Urogynecologic Surgery and Its Sexual Function Consequences

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Editor-in-Chief, Sexual Medicine Reviews
Editor Emeritus, The Journal of Sexual Medicine
Editor Emeritus, International Journal of Impotence Research
<table>
<thead>
<tr>
<th>Mid-Urethral Sling Surgery</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Surgery</strong></td>
</tr>
<tr>
<td>Relevant Anatomy</td>
</tr>
<tr>
<td>Sexual Function Consequences</td>
</tr>
</tbody>
</table>

Others

LEEP, Labioplasty
Incision and dissection is made into anterior vaginal wall peri-urethral tissue.
What is this anterior vaginal wall peri-urethral tissue???
Mid-Urethral Sling Surgery

Surgery

Relevant Anatomy

Sexual Function Consequences

Others

LEEP, Labioplasty
Orgasm types

i) ‘clitoral’ - rhythmic contractions of the vagina activated by clitoral stimulation

ii) ‘vaginal’ - rhythmic contractions of the vagina activated by anterior vaginal wall/peri-urethral female prostate tissue stimulation

iii) ‘uterine’ - buffeting and displacing cervix and causing it to rub against the peritoneal lining inducing pleasure accompanied by apnea and gasping

iv) ‘blended’
Urogynecologic Surgery and Its Sexual Function Consequences

Female

Prostate

Stimulation of anterior vaginal wall ➔ orgasm

Male

Prostate

Stimulation of anterior rectal wall ➔ orgasm
Urogynecologic Surgery and It’s Sexual Function Consequences

Anatomy – Female Prostate

A) Hematoxylin-eosin staining of urethra and peri-urethral glandular structure suspected to be female prostate

U1 = urethra
P1 = peri-urethral gland

B) Polyclonal prostate-specific antigen (PSA) staining (brown color)

Light arrow indicates islet of urothelium with weak PSA expression.

U1 = urethra

P1 = peri-urethral gland

C) monoclonal PSA staining (brown color), thick arrow indicates strong apical cytoplasmic accumulation of PSA, light arrow indicates islet of urothelium with weak PSA expression.

U2 = urethra
P2 = peri-urethral gland

D) Monoclonal prostate specific alkaline phosphatase (PSAP) staining (brown color), showing strong apical cytoplasmic accumulation of PSAP (thick arrow)

E) Monoclonal androgen receptor (AR) staining (brown color), showing strong to moderate nuclear AR expression and AR negative cytoplasm.

F) monoclonal PSA staining (brown color), thick arrow indicates strong apical cytoplasmic accumulation of PSA, light arrow indicates islet of urothelium with weak PSA expression.

U2 = urethra
P2 = peri-urethral gland

100¥ magnification.
ANTERIOR VAGINAL WALL PERI-URETHRAL TISSUE IN A FEMALE CADAVER

H&E STAINING
Sample is above the sling (closer to the bladder)

URETHRA

Michael A. Adams, PhD
Department of Biomedical and Molecular Sciences
Queen's University
Kingston, Ontario, Canada,
ANTERIOR VAGINAL WALL PERI-URETHRAL TISSUE IN A FEMALE CADAVER

GLANDS AROUND THE URETHRA (a few examples of glands are circled)

H&E STAINING
Sample above sling

URETHRA

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GLANDS AROUND THE URETHRA (a few examples of glands are circled)

H&E STAINING
Sample below sling
ANTEOR VAGINAL WALL PERI-URETHRAL TISSUE IN A FEMALE CADAVER

PSA GLANDULAR STAINING (example of a gland outlined)

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PSA GLANDULAR STAINING (example of a gland outlined)
ANTERIOR VAGINAL WALL PERI-URETHRAL TISSUE IN A FEMALE CADAVER

PGP9.5 NERVE STAINING (example of the same gland outlined from the PSA staining, brown areas at the arrow heads = positive PGP9.5 staining)

Note: the gland will change shape between the two slides, since they are not serial sections, therefore this is why the gland appears to be a slightly different shape.
ANTERIOR VAGINAL WALL PERI-URETHRAL TISSUE IN A FEMALE CADAVER

PGP9.5 NERVE STAINING (example of the same gland outlined from the PSA staining, brown areas at the arrow heads = positive PGP9.5 staining)
ANTERIOR VAGINAL WALL PERI-URETHRAL TISSUE IN A FEMALE CADAVER

PGP9.5 STAINING
Sample is above the sling (closer to the bladder)

Gland outlined, positive nerve staining example indicated by the arrows (brown), blood vessels asterisks

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ANTERIOR VAGINAL WALL PERI-URETHRAL TISSUE IN A FEMALE CADAVER

PGP9.5 STAINING
Below the sling

Glands outlined, positive nerve staining example indicated by the arrows (brown), blood vessels asterisks

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PGP9.5 STAINING
Below the sling

Positive staining of nerves (dark brown areas)
ANTERIOR VAGINAL WALL PERI-URETHRAL TISSUE IN A FEMALE CADAVER

Substance p 7-6 gland2 10X

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ANTERIOR VAGINAL WALL PERI-URETHRAL TISSUE IN A FEMALE CADAVER

Substance P 7-6 gland2 20X
ANTERIOR VAGINAL WALL PERI-URETHRAL TISSUE IN A FEMALE CADAVER

H&E STAINING

Rectus sling sheath outlined by blue stain

URETHRA

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PGP9.5 STAINING

Positive nerve staining example indicated by the arrows (brown)

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Urogynecologic Surgery and It’s Sexual Function Consequences

<table>
<thead>
<tr>
<th></th>
<th>Ejaculate analysis</th>
<th>urine analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSA</td>
<td>213 ng/ml</td>
<td>0.8 ng/ml</td>
</tr>
<tr>
<td>Creatinine</td>
<td>33.0 mg/dl</td>
<td>178.0 mg/dl</td>
</tr>
<tr>
<td>PAP</td>
<td>329 U/l</td>
<td>42 U/l</td>
</tr>
<tr>
<td>PSAP</td>
<td>271 U/l</td>
<td>37 U/l</td>
</tr>
<tr>
<td>Creatinine</td>
<td>30.5 mg/dl</td>
<td>223.7 mg/dl</td>
</tr>
</tbody>
</table>

US - 3 cm long excretory duct between urethra and anterior vaginal wall which ended at the level of the urethral meatus.

Endoscopy - blind ending after 3 cm
The source of fluid expulsion during orgasm was not consistent with urine, but was similar to male ejaculate.
Three Testosterone-Dependent Organs in the Vestibule

Glans clitoris
Minor Vestibular Glands
Peri-urethral tissue – G-spot

Pre-Testosterone Treatment
Post-Testosterone Treatment
Male PSA = <4 ng/ml

F-M Transexual (12 months)

= 30.0 ng/L
= 0.030 ng/ml
Anterior Vaginal Wall, Peri-Urethral Tissue – PROSTATE

Peri-urethral Tissue:

- Multiple glands – androgen receptor, PSA
- Richly innervated - substance P detected
- Richly vascularized
- Mesh material passes in close relationship to the nerves and glands
- Growth responsive to exogenous testosterone
- Ejaculate of woman – high PSA
- Prostate of woman - adenocarcinoma
Mid-Urethral Sling Surgery

- Surgery
- Relevant Anatomy
- Sexual Function Consequences

Others

LEEP, Labioplasty
AA - Patient Testimonial

PRE-OP TVT/TOT - I always had clitoral and vaginal nerve sensation and was able to achieve an orgasm easily

My husband was able to manipulate his fingers where he could actually "milk" the G-spot that produced the fluid that I release when I "squirt"

POST-OP TVT/TOT - The fluid was ejected but I felt no sensation of an orgasm

The stimulation to the G-spot is OK but I am no longer able to "get over the hill"
In men, the male peri-urethral tissues are anatomically separate from male prostate.

In women, peri-urethral tissues are contiguous with female prostate tissue.

SUB-URETHRAL SLING SURGERY FOR STRESS INCONTINENCE MAY RESULT IN ORGASMIC DYSFUNCTION THROUGH DIRECT INJURY TO ANTERIOR VAGINAL WALL, PERI-URETHRAL FEMALE PROSTATIC TISSUE.
In women with stress incontinence, surgical placement of a sub-urethral sling will directly injure anterior vaginal wall, peri-urethral female prostatic tissue.

Lowenstein, Lior MD; “Topographic Relation of Mid-urethral Sling for Stress Incontinence to Critical Female Genital Structures”. Journal of Sexual Medicine 2009; 2954-2957
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In women with stress incontinence, surgical placement of a sub-urethral sling will directly injure anterior vaginal wall, peri-urethral female prostatic tissue.

Tunitsky-Bitton, Elena MD et al “Ultrasound Evaluation of Midurethral Sling Position and Correlation to Physical Examination and Patient Symptoms”. Female Pelvic Medicine and Reconstrucive Surgery 2015; 00: 1-6
SUB-URETHRAL SLING SURGERY FOR STRESS INCONTINENCE MAY RESULT IN ORGASMIC DYSFUNCTION THROUGH DIRECT INJURY TO ANTERIOR VAGINAL WALL, PERI-URETHRAL FEMALE PROSTATIC TISSUE

Approximately 23 papers examining 2,350 women from years 2002-2015
- 5 Randomized Controlled Trials
- 4 Retrospective Cohorts
- 14 Prospective Cohorts

Follow-up ranged from 3 months to 24 months after surgery


Female Sexual Function Index (FSFI)

11. Over the past 4 weeks, when you had sexual stimulation or intercourse, how often did you reach orgasm (climax)?

0. No sexual activity
5. Almost always or always
4. Most times (more than half the time)
3. Sometimes (about half the time)
2. A few times (less than half the time)
1. Almost never or never

12. Over the past 4 weeks, when you had sexual stimulation or intercourse, how difficult was it for you to reach orgasm (climax)?

0. No sexual activity
5. Extremely difficult or impossible
4. Very difficult
3. Difficult
2. Slightly difficult
1. Not difficult

13. Over the past 4 weeks, how satisfied were you with your ability to reach orgasm (climax) during sexual activity or intercourse?

0. No sexual activity
5. Very satisfied
4. Moderately satisfied
3. About equally satisfied and dissatisfied
2. Moderately dissatisfied
1. Very dissatisfied

Q10 Compared to orgasms you have had in the past, how intense are your orgasms now?

1. Much less intense
2. Less intense
3. Same intensity
4. More intense
5. Much more intense
<table>
<thead>
<tr>
<th>Study and Year</th>
<th>Sling Type</th>
<th>Questionnaire(s)</th>
<th>Follow-Up</th>
<th>Sample Size</th>
<th>Sexual function Outcome</th>
<th>Orgasmic Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>El Enen 2009</td>
<td>TOT</td>
<td>FSFI</td>
<td>12 months</td>
<td>62</td>
<td>Overall improvement (not SS)</td>
<td>10 females had orgasm less frequently after surgery</td>
</tr>
<tr>
<td>Elzevier 2004, 2008</td>
<td>TOT, TVT, TVT-O</td>
<td>Lemack</td>
<td>3 months</td>
<td>78, 65</td>
<td>Overall improvement (not SS)</td>
<td>6.5% of females had orgasm less frequently after surgery</td>
</tr>
<tr>
<td>Murphy 2008</td>
<td>TVT, TVT-O</td>
<td></td>
<td>14.7 months</td>
<td>139</td>
<td>No overall change</td>
<td>Not specifically studied</td>
</tr>
<tr>
<td>Pace/Vicentini 2008</td>
<td>TVT, TOT</td>
<td></td>
<td>3 months</td>
<td>101</td>
<td>No overall change</td>
<td>Not specifically studied</td>
</tr>
<tr>
<td>Yeni 2003</td>
<td>TVT</td>
<td>FSFI</td>
<td>6 months</td>
<td>32</td>
<td>Overall deterioration</td>
<td>Orgasm pre-op score 3.40, post-op 3.06, control 4.12</td>
</tr>
<tr>
<td>Mazouni 2004</td>
<td>TVT</td>
<td>Own questions</td>
<td>&gt;6 weeks</td>
<td>55</td>
<td>Overall deterioration; 11 (20%) had deteriorated fxn (p&lt;0.01)</td>
<td>Not specifically studied</td>
</tr>
<tr>
<td>Maalta 2002</td>
<td>TVT</td>
<td>Own questions</td>
<td>6 months</td>
<td>43</td>
<td>Only 2 improved, most stayed same, 6 (14%) had deteriorated fxn (not SS)</td>
<td>Not specifically studied</td>
</tr>
<tr>
<td>Abdel-Fiattah 2010</td>
<td>TOT, TVT-O</td>
<td>PISQ</td>
<td>12 months</td>
<td>199</td>
<td>Overall improvement (not SS)</td>
<td>Few deteriorated in orgasm and pain domains</td>
</tr>
<tr>
<td>Marszalek 2007</td>
<td>TVT</td>
<td>Own questions</td>
<td>18 months</td>
<td>52</td>
<td>1/3 improved, 14.3% worsened overall</td>
<td>Not specifically studied</td>
</tr>
<tr>
<td>Wadie 2010</td>
<td>PVS, TVT</td>
<td>FSFI</td>
<td>24 months</td>
<td>63</td>
<td>Overall improvement (not SS)</td>
<td>Orgasm increased overall by 10%</td>
</tr>
<tr>
<td>De Souza 2012</td>
<td>TVT, TOT</td>
<td>PISQ</td>
<td>6 and 12 months</td>
<td>87</td>
<td>Overall improvement (not SS)</td>
<td>Orgasm (Q12) similar pre and post op (not SS)</td>
</tr>
<tr>
<td>Ching-Chung 2012</td>
<td>TOT</td>
<td>PISQ</td>
<td>12 months</td>
<td>102</td>
<td>No overall change</td>
<td>Orgasm deteriorated (p&lt;0.001)</td>
</tr>
<tr>
<td>TOMUS trial 2012</td>
<td>TOT, retropubic</td>
<td>PISQ</td>
<td>6 and 24 months</td>
<td>597</td>
<td>Overall improvement (SS)</td>
<td>Not specifically studied</td>
</tr>
<tr>
<td>Dursan 2012</td>
<td>TOT</td>
<td>FSFI</td>
<td>6 months</td>
<td>96</td>
<td>Satisfaction and pain improved (SS)</td>
<td>Orgasm score before 8.77, and post-op 9.29 (improved but not SS)</td>
</tr>
<tr>
<td>Naumann 2012</td>
<td>TVT, single incision</td>
<td>FSFI</td>
<td>6 months</td>
<td>150</td>
<td>Overall improvement (SS)</td>
<td>Orgasm scores increased (p&lt;0.001)</td>
</tr>
<tr>
<td>Tang 2012</td>
<td>TVT-S single incision</td>
<td>PISQ</td>
<td>6 and 12 months</td>
<td>33</td>
<td>Overall improvement (not SS)</td>
<td>Orgasm scores stayed similar pre and post-op</td>
</tr>
<tr>
<td>Naumann 2012</td>
<td>TVT, TOT, TVT-O</td>
<td>Lemack</td>
<td>3-12 months</td>
<td>136</td>
<td>1/4 improved, most had no overall change</td>
<td>Not specifically studied</td>
</tr>
<tr>
<td>Bekker 2009</td>
<td>TOT, TVT-O</td>
<td></td>
<td>12 months</td>
<td>133</td>
<td>No overall change</td>
<td>Orgasm deteriorated from 28 (35.4%) to 22 (23.2%)</td>
</tr>
<tr>
<td>Filocamo 2011</td>
<td>TOT, retropubic</td>
<td>FSFI</td>
<td>6 months</td>
<td>56</td>
<td>No overall change</td>
<td>Orgasm frequency decreased from 1.4 to 1.1 (p=0.006), and orgasm intensity also worsened from 2.0 to 2.1 (not SS)</td>
</tr>
<tr>
<td>Naumann 2012</td>
<td>TVT-O</td>
<td>PISQ</td>
<td>6 months</td>
<td>56</td>
<td>No overall change</td>
<td>Not specifically studied</td>
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Meta-analysis for sexual satisfaction using a random effects model revealed a total effect of 0.67, implying that the two-thirds of women showed a statistically significant improvement in sexual satisfaction following the mid-urethral sling surgery.
The same meta-analysis for orgasm satisfaction revealed an orgasm effect size of only 0.33, implying that 33% of the patients showed a statistically significant improvement in orgasm.

Thus, concerning orgasm satisfaction, the meta-analysis revealed approximately 27% of women experienced worsening of orgasm satisfaction while approximately 40% realized no change.
There was a large discrepancy noted in orgasm satisfaction versus overall sexual satisfaction following sub-urethral sling placement.

It is hypothesized that women who were pre-operatively experiencing vaginal orgasm are at risk of developing orgasmic dysfunction secondary to direct sub-urethral sling injury to anterior wall, peri-urethral female prostatic tissue.
### Mid-Urethral Sling Surgery

- Surgery
- Relevant Anatomy
- Sexual Function Consequences

### Others

LEEP, Labioplasty
Can LEEP surgery on the cervix cause orgasm dysfunction?
Sexual Function of the Cervix

External and Internal Orgasm

External – Clitoral

Internal – Female Prostate

Internal – Cervix and Uterus

Courtesy Dr I Goldstein
Cutler et al (2000) reported: 35% of 128 women stated that cervical stimulation contributed to their orgasm function.

Kilkku et al (1983) reported a lesser incidence of orgasms in women who underwent total hysterectomy (removal of both the cervix and the uterus) VERSUS women who underwent subtotal hysterectomy (removal of just the uterus).

Komisaruk et al (2006) reported: during sexual intercourse cervical stimulation was qualitatively different (a “shower of stars”) VERSUS vaginal (female prostate/anterior vaginal wall) or clitoral stimulation.

Is it really that surprising that the removal of a significant portion of the cervix (LEEP/cone biopsy) can result in female sexual dysfunction?
Komisaruk et al (2011) using functional MRI of the brain, presented evidence that self-stimulation of the cervix activated the genital sensory cortex (paracentral lobule) overlapping with the regions activated by self-stimulation of the vagina or the clitoris, providing evidence that cervical sensory activity can rise to the level of awareness just as can vaginal or clitoral sensory activity.

Is it really that surprising that the removal of a significant portion of the cervix (LEEP/cone biopsy) can result in female sexual dysfunction.
We have had women who have lost orgasm satisfaction after undergoing a Loop Electrosurgical Excision Procedure (LEEP) or after hysterectomy.

There are definitely women who report cervical stimulation feels pleasurable.

It seems straight-forward that removing a pleasurably sensate structure will eliminate the pleasure: just as clitoridectomy would, or just as injury to the female prostate during TOT, TVT would.

All organs are either singly (somatic) or doubly (autonomic and somatic) afferently innervated; however, the uterine cervix and likely female prostate are evidently TRIPLY afferently innervated - the pelvic, hypogastric, and vagus nerves each convey sensory activity from the cervix and likely female prostate. Thus, the female genitalia have very important adaptive functions.

**Table 4** Comparison of sexual function before and after LEEP: specific aspects overview

<table>
<thead>
<tr>
<th>Sexual function</th>
<th>Worse after LEEP</th>
<th>Same after LEEP</th>
<th>Better after LEEP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall SI satisfaction</td>
<td>18 (20.2)</td>
<td>65 (73.3)</td>
<td>6 (6.7)</td>
</tr>
<tr>
<td>Sexual desire</td>
<td>9 (10.2)</td>
<td>73 (82.0)</td>
<td>7 (7.9)</td>
</tr>
<tr>
<td>Vaginal lubrication</td>
<td>14 (15.7)</td>
<td>69 (77.5)</td>
<td>6 (6.7)</td>
</tr>
<tr>
<td>Vaginal elasticity</td>
<td>14 (15.7)</td>
<td>70 (78.7)</td>
<td>5 (5.6)</td>
</tr>
<tr>
<td>Orgasmic satisfaction</td>
<td>10 (11.2)</td>
<td>78 (87.6)</td>
<td>1 (1.1)</td>
</tr>
<tr>
<td>SI-related anxiety</td>
<td>19 (21.3)</td>
<td>46 (53.9)</td>
<td>22 (24.7)</td>
</tr>
<tr>
<td>Patient-perceived partner's satisfaction</td>
<td>7 (7.9)</td>
<td>71 (79.8)</td>
<td>11 (12.4)</td>
</tr>
</tbody>
</table>

LEEP = loop electrosurgical excision procedure; SI = sexual intercourse.
Individual elevations of the cervix are observed that result from individual mechanical uterine contractions during orgasm. These are likely produced by hormonal effects - circulating oxytocin - released at orgasm. Oxytocin secretion can result from sensory stimulation via the pudendal, pelvic, hypogastric, and/or vagus nerves. The cervical elevations during orgasm and uterine contraction are NOT LIKELY the result of efferent motor neural activity to the cervix.
LEEP – Loop Electrosurgical Excision Procedure – Injures Nerves to Cervix

Simulation of the excision to check the loop size.

Excision in the latero-lateral direction with a loop electrode and the removal of the sample.

Complement with an antero-posterior excision of the endocervical canal with a loop electrode.

And hemostasis of the bleeding vessels with electrodes with tips for coagulation.

Vaporization with the same electrode with a tip of the entire surgical wound.

Cervix tissue excised during LEEP.

Viewing of the surgical sample fixed on a Styrofoam plate with the demarcation of the 15-hour point.
AD is a 38-year old woman who reports that she had a cervical loop electrosurgical excision procedure (LEEP) procedure in 2010. Ashley reported that prior to the LEEP procedure she had excellent satisfying orgasms. However, after the LEEP procedure, something went "drastically wrong" with her body. Ashley reports lack of sensation in her genitals. Ashley reports that she has no sexual urges and very poor orgasm. This has been very distressing.
Can labioplasty cause orgasm dysfunction?
Somatic nerves via branches of the pudendal nerve – the vestibule and the vulva have a high density of somatic nerve fibers

Iatrogenic Sexual Dysfunction - Labioplasty
Figure 7a Preoperative labioplasty

Figure 7b Postlabioplasty (same patient as Fig. 7a)

Figure 7c Preoperative labioplasty

Figure 7d Postlabioplasty (same patient as Fig. 7c)

Figure 8 Botched labioplasty

Figure 10 Redundant prepuce

Figure 11 Botched labioplasty

Figure 12a Elongated clitoral hood

Figure 12b Labia hypertrophy with elongated hood
Vulva, vestibule and vagina (including anterior vaginal wall peri-urethral prostate tissue) are sexual organs

Surgery on the vulva, vestibule and vagina MAY HAVE SEXUAL FUNCTION CONSEQUENCES