

Is the cure of severe involuntary urinary loss by surgical repair of the bladder neck area of vagina possible?

A point of view about managing the tethered vagina syndrome

Ion-Andrei
Mueller-
Funogea¹,
Klaus
Goeschen²,
Peter Petros³

1. EUREGIO-Pelvic-floor,
Unit MZ StaedteRegion
Aachen, Germany
2. Kvinno Center Hannover,
Germany
3. University of Western
Australia, Australia

Correspondence:
Dr. Ion-Andrei
Mueller-Funogea
e-mail: andrei.
muellerfunogea@
gmail.com

Abstract

Background. Tethered vagina syndrome seems to be an iatrogenic condition caused by scar-induced tightness in the bladder neck area of the vagina. In this regard, the bladder works like a watering can, due to loss of elasticity in the bladder neck area. This situation is somewhat similar to “motor detrusor instability”, and is considered as being almost incurable. The first step usually is to free all scar tissue from urethra and bladder neck and the second, to increase the tissue in the bladder neck area of vagina, thereby restoring elasticity. No specific operative procedure was recommended. **Purpose.** To test the efficacy and safety of the adequate surgical procedure which aim to restore elasticity in the bladder neck area of vagina. **Methods.** Between January 2001 and December 2009 was performed a plastic operation in the bladder neck area of vagina on 119 patients. In order to permanently improve the continence outcome, “I-plasty” was performed in 13 patients, a free skin graft in 21 patients and finally a bulbocavernosus-muscle-fat-skin-flap-operation from the labium majus in 85 patients. A follow up was performed 5-7 days, 6-8 weeks and 6 month after the operation. All these patients were classified by several physicians as incurable. They were explicitly informed by our team about the principle and aim of the operative procedure as possible attempt to cure the problem. They noticed the trial character of the surgery and signed their agreement on an officially registered sheet. **Results.** We considered cured painless patients with involuntary urine loss <10 gm during 24 hours. At 6 month review, the cure rate was 3/13 (23%) for I-plasty, 11/21 (52%) for the skin graft and 68/85 (80%) for the bulbocavernosus-flap. **Conclusion.** In our study, the bulbocavernosus-muscle-fat-skin-flap was the most effective way to cure severe incontinence caused by scarring due to previous vaginal or bladder neck surgery.

Keywords: tethered vagina, urinary incontinence, zone of critical elasticity, bulbocavernosus-flap operation

Introduction

Tethered vagina syndrome is an iatrogenic, but as yet, not well recognized condition. It is caused by scar-induced tightness in the middle zone of the vagina.

This syndrome was first described by Petros and Ulmsten, and later in 1993⁽¹⁻³⁾. It is not defined as a separate entity by the International Continence Society^(4,5). This problem is somewhat similar to “motor detrusor instability”, and may arise in patients with multiple previous operations in the bladder neck area of vagina. The classical symptom is commencement of uncontrolled urine leakage as soon as the patient’s foot touches the floor; indeed, often commencing as the patient rolls over to get out of bed in the morning. The patient does not complain of bed-wetting during the night. The symptoms are caused by loss of elasticity in the bladder neck area of the vagina: the so-called “zone of critical elasticity” (ZCE).

Vaginal examination characteristically describes a very tight anterior vaginal wall, with thick scarring or excessive elevation evident in the area of bladder neck. On ultrasound, no significant movement, funneling or

opening out of bladder neck is evident during straining or squeezing.

During squeezing the bladder neck stays in this position, whereas the posterior wall of the bladder moved in the normal position.

Because scar tissue timely contracts, further could remain for many years after vaginal repair or bladder neck elevation. The anatomical basis of this operation resides in the Integral Theory^(5,6), which states that adequate elasticity is required in the bladder neck area of the vagina, allowing the opposite muscle forces to operate independently of each other. The aim of this study is to prospectively test if a surgical therapy is possible, and to search for the most efficient surgery by analyzing the validity of three different operations⁽¹⁻³⁾, all of which aim to restore elasticity in the bladder neck area of the vagina.

Methods

Prospective observational studies were performed to analyze the efficacy and safety of improving surgical procedures. The study was conducted between January 2001 and December 2009 and was based on 119

Received:
January 29, 2012
Revised:
April 24, 2012
Accepted:
May 26, 2012

patients with the above mentioned problems due to at least two bladder neck operations in the past. All the operations were done by gynecologist through vaginal access and with usual instruments.

Surgical techniques

The I-plasty is a method for tension-free adaptation of wounds, the free skin graft is used in the plastic surgery to cover tissue defects and the bulbocavernosus-muscle-fat-skin-flap (Martius-graft) is used for the cure of vesico-vaginal or recto-vaginal fistulas. Hence were these techniques used in our study the first time ever to recover the suburethral elasticity(original indication).

First we performed in 13 patients an I-plasty with minor results. Next, we managed in 21 patients a free skin graft in order to improve the continence outcome, without any good results. Further we performed in 85 patients a bulbocavernosus-muscle-fat-skin-flap from the labium majus who finally showed a major improvement of continence after operation. All patients were examined pre- and postoperatively. A follow up was performed 5-7 days, 6-8 weeks and 6 month after the operation.

Inclusion criteria

All patients had the above mentioned symptoms and at least two previous bladder neck operations in the past. Presence or absence of uterus and association with other anatomical defects (such as cystocele, enterocele and/or rectocele) were not observed.

Exclusion criteria

Clinical and urodynamic proved stress urinary incontinence, urethral hypermobility and closure deficiency in perineal ultrasound and clinical and urodynamic proved -frequency, urgency, nocturia, were all excluded.

Ethics

The patients were explicitly informed about the trial character of the surgery together with the possible complications and signed it on an officially patient information leaflet.

Mean age was 65 years (between 42 and 80), mean weight 81 kg (between 61 and 105) and parity mean 2.6 (between 1 and 5). The mean number of previous bladder neck operations was 3.4 (between 2 and 11): Kelly vaginoplasty and/or Burch or Stamey-Pereira suspension or suburethral polypropylene sling tension-free suspension. Mean urine loss during the 24 hour pad test was 453 ml (between 175 and 1330).

All patients presented symptoms of sudden uncontrolled urine loss on getting out of bed, or getting off a chair. Urine began running uncontrollably immediately the patient's foot touched the floor. All were tested pre-operatively with urodynamics and pre- and post-operatively with vaginal ultrasound and 24 hour pad test.

Preliminaries

Whatever the technique used to restore elasticity, it is essential to dissect the vagina from the bladder neck and urethra, and then to free all scar tissue from urethra, bladder neck and pubic bones ('urethrolysis').

The I-plasty-operation was performed in 13 patients. I-plasty aims to increase the volume of tissue in the bladder neck area of the vagina, thereby restoring elasticity. To reach this aim a vertical full thickness incision was made from midurethra to at least 3-4 cm beyond bladder neck. The vaginal skin was dissected off the scar tissue and was extensively mobilized, forwards to the edges of the vaginal hammock, backwards as far possible right down to the hysterectomy scar, and as laterally as possible. The freed tissue was brought into the ZCE and sutured transversely with interrupted sutures.

The skin graft operation was performed in 21 patients. After a full thickness transverse incision in the area of bladder neck the vagina, urethra and bladder neck were freed from the scar tissue. This resulted in opening up of a large gap. A full thickness skin graft approximately 6x4 cm was taken from the lower abdominal wall. After removal of underlying fat, the graft was applied to the bladder base using several quilting sutures. The graft was then trimmed as necessary, and sutured to the adjacent vaginal skin with interrupted 00 Vicryl.

"Skin-on" Martius flap graft. In 85 patients the large gap after scar dissection was covered with a bulbocavernosus-muscle-fat-skin-flap from the labium majus. A 5x3 cm ellipse of vulval skin was created over the labium majus and transferred with underlying fat and muscle through a tunnel into the dissected area. The tunnel must be sufficiently large to avoid constriction of the vascular pedicle. The graft was attached to the adjacent vaginal skin.

Results

The cure rates that means massive improvement of incontinence (urine loss <10 gm during 24 hours) were 3/13 (23%) for I-plasty, 11/21 (52%) for the skin graft and 68/85 (80%) for the bulbocavernosus-flap. The assessment method of the curing was by a specific questionnaire 6-8 weeks and 6 months after the operation.

Follow-up ended after 6 months. The patients were informed to give us feed-back if 2 symptoms became recurrent: massive urine loss moving from clino- into orto-statism and empty bladder before reaching the toilet. These symptoms excluded urgency and stress-incontinence. Other signs were not related to the pathophysiology of the bladder neck.

The mean operating time was 42 minutes for the I-plasty, 65 minutes for the skin-graft and 88 minutes for the Martius-flap (generally between 41 and 98 min). No serious bleeding was observed. The mean hospital stay was 2,5 days for the I-plasty, 3,1 days for the skin-flap and 5,8 days for the Martius-flap (generally between 2 and 9 days). All patients were mobile at least 4 hours after the operation. Only 2 patients after Martius-flap and one patient after skin-flap could not pass urine after removal of the catheter one day after the operation and further permanent catheter was necessary for another 1

day. Postoperative urinary tract infections were detected in 1/13 (7,7%) of the I-plasty patients, in 2/21 (9,5%) of the skin-flap and 8/85 (9,4%) of the Martius-flap patients and seem to be in direct dependence on the operating time. Every patient was dismissed as continent and with a residual urine volume not bigger as 50 ml (ultrasound volume measurement).

Discussion

The International Continence Society has no definition for the tethered vagina syndrome. The tethered vagina syndrome⁽¹⁾ may be conceptually similar to “motor detrusor instability”, in that the urine loss is massive or uncontrolled. As the mechanism for opening out the posterior urethral wall is mechanical, urgency is frequently not found with this condition. Urge waves are not identified in urodynamics of these patients. The cause is iatrogenically induced fibrosis in the bladder neck area of the vagina. It is far more common in regions where surgeons are taught to remove significant amounts of vaginal skin during vaginal repairs.

The explanation for cure of this condition by restoration of elasticity in this area may be explained by reference to a previously described hypothesis^(5,6): there are separate urethral and bladder neck closure mechanisms. In the former, forward vectors stretch the underlying vagina on each side to close the urethra from behind. In the latter, backward/downward vectors stretch the proximal vagina and bladder base backwards and downwards to close off the bladder neck. Adequate elasticity is required for these separate movements. If fibrosis occurs at this critical point then the opportunity for independent movement is lost and the stronger posterior force overcomes the weaker anterior force. As a result the urethra is forced open.

Often there is very little stress incontinence. The reason is that cough creates short sharp fast-twitch contractions, and there may be just sufficient elasticity at ZCE to prevent urine leakage on coughing. Getting out of bed in the morning stretches ZCE far more as the pelvic floor contracts to support all the intra-abdominal organs. The classical symptom is commencement of uncontrolled urine leakage as soon as the patient's foot touches the floor.

Often there is no urgency, as the cause is mechanical: a scar at ZCE tethers the more powerful backward forces F2 to the weaker forward forces F1, and the bladder is pulled open as in micturition.

To cure this condition the aim must be to restore elasticity in the bladder neck area of the vagina, ZCE so that F1 and F2 can act independently of each other. As a first step, it is essential to dissect the vagina from the bladder neck and urethra, and to free all scar tissue from urethra, bladder neck and pubic bones ('urethrolysis'). There must be no scar tissue anchoring the bladder neck to the pelvic side wall.

The second step is to bring fresh tissue to the bladder neck area of the vagina in order to restore elasticity, and prevent new scar creation in this area.

Our results demonstrate that the I-plasty operation cures less than one fourth of the patients. Therefore we decided not to continue with this method in cases where there is obvious tissue deficit. It is still the simplest technique but only indicated if there is no tissue deficit. The I-plasty works very well in patients where the cause is excessive bladder neck elevation, for example, after a Burch colposuspension. If there is a severe shortage of tissue or a large gap after dissection, this defect has to be covered with a skin graft or a flap.

The results with free skin graft are much better than with I-plasty, but a cure rate of about 50% is still not convincing. A free graft is problematical because there is no blood supply. Therefore up to one third may not “take”, or the graft may shrink excessively.

The bulbocavernosus-flap operation is technically more challenging, but brings its own blood supply. This is in our opinion the explanation for the high cure rate. Using this technique it is very important not to compromise the blood supply of the graft. Therefore the pedicle must be thick enough to prevent too much compression to the vessels in the pedicle, and the space created in the lateral vaginal wall for passage of the graft must be adequate.

Conclusions

The results appear to sustain the hypothesis that adequate tissue elasticity is required for the separate function of the bladder and urethral closure mechanisms. Application of a muscle-fat-flap to the zone of critical elasticity after scar dissection restores the tissue elasticity in the bladder neck area of vagina and continence for the most of patients. The difference between incontinence caused by urethral hypermobility (“stress-incontinence”) and incontinence caused by urethral immobility (tethered vagin) is necessary to be known in order to choose an adequate surgical therapy.

All the figures and pictures in this paper are original and property of the authors.

The study was approved by the Ethical Committee of the AAVIS (Australian Association of Ambulatory Vaginal and Incontinence Surgeons). ■

References

1. Petros PE, Ulmsten U, The tethered vagina syndrome, post surgical incontinence and I-plasty operation for cure. *Act Obstet Gynecol Scand* 1990; 69: 63-67; Suppl 153.
2. Petros PE, Reconstructive Pelvic Floor Surgery According to the Integral Theory. In: Petros PE, The Female Pelvic Floor. Springer Heidelberg 2006; 135-141; Chapter 4.
3. Petros PE, The integral theory system: A simplified clinical approach with illustrative case histories *Pelvipereineology* 2010; 29: 37-51.
4. Abrams P, Cardozo L, Fall M, Griffiths G, Rosier P, Ulmsten U, van Kerrebroeck P, Victor A, Wein A, The Standardization of Terminology of Lower Urinary Tract Function: Report from the Standardisation Sub-Committee of the International Continence Society. *Neurourology and Urodynamics* 2002; 21:167-178.
5. Petros PE, Ulmsten U, An Integral Theory of Female Urinary Incontinence, *Acta Obst Gynecol Scand* 1990; 1-79; Suppl 153.
6. Petros PE, Ulmsten U, An Integral Theory and its Method for the Diagnosis and Management of Female Urinary Incontinence. *Scand J Urol Nephrol* 1993; 1-93; Suppl 153.