵⁵

The following steps describe the open Burch colposuspension:

1. Either a pfannenstiel or straight midline subumbilical incision is made (at least 5 cm).
2. The retropubic space is exposed and peritoneum is swept superiorly. The periurethral fat is removed for adequate visualization of the anterolateral vaginal wall.

3. A Foley catheter is inserted per urethra, and the balloon is inflated. With an index finger in the vagina and gentle traction on the catheter, the bladder neck with the Foley balloon is palpable. With an assistant providing exposure by retracting the bladder medially and superiorly, the endopelvic and vaginal fascia are visible.
 4. Two (or 3) absorbable stitches are then placed through the endopelvic and vaginal fascial complex, using the index finger to determine the appropriate depth (care should be taken to not violate the vaginal mucosa). The most cephalad suture is usually placed at the level of the bladder neck (2 cm lateral), and sutures are placed about 1 cm apart caudally.
 5. The vaginal sutures are then placed through Cooper ligament and tied loosely (2- to 4-cm suture bridge between vagina and Cooper ligament) in a tension-free manner.
 6. Cystoscopy is performed to rule out suture penetration into the bladder/urethra and also to confirm ureteral efflux. The placement of a drain in the retropubic space is usually unnecessary.
 7. Many surgeons leave a catheter in place for several days postoperatively before a void trial; however, this may not be necessary.
- Laparoscopic or robotic (intraperitoneal approach):

1. The surgeon starts with a 10-mm port at the umbilicus for the camera, with two 5-mm lower lateral working ports on either side of the abdomen (generally several finger-breadths above and medial to the anterior superior iliac spine bilaterally)
2. The bladder is filled in a retrograde fashion through a Foley catheter to define its outline. The space of Retzius is then opened sharply in a semilunar fashion to access the bladder neck and periurethral tissue.
3. Suture placement and postoperative care are similar to the open procedure from this point on.

SUMMARY

Despite waning enthusiasm for the Burch procedure over the past 20 years by many surgeons, there remains an appropriate niche for the colposuspension in today's day and age. Given excellent long-term outcomes over the course of the last half-century, the Burch colposuspension should be considered an appropriate surgical treatment for any woman with SUI. Given excellent long-term outcomes over the course of the last half-century,

the Burch colposuspension should be considered an appropriate surgical treatment for any woman with SUI, especially in settings where vaginal access is limited, where intra-abdominal surgery is already planned, or if mesh is contraindicated. As such, the Burch procedure has an ongoing role in the surgical repair of female SUI and should remain in the surgical repertoire of female pelvic medicine and reconstructive surgeons.

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