IS THE ANTERIOR VAGINAL WALL SLING A GOOD ALTERNATIVE FOR INTRINSIC SPHINCTERIC INSUFFICIENCY?

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ABSTRACT

Objectives: We present our experience with the anterior vaginal wall sling, in the treatment of patients with stress urinary incontinence (SUI) due to urethral intrinsic sphincteric deficiency.

Material and Methods: Forty-five women (mean age 53.4 years) with urodynamically proven intrinsic sphincteric deficiency (Valsalva Leak Point Pressure below 60cm H2O) were studied, prospectively. Coexisting bladder neck hypermobility was assessed using transperineal ultrasound. Patients with severe pelvic prolapse (grade 3 or 4) were excluded. Multivariable logistic regression was used to identify the variables that influenced the outcome (statistical significance was established for p<0.05). Follow-up ranged from 26 to 61 months (mean 40 months).

Results: Complete SUI cure was achieved in 14 women (31.1%) and 17 other women (37.8%) described SUI improvement and were satisfied with the outcome. Statistical analysis showed that factors such as age below 35 years (p=0.0251), and preoperative bladder neck hypermobility (p=0.0176), were strongly related to postoperative continence.

Conclusions: We concluded that the vaginal wall sling has a high rate of failure in the treatment of patients with intrinsic sphincteric deficiency. This technique should not be proposed if hypermobility is not associated, especially in the case of elderly patients.

Key words: urinary incontinence; stress; surgical technique; vagina; sling

INTRODUCTION

The main goal of the sling procedure is to correct stress urinary incontinence (SUI) resulting from intrinsic sphincteric deficiency. Recently, slings have also been proposed for patients with associate or exclusive urethral hypermobility (1). In this procedure, continence is restored because of improved pressure transmission ratio in the urethra, obtained through the support provided by the sling (2). A wide variety of materials have been proposed to be used in slings, e.g. autologous materials (rectus fascia, fascia lata, and anterior vaginal wall), biological homologous or heterologous material (cadaveric fascia, unepithelized dermal grafts, bovine pericardium, porcine intestinal submucosa), or synthetic material (expanded polytetrafluoroethylene or polypropilpropylene) (1).

Modern concepts of female pelvic anatomy and physiology have resulted in a new approach for treating SUI (3) that involves the complete anatomical restoration of the pelvic fascial and muscular structures of the continence mechanism, especially those related to suburethral support of the midurethra. Anterior vaginal wall sling has evolved from vaginal wall sling, which has been previously described by Raz et al. (3). In the vaginal wall sling first described, a rectangular graft of vaginal epithelium anchored with
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polypropylene sutures in both extremities was sus-
pended to suprapubic area in the same way as in a
classical aponeurotic sling. The main purpose of an-
terior vaginal sling is to strengthen urethropelvic liga-
ments using sutures applied from lateral aspect of
midurethra to ligament insertion in the tendineous arc
of obturator fascia. A formal Raz bladder neck sus-
pension is also performed simultaneously. Accord-
ing to Raz et al. experience, the anterior vaginal wall
sling can play a major role in anterior pelvic recon-
struction and is expected to cure all pathophysiologic
components of SUI with a high rate of success, re-
gardless of the urodynamic diagnosis (3). Our expe-
rience with the anterior vaginal wall sling in treating
female intrinsic sphincteric deficiency was distinct,
and is presented below.

PATIENTS AND METHODS

All patients with urinary stress incontinence
resulting from intrinsic sphincteric deficiency, defined
as having Valsalva leak point pressure (VLPP) be-
low 60cm H₂O, attended at our institution from 1993
to 1996, were initially selected for this study. After
careful evaluation, 45 patients were prospectively
studied. Patients who presented severe pelvic prolapse
(grades 3 or 4), VLPP above 60cm H₂O, or detrusor
instability, were excluded from the study. Preopera-
tively, all patients underwent a complete physical and
pelvic examination, including an objective assess-
ment of urinary leakage during stress maneuvers. Pelvic
prolapse was graded according to Baden et al. (4).
Urodynamic evaluation was performed with 2 ure-
thral catheters (one 8F for filling and another 4F for
bladder pressure measurement). A rectal saline filled
8F catheter-balloon was placed above the anal sphinc-
ter to obtain abdominal pressure. The test included
medium filled water cystometry, VLPP assessment,
and pressure-flow study. Patients with VLPP below
60cm H₂O were diagnosed as having intrinsic sphinc-
teric deficiency, based on McGuire’s criterion (5).
Urethral mobility was evaluated in all patients using
transperineal ultrasound. Urethral hypermobility was
considered as partly a cause of SUI in cases where
urethral descent on transperineal ultrasound was
above 10mm. All examinations were performed by
the same senior radiologist.

All operations were performed by the same
senior surgeon. After spinal or epidural anesthesia,
the patient was placed in dorsal lithotomy position.
The vagina, perineum, and lower abdomen were pre-
pared in usual fashion and draped. A urethral 16F
Foley catheter was inserted and the balloon was filled
with 10mL of sterile saline, emptying thus the blad-
der and providing a landmark for the bladder neck.
The posterior vaginal wall was retracted with a
weighted vaginal speculum. Submucosal saline in-
jections were used to ease the dissection of vaginal
wall. Two paramedian oblique incisions were made
from the bladder neck to the midurethra. Dissection
proceeded just under the vaginal epithelium until ex-
posing pubocervical fascia. Endopelvic fascia was
bilaterally perforated by laterally inserting
Metzembau scissors in bladder neck, close to the
urethropelvic ligament insertion in the obturator’s
tendinous arch. This maneuver allowed the surgeon
to reach the retropubic area (Figure-1). The
urethropelvic ligament was bluntly dissected from the
tendinous arch and, when necessary, urethralysis was
performed during this step, by dissection of all ad-
herences between the urethra and surrounding tissues,
until it became completely free of scar tissue. The
vaginal wall sling was fashioned by placing 2 num-
ber 0 polypropylene helical sutures on each side of
the urethra and bladder neck. The first pair of sutures
was bilaterally applied to the midurethra, and included
medial and lateral edges of the perforated
urethropelvic ligament, the pubocervical fascia, and
the vaginal wall without the epithelium. The second
pair was bilaterally placed at the bladder neck, and
included the medial stump of urethropelvic ligament,
the pubocervical fascia, and the vaginal wall without
the epithelium. (Figure-2). A 1cm midline transverse
suprapubic incision was made, and the sutures were
transferred towards this incision with a Stamey sus-
pension needle. Cystoscopy was performed to rule
out bladder or urethral perforation. The sutures were
tied with the cystoscope inside the urethra and paral-
lel to the vaginal axis, without any tension. Suprapu-
bic cystostomy was not performed in any patient. The
abdominal incision was closed with interrupted 4-0
nylon stitches, and the vaginal wall was sutured with 2-0 chromic interrupted stitches. An antibiotic-soaked vaginal pack was placed to be retrieved in 24 hours. A Foley catheter was left indwelling for 48 hours, when residual urine volume was measured. If residuals exceeded 100mL, or 30% of total bladder capacity, the catheter was reinserted and the patient was re-evaluated after 4 days, and then weekly, until the aforementioned criteria were met, and catheter withdrawal was possible. If after a month, the patient still did not have the catheter removed, clean intermittent self-catheterization was implemented for 3 postoperative months, after which vaginal urethrolysis was proposed if infravesical obstruction was diagnosed.

Patients were reviewed at 1 week, at 1, 3 and 6 months, and annually thereafter. At each visit, detailed history concerning voiding symptoms and urine leakage plus a physical and pelvic exam were undertaken, including direct assessment of urinary leakage during stress maneuvers (Bonney–Marshall test). All visits were supervised by the head researchers.

Success was defined by complete continence without symptoms of bladder dysfunction or residual persistent leakage with minimal patient discomfort (i.e., important improvement from previous state). Unsuccessful outcome was defined as unchanged or worsened urinary incontinence.

Statistical analysis was carried out using a logistic regression model. If the variable was dichotomic (e.g., presence or absence of urethral hypermobility), logistic transformation was used. Proportional odds ratio was used for trichotomic or polytomic variables. Variables included in multivariate logistic regression analysis were age, associated urge-incontinence, presence of nocturnal enuresis, previous abdominal and/or vaginal surgery for urinary incontinence, associated bladder neck hypermobility, and leakage in resting position. Chi-square analysis and Fischer’s exact test were respectively used to assess individual dichotomic or trichotomic variables versus successful or unsuccessful outcome. Statistical significance was established at p<0.05.

RESULTS

The patients’ ages ranged from 29 to 75 years (mean 53.4 years). Demographic data are summarized in Table-1. Most of the patients presented some degree of anterior vaginal relaxation (mild cystocele: 19 patients; moderate cystocele: 16 patients). Preoperative urodynamic evaluations are summarized in Table-2.
The procedure lasted from 40 to 135 minutes (mean=81, standard deviation=12). Three patients bled profusely (>200mL) during vaginal dissection and endopelvic fascia perforation, but the hemorrhage was controlled by manual compression and electro-coagulation without needing blood transfusions. Average hospital stay was 2.3 days (ranged from 2 to 4 days). Sixteen patients (35%) were discharged without bladder catheter. The remainder stayed with urethral catheter for 4 to 25 days (average = 4 days). No patient underwent clean intermittent catheterization. For patients who progressed with urinary retention or significant post-void residual volume, were performed weekly attempts to remove the Foley catheter until voiding improvement. Analgesic requirements were minimal.

Follow-up ranged from 26 to 61 months (median=40). Complete cure of SUI, defined as complete continence without symptoms of bladder dysfunction or residual persistent leakage, and absence of objective leakage during Valsalva’s maneuver, was achieved in 14 women (31.1%), and 17 (37.8%) presented improvement from SUI and were satisfied with the outcome. Therefore, according to the criteria above, the outcome was successful in 31 women (68.9%). However, SUI symptoms persisted or urine leakage worsened in the remaining 14 patients (31.1%). Up to present, surgery had failed in 8 patients who underwent aponeurotic sling implant using the rectus fascia.

Finally, multivariate logistic regression revealed that only 2 variables, namely age above 35 years (p=0.0251), and lack of urethral hypermobility (p=0.0176), negatively influenced the outcome. The cure probability and the odds ratio involving these variables are demonstrated in Tables-3 and 4.

**DISCUSSION**

Stress urinary incontinence resulting from intrinsic sphincteric insufficiency occurs more frequently in patients who have previously undergone surgery to treat incontinence, or who have pelvic irradiation, trauma of ischiopubic region or urethral dysfunction of neurological origin (3). Treating sphincteric insufficiency implies increased urethral resistance, which can be achieved with a sling, submucosal injection of different substances or implantation of an artificial urinary sphincter (6).

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**Table 1 - Demographics data.**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean ± SD (range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>53.4 ± 0.9 years (29-75)</td>
</tr>
<tr>
<td>Vaginal deliveries</td>
<td>3.8 ± 2.9 deliveries (0-15)</td>
</tr>
<tr>
<td>Previous vaginal anti-incontinence procedures</td>
<td>0.84 ± 0.6 procedures (0-2)</td>
</tr>
<tr>
<td>Total anti-incontinence surgeries</td>
<td>1 ± 0.8 procedures (0-3)</td>
</tr>
</tbody>
</table>

**Table 2 - Results of preoperative urodynamic evaluation (n = 45).**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Mean ± SD (range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum cystometric capacity (ml)</td>
<td>360.00 ± 110.3 (200-700)</td>
</tr>
<tr>
<td>Valsalva leak point pressure (cm H2O)</td>
<td>30.9 ± 11.5 (5-55)</td>
</tr>
<tr>
<td>Peak flow (ml/sec)</td>
<td>22.4 ± 2.1 (17-27)</td>
</tr>
<tr>
<td>Detrusor pressure at peak flow (cm H2O)</td>
<td>21.4 ± 9.4 (10-58)</td>
</tr>
<tr>
<td>Residual volume</td>
<td>6.1 ± 1.5 (0-30)</td>
</tr>
</tbody>
</table>
Slings made from autologous material have been used since the technique was first described by Aldridge in 1942 (7). Recently, other synthetic materials have been proposed in order to diminish the potential morbidity related to the harvest of aponeurotic or fascial grafts (1). However, the main problem of synthetic material is a greater risk of erosion and infection than biological grafts (8).

The urethral fascial support depends on pubourethral and urethropelvic ligaments (9). Pubourethral ligaments support the urethra against the inferior branch of pubic symphysis, which has a band of prepubic fibers (more tenuous), and another more robust band of retropubic fibers. They divide the urethra into 3 distinct functional regions. The proximal region, also called intra-abdominal region, is related to passive continence secondary to transmission of abdominal pressure variations that act in conjunction with the bladder neck. The intermediate region includes the midurethra, which is responsible for the active sphincteric mechanism. The function of the region that is distal to the pubourethral ligament is related to urinary conduction only, with no involvement of continence mechanism (10). The thickness of anal levator muscle fascia is due to the urethropelvic ligaments that extend parallel to urethra from midurethra to the bladder neck, corresponding to 3 and 9 o’clock positions, and are laterally inserted into the tendinous arch of pelvic fascia. It provides an increase in urethral resistance and supports the urethra and bladder neck. Increased abdominal pressure causes reflexive contraction of anal levator muscle, which increases the tension of urethropelvic ligaments, which results in suspension and compression of the urethra (11). The vaginal wall sling is based on these concepts and aims at restoring the natural elements of urethral support by plication of urethropelvic ligaments with the tendinous arch, so that the urethra is stabilized using available natural tissues (3). The bladder neck support is obtained by applying helicoidal sutures, according to the technique previously described by the same author for the endoscopic suspension of the bladder neck. In a study conducted with 160 patients, of which 95 (59.3%) presented intrinsic sphincteric insufficiency, patient’s subjective report demonstrated a success rate of 93%.

### Table 3 - Age and urethral mobility related to patients’ outcome; p-values derived from multivariate logistic regression.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Intercept*</th>
<th>P</th>
<th>Odds Ratio</th>
<th>Confidence Interval (0.95)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age = 35 years</td>
<td>-0.0783</td>
<td>0.0251</td>
<td>0.925</td>
<td>0.864; 0.990</td>
</tr>
<tr>
<td>Hypermobility**</td>
<td>1.9234</td>
<td>0.0176</td>
<td>6.844</td>
<td>1.339; 33.472</td>
</tr>
</tbody>
</table>

* Intercept positive values indicate better responses with increasing values, and intercept negative values indicate worsening response with increasing values.

** Urethral descent on transperineal ultrasound ≥10mm.

### Table 4 - Odds ratio values for likelihood for cure or improvement versus unchanged or worsened factoring age and the presence or absence of preoperative hypermobility.

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Hypermobility</th>
<th>No Hypermobility</th>
</tr>
</thead>
<tbody>
<tr>
<td>29 - 34</td>
<td>23.675</td>
<td>3.459</td>
</tr>
<tr>
<td>35 - 49</td>
<td>14.8</td>
<td>2.162</td>
</tr>
<tr>
<td>50 - 74</td>
<td>4.573</td>
<td>0.668</td>
</tr>
<tr>
<td>&gt; 75</td>
<td>0.646</td>
<td>0.094</td>
</tr>
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</table>
In the same study, 9% of the patients reported urinary urge associated with urine leakage during postoperative period. Stratified analysis did not demonstrate significant differences in relation to the etiology of incontinence, although patients with intrinsic sphincteric insufficiency have shown relatively long periods of postoperative urinary retention. Complications described were uncommon, and were related to vaginal suture infection, suprapubic pain, and in 5% of the cases, to prolonged urinary retention (more than 30 days). Despite the good preliminary results obtained, the author did not report on long-term progression of these patients. A trend towards late recurrence of incontinence among patients with sphincteric deficiency was also described, similarly in the present study.

In this study, only 31.1% of the patients had favorable outcome. Those patients who progressed to incontinence recurrence underwent an aponeurotic pubovaginal sling implant, during which intense periurethral fibrosis - often verified - required ample urethrolysis before implanting the new sling. Fibrosis and urethral fixation were considered to have resulted because of the sutures in the midurethra and the urethral pressure against the pelvic wall. This very same mechanism may be considered a possible cause for worsening of incontinence referred by some patients.

We consider that the lack of objective parameters (other than direct observation of urinary leakage and patient interview) applied for recent incontinence assessment may not be very important, regarding the results obtained. Statistical analysis has shown that both young age and presence of hypermobility are related to success. It can be argued that better collagen synthesis or better collagen turnover, theoretically found among younger individuals, could have a positive impact on the outcome (13). Recently other prospective study in 373 patients presented comparative results of vaginal wall sling, either in women with urethral hypermobility or in those with intrinsic sphincteric deficiency (14). Despite the favorable results presented in both group of patients, the technique described is based on the use of a rectangular shape graft of vaginal wall as suburethral support for the bladder neck and proximal urethra, as the technique first described by Raz et al. in 1989 (3). We considered this procedure technically comparable with that of the aponeurotic sling, and thus, similar results would be expected. Otherwise, this technique has important conceptual differences from the procedure discussed in our study, and so we are not able to compare the results.

**CONCLUSION**

We concluded that the vaginal wall sling has a high rate of failure in the treatment of patients with intrinsic sphincter deficiency. This technique should not be used for patients with stress urinary incontinence due to intrinsic sphincteric deficiency without associated hypermobility, especially in the case of elderly patients.

**REFERENCES**


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EDITORIAL COMMENT

The authors present a retrospective review of their experience using an anterior vaginal wall sling in the treatment of female urinary incontinence secondary to intrinsic sphincter deficiency (ISD).

Findings included a cure rate of 31.1% and an improved rate of 37.8%. Variables associated with success included age of less than 35 years and preoperative diagnosis of urethral hypermobility.

The authors should be applauded for their candid thoughts and results in the use of the anterior vaginal wall sling. The importance of this manuscript is in its contribution to the discussion of the efficacy of various approaches to treatment of female stress urinary incontinence from ISD as well as the notation of the importance of the physical examination (e.g. urethral hypermobility) in predicting success or failure with this approach. Key points for the reader to ponder is the contrast of results in reports in the literature regarding the anterior vaginal wall sling (1,2), the tendency of the anterior vaginal wall sling to fail in the presence of severe ISD (2), and the use of the preoperative Marshall test before selecting this technique. It is hoped that the authors will reexamine their study population in 3 to 5 years to establish or disprove the durability of results in this operation.

References

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