

Transperineal Ultrasound in Stress Urinary Incontinence: From Bladder Neck Hypermobility Assessment to Laparoscopic Burch Colposuspension

Soha Galal Ibrahim Siam, Reda Abdul Aziz Ahmad Mostafa, Ahmed Mohammed Hussien Ahmed, Mahmoud Ismail Abdelrahman Kotb

Department of Obstetrics and Gynecology, Faculty of Medicine, Zagazig University, Zagazig, Egypt

***Corresponding author:** Ahmed Mohammed Hussien Ahmed

Abstract

Background: Urinary incontinence significantly affects patients' quality of life worldwide and poses a substantial global economic burden. Stress urinary incontinence is characterized by sudden involuntary leakage of urine during activities that increase intra-abdominal pressure, such as exertion, sneezing, coughing, laughing, or straining. Transperineal ultrasound provides a noninvasive, dynamic, and objective assessment of pelvic floor anatomy and bladder neck mobility.

Objective: To review stress urinary incontinence, the role of transperineal ultrasound in assessing bladder neck hypermobility, and laparoscopic Burch colposuspension as a surgical treatment option.

Conclusion: Transperineal ultrasound provides objective information about bladder neck mobility and can be used in the peri-operative assessment of stress urinary incontinence. Burch colposuspension remains an effective long-term surgical option, while the laparoscopic approach provides the additional benefits associated with minimally invasive surgery.

Keywords: stress urinary incontinence; transperineal ultrasound; bladder neck mobility; Burch colposuspension; pelvic floor.

Introduction

Urinary incontinence, defined by the International Continence Association as any involuntary leakage of urine, significantly affects patients' quality of life worldwide and poses a substantial global economic burden. In women, this condition exceeds 60% during their lifetime, with a higher incidence among those who have had children and increasing with age. Types of urinary incontinence include stress, urge, overflow, and mixed incontinence, each with distinct and sometimes overlapping causes. ⁽¹⁾

Stress urinary incontinence is characterized by the sudden involuntary leakage of urine during activities that increase intra-abdominal pressure, such as exertion, sneezing, coughing, laughing, or straining. This condition arises from a combination of anatomical and physiological factors that disrupt the normal urinary continence control mechanisms. Nonmodifiable risk factors include female sex and White race, whereas modifiable factors include smoking, obesity, and chronic constipation. ⁽²⁾

In women, factors such as pregnancy, multiple vaginal deliveries, menopause, obesity, and pelvic surgeries, such as hysterectomy, are significant contributors to stress urinary incontinence. In addition, pelvic organ prolapse, commonly occurring postmenopausal or after childbirth, is often associated with stress incontinence. ⁽³⁾

Stress incontinence is far less common in men and typically occurs following prostate surgical procedures. A survey conducted between 2005 and 2016 involving over 15,000 women in the United States found that more than half had experienced some form of incontinence, with approximately 25% reporting stress-only urinary incontinence. Although not life-threatening, urinary incontinence profoundly impacts the aging population,

necessitating surgical intervention when conservative treatments fail. Stress incontinence imposes substantial financial burdens, with management costs in the United States exceeding \$13 billion annually in recent years. ⁽⁴⁾

Treatment options include conservative and behavioral measures, lifestyle changes, bladder training, Kegel exercises, physical therapy, biofeedback, electrostimulation, pharmacotherapy, pessaries, urethral bulking agents, slings, and various other surgical procedures, including artificial sphincters. ⁽⁵⁾

Stress Urinary Incontinence

Etiology

Stress urinary incontinence occurs when the pressure inside the bladder exceeds the urethra's ability to remain closed, often due to damage to the sphincteric muscles that maintain continence. The etiologies of stress urinary incontinence are multifactorial and include the following: ⁽⁶⁾

Loss of support from pelvic floor musculature and connective tissue and urethral hypermobility: This involves the loss of pelvic support, which can originate from connective tissue disorders; chronic cough; obesity; pelvic floor trauma; vaginal delivery, especially if traumatic; pregnancy; pelvic or vaginal surgery; genitourinary syndrome of menopause or other hypoestrogenic states; chronic constipation; heavy lifting; and smoking. This is the most common etiology of stress incontinence in women. ⁽⁷⁾

Intrinsic sphincter deficiency: This is due to sphincteric neuromuscular dysfunction or damage from previous pelvic surgeries, neuropathic and spinal disorders, trauma, cauda equina, sacral and severe pelvic fractures, nerve injury from abdominal surgeries, myelodysplasia, radiation therapy of the pelvis, or complications of urological surgery such as transurethral resection of the prostate or radical prostatectomy. The degree of leakage tends to be greater and may result in continuous dripping. Intrinsic sphincter deficiency may occur in both genders but is the most common etiology of significant stress incontinence and continuous urinary leakage in men. ⁽⁸⁾

Although vaginal atrophy is most common in menopausal patients, it can affect women of any age who experience decreased estrogen stimulation of the urogenital tissues. In premenopausal women, a hypoestrogenic state may occur during the postpartum period, with lactation, or due to conditions such as hypothalamic amenorrhea or the use of antiestrogenic drugs. Importantly, not all patients with atrophic vulvovaginal changes observed during a pelvic examination exhibit symptoms. ⁽⁹⁾

Recent research indicates that heavy metal exposure, particularly in younger and middle-aged females, is positively associated with stress incontinence. Elevated levels of lead and cadmium in the serum and cadmium and cesium in the urine are positively associated with the risk of stress incontinence. In a retrospective study involving 590 women, high-density lipoprotein (HDL) cholesterol levels were negatively correlated with the development of stress urinary incontinence. Specifically, higher levels of HDL were associated with a lower risk of stress incontinence. Targeting HDL levels offers a potential future avenue for preventing and treating stress urinary incontinence. ⁽¹⁰⁾

Epidemiology:

Stress urinary incontinence (SUI) is the most common type of urinary incontinence in women, affecting approximately 37.5% of women with urinary incontinence, while nearly 62% of women experience some form of urinary leakage during their lifetime. Its prevalence increases with advancing age, menopause, obesity, and vaginal childbirth, with pregnancy-related SUI also increasing the risk of persistent symptoms later in life. Despite its high prevalence and negative impact on quality of life, only about 60% of affected women seek medical care. In men, SUI is relatively uncommon and is mainly associated with prostate surgery. ^(11, 12, 13)

Pathophysiology:

Stress urinary incontinence (SUI) is a multifactorial condition resulting from impaired support of the urethra and bladder neck, together with weakness of the pelvic floor muscles and urethral sphincter. Normal continence depends on the coordinated function of the levator ani muscles, external urethral sphincter, pelvic connective tissues, and neural control. Risk factors such as aging, pregnancy, vaginal childbirth, menopause, obesity, and

pelvic surgery can weaken these supporting structures, leading to urethral hypermobility and reduced urethral closure pressure. Consequently, increases in intra-abdominal pressure may exceed urethral pressure, resulting in involuntary urine leakage during activities such as coughing, sneezing, or physical exertion. ^(6, 14, 15)

Sonographic Parameter

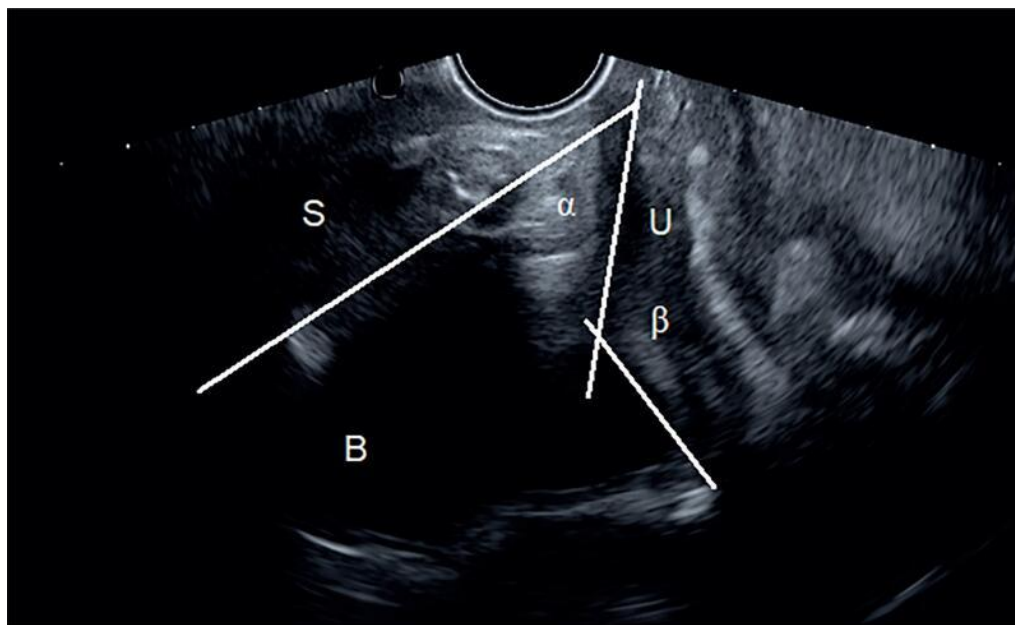
Ultrasound imaging has developed rapidly and been widely applied in the urogynecological field in the evaluation of pelvic floor dysfunction, including urinary incontinence, since the 1980s. The position and mobility can be accurately accessed by TPUS, providing real-time data in any situation, such as sitting, standing, coughing, and straining, to mimic daily activity. ⁽¹⁶⁾

TPUS has been reported as a useful tool to evaluate female SUI and hypermobility of the bladder neck with a clear reference point of the pubic symphysis. TPUS is not routinely applied in predicting USI due to inadequate sensitivity, even though several parameters, including UH, were found significantly different between women with and without SUI. ⁽¹⁷⁾

Evaluation of Stress Urinary Incontinence Using Transperineal Ultrasonography

Accurate assessment of stress urinary incontinence (SUI) is essential to guide appropriate management and avoid unnecessary interventions. Patient-reported symptom questionnaires are commonly used for evaluation, while physical tests such as the Q-tip test, radiographic imaging, and ultrasonography provide objective data. The role of urodynamic studies remains controversial, particularly in uncomplicated SUI cases, emphasizing the need for reliable, non-invasive, and cost-effective diagnostic methods. ⁽¹⁸⁾

Transperineal ultrasonography has emerged as a useful tool to evaluate bladder and urethral dynamics during the Valsalva maneuver. In cases of hypermobile urethra, which is considered a primary pathophysiological factor in SUI, the proximal urethra rotates postero-inferiorly, and the bladder neck descends during straining. Key parameters commonly assessed include bladder neck descent (BND), the symphysis pubis–urethra angle (α angle), and the posterior urethrovesical angle (β angle). The longitudinal axis of the symphysis pubis serves as a fixed reference line for α angle measurement, while a horizontal line across the postero-inferior margin of the symphysis is used to evaluate bladder neck descent. ⁽¹⁹⁾



S: symphysis pubis, U: urethra, B: bladder

Figure 3. α and β angles at rest. *Keshavarz et al.* ⁽²⁰⁾

Bladder volume at the time of imaging significantly influences measurements. A partially filled bladder (approximately 150–200 mL) provides adequate visualization without restricting the Valsalva maneuver, whereas an empty bladder can limit visibility and yield higher variability in measured values. BND has been consistently identified as a reliable predictor of urethral hypermobility, whereas rotation angles of the proximal urethra show more variability and overlap between SUI and control groups. ⁽²¹⁾

Transperineal ultrasonography allows evaluation of both resting and Valsalva angles. In SUI, α and β angles are typically higher during straining, reflecting increased urethral rotation and bladder neck descent. The change in angles from rest to Valsalva ($R\alpha$ and $R\beta$) is also increased in SUI, providing an additional measure of urethral hypermobility. These parameters correlate well with Q-tip test measurements, offering a less invasive and more comfortable alternative for patients. Pain scores are generally lower with ultrasonography compared to the Q-tip test, enhancing patient tolerance. ⁽¹⁹⁾

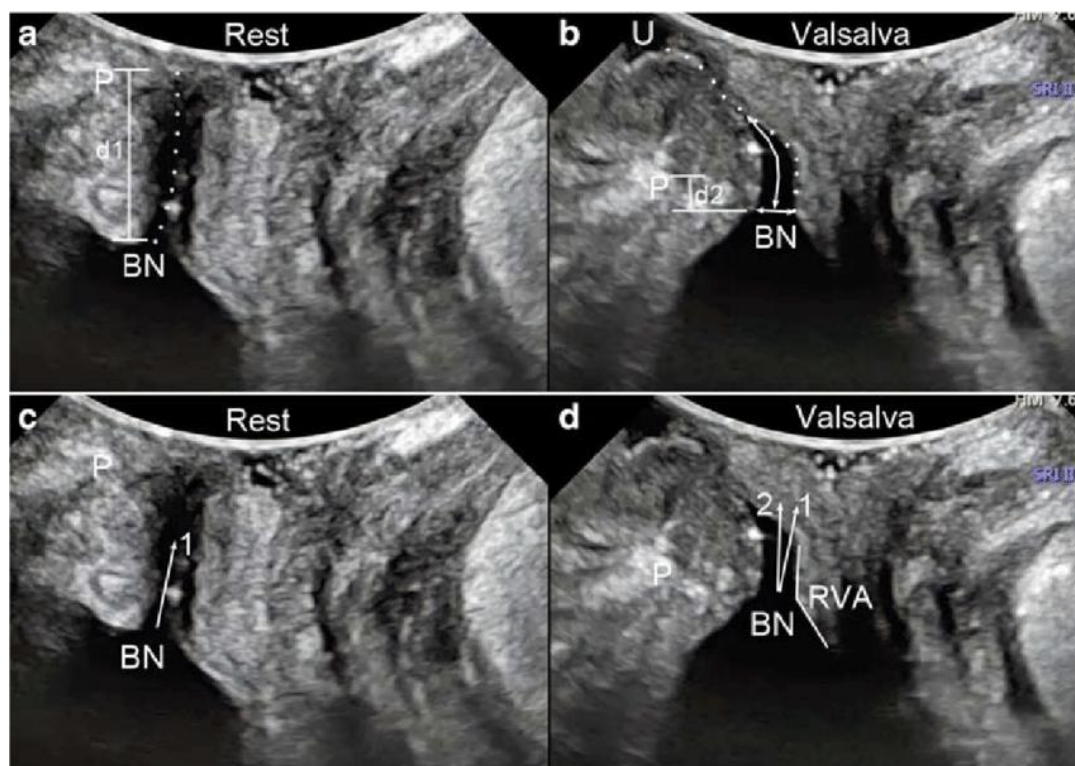


Figure 4. Transperineal ultrasound images in the mid-sagittal plane during real-time leaking. A and C were taken at rest, B and D during the Valsalva manoeuvre. *Wen et al.* ⁽²²⁾

The Role of Transperineal Ultrasound in the Preoperative and Postoperative Assessment of Laparoscopic Burch Colposuspension

Peri-operative transperineal ultrasound plays a pivotal role in the surgical management of stress urinary incontinence by providing a dynamic, objective assessment of pelvic floor anatomy. This imaging modality allows surgeons to quantify the functional defects of the lower urinary tract before intervention and rigorously evaluate the anatomical correction achieved after the laparoscopic Burch colposuspension. ⁽²³⁾

Preoperative Assessment Roles

In the preoperative phase, the primary utility of transperineal ultrasound is the definitive characterization of bladder neck hypermobility, which is the specific indication for the Burch procedure. By positioning the transducer on the perineum, clinicians establish a coordinate system using the inferior border of the pubic symphysis as a fixed reference point. Key measurements taken at rest and during maximal Valsalva maneuvers include the vertical and horizontal position of the bladder neck, the urethral rotation angle, and the retrovesical

(beta) angle. A vertical bladder neck descent of significantly more than 15 mm or 25 mm (depending on the specific study criteria) is often used to confirm the diagnosis of hypermobility. ⁽²⁴⁾

Furthermore, the imaging helps distinguish between pure anatomical support defects and intrinsic sphincter deficiency by visualizing urethral funneling—a widening of the proximal urethra during stress. This distinction is crucial, as the presence of severe sphincter deficiency might influence the surgeon to consider alternative or adjunctive procedures alongside the colposuspension. ⁽¹⁷⁾

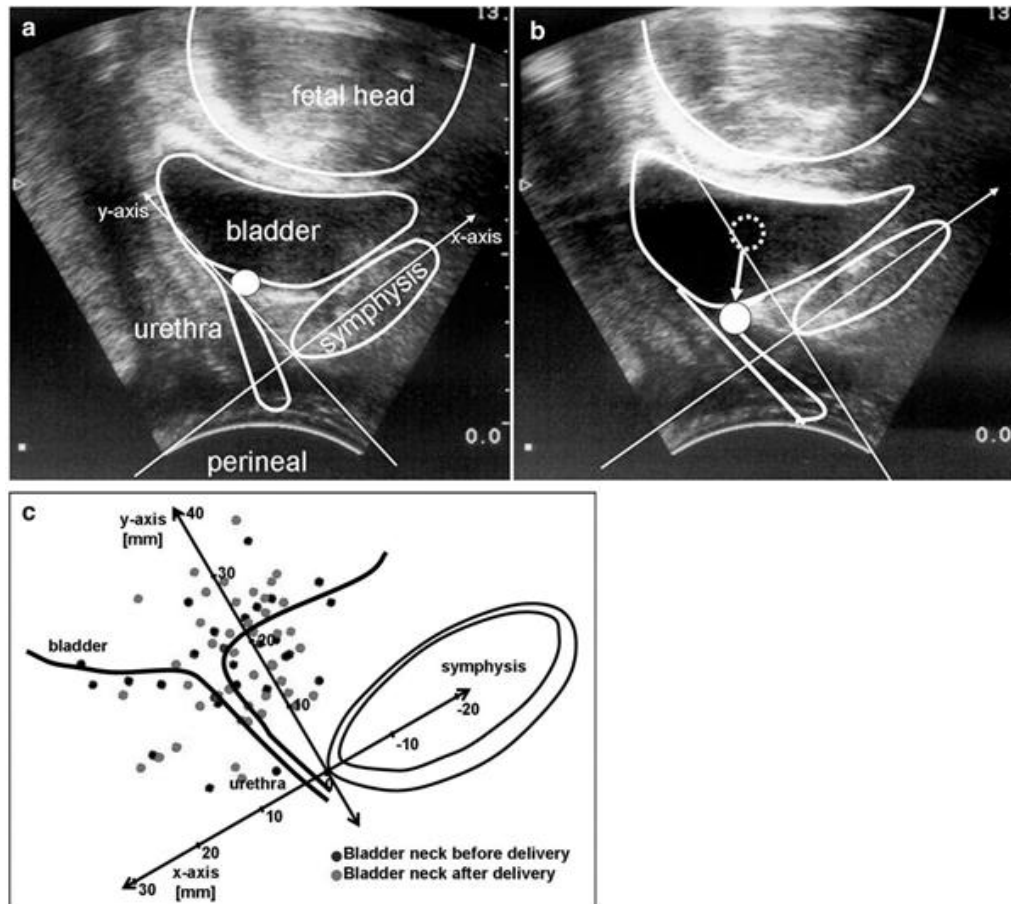


Figure 5. Perineal ultrasound for evaluating the bladder neck mobility. *Jamard et al.* ⁽²⁵⁾

Postoperative Assessment Roles

During the intra-operative and immediate post-operative periods, ultrasound assessment can be valuable for monitoring the degree of surgical correction, although this is more commonly described in research settings than routine practice. The primary goal of the laparoscopic Burch colposuspension is to elevate and stabilize the paravaginal fascia against Cooper's ligament. Ultrasound imaging can assist surgeons in verifying that the bladder neck has been adequately elevated without being over-corrected. Over-elevation or excessive compression can lead to postoperative voiding dysfunction, urinary retention, or de novo urge incontinence. By visualizing the bladder neck's position in real-time or immediately after the procedure, surgeons can ensure that the urethra remains mobile enough for voiding while being sufficiently supported to prevent leakage under stress. ⁽²⁶⁾

Postoperatively, the technology serves as a critical quality control tool to verify the success of the suspension. The scans are used to calculate the "Delta H," or the vertical elevation of the bladder neck compared to its preoperative baseline. A successful laparoscopic Burch colposuspension is anatomically defined by the restoration of the bladder neck to a high, retropubic position and the significant reduction of its dorsocaudal movement during coughing or straining. ⁽²⁷⁾

If a patient experiences recurrent incontinence, ultrasound can differentiate between a failure of the surgical suspension (recurrence of hypermobility) and non-structural causes such as detrusor overactivity. Additionally, the imaging is instrumental in investigating voiding dysfunction; findings of excessive bladder neck elevation or an acutely narrowed urethrovesical angle can indicate surgical overcorrection, helping to explain symptoms like urinary retention or de novo urgency. ⁽²⁸⁾

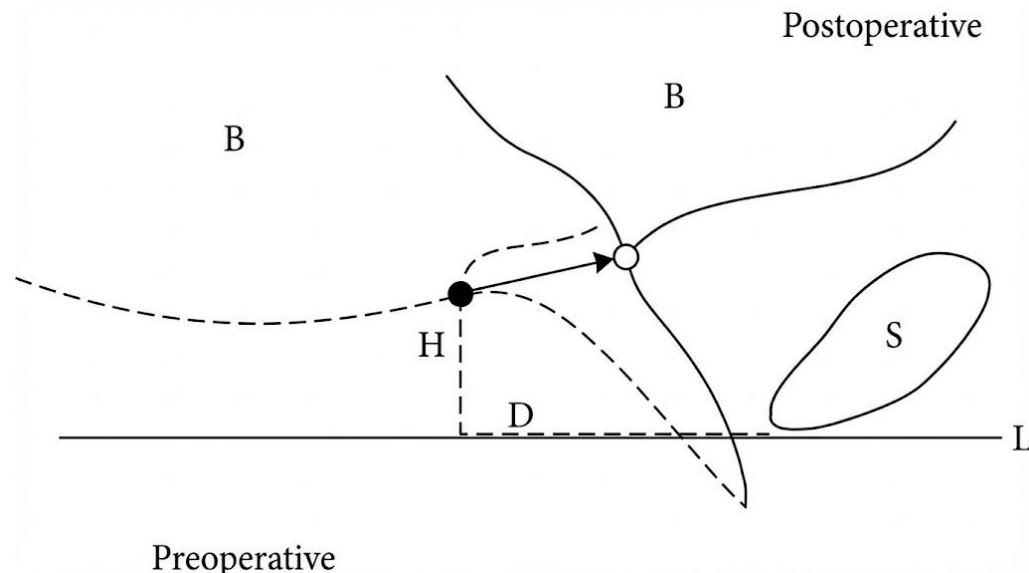


Figure 6. Schematic diagram of bladder-neck position before (broken line) and after (solid line) colposuspension with the parameters H and D, indicating the postoperative elevation of the bladder neck as reflected by the increased distance of H from the horizontal line through the inferior border of the symphysis pubis. ⁽²⁹⁾

Laparoscopic Burch Colposuspension

History of Burch Colposuspension

Burch originally developed this suspension procedure as a modification to the first retropubic suspension, the Marshall-Marchetti-Krantz (MMK) operation, to provide improved treatment for surgical management of stress urinary incontinence and correction of cystocele. The MMK procedure, sought to address stress urinary incontinence by fixing the periurethral tissue to the periosteum of the pubis symphysis with sutures. ⁽²⁴⁾

Burch found while performing the MMK procedure that the periosteum was not a stable structure to hold sutures. Initially he promoted attaching endopelvic fascia to the tendinous arch of the pelvis; however, he found similar issues with maintaining suture durability. In later iterations, he discovered the utilization of Cooper's (iliopectineal) ligament as the point of fixation for the endopelvic fascia and retropubic elevation of the bladder neck. ⁽²⁾

Burch's procedure historically had similar cure rates for SUI as the MMK procedure, ranging from 65% to 91%, at 2–7 years follow-up, but without running the risk of osteitis pubis (0.7%) seen in MMK complications. Eventually, the International Consultation on Incontinence Committee determined in 2009 that there was no evidence to continue MMK procedure because of potentially harmful infection risk. In 1978, the Burch procedure was further modified to its current technique. Adjustments included placing paravaginal sutures further lateral to the bladder neck (2 cm) in the endopelvic fascia to minimize injury to neurovascular tissue adjacent to the urethra and looser approximation of sutures from vaginal tissue to Cooper's ligament by leaving a 2–4 cm bridge to avoid overlifting the bladder neck which ultimately could cause bladder neck obstruction and urinary retention. ⁽²⁴⁾

In 1991, the first laparoscopic Burch procedures were performed in response to trends toward minimally invasive surgery to achieve shorter hospital stays, less pain and morbidity, and faster overall recovery. Although initial studies in the early 2000s proved difficult for laparoscopic approach due to high learning curve and trends

toward higher complication rates and longer operative times, outcomes have improved for laparoscopy with similar objective cure rates to open approach up to 5 years follow-up with the additional benefits of reduced blood loss, improvement in postoperative pain, faster discharge from hospital, and overall association with minimally invasive surgery. ⁽³⁰⁾

Not long after the first laparoscopic Burch procedure, the earliest mention of robotic-assisted Burch colposuspension was cited as a part of a feasibility study of 17 urologic laparoscopic procedures that were performed with the use of one or two robotic arms as a substitute for surgical assistants. A complete robotic-assisted Burch procedure was first reported in 2007 in a paper of two case reports. Another minimally invasive variant of the Burch procedure proposed in 2004 advocated the use of 1.5–2.5 cm Pfannenstiel mini-incision technique under spinal anesthesia and a suturing device to allow suture passage and retrieval in one motion. ⁽²⁷⁾

Burch colposuspension was considered the gold standard surgical treatment of stress urinary incontinence until the urethral sling gained widespread acceptance. Transvaginal tape was first described in 1995, and the first midurethral sling was approved by the FDA in 1998. Since then, midurethral slings have become the dominant form of surgical treatment for SUI over the last 20 years, accounting for 80% of surgical corrections in 2009. ⁽³¹⁾

However, negative publicity toward synthetic mesh for any procedure after the 2011 FDA warning of complications from transvaginal mesh for surgical treatment of pelvic organ prolapse has kept Burch procedure as a relevant alternative option for treatment of SUI for patients who have failed a prior incontinence procedure and decline mesh implantation or where suburethral mesh slings are not available. ⁽³²⁾

Surgical Technique

The iliopectineal line is contained within the retropubic space. Therefore, understanding the anatomy of the retropubic space is critical to performing a Burch procedure safely. The retropubic space, also known as the space of Retzius, is bordered by the pubic bone anteriorly and the bladder posteriorly. It is laterally bounded by the obturator internus muscle, levator muscles, and the arcus tendineus fascia pelvis. The space contains several nerves and vascular structures. The iliopectineal ligament runs along the superior aspect of the ischiopubic rami bilaterally. ⁽³³⁾

The obturator canal, containing the obturator neurovascular bundle, is located 5–6 cm from the pubic symphysis and 1–2 cm inferior to the iliopectineal line. Lateral to the proximal bladder neck lies a plexus of veins called the veins of Santorini as well as nerves that innervate the urethra and bladder. Familiarity with these structures is paramount to the placement of Burch sutures through the periurethral fascia and the iliopectineal line accurately and safely. ⁽³⁴⁾

Laparoscopic and robotic Burch procedure is initiated with identification of the bladder. This is typically performed by backfilling the bladder with at least 200 mL of fluid in order to identify the site of entry into the retropubic space. Once this is performed, the medial umbilical ligaments are identified, and a transverse incision is created in the anterior abdominal wall peritoneum about 2–3 cm above the edge of the bladder to enter the retropubic space. Staying medial to the medial umbilical ligaments avoids injury to the inferior epigastric vessels, which course laterally. ⁽³⁵⁾

Pneumodissection from the insufflated abdomen facilitates the opening of the retropubic space. The bladder is reflected inferiorly by dissecting through the adventitial tissue of this area with careful attention to hemostasis. Dissection should be carried out in the midline toward the pubic symphysis. Once the pubic bone is identified, dissection is continued laterally toward the obturator internus muscles. Cooper's ligament is cleared off with mostly blunt dissection. ⁽³⁶⁾

Dissection in the retropubic space is continued caudally through the adventitial tissue to expose the periurethral tissue. Overlying adipose tissue is then cleared off bluntly, ideally while an assistant elevates the periurethral tissue on either side of the Foley catheter balloon to expose the glistening white periurethral fascia. Upward periurethral pressure with a vaginal hand or instrument is used to identify the location of Burch sutures at the proximal urethral and bladder neck. A suture is placed through the ligament, then through the periurethral tissue 1–2 cm lateral to the proximal urethral, and then back through the ligament. The suture is then cut and held.

A second suture is placed in a similar fashion through the ligament, then just lateral to the bladder neck, and back through the ligament. This is repeated on the contralateral side. ⁽³⁷⁾

Placement of the periurethral sutures is performed with an assistant hand in the vagina with the index and middle fingers straddling the urethra. In some cases, a sterile thimble or other instrument has been described to protect the surgeon's finger. The Foley balloon is palpated in order to identify the bladder neck. Once all four sutures are placed, the sutures are tied down to stabilize the urethra. Typically permanent suture is used. Both monofilament and polyfilament sutures have been described. The authors utilize No. 0 permanent Prolene or Gore-Tex suture on an SH needle. The sutures are tied leaving a suture bridge such that the urethral is elevated toward but not all the way to Cooper's ligament. Postoperatively, cystourethroscopy is performed to assess integrity of the bladder and urethra. A voiding trial is recommended postoperatively to evaluate for postoperative urinary retention. ⁽³⁸⁾

Surgical approaches

The procedure generally follows two primary surgical approaches: the transperitoneal approach and the extraperitoneal approach. While the method of accessing the surgical field differs between these two, the fundamental goal remains the same: to suspend the periurethral vaginal tissue to Cooper's ligament (the iliopectineal ligament) to stabilize the bladder neck. ⁽³⁹⁾

The Transperitoneal Approach

In the transperitoneal technique, the surgeon typically utilizes a three- or four-trocar system. A primary port is placed at the umbilicus for the laparoscope, while accessory ports are inserted in the lower abdominal quadrants to facilitate dissection and suturing. According to literature, this approach requires the surgeon to incise the peritoneum to access the Space of Retzius (the retropubic space). The bladder is mobilized, and the anterior abdominal wall is cleared of fatty tissue to visualize the relevant anatomy, including the pubic symphysis, Cooper's ligaments, and the bladder neck. This route is often preferred when the patient requires concomitant intra-abdominal pelvic surgery, such as a laparoscopic hysterectomy, as it provides a comprehensive view of the pelvic cavity. However, it necessitates the careful mobilization of the bladder and bowel, which may increase the operative time due to the need to release intraperitoneal adhesions. ⁽⁴⁰⁾

The Extraperitoneal Approach

The extraperitoneal approach is designed to access the Space of Retzius directly without entering the peritoneal cavity, thereby reducing the risk of intraperitoneal organ injury and postoperative adhesions. In this method, a space is created between the rectus muscle and the peritoneum, often using a balloon dissector or CO₂ pneumodissection. A camera port is usually placed just above the pubic hairline or at the umbilicus (with the camera staying pre-peritoneal), followed by working ports. Studies indicate that this approach is often favored for patients who have undergone previous abdominal surgeries, as it avoids the potential complications of navigating through bowel adhesions. While some studies suggest the operating time and blood loss are comparable to the transperitoneal route, the extraperitoneal approach eliminates the need to open and subsequently close the peritoneum. ⁽⁴¹⁾

Surgical Dissection and Suspension Technique

Regardless of the access route (transperitoneal or extraperitoneal), the core suspension technique mirrors the classic open Burch procedure. The surgeon dissects the retropubic space to clearly identify the bladder neck, the paravaginal fascia, and Cooper's ligament. The standard technique involves placing non-absorbable sutures (typically two on each side) through the paravaginal fascia, excluding the vaginal mucosa, and anchoring them to the ipsilateral Cooper's ligament. Literature highlights that using sutures is superior to using mesh or surgical tackers, as the latter have been associated with lower cure rates and higher complication risks. The sutures are tied with sufficient tension to elevate the vaginal wall and stabilize the urethrovesical junction without causing obstruction. ⁽⁴²⁾

Outcomes of Burch Colposuspension

Burch colposuspension remains one of the most effective long-term surgical options for stress urinary incontinence. Overall continence rates after open retropubic colposuspension are reported at 85–90% at one year postoperatively, with a decline to approximately 70% at five years and 65–70% at 20 years of follow-up. This sustained efficacy underscores the durability of the procedure over decades. ⁽³¹⁾

With the advent of minimally invasive surgery, laparoscopic Burch colposuspension has been compared with the traditional open approach. Early experiences demonstrated comparable subjective outcomes, though objective outcomes were sometimes inferior with laparoscopy, likely reflecting the learning curve and longer operative times. Various technical modifications in laparoscopic cases, including the use of clips, mesh, and staples for fixation of periurethral tissue, have generally been shown to be less effective than traditional suture-based repairs. Evidence indicates that placement of two sutures on each side of the paravaginal fascia provides superior curative outcomes and reduces the risk of voiding dysfunction compared to a single suture per side. Comparisons between extraperitoneal and transperitoneal laparoscopic approaches show similar short-term cure rates, with no significant differences in effectiveness. ⁽²⁷⁾

Short-term follow-up studies indicate similar subjective and objective cure rates between laparoscopic and open colposuspension. While laparoscopic procedures may require longer operative times, they are associated with less postoperative pain, reduced analgesic requirements, lower estimated blood loss, shorter catheterization duration, and faster recovery with shorter hospital stays. ⁽⁴³⁾

Overall, choice of approach is best guided by surgeon experience and patient-specific factors, as both techniques provide comparable efficacy. ⁽⁴³⁾

Comparisons of Burch colposuspension with mid-urethral sling procedures, such as tension-free vaginal tape (TVT), indicate broadly similar long-term continence outcomes. Sling procedures may offer shorter operative times, shorter hospital stays, and faster return to normal activity, but can be associated with higher risks of urinary tract infections, de novo urgency, voiding dysfunction, and reoperation. Burch colposuspension has demonstrated effectiveness as a secondary treatment following failed anti-incontinence surgery, with objective cure rates ranging from approximately 55% to 90% over 18–24 months and subjective cure rates up to 93%. Effectiveness may decrease with multiple prior anti-incontinence procedures, suggesting caution in patients with two or more previous operations. ⁽⁴⁴⁾

Conclusion

Transperineal ultrasound has emerged as a noninvasive alternative for assessing urethral mobility and provides objective information about bladder neck mobility. Postoperatively, the technology serves as a quality control tool to verify the success of suspension and assess the position and mobility of the bladder neck. Burch colposuspension remains one of the most effective long-term surgical options for stress urinary incontinence. Overall, choice of surgical approach is best guided by surgeon experience and patient-specific factors, as both laparoscopic approaches provide comparable efficacy.

References

1. **Al-Ahmadi FQ, Awaji NAM, Alshehri HA *et al.* (2024):** Urinary Incontinence Diagnosis and Management and its Impact in Woman's Health Quality of Life. *Journal of International Crisis and Risk Communication Research*, 7(S6), 1401.
2. **Azoolay O (2020):** Stress incontinence University of Zagreb. School of Medicine. Department of Gynecology and ...].
3. **Wu JM (2021):** Stress incontinence in women. *New England Journal of Medicine*, 384(25), 2428-2436.
4. **Smith WJ, VanDyke ME, Venishetty N *et al.* (2023):** Surgical management of male stress incontinence: techniques, indications, and pearls for success. *Research and Reports in Urology*, 217-232.

5. **Mundet L, Rofes L, Ortega O *et al.* (2021):** Kegel exercises, biofeedback, electrostimulation, and peripheral neuromodulation improve clinical symptoms of fecal incontinence and affect specific physiological targets: an randomized controlled trial. *Journal of neurogastroenterology and motility*, 27(1), 108.
6. **Falah-Hassani K, Reeves J, Shiri R *et al.* (2021):** The pathophysiology of stress urinary incontinence: a systematic review and meta-analysis. *International Urogynecology Journal*, 32(3), 501-552.
7. **Tim S, & Mazur-Bialy AI (2021):** The most common functional disorders and factors affecting female pelvic floor. *Life*, 11(12), 1397.
8. **Santiago JE, Cameron AP, & Navarrete RA (2020):** Addressing sphincter dysfunction in the female with neurogenic lower urinary tract dysfunction. *Current Bladder Dysfunction Reports*, 15(3), 142-152.
9. **Sarmento ACA, Costa APF, Vieira-Baptista P *et al.* (2021):** Genitourinary syndrome of menopause: epidemiology, physiopathology, clinical manifestation and diagnostic. *Frontiers in Reproductive Health*, 3, 779398.
10. **Ni J, Li Z, Lu Y *et al.* (2022):** Relationship between exposure to cadmium, lead, and mercury and the occurrence of urinary incontinence in women. *Environmental Science and Pollution Research*, 29(45), 68410-68421.
11. **Vaughan CP, & Markland AD (2020):** Urinary incontinence in women. *Annals of internal medicine*, 172(3), ITC17-ITC32.
12. **Abufaraj M, Xu T, Cao C *et al.* (2021):** Prevalence and trends in urinary incontinence among women in the United States, 2005–2018. *American journal of obstetrics and gynecology*, 225(2), 166. e161-166. e112.
13. **Chang S, -R. L, W.-A. C *et al.* (2021):** Risk factors for stress and urge urinary incontinence during pregnancy and the first year postpartum: a prospective longitudinal study. *International Urogynecology Journal*, 32(9), 2455-2464.
14. **Pipitone F, Sadeghi Z, & DeLancey JO (2021):** Urethral function and failure: A review of current knowledge of urethral closure mechanisms, how they vary, and how they are affected by life events. *Neurourology and Urodynamics*, 40(8), 1869-1879.
15. **Yang X, Wang X, Gao Z *et al.* (2022):** The anatomical pathogenesis of stress urinary incontinence in women. *Medicina*, 59(1), 5.
16. **Pham TX, Quiroz LH (2021):** Ultrasonographic imaging of the pelvic floor. *Obstet Gynecol Clin North Am.*, 48 (3): 617-637.
17. **Obaid AA, Al-Hamzawi SA, & ALWAN AAA (2021):** Laparoscopic and Open Burch Colposuspension For Stress Urinary Incontinence: Advantages/Disadvantages. *International Journal of Pharmaceutical Research* (09752366), 13(1).
18. **Abrar S, Razzak L, & Mohsin R (2021):** The practice of Burch Colposuspension versus Mid Urethral Slings for the treatment of Stress Urinary Incontinence in developing country. *Pakistan Journal of Medical Sciences*, 37(5), 1359.
19. **Sharama K (2024):** Evaluation of the Role of Transperineal Ultrasound in Urinary Stress Incontinence in Women.
20. **Keshavarz E, Pouya EK, Rahimi M *et al.* (2021):** Prediction of stress urinary incontinence using the retrovesical (β) angle in transperineal ultrasound. *Journal of Ultrasound in Medicine*, 40(8), 1485-1493.
21. **Schallom M, Prentice D, Sona C *et al.* (2020):** Accuracy of measuring bladder volumes with ultrasound and bladder scanning. *American Journal of Critical Care*, 29(6), 458-467.

22. **Wen L, Zhao B, Chen W *et al.* (2020):** Real-time assessment of the behaviour of the bladder neck and proximal urethra during urine leaking in the cough stress test (CST) in supine and standing positions using transperineal ultrasound. *International Urogynecology Journal*, 31(12), 2515-2519.
23. **Walters MD (2021):** Retropubic Operations for Stress Urinary. *Walters & Karram Urogynecology and Reconstructive Pelvic Surgery-E-Book*, 243.
24. **Marquini GV, & Sartori MGF (2022):** Burch procedure: a historical perspective. *Revista Brasileira de Ginecologia e Obstetrícia/RBGO Gynecology and Obstetrics*, 44(05), 511-518.
25. **Jamard E, Blouet M, Thubert T *et al.* (2020):** Utility of 2D-ultrasound in pelvic floor muscle contraction and bladder neck mobility assessment in women with urinary incontinence. *Journal of gynecology obstetrics and human reproduction*, 49(1), 101629.
26. **Grewal K, Jones B, L'Heveder A *et al.* (2021):** The use of intra-operative ultrasound in gynecological surgery: a review. *Future Science OA*, 7(3), FSO678.
27. **Izett-Kay M, & Vashisht A (2023):** Laparoscopic Colposuspension. In *Textbook of Female Urology and Urogynecology* (pp. 1061-1076). CRC Press.
28. **Luck A, & Raffee S (2022):** Burch Colposuspension. In *Female Urinary Incontinence* (pp. 257-272). Springer.
29. **Anapolski M, Alkatout I, Wedel T *et al.* (2021):** Laparoscopic approaches to the retropubic space: three alternatives with anatomical considerations. *Minimally Invasive Therapy & Allied Technologies*, 30(3), 154-162.
30. **MARTIN-DEL-CAMPO LA (2021):** Clinical Anatomy and Physiology of the Abdominal Wall. *Atlas of Robotic General Surgery E-Book*, 23.
31. **Karmakar D, Dwyer PL, Murray C *et al.* (2021):** Long-term effectiveness and safety of open Burch colposuspension vs retropubic midurethral sling for stress urinary incontinence—results from a large comparative study. *American journal of obstetrics and gynecology*, 224(6), 593. e591-593. e598.
32. **Raju R, Abdelaziz A, Karram M *et al.* (2023):** Complications of Synthetic Mesh Used to Repair Pelvic Organ Prolapse and Stress Urinary Incontinence. In *Textbook of Female Urology and Urogynecology* (pp. 990-999). CRC Press.
33. **Waghmare M (2024):** Retroperitoneal Anatomy. *Complex Total Laparoscopic Hysterectomy (TLH) with Newer Approaches in Bladder Dissection*, 3.
34. **Šaherl LK, & Rakuša M (2022):** An anatomical description of the obturator region with clinical aspects. *Journal of the Anatomical Society of India*, 71(3), 234-241.
35. **Da David Jiang AAW (2022):** Patient Preparation and Positioning for Laparoscopic and Robotic Urologic Surgery. *Atlas of Laparoscopic and Robotic Urologic Surgery-E-Book*, 1.
36. **Yadav A (2023):** Anatomy and operative approaches including minimal access. *Abdominal Trauma, Peritoneum, and Retroperitoneum*, 173.
37. **Humphries LA, Hincapie MA, & Nezhat CH (2022):** Retroperitoneal dissection. In *Reproductive Surgery: Current Techniques to Optimize Fertility* (pp. 239-250). Springer.
38. **Valderrama V, Collins SA, Swift S *et al.* (2020):** Joint report on the terminology for surgical procedures to treat stress urinary incontinence in women. *International Urogynecology Journal*, 31(3).