



# Vaginal Mesh for Urinary Incontinence and Prolapse: Impact on Sexual Function

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Published online: 31 January 2019

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## Abstract

**Purpose of Review** The evolution of vaginal mesh has had a large positive impact on quality of life for patients with stress incontinence and pelvic organ prolapse; for instance, the mid-urethral sling is considered the gold standard treatment for stress incontinence. There are unique side effects, however, for the use of mesh in surgical implantation, including infection, erosion, extrusion, and changes in urinary habits as well.

**Recent Findings** A side effect that may be overlooked in these women undergoing vaginal mesh surgery is sexual dysfunction; while the surgery itself may strongly improve quality of life, there can be some detrimental sexual side effects that may hinder the patient's quality of life or sexual function overall. Changes in sexual function can be encountered in anywhere from 5 to 20% of all women undergoing surgery for stress incontinence or vaginal prolapse, and the scope of these changes vary from positive to negative. These changes can be broken down by sub-topics explored in the FSFI including dyspareunia or pain, overall function, lubrication, and orgasm.

**Summary** Sexual function is an often overlooked and underdiscussed topic in the medical field and between clinicians and patients overall. It is imperative that clinicians discuss any and all possible complications of mesh surgery with patients preoperatively, including any effects, both positive and negative, in regard to sexual function.

**Keywords** Mesh implant · Pelvic organ prolapse · Stress incontinence · Vaginal mesh · Prolapse repair · Mesh sling

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This article is part of the Topical Collection on *Urology, Gynecology, and Endocrinology*

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## Introduction: Current Use of Mesh for Stress Urinary Incontinence and Vaginal Prolapse

Stress urinary incontinence is defined as the leakage of urine due to increased abdominal pressure that overcomes the urethral leak-point pressure mechanism. This often occurs with sneezing, laughing, coughing, and exercising. Approximately 200,000 mid-urethral slings are placed yearly for stress urinary incontinence [1]. The mechanism of action of the mid-urethral sling involves providing a hammock-like support underneath the posterior urethral wall. This support is something that is often lost during pregnancy, aging, and tissue changes that occur with hormone loss. The mid-urethral sling or MUS eliminates the urethral hypermobility that is seen with a loss of support of the posterior urethra; this loss of support translates to stress urinary incontinence [2].

Vaginal prolapse is the loss of support from muscles, ligaments, and tendons throughout the pelvic floor. The pelvic

floor is divided into the anterior, apical, and posterior compartments. The prolapse specific to these compartments is cystocele, uterine prolapse or enterocele, and rectocele, respectively. Grafts or synthetic mesh can be used to augment repairs of these pelvic floor defects, either transvaginally or abdominally. The graft provides support and scaffolding for either tissue ingrowth through the mesh or scar formation, depending on the exact material used [2]. These grafts are most commonly placed within the anterior compartment transvaginally, but have also been used posteriorly as well. The abdominal sacrocolpopexy procedure involves the use of mesh between the sacrum and vaginal cuff (post-hysterectomy) within the apical compartment, and has recently become more commonplace as a robotically assisted laparoscopic procedure [3••].

## Adverse Effects of Surgery with Transvaginal Mesh

### For Stress Urinary Incontinence

Intraoperative complications of mesh sling surgery include bleeding during entry into the retropubic or obturator spaces, and direct injury to organs such as the urethra, bladder, bowel, or ureters during dissection or trocar placement [4]. Postoperative complications include de novo urgency or urge incontinence, urinary retention, and bleeding or infection. Complications unique to operative mesh use include extrusion, or exposed mesh within the vaginal cavity, and erosion which is mesh material in the lumen of a genitourinary or pelvic organ [4]. Sexual dysfunction is also a postoperative complication, with a large focus on dyspareunia overall. Sexual dysfunction is difficult to define as a complication however; this difficulty is based on prior lack of consensus on the signs and/or symptoms and exact definition of this type of complication.

### For Vaginal Prolapse

Intraoperative complications of mesh placement for prolapse repair include bleeding during entry into the retropubic, presacral, obturator, and ischioanal spaces and direct injury to organs such as the rectum, bowel, bladder, or ureters during dissection or trocar placement [2]. Postoperative complications include bleeding, infection, dyspareunia, narrowing of the vaginal canal, and “trigger points” or localized areas of pain within the vaginal canal. Again, complications specific to mesh used in these procedures include extrusion, with rates as high as 10%, along with erosion in up to 5% of all patients [2]. Extrusion rates are higher here due to the larger graft-size and increased surface area of mesh used in these repairs compared with the size of the mid-urethral sling. Sexual dysfunction is

also a significant complication of this procedure, and again, difficult to define overall due to prior lack of consensus on signs and symptoms.

## FDA Warning on Transvaginal Mesh

In September 2011, the FDA issued an updated opinion about complications associated with transvaginal mesh for pelvic organ prolapse, or POP. At this publication they reclassified transvaginal mesh for POP as high-risk devices or class 3, and transvaginal mesh for SUI as low-moderate risk or class 2 [5]. The American Urologic Association position statement on the use of mesh for SUI recognizes the efficacy of MUS as comparative to, or superior to other techniques without mesh, and recognizes their overall risks and complications [6]. Exact risks and complications however are not listed in any specific format. Conversely, the AUA position statement on transvaginal mesh for POP recognizes the decision to augment any surgical repair with mesh should involve careful informed consent and discussion between the surgeon and patient. This consensus, however, then goes on to list sexual dysfunction and pain specifically as possible postoperative complications of transvaginal mesh surgery.

## How Is Sexual Function Measured/Defined

There are several questionnaires used to evaluate sexual function, however the FSFI and PISQ-12 are the two most well-validated tests for study purposes. Since 2008, the Female Sexual Function Index, or FSFI, has been one of the most common and accepted questionnaires for screening. The FSFI is a self-reported 19-item questionnaire that was first described by Rosen [7]. The test is divided into 6 domains; desire, arousal, lubrication, orgasm, pain, and overall sexual satisfaction. All domains are summed individually as well as together for a total score. The Pelvic Organ Prolapse/Urinary Incontinence Sexual Function Questionnaire involves 12 questions with 3 on desire, 2 on orgasm, 1 on pain, and 2 questions dealing with incontinence and the last question dealing with pelvic organ prolapse. The PISQ-12 was abbreviated from a prior 31-item questionnaire and validated over a significant amount of patients as well [8].

## Adverse Effects of SUI Surgery on Sexual Function

### Overall Sexual Satisfaction

Sexual satisfaction is complex, often being only patient-perceived and encompassing multiple factors. There are

multiple reasons for sexual dysfunction after vaginal surgery including dyspareunia, fear of leakage during sexual activity, and decreased lubrication despite arousal. A recent meta-analysis published in 2017 on sexual function after MUS surgery revealed that approximately 67% of the MUS procedures resulted in either equivocal or improved sexual function postoperatively [9•]. Overall sexual satisfaction has been found to be most commonly improved after MUS surgery for SUI. This is likely due to the fact that sexual satisfaction is most certainly related to coital dryness. Women with coital incontinence have been shown to avoid sexual activity compared with those without coital incontinence [10]. In a study by Naumann et al., total FSFI scores were compared in patients who were reported dry postoperatively vs. those reported wet postoperatively; the statistical improvement was significant for those patients that were reported to be dry overall, and there was no statistically significant change in those patients who continued to be “wet” after surgery [11]. In another study by Simsek, 81 patients showed significantly improved FSFI scores compared to those with continued urine loss postoperatively [12]. In a prospective multicenter study of 133 women undergoing the MUS, overall sexual function increased as did coital continence postoperatively; 30 women reported coital incontinence as a reason for sexual inactivity preoperatively compared to only 4 postoperatively [13]. It is fairly clear by looking at most of these studies that overall sexual satisfaction is correlated with increased degree of continence postoperatively.

## Orgasm

The female orgasm has much variability, is very complex, and encompasses multiple factors such as perceived relationship quality, nature of arousal, state of lubrication, and degree of clitoral and/or vaginal stimulation [14]. Women have self-reported achieving orgasms through vaginal, clitoral, and blended vaginal/clitoral stimulation as well. The clitourethrovaginal complex comprises the clitoris, urethra, and anterior vaginal wall, and has been described as an area highly prevalent for orgasmic function [15]. Disrupting these anatomical structures with surgical intervention for SUI or POP may interfere with orgasmic function in women. Caruso et al. showed a change in clitoral blood flow after placement of the MUS for SUI [16]. A majority of the literature shows no statistical change in orgasm function after the MUS for SUI. A recent meta-analysis showed only 33% of studies analyzed for orgasm after the MUS showed any statistically significant improvement in orgasm function [9•]. Recently, Arslan published a study involving trans-obturator tape and modified trans-obturator tape technique that showed a statistically significant change in orgasm using the modified technique; the modified technique involved an outside-in single incision sling with groin puncture sites however no anterior vaginal wall dissection. The sling was still found to sit

within the periurethral space. The statistically significant improvement in orgasm, however, was only shown 3 months postoperatively [17••].

## Dyspareunia

Dyspareunia, or painful intercourse, is multifactorial in nature and can be caused by psychological, anatomical, or emotional factors. Painful intercourse that occurs with first entry or deep vaginal penetration makes up a significant proportion of perceived sexual dysfunction. Prior reported incidences of de novo dyspareunia after MUS surgery for SUI have been as high as up to 20% overall [4]. A 2016 review by Alwaal that analyzed sexual dysfunction in women following MUS for SUI concluded that while sexual activity may remain unchanged or improve postoperatively, dyspareunia is still found in a significant number of patients after surgery [18]. Tuncer et al. found no statistically significant change in dyspareunia following the trans-obturator tape procedure for SUI [19]. A very interesting study by El Enen et al. actually showed a statistically significant improvement in dyspareunia after MUS surgery; however, there was still a dyspareunia rate of 20% after surgery despite being lower than the preoperative rate of 34% [1].

## Adverse Effects of POP Surgery on Sexual Function

### Overall Sexual Function

In the same context as MUS surgery, most of the studies involving transvaginal mesh repair for POP show either no change or overall improvement in sexual satisfaction. This is likely due to women feeling more comfortable with their anatomy when they no longer feel the sensation of a vaginal bulge or need to reduce their prolapse in order to have a bowel movement or urinate better. Wang et al. and Long et al. showed no statistically significant change in overall sexual satisfaction after vaginal mesh surgery for POP [20, 21]. Farthmann et al. examined 289 women with  $\geq$  Grade 1 cystocele that were symptomatic with prolapse; they used a questionnaire that included 3 questions on general sexual satisfaction. At both 6 and 12 months, a statistically significant increase in sexual satisfaction was noted [22]. Of note, however, this article showed an extrusion rate of 11%, which is higher than most previously reported averages. Gupta et al. examined sexual function before and after both transvaginal mesh as well as sacrocolpopexy. They used the PISQ-12 to query 130 women undergoing transvaginal repair and 74 women undergoing sacrocolpopexy; both groups showed a statistically significant improvement in sexual satisfaction at both 6 and 12 months postoperatively [3••]. This article was

particularly interesting as it included a group of women undergoing transabdominal (robotic) sacrocolpopexy; while the mesh was not placed within the vagina itself, it was incorporated into the pelvic floor and remained attached to the vaginal cuff. As this robotically-assisted procedure becomes more prevalent, additional studies will need to be completed to determine the effects of sexual function, dyspareunia, orgasm, and lubrication postoperatively.

### Orgasm

The clitourethrovaginal complex would thus be similarly disrupted specifically with the placement of transvaginal mesh for anterior or cystocele repair. Interestingly enough, however, there appears to be no difference in orgasm comparing either the anterior or posterior approaches with transvaginal mesh. Long et al. showed no statistically significant change in orgasm amongst anterior repair vs. combined anterior and posterior repair [21]. Hoda followed 96 women who underwent anterior or posterior repair for prolapse and showed no significant change in orgasm function [23]. Another study by Moon showed that patients with various posterior or combined posterior and anterior repairs showed no statistically significant change in orgasm overall [24]. Therefore, even when eliminating any disruption to the anterior vaginal wall there does not appear to be much improvement in orgasm function after POP, further confusing the idea that orgasm function is related only to the CUV complex or anterior vaginal wall.

### Dyspareunia

Dyspareunia is a very commonly reported complaint after transvaginal mesh surgery for POP, and can be found in up to 20–25% of patients after these procedures [2]. In a study by Long et al. that examined anterior vs. anterior and posterior transvaginal mesh repair for POP, dyspareunia was significantly worse for both groups 6 months postoperatively [21]. A prospective long-term study with 5 years postoperative follow-up showed that dyspareunia was significantly worse at all follow-up time points in women undergoing transvaginal mesh for POP [25]. Similarly, Wang studied 70 women who underwent transvaginal mesh for POP and also showed a statistically significant higher rate of dyspareunia 6 months after surgical intervention [20]. Another important study to mention involved examining sexual function in patients after both transvaginal mesh and abdominal sacrocolpopexy; interestingly enough, there was a small decrease in dyspareunia postoperatively in those patients undergoing sacrocolpopexy (not statistically significant), however the rate of dyspareunia in transvaginal mesh repair patients was stable overall [3••].

## Discussion

The number of surgeries completed yearly for SUI has increased over the years, with the MUS being the most commonly performed according to the literature [26]. While overall sexual function is often improved, orgasm function can be equivocal or worsened. Orgasm by vaginal penetration exclusively is experienced by approximately 15–20% of the female population [27]. Stimulation for vaginal orgasm is centered around the anterior vaginal wall, periurethral, and female prostate tissue. During placement of the MUS the sling traverses the anterior vaginal wall and lies within adjacent periurethral prostate tissue. Therefore, MUS placement may increase the likelihood of disruption of neural pathways for vaginal orgasm. Disruption of the anterior vaginal wall occurs with both trans-obturator and retropubic sling approaches [9•].

Data reports continue to be inconsistent for orgasm function, ranging widely from significantly improved to significant deterioration even amongst women with the same procedure performed. Literature reports in the past have demonstrated that women experience different types of orgasm including clitoral, vaginal, and combined. Determining the mode of orgasm prior to surgery will allow researchers to more objectively and accurately measure orgasm function as related to mid-urethral sling procedures. More importantly, the use of ultrasound and questionnaires like the FSFI will allow physicians to be able to discuss sexual function outcomes with patients prior to surgical intervention. There are very few studies that include orgasmic function in relation to transvaginal mesh surgery for SUI or POP, and there is a vast opportunity for continuing research in this area.

Prior literature also shows many inconsistencies in the rate of dyspareunia and de novo dyspareunia after both MUS and POP repair. In the context of POP surgical repair, dyspareunia may be more common overall (as compared to MUS surgery) due to possible vaginal canal narrowing or shortening, especially with extensive placement of transvaginal mesh. In MUS surgery a much smaller piece of mesh is utilized overall, however the axis of the vaginal canal in relation to the periurethral, anterior vaginal wall tissue may change with sling placement [2, 4, 15]. The pudendal nerve serves both sensory and motor capabilities in the female genitalia; the dorsal nerve of the clitoris and perineal nerve carry sensation from the female perineum, vulva, and labia, and serve as the two end-branches of the pudendal nerve [2]. Any interruption in these neural pathways with surgical dissection or mesh placement can account for increased discomfort or dyspareunia during sexual activity or even orgasmic function during sexual activity [15, 16].

Lubrication plays an important role in sexual function as it prepares the vagina for penetration. Lubrication, or vaginal wetness, during intercourse is a subjective measure with inconsistent results as it relates to sexual function. Perceived

vaginal wetness is multi-factorial and encompasses both physiologic and psychologic mechanisms. During sexual arousal, lubrication fluid from the vaginal venous plexus enters the lumen transvaginally as a transudate [28]. Other contributors to vaginal secretions include vulvar secretions from sebaceous, sweat, Bartholin's, and Skene's glands, exfoliated epithelial cells, cervical mucus, and fluid from the upper reproductive tract including endometrial and tubal fluid [29, 30].

Lubrication after vaginal mesh placement, as reported by the FSFI scale, reveals lubrication remains unchanged or improves after surgery. There does not appear to be any direct correlation between lubrication and other sexual function domains such as sexual satisfaction, dyspareunia, or orgasm [1] [17••] [19, 31, 32]. A common misnomer is that Skene's glands are primarily responsible for lubrication during sexual activity. Skene's glands are located in the anterior vaginal wall and are one of the many structures important in female sexual function that are subject to disruption during mid-urethral sling placement. However, with significant contributors to vaginal lubrication from multiple locations in the female reproductive system, sole disruption of the anterior vaginal wall from mesh placement should theoretically not have a significant impact on lubrication. More research into the function of the glands and tissues involved in lubrication and how they contribute to female sexual function is warranted.

## Conclusion

As seen from prior literature, results of postoperative sexual function after vaginal mesh surgery are inconsistently reported. Overall, it appears that sexual satisfaction improves as patients regain continence or as "dryness" improves. It also appears that as the degree of prolapse lessens after surgical correction, so does the improvement in sexual satisfaction comparatively increase. The subcategories of dyspareunia and orgasm, in relation to sexual function, have had variable results in the past as well when examining postoperative changes after surgery for SUI or POP. Sexual function is a very subjective determination that is severely lacking objective evidence in regard to anatomical, hormonal, aging, and surgical changes within the female pelvis and perineum. Many more studies are needed in this area to evaluate female sexual function across age groups, hormonal status, cultures, and sexual practices. Only by defining sexual function correctly can we begin to study the effects of different surgical procedures on this controversial topic. For instance, more anatomical studies will need to be completed to further evaluate any possible interference in nerve or glandular tissue

within the anterior vaginal wall. There is a known cadaver study being completed currently at Queens University in Canada that involves implanting cadaver pelvises with slings and staining the nearby periurethral tissue for nerves, prostatic tissue, and hormones.

The FSFI is one of the best and most well-validated questionnaires overall that subjectively assesses female sexual function. More questionnaires assessing types of orgasm, vaginal vs. clitoral vs. blended are needed in order to study orgasm function further. Lubrication is also a very difficult subjective idea to characterize, and additional testing and querying is needed to make a better definition on the idea of vaginal lubrication in regard to sexual activity and function. Current objective assessments of female sexual function are lacking, however, new areas of development here include sensory testing with hot/cold temperatures as well as vibratory sensation. Another future area of interest may include using vaginal plethysmography to determine vaginal blood flow and genital sensation before and after pelvic surgical intervention. The areas of female sexual function and dysfunction are vast and encompass many anatomic, neuronal, hormonal, and emotional conditions. The amount of literature and data on female sexual function and dysfunction is still wholly rudimentary and remains as yet underdeveloped for physicians and scientists of the present time. Hopefully, future endeavors will help to elucidate this growing area of medicine.

## Compliance with Ethical Standards

**Conflict of Interest** Nicole Szell, Jacquelyn Booher, and Todd Campbell each declares that they have no potential conflicts of interest.

**Human and Animal Rights and Informed Consent** This article does not contain any studies with human or animal subjects performed by any of the authors.

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