



COMMITTEE OPINION

Number 694 • April 2017

Committee on Gynecologic Practice American Urogynecologic Society

This Committee Opinion was developed by the American College of Obstetricians and Gynecologists' Committee on Gynecologic Practice and the American Urogynecologic Society.

This document reflects emerging clinical and scientific advances as of the date issued and is subject to change. The information should not be construed as dictating an exclusive course of treatment or procedure to be followed.

Management of Mesh and Graft Complications in Gynecologic Surgery

ABSTRACT: This document focuses on the management of complications related to mesh used to correct stress urinary incontinence or pelvic organ prolapse. Persistent vaginal bleeding, vaginal discharge, or recurrent urinary tract infections after mesh placement should prompt an examination and possible further evaluation for exposure or erosion. A careful history and physical examination is essential in the diagnosis of mesh and graft complications. A clear understanding of the location and extent of mesh placement, as well as the patient's symptoms and therapy goals, are necessary to plan treatment approaches. It is important that a treating obstetrician–gynecologist or other gynecologic care provider who seeks to revise or remove implanted mesh be aware of the details of the index procedure. Diagnostic testing for a suspected mesh complication can include cystoscopy, proctoscopy, colonoscopy, or radiologic imaging. These tests should be pursued to answer specific questions related to management. Given the diverse nature of complications related to mesh-augmented pelvic floor surgery, there are no universal recommendations regarding minimum testing. Approaches to management of mesh-related complications in pelvic floor surgery include observation, physical therapy, medications, and surgery. Obstetrician–gynecologists should counsel women who are considering surgical revision or removal of mesh about the complex exchanges that can occur between positive and adverse pelvic floor functions across each additional procedure starting with the device implant. Detailed counseling regarding the risks and benefits of mesh revision or removal surgery is essential and can be conducted most thoroughly by a clinician who has experience performing these procedures. For women who are not symptomatic, there is no role for intervention.

Recommendations

The American College of Obstetricians and Gynecologists and the American Urogynecologic Society make the following recommendations:

- Short-term voiding dysfunction after placement of a synthetic midurethral sling is common and, if improving, can be managed expectantly for up to 6 weeks. However, retention (inability to empty the bladder) or small-volume voids with large post-void bladder residual volume should receive earlier intervention.
- Asymptomatic exposures of monofilament macroporous meshes can be managed expectantly.
- A trial of vaginal estrogen can be attempted for small (eg, less than 0.5-cm) mesh exposures.
- Persistent vaginal bleeding, vaginal discharge, or recurrent urinary tract infections (UTIs) after mesh placement should prompt an examination and possible further evaluation for exposure or erosion.
- Pelvic pain (including dyspareunia), possibly related to nonexposed mesh, is complex, may not respond to mesh removal, and should prompt referral to a clinician with appropriate training and experience, such as a female pelvic medicine and reconstructive surgery specialist.
- Mesh removal surgery should not be performed unless there is a specific therapeutic indication.

The purpose of this document is to provide obstetrician–gynecologists with guidance on how to manage simple mesh complications. This document also suggests when referral to a clinician with appropriate training and experience, such as a female pelvic medicine and reconstructive surgery specialist, is indicated for mesh complications related to vaginal prolapse surgery.

Background and General Principles

In gynecologic surgery, grafts or mesh may be used when the surgical procedure requires the use of bridging material to reinforce native structures. The term “graft” refers to a biological material that comes from either a human or an animal (xenograft). Autologous grafts can be harvested from the same person, whereas allografts come from human donors or cadavers. In gynecologic surgery, mesh refers to synthetic material (usually polypropylene). Because of complications attributed to multifilament and small-pore-size synthetic mesh, type 1 synthetic meshes (monofilament with large pore size) currently are used in the United States. This document focuses on the management of complications related to mesh used to correct stress urinary incontinence (SUI) or pelvic organ prolapse (POP).

Clinical Presentations of Complications

Vaginal mesh exposure may be entirely asymptomatic. Alternatively, vaginal mesh exposure can produce symptoms such as spotting or bleeding, discharge, pain, or pain with sex (for the patient or partner). Persistent vaginal bleeding, vaginal discharge, or recurrent UTIs after mesh placement should prompt an examination and possible further evaluation for exposure or erosion. Pain can be constant or associated only with activity (eg, sex). Furthermore, pain often is complex and multifactorial and may require a multidisciplinary approach.

Diagnostic Evaluation for Mesh and Graft Complications

A careful history and physical examination is essential in the diagnosis of mesh and graft complications. In the context of POP, grafts and mesh can be placed abdominally (eg, sacrocolpopexy) or transvaginally (eg, mesh-augmented apical, anterior and, rarely, posterior repairs). A clear understanding of the location and extent of mesh placement, as well as the patient’s symptoms and therapy goals, are necessary to plan treatment approaches. It is important that a treating obstetrician–gynecologist or gynecologic care provider who seeks to revise or remove implanted mesh be aware of the details of the index procedure. Prior operative reports are often the best source for obtaining this information. Operative reports from prior attempts to revise or remove the implanted material also should be reviewed. Mesh may be implanted into pelvic anatomical structures in a number of different

ways. The surface area of implanted mesh material also varies across surgical approaches and devices. Although each device is designed to secure the supporting mesh to specific pelvic structures, the result can be variable. Some pelvic structures that have been used to secure mesh include the sacrospinous ligament, sacrotuberous ligament, obturator membrane, and adductor compartment muscles, as well as the anterior longitudinal ligament. Pelvic structures can be injured during or after surgeries in which mesh is used. Examples of these structures are the sacrum (1), bladder (2), and rectum (3). Diagnostic testing for a suspected mesh complication can include cystoscopy, proctoscopy, colonoscopy, or radiologic imaging. These tests should be pursued to answer specific questions related to management. Given the diverse nature of complications related to mesh-augmented pelvic floor surgery, there are no universal recommendations regarding minimum testing.

General Principles of Management of Mesh and Graft Complications

Approaches to management of mesh-related complications in pelvic floor surgery include observation, physical therapy, medications, and surgery. [Table 1](#) presents an overview of specific mesh and graft complications and management options. There may be settings in which observation of exposed mesh is reasonable (4). Surgical intervention or referral is not always necessary for type 1 (monofilament and macroporous) mesh exposures into the vagina. Asymptomatic exposures of monofilament macroporous meshes can be managed expectantly. For women with symptoms, a trial of vaginal estrogen can be attempted for small (eg, less than 0.5 cm) mesh exposures. Topical estrogen may improve or resolve the mesh exposure, though there is little prospective, comparative evidence supporting this approach. A period of 6–12 weeks is a reasonable period to try topical estrogen.

One multicenter study of mesh complications after reconstructive surgery found that 60% of women required two or more interventions and that the first intervention was surgical in approximately one half of cases (5). These procedures are complex and should be approached with caution. Surgeons who are unfamiliar with the original index procedure or the management issues that follow should refer the patient to a surgeon who is familiar with these types of repairs.

Informed Consent

The obstetrician–gynecologist should counsel women who are considering surgical revision or removal of mesh about the complex exchanges that can occur between positive and adverse pelvic floor functions across each additional procedure starting with the device implant. Detailed counseling regarding the risks and benefits of mesh revision or removal surgery is essential and can be conducted most thoroughly by a clinician who has experience performing these procedures.

Table 1. Overview of Mesh and Graft Complications After Gynecologic Surgery and Suggested Management ↩

Complication	Procedure Most Commonly Associated With Complication	Suggested Management
Urinary retention or prolonged voiding disorder or obstructive symptoms	MUS or pubovaginal sling	<ul style="list-style-type: none"> Place urethral catheter Teach intermittent catheterization Consider sling release
Vaginal mesh exposure (asymptomatic and type 1 mesh)	MUS, TVM, or ASC	<ul style="list-style-type: none"> Observation Topical estrogen If the mesh is multifilament, then referral to a clinician with appropriate training and experience*
Vaginal mesh exposure (symptomatic)	MUS, TVM, or ASC	<ul style="list-style-type: none"> Topical estrogen If topical estrogen fails, referral to a clinician with appropriate training and experience*
Organ erosion (bladder, rectum)	MUS, TVM, or ASC	Referral to a clinician with appropriate training and experience*
Pain	MUS, TVM, or ASC	Referral to a clinician with appropriate training and experience*
Dyspareunia	MUS, TVM, or ASC	Referral to a clinician with appropriate training and experience*
Bowel dysfunction	TVM or ASC	Referral to a clinician with appropriate training and experience*
Sacral osteomyelitis or discitis	ASC	Referral to a clinician with appropriate training and experience*

Abbreviations: ASC, abdominal sacral colpopexy; MUS; midurethral sling; TVM, transvaginal mesh.

*Such as a female pelvic medicine and reconstructive surgery specialist

Complications: Midurethral Sling

Substantial safety and efficacy data support the role of synthetic mesh midurethral slings as a primary surgical treatment option for female SUI (6). However, mesh-related complications can occur.

Voiding Disorders

Management of incomplete voiding after midurethral sling placement is dependent on the underlying etiology. In general, prompt treatment of incomplete voiding is important to relieve patient discomfort and to prevent complications related to increased bladder pressures. Voiding dysfunction can occur after any type of procedure to address incontinence. This document will focus on treatment with a midurethral sling.

Short-Term Voiding Dysfunction

Short-term voiding dysfunction after placement of a synthetic midurethral sling is common and, if improving, can be managed expectantly for up to 6 weeks. However, retention (inability to empty the bladder) or small-volume voids with large postvoid bladder residual volume should receive earlier intervention. New onset voiding difficulty after midurethral sling surgery often is transient, and etiologies may include periurethral tissue

edema, anesthetic effects, opiates, pain, or outlet obstruction. Most incomplete bladder emptying after midurethral sling placement is self-limited and resolves with expectant management. In a prospective, randomized surgical trial of 600 women undergoing midurethral sling surgery, the frequency of incomplete bladder emptying was 20% on postoperative day 1, 6% at 2 weeks, and 2% at 6 weeks (7). Very few women in this trial underwent sling release surgery. In women with normal baseline voiding, most voiding dysfunction after midurethral sling surgery will resolve spontaneously.

A trial of void before discharge from the hospital can help determine early in the postoperative course if a patient is at risk of overdistention. If a patient is found to have postoperative voiding difficulty, she should be treated conservatively with indwelling catheterization or clean intermittent self-catheterization to prevent overdistention. Bladder overdistention can cause stretch injury, prolonging the time needed for catheterization. Clean intermittent self-catheterization is preferred for patient convenience (and often comfort) and a lower overall infection risk (8). However, for women who are unable to perform clean intermittent self-catheterization, a temporary indwelling catheter is an option. Suppressive antibiotics are not indicated during this time (8, 9).

Urinary tract infection can be triaged and treated per routine recommendations.

Among women performing clean intermittent self-catheterization, once postvoid bladder residual volume measures less than 150 mL on three consecutive occasions, assisted bladder drainage can stop. Patients who require indwelling catheters for assisted bladder drainage should have continuous drainage with voiding trials weekly until the residual volume measures less than 150 mL. If the patient demonstrates continuous improvement (a decrease) in residual volume over time, it is reasonable to monitor her progress for up to 6 weeks; however, if the residual volume remains persistently high (greater than 150 mL) at 6 weeks, sling release should be considered. In a patient with significant voiding dysfunction (eg, retention [unable to void at all], or if the patient is only voiding 50 mL or 100 mL with high postvoid bladder residual volume) who has not experienced a distention injury, the obstetrician–gynecologist or other gynecologic care provider should consider a sling loosening or sling release after approximately 2 weeks.

Recurrent SUI after sling release for obstruction occurs in approximately 40% of women (10). In one case series of 23 women undergoing tension-free vaginal tape release for voiding dysfunction, 61% of women remained continent 6 weeks after the release procedure, 26% reported improvement in SUI symptoms from baseline, and 13% had recurrence of their SUI (10). In another series that included 107 women, 49% of women reported recurrent SUI and 14% underwent repeat surgery for SUI after sling release (11). It remains unclear whether timing of the sling release (early versus late) has an effect on SUI outcomes.

Long-Term Voiding Dysfunction

Referral to a clinician with appropriate training and experience, such as a female pelvic medicine and reconstructive surgery specialist, is recommended for suspected long-term voiding dysfunction (typically 3 months or longer) after a midurethral sling placement. Bladder outlet obstruction from a midurethral sling can result in high-pressure voiding that leads to ureteral reflux, upper tract dilation, deterioration of renal function, and detrusor decompensation. Evaluation includes a complete history about the prior procedures and obtaining data about the type of anti-incontinence procedure performed. Baseline voiding patterns or studies and any subsequent multichannel urodynamic testing results, including emptying studies, also should be reviewed. It is important to inquire about general health issues that can affect voiding function, such as diabetes, constipation, or neurologic disease. The physical examination should include a pelvic examination to assess for pelvic floor muscle dysfunction or POP. Neurologic etiologies also should be considered. It is important to try to distinguish the underlying etiology of the voiding dysfunction and determine how much of it can be attrib-

uted to the midurethral sling, the most important factor being the temporal relationship. If a patient is voiding normally before an incontinence sling placement and afterward is having voiding difficulty, the etiology is likely the sling.

At a minimum, diagnostic testing should include obtaining a postvoid residual volume. Noninvasive uroflow testing can assess voiding pattern and maximum flow rates. Filling cystometry can assess detrusor function during filling, and pressure-flow studies assess detrusor pressures during voiding. Low flow rates with high detrusor pressures are suggestive of bladder outlet obstruction. Voiding diagnoses that are based on multichannel urodynamic studies lack precision, so interpretation of these studies must be considered cautiously (12). Cystoscopy may be considered if there is any suspicion of mesh erosion.

The treatment for long-term voiding dysfunction due to outlet obstruction after a midurethral sling procedure is a sling release. A small incision is made in the previous incision site or an anterior vaginal sulcus, the full width of the sling is isolated completely, an instrument is placed beneath the sling, and the sling is transected. Notably, sling release may not resolve the voiding dysfunction completely if the patient has baseline impaired detrusor function.

Vaginal Mesh Exposure

Mesh exposure after a midurethral sling procedure occurs in 1–2% of cases (13). Expectant management of exposed vaginal mesh, with or without topical estrogen, can be appropriate in asymptomatic patients who have type 1 mesh. Small case reports document that spontaneous reepithelialization can occur (14). If topical estrogen therapy is not successful, consideration can be given to surgically excising the edges of the vaginal incision and reapproximating the fresh incision edges. Care should be taken to ensure a tension-free closure and everting of the vaginal edges. There are few published success rates for primary reclosure; however, it is considered to be a low-risk procedure.

If expectant management with estrogen therapy and primary reclosure is unsuccessful and preservation of the sling remains the patient's preference, there are few data to guide patient decision making. Approaches described in case reports for preserving a functioning but exposed midurethral sling include full thickness autologous graft transposition and Martius graft transposition (15, 16). If approaches for sling preservation are unsuccessful and the patient is still symptomatic, sling excision can be performed; however, there is a risk of recurrent SUI. Excision of the entire mesh usually is not necessary.

Bladder and Urethral Erosion of Midurethral Sling

In the event of mesh erosion into the bladder or urethra, referral to a specialist familiar with reconstructive

techniques is warranted. Intravesical mesh erosion can be associated with adherent calculi, making extraction of the mesh through minimally invasive approaches difficult. The specialist may consider the following techniques: combined laparoscopic and cystoscopic excision of the portion of eroded mesh in the bladder (17); combined vaginal and laparoscopic approaches (18); or using assistance from ear, nose, and throat instruments to avoid the need for urethrotomy (19).

Pain

Pain after a midurethral sling procedure requires a focused and systematic examination of the pelvic skeletal and muscular anatomy to localize the specific structures associated with the patient's pain. It is important to determine levator tone and tenderness as a potential contributing factor to the patient's pain. Conservative management of mesh-associated pain can include physical therapy and trigger-point injections. When conservative options are unsuccessful, sling excision may be an option. Excision can include all or part of the mesh, but it is not uncommon for the mesh to be implanted into structures that are difficult to access surgically. For example, mesh implanted into the adductor compartment of the lower extremity can be hard to identify and remove (20). Notably, incomplete removal can make future surgical attempts, if required, more complicated; thus, the first attempt should be well planned.

Pubovaginal Slings With Autologous or Other Biologic Grafts

Voiding disorders may be more common after pubovaginal sling procedures than after midurethral sling procedures, although management is similar. Vaginal exposure and erosion are less common with autologous or biologic grafts than with synthetic mesh.

Complications: Transvaginal Mesh for Prolapse

Pelvic organ prolapse vaginal mesh repair should be limited to high-risk individuals in whom the benefit of mesh placement may justify the risk. This includes individuals with recurrent prolapse (particularly of the anterior or apical compartments) or with medical comorbidities that preclude more invasive and lengthier open and endoscopic procedures (21).

Wound Complications: Noninfectious and Infectious

Noninfectious wound complications after transvaginal mesh procedures may include granulation tissue and sinus tract formation. A detailed examination to rule out underlying mesh or suture exposure should be performed. A conservative approach, including observation or chemical cautery of granulation tissue, may be tried. If a wound complication is persistent, referral to an obstetrician-gynecologist with appropriate training and

experience, such as a female pelvic medicine and reconstructive surgery specialist, is recommended.

Vaginal Mesh Exposure

Although management of mesh exposure for transvaginally placed mesh for POP is similar to that for midurethral sling, the involved anatomy and volume of mesh varies. Given these differences, among symptomatic patients (those reporting pain, bleeding, or partner dyspareunia), referral to an obstetrician-gynecologist with appropriate training and experience, such as a female pelvic medicine and reconstructive surgery specialist who is familiar with managing these complications, is recommended.

Pain

Similar to when pain is associated with a midurethral sling, a detailed and systematic examination should be performed to localize the anatomy involved in the pain (including contributing anatomy, such as the levator muscles) and determine how it relates to the mesh procedure. Pain-related reports are complicated and often multifactorial. These issues may require multidisciplinary management and are not always entirely responsive to treatment. Prolonged pain can become centralized (eg, pain that is not localized to peripheral anatomy or trauma). Pelvic pain (including dyspareunia), possibly related to nonexposed mesh, is complex, may not respond to mesh removal, and should prompt referral to a clinician with appropriate training and experience, such as a female pelvic medicine and reconstructive surgery specialist. Poor understanding of chronic pain management complicates pain control that is attributed to transvaginal mesh (22). Pelvic floor physical therapy, trigger-point injections, and medications designed to disrupt or alter peripheral or central pain transmission are potentially helpful conservative options.

Surgery may be an option, but patients should be counseled that successful pain and dyspareunia outcomes after surgery are not uniform. The ideal timing of surgery cannot be estimated from the available data, although there are hypothetical and experiential reasons to favor earlier intervention (23). Surgery may involve extensive dissection and collaboration with other medical specialties, such as urology, colorectal surgery, or pain management. Outcomes of mesh revision surgery are variable (24–26). Many short-term case series describe positive functional outcomes (24, 25, 27–29), though recurrent prolapse or urinary incontinence can occur in up to one third of cases (30). However, in contrast, one series of 111 women treated for mesh complications with and without reoperation found that after at least 2 years, 29% reported the same or worse symptoms than those that occurred at presentation (31). Other series reported that 50% of cases had persistent pain or dyspareunia after revision surgery (26, 32). It should be noted that these data are limited by study design and mixed outcome assessments.

There are risks to dissecting into the ischioanal fossa to access the sacrospinous ligament or adductor compartment for access to the obturator membrane. These include neurologic and vessel injury as well as significant blood loss. Likewise, coincident with the mesh revision or removal surgery, the vaginal length or caliber can be altered, contributing to dyspareunia and making it difficult to differentiate the sequelae of the revision procedure from those of the antecedent mesh procedure.

Complications: Abdominally Placed Mesh (Sacrocopexy)

Vaginal Mesh Exposure

Like transvaginal mesh exposure, transabdominal mesh exposure, if asymptomatic and due to a monofilament mesh, may be managed conservatively with observation and topical estrogen. If the patient is symptomatic, the exposure is persistent, or a multifilament mesh was used, referral to a clinician with appropriate training and experience (such as a female pelvic medicine and reconstructive surgery specialist who is familiar with managing this complication) should be considered. Vaginal mesh excision of visualized mesh can be performed. If this approach fails, it is possible that a more complicated revision or excision of the mesh using an abdominal or laparoscopic approach may be necessary.

Pain

De novo vaginal apical pain has been reported after sacrocopexy. This complication is uncommon but may require complete excision of the mesh to relieve symptoms (33). A referral to a specialist should be considered.

Sacral Osteomyelitis or Discitis

Osteomyelitis and discitis are serious and increasingly reported complications of sacrocopexy. They should be considered in women who have back pain after this procedure. At the time of surgery, the most prominent landmark (often thought to be the sacral promontory) is actually the L5-S1 disc, and ideal placement of sacral sutures to prevent discitis is caudad to this prominence. These infections can present remote from surgery with significant morbidity and are diagnosed with imaging. Noncontrast magnetic resonance imaging is typically the most appropriate diagnostic approach. A patient with this condition should be referred to an obstetrician–gynecologist with appropriate training and experience, such as a female pelvic medicine and reconstructive surgery specialist. Often, a multidisciplinary approach, including working with specialists in orthopedic surgery, neurosurgery, infectious disease, and female pelvic medicine and reconstructive surgery, is required to manage this complication. Conservative approaches may start with antibiotics; however, if there is an abscess, surgical drainage; removing the graft; and possible debridement with reconstruction of the sacrum, lumbar vertebra, or disc spaces may be required.

Mesh Erosion Into Viscera

Erosion of mesh into organs, including the bladder, rectum, or bowel, is a rare complication. A patient who experiences this type of erosion should be referred to a specialist for management.

Asymptomatic Patients Who Request Removal of Mesh

Some asymptomatic women without any adverse effects after mesh-augmented pelvic surgery may request mesh removal. This request may come from a belief that the mesh is harmful, has been recalled, or that their medicolegal claim will be stronger if they have mesh removal surgery. For women who are not symptomatic, there is no role for intervention. Indeed, the removal of the mesh is more likely to cause adverse symptoms than to prevent future problems. Mesh removal surgery should not be performed unless there is a specific therapeutic indication.

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Full-text document published concurrently in the April 2017 issue of *Female Pelvic Medicine & Reconstructive Surgery*.

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ISSN 1074-861X

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