

# PELVIPERINEOLOGY

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# Cure of interstitial cystitis and Hunner's ulcer by TFS ligament repair brings new insights into pathogenesis and management

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**Citation:** Petros P. Cure of interstitial cystitis and Hunner's ulcer by TFS ligament repair brings new insights into pathogenesis and management. *Pelviperineology*. 2021;40(4):169-171.

This report concerns the first cure of Interstitial Cystitis (IC) and histologically validated Hunner's ulcer in the literature by Tissue Fixation System (TFS) mini-sling repair of cardinal and uterosacral ligaments. The cure was unintentional. A 73-year-old woman was managed according to the protocol for Posterior Fornix Syndrome (PFS)\*: validated Integral Theory System Questionnaire, diagnostic algorithm which uses symptoms to locate ligament damage, vaginal examination to confirm uterosacral ligament damage and finally, "simulated operation", mechanical support of the apex with a speculum to test for relief of urgency and pain.

The significance of this cure goes far beyond a case report. It demonstrates that IC is not incurable as was generally believed. Furthermore, the criteria for PFS conforms exactly to the European/International Society for the Study of Interstitial Cystitis (ESSIC) definition for IC which opens opportunities for further research in order to define the differences, if any, between PFS and IC.

\*PFS was first described in 1993 as part of the 2<sup>nd</sup> iteration of the Integral Theory of female Urinary Incontinence.<sup>1</sup> PFS comprises predictably grouped symptoms of urge, frequency, nocturia, abnormal emptying/retention, and chronic pelvic pain

caused by uterosacral ligament (USL) laxity, cured or improved by native uterosacral ligament plication.

As he sailed into the Swan River, Western Australia, on January 10, 1697, Willem Hesselsz de Vlamingh saw a black swan. This disproved forever what had been accepted for thousands of years as incontestable fact, that all swans were white. Thus, it is with the unintentional discovery of a surgical cure of interstitial cystitis (IC) and Hunner's ulcer by ligament repair.<sup>2</sup> It can no longer be said that IC is incurable. Scheffler's Case was consistent with the ESSIC definition for IC:<sup>3</sup> "*persistent or recurrent chronic pelvic pain, pressure, or discomfort perceived to be related to the urinary bladder accompanied by at least one other urinary symptom such as an urgent need to void or urinary frequency diagnosed in the absence of any identifiable pathology which could explain these symptoms.*" and also, previous IC criteria, glomerulations and histologically validated Hunner's ulcer.

Clearly, it cannot be claimed that ligament repair can cure every case of IC. This editorial limits its aim to seeking insights for pathogenesis and management.

Scheffler did not set out to cure IC. He followed standard protocol for cure of the Posterior Fornix Syndrome (PFS)\*.<sup>1</sup> The first assessment was carried out in March 2016. Scheffler

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reported: *"She was assessed by the validated Integral Theory System Questionnaire\*\* and a diagnostic algorithm which uses symptoms to locate ligament damage. On examination, a moderate cystocele and an entero/rectocele were seen with laxity of the cardinal/uterosacral ligaments (USLs), lax pubocervical and rectovaginal fascia. "Simulated operation"\*\*\*; mechanical support of the anterior vaginal wall/apex with a speculum led to almost complete relief of urgency and pain."*

\*\*The validated ITSQ (Integral Theory System Questionnaire) is specific for the PFS diagnostic protocol. Specific symptoms locate which damaged ligaments may be causing the prolapse and symptoms. Chronic pelvic pain and nocturia are uniquely caused by USL laxity.

\*\*\*Simulated operation is a screening test for PFS: a speculum gently inserted into the posterior fornix mechanically supports lax USLs and nerve plexuses S2-4 and T11-L2 in order to relieve pain and urgency.

The pre-operative assessment for PFS being positive, Scheffler proceeded to Urodynamic examination. Maximum capacity was 430 ml (limited by pain), and the detrusor was stable.

Compliance was normal, and there was no urine leakage. According to the cystoscopy: bladder capacity was 300 ml, there was diffuse distension bleeding, chronic cystitis with patchy mucosal reddening, glomerulations, and non-ulcerating Hunner's ulcer. Resection biopsies showed large numbers of mast cells within the muscular layer. Further clinical testing with a 2<sup>nd</sup> "simulated operation" with a tampon inserted in the vaginal apex to support the USLs again improved urge and pain. Satisfied that lack of apical support was the pathogenic factor, Scheffler proceeded to repair the cardinal and uterosacral ligaments with TFS tensioned tape. Post-operatively, there was good anatomical correction of the apical descensus and cystocele. Symptoms gradually disappeared with voiding reduced to 5–6 times daily and nocturia once. A follow-up cystoscopy in September 2016 showed complete healing of the Hunner's ulcer, no bleeding, and no glomerulations. Bladder capacity was now 700 ml. Following this, the patient was seen regularly with no further symptom recurrence.

Scheffler's discovery raised two important questions.

- (1) Was IC a one-off cure?
- (2) Is IC a manifestation of PFS caused by USL weakness?

Similarities with Table 1 indicate that it may not have been a one-off cure. The symptoms in the Goeschen's study of 198 PFS

women who underwent a USL sling<sup>4</sup> conform in every way to the ESSIC definition of IC and are virtually identical with those in Butrick's classic IC study of 408 women<sup>5</sup> (Table 1). Butrick treated his patients with bladder installations with no cure. Goeschen performed a USL sling and achieved significant anatomical and symptomatic cure.<sup>5</sup>

The 2<sup>nd</sup> question can only be answered by an RCT, where one group has bladder installations, and the other a USL repair, or a USL sling if post-menopausal.<sup>4</sup>

Hypotheses for the pathogenesis and cure of IC and Hunner's ulcer<sup>2</sup> are detailed below. Both the speculum test and the sling mechanically support the USLs and the visceral nerve plexuses (VPs). Unsupported, the VPs are susceptible to stimulation by gravity or muscle movement and so send afferent impulses to the cortex. These are interpreted as pain from an injury to the end organ, the bladder. Thus alerted, the cortex sends efferent signals via visceral nerves to special resident cells at the end-organ. These activate inflammatory cells such as mast cells to initially form non-ulcerating Hunner's ulcer. If the inflammatory response is excessive, the inflammation may cause ulceration. Overactive bladder (OAB) cure is explained differently. Repair of loose USLs restores the muscle forces which stretch the vagina to support the urothelial stretch receptors from below, thus diminishing the afferent impulses which, beyond a threshold which is different for each patient, are interpreted by the cortex as urge.

Finally, a 3<sup>rd</sup> question needs to be asked: "How can this method be applied?"

For premenopausal women, a simple USL plication done vaginally as reported,<sup>3</sup> or laparoscopically, should give good results for both pain and urge symptoms. As postmenopausal women generally have ligaments which are collagen deficient, we have found a sling is generally required for a longer-term cure. Whatever the surgical option, it is imperative to have a positive speculum test prior to any surgery.

**Keywords:** Hunner's ulcer; interstitial cystitis; TFS mini-sling

## ETHICS

**Peer-review:** Internally peer-reviewed.

## DISCLOSURES

**Financial Disclosure:** The authors declared that this study received no financial support.

**Table 1. Similarity between interstitial cystitis symptoms and the Posterior Fornix Syndrome**

Similarity between interstitial cystitis symptoms and the Posterior Fornix Syndrome	
Butrick Interstitial cystitis (n=408)	Goeschen Posterior Fornix Syndrome (n=198)
Bladder installations NO CURE	Uterosacral sling % cure in brackets
Bladder pain/interstitial cystitis (n=157)	Voiding dysfunction (n=68) (54%)
Chronic pelvic pain (n=98)	Urge incontinence (n=55) (80%)
Vulvodynia/dyspareunia (n=40)	SUI (n=66) (95%)
Voiding dysfunction (n=70)	POP (n=198) (90%)
Dyspareunia (n=54)	Chronic pelvic pain (n=198) (74%)
SUI (n=24)	Nocturia (n=63) (79%)
POP (n=21)	
Hunner's ulcer (n=18)	No Hunner's ulcer reported
Butrick. Int Urogynecol J Pelvic Floor Dysfunct. 2009(9):1047-53.	Goeschen K, Gold D. Pelviperineology. 2017;36:84-88.

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## IN THE PATH OF THE GIANTS

This section in Pelviperineology Journal, aims to interview the outstanding clinicians and scientists that had a special impact on the profession of Pelviperineology over the years.

**Prof. Michael Swash, MD FRCP FRCPath**

Interviewers: Jacob Bornstein, Darren M. Gold, Pelviperineology



**Figure 1.** Prof. Dr. Michael Swash, writing at home

### • **What, would you say, is your main achievement, with an emphasis on the field of pelviperineology?**

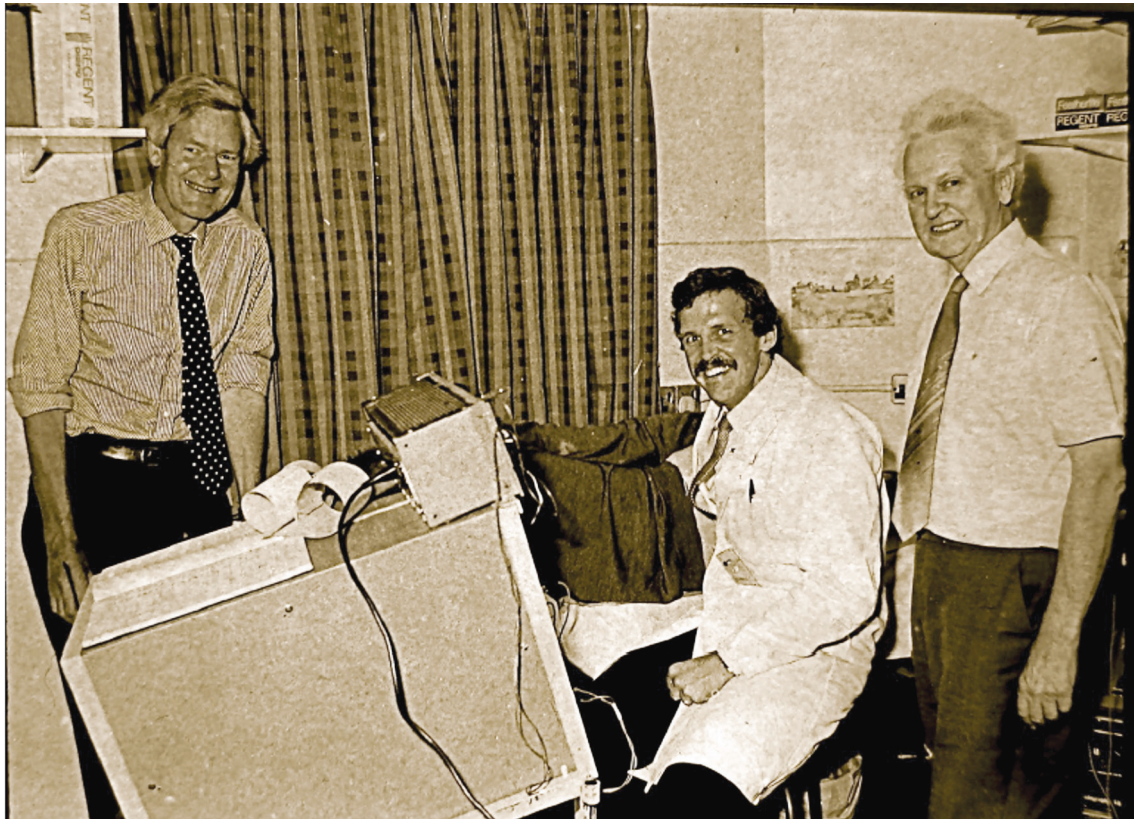
The demonstration that in women's pelvic floor disorders, a term we introduced in our book, *Coloproctology and the Pelvic Floor; Ed MM Henry & M Swash (1987 and subsequent editions, including a Russian edition for the USSR)*, were associated with laxity of the pelvic floor, so that its tone was insufficient during straining and coughing, leading to faecal and urinary incontinence. We showed that this was also a factor in certain types of constipation and difficulty in defaecation. Using anal manometry, defaecating proctography and EMG and nerve conduction studies, we showed that this incontinence was due to muscle weakness, secondary at least in part to nerve damage sustained in childbirth, and that it was often also associated with anal sphincter injury. We also showed that this was a progressive

disorder, especially associated with menopause and aging. We derived a unifying algorithm indicating the inter-relationship of the various causative factors. Later, with Peter Petros, we integrated pelvic ligamentous stretch and loss of elasticity into the causative hypothesis, a concept that generated a logical approach to clinical management. The conventional ideas were thus overturned, or modified, although general recognition was slow in developing.

I have also worked in other areas, especially in Motor Neuron Disease/ALS, in neuromuscular diseases and in general neurology

### • **What in your youth and in early and late training years, prepared you to become top-notch in your field?**

I was educated at the London Hospital Medical College at the Royal London Hospital. The Dean sent me as an exchange



**Figure 2.** The first measurement of motor conduction velocity in the spinal cord in man  
 Prof. Pat Merton (subject on couch): Dr. Steven Snooks, research fellow in physiology lab at St. Mark's Hospital, London. Mr. Bert Morton, Engineer at Queen Square; Michael Swash (standing)

student to the Medical College of the University of Virginia in Charlottesville, Virginia, where I was suddenly briefly free of a fixed curriculum. After qualifying I was for 6 months on the House in Neurosurgery at the London Hospital, before working for 2 years in a busy general hospital in Bath in Medicine – and dabbling in General Practice. I was then sent by Dr Christopher Earl, Neurologist at the London Hospital to Case-Western Reserve University, in Cleveland, Ohio to study Neurology with the Harvard team who had moved to Cleveland from Boston on the retirement from Harvard of Prof Derek Denny-Brown. After 3 years, I moved to the Neurology Department in Washington University at St Louis, Missouri, to study Neurophysiology, before returning to London. This diverse, unconventional experience provided a unique multiskilled background and supported my natural inclination to test polemical beliefs put forward by others, whether by a literature search or by my own observations.

**• You have changed the understanding that was common in the past. What did you first notice that alerted you to the fact that our understanding of the subject was incorrect?**

As a student on the Gynaecology rotation in medical school, I noted that there was evident weakness of the perineal muscles

in prolapse associated with urinary incontinence but that a coherent understanding of this was lacking. Further, surgical management was directed to the uterus, which seemed to me peculiar, since the prolapse was itself symptomatic rather than causative. However, one could not usefully comment from such a junior position!

**• How did you proceed to determine what was the scientific truth?**

With my distinguished senior colorectal surgical colleague, Sir Alan Parks, I started by examining muscle biopsies of pelvic floor muscles. We showed that there was chronic partial denervation, sometimes with associated direct injury to the external anal sphincter. Fortunately, at the time of Alan's sudden death, I had established an anorectal physiology lab, also equipped for neurophysiological studies, in a modified corridor by a little-used back door at St Mark's Hospital, with the enthusiastic support of the surgical staff. Almost immediately, a stream of gifted Research Fellows appeared, many directed to my lab by my colleagues at St Marks. Some of these Research Fellows arrived with funding from their own countries and, consequently, I was largely spared the drudgery of repeatedly applying for research





Figure 3. At Stratford on Avon before the theatre performance

funds, although we were particularly grateful for funding from the Royal College of Surgeons, and from St Mark's itself. We provided an anorectal manometric service as well as conducting our new electrophysiological measurements, that included EMG and soon also pudendal nerve terminal motor latencies, using a unique technique.

#### •How did you know you were right with your new approach?

We had the appropriate investigative tools. No-one had previously applied neurophysiological techniques in association with manometry and radiology to the problem. Furthermore, we started with pathological information from our biopsy studies. The results were pleasingly consistent, on a scale of severity linked to different functional states, suggesting an underlying unitary process.

#### •Looking backwards would you have done anything differently? If yes, what, and how?

Yes: I would have sought much earlier to expand the work more widely into stress urinary incontinence. However, we found that the world of urology was, to an outsider, somewhat inward-looking and that it was entirely understandably firmly linked to its established investigative and surgical procedures, in which there were major financial and training investments. Change associated with our new and unconventional ideas was therefore difficult to integrate with conventional practice.

#### •Can you quote the main publications that reflect your achievements?

Injury to innervation of pelvic floor sphincter musculature in childbirth. Snooks SJ, Swash M, Setchell M and Henry MM. *Lancet* 1984; 2: 546-50.

Damage to the innervation of the voluntary anal and periurethral sphincter musculature in incontinence. Snooks SJ, Barnes PRH and Swash M. *J Neurol Neurosurg Psychiatr* 1984; 47: 1269-73.

Perineal nerve damage in genuine stress urinary incontinence: an electrophysiological study. Snooks SJ, Badenoch D, Tiptaft R and Swash M. *Br J Urol* 1985; 57: 422-426.

Faecal incontinence due to external anal sphincter division in childbirth is associated with damage to the innervation of the pelvic floor musculature: a double pathology. Snooks SJ, Henry MM and Swash M. *Br J Obstet Gynaecol* 1985; 92: 824-8.

A unifying concept of pelvic floor disorders and incontinence. Swash M, Snooks SJ, Henry MM. *J R Soc Med* 1985; 78: 906-11.

Effects of aging on the anorectal sphincters and their innervation. Laurberg S, Swash M. *Dis Colon Rectum* 1989; 32: 737-42.

Effect of vaginal delivery on the pelvic floor: a five-year follow-up. Snooks SJ, Swash M, Mathers SE, Henry MM. *Br J Surg* 1990; 77: 1358-60.

Fowler's syndrome: what it is and what it's not. Swash M, Petros P. *Pelviperineology* 2020; 39: 105-12.



The Integral Theory: a musculo-elastic theory of pelvic floor function and dysfunction. Papa Petros, P and Swash M. In GA Santoro, P Wiczerek, C Bartram (Eds). Pelvic Floor Disorders: imaging and a multidisciplinary approach to management. London, Springer-Verlag 2010; 17-24 (and 2<sup>nd</sup> edition 2020).

And other chapters in many books on pelvic floor disorders. There are many other papers on neurological topics, especially ALS and neuromuscular diseases.

- **Comments for new physicians interested in the field**

First, do not imagine that research in this area of medicine is complete. There is much yet to do.

Second, do not be discouraged by the sheer number of previous papers! Many of these simply repeat earlier research – they are “me too” papers.

Third, start with a blank mind: try to develop a concept of your own, however minor. Test it and see where it leads.

Fourth, then consider how your idea fits into what is known or accepted as known, in the literature. Sometimes, established ideas turn out to be incorrect.

Fifth, be very careful to do no harm in your studies.



# Prospective follow-up of women undergoing uterine-preserving surgery for symptomatic pelvic organ prolapse

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## ABSTRACT

**Objective:** Approximately 25% of all women will suffer from pelvic organ prolapse (POP), with its incidence increasing with age. Treatment includes pelvic floor physical rehabilitation, and pelvic floor surgical reconstruction. The aim of this study is to evaluate the post-surgical anatomical and functional status of the patients when presenting up to 6 months after uterine-preserving reconstructive surgeries.

**Materials and Methods:** This prospective study included women above the age of 30, suffering from symptomatic POP who had undergone uterine-preserving vaginal approach surgery with Mesh. The Pelvic Floor Impact Questionnaire-7 (PFIQ-7) was used to assess the women's subjective perception regarding urinary, bowel and psycho-sexual function. The questionnaire was undertaken 6 months after surgery via a telephone interview. A positive effect rate, representing an improvement in the quality-of-life following surgery, was defined as 80% of the cohort ranking '0' or '1' (reflecting the "no at all" to "somewhat" effects on the questionnaire) regarding a specific question about symptomatic POP.

**Results:** The study cohort included 41 women with an average age of  $66.87 \pm 10.61$  years old. In 87.8% (35/41) of the patients, a posterior repair was made using a PROLIFT® mesh. In 7.5% (5/41), a posterior PROLIFT and anterior PROSIMA® were used. One patient (1/41) had an anterior and posterior repair using a PROLIFT mesh. Vaginal uterine-preserving surgery improved urinary symptoms by 58%–70%, bowel symptoms by 82.6%–92.7%, and vaginal and pelvic symptoms by 82.9%–87.8%. The success rate was higher above the age of 60. The age of the patient had a small/moderate positive correlation with urinary symptoms ( $p=0.416$ ), a small positive correlation with vaginal-pelvic symptoms ( $p=0.367$ ) and no correlation with bowel symptoms ( $p=0.149$ ).

**Conclusion:** Uterine-preserving surgical interventions are an effective method for treating symptomatic POP. Women undergoing reconstructive pelvic surgery reported a high post-operative resolution rate of intestinal and vaginal symptoms. Urinary symptoms are more challenging to overcome by surgical interventions.

**Keywords:** Pelvic organ prolapse, uteri-preserving surgery, PFIQ-7, hysterectomy

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## INTRODUCTION

Pelvic organ prolapse (POP) is a condition of growing medical importance as its occurrence is increasing with an aging world population. The lifetime risk for POP is estimated to reach about 50% among women in the western world,<sup>1</sup> while the lifetime risk for surgical intervention due POP and incontinence is around 11%–19%.<sup>2</sup> POP is a leading cause for gynecological surgery in general and particularly for hysterectomy in women over the age of 50 years.<sup>3</sup> The importance of an appropriate treatment for symptomatic POP cannot be overemphasized. The spectrum of symptoms includes urinary<sup>4</sup> and fecal<sup>5</sup> incontinence, reduced sexual satisfaction<sup>6,7</sup> and reduced psychological value of the reproductive system as well as a desire to preserve fertility.

Hysterectomy has been long considered as the treatment of choice for symptomatic POP.<sup>8</sup> However, its necessity at the time of prolapse surgery is being questioned with the progress of novel surgical techniques and an understanding that hysterectomy might be an independent risk factor for POP.<sup>9,10</sup> Its use as a “gold standard” procedure for the treatment of symptomatic POP has declined.<sup>11</sup> The need for recurrent surgical intervention in women who have undergone hysterectomy and have developed post-operative POP symptoms played a key role in the efforts for the trend to preserve the uterus. However, no clear guidelines exist concerning the use of hysterectomy with POP repair, and the operative approach is primarily made according to the experience and preference of the surgeon and the patient.<sup>12,13</sup> Uterine-preserving procedures for the treatment of POP had comparably long-term follow-up outcomes in terms of recurrence of POP symptoms in contrast to those reported following hysterectomy. The aim of this study was to evaluate the post-surgical anatomical and functional status of the patients when presenting up to 6 months after uterine-preserving POP reconstructive surgeries.

## MATERIALS AND METHODS

This study was a cohort prospective descriptive study. The patients' data was collected from the medical records. The study population included women who had had uterine-preserving POP reconstructive surgeries at the participating medical centers during 2016.

The inclusion criteria consisted of women above the age of 30 with full medical records available, including their obstetric history. Previous caesarean section or pelvic surgical intervention not due to POP causes were included. All women underwent a urodynamic/stress cough test with prolapse reduction for the diagnosis of urinary stress incontinence. The diagnosis was made if the patient had at least stage 2 prolapse. Exclusion criteria

were previous pelvic procedures due to POP or insufficient medical records. The study was approved by our institutional IRB committee, and patients who met the inclusion criteria signed informed consent prior to participation in the study.

Data was collected by phone interview and from the patient's medical records. On the first post-operative day, the patients were interviewed regarding any post-operative complications. Physical examination was conducted one month after surgery, including POP-Q evaluation. The information collected from patients' medical records included anamnesis and the patients' physical examination results. The mined data included age, parity, body mass index, general health, length and nature of their complaints, personal and familial medical history, previous surgical procedures, and pre-surgical physical examination – including POP-Q system status, full medical history and the surgery performed. All women underwent post-operative follow-up within 3–6 months postoperatively to assess recurrent prolapse or mesh exposure or other potential complications of the surgery.

A telephone interview 6 months after surgery was carried out by an obstetrics and gynecology resident. In this interview, the patients were requested to answer a PFIQ-7 questionnaire.<sup>14</sup> This (PFIQ-7) questionnaire was previously tested and validated in Hebrew and used in a similar setting and for patients with pelvic floor disturbances.<sup>14,15</sup> The interview was held in Hebrew after translating the PFIQ-7 questionnaire (Appendixes 1 and 2). The patients graded the success of their surgery in terms of the level of the urinary, bowel and vaginal/pelvic symptoms. Each of the systems received a specific score of 0–100 (the lower, the better) and a total score which summarizes all the symptoms was calculated for each patient. The data collected at the 6<sup>th</sup> month interview included the patient's ability to perform house chores. Success for every examined parameter in the questionnaire was defined as an 80% improvement rate. This success rate included the patient's rating 0 which reflects “no effect at all” or mild effect for each given aspect of the questionnaire.

## Statistical Analysis

Continuous variables are described by mean and standard deviation, median and range, and compared by student's t-test or Mann-Whitney tests as appropriate. Dichotomy variables are presented as frequencies and percentages and compared by chi-square test or Fisher's exact test as appropriate. The correlation between the age and the effect on the different systems was calculated using Spearman's correlation coefficient test. The results reliability for every system examined (i.e. urinary, intestinal and vaginal) was calculated with Cronbach's alpha. The calculation was made prior to calculating the mean. A



value greater than 0.7 indicates reliable results – which allows the collected data to be further averaged. Statistical significance is determined as  $p\text{-value} < 0.05$ . Data was analyzed using SPSS, V.21. The reliability value was calculated using the Cronbach's Alpha.

## RESULTS

A cohort of 63 patients who met the inclusion criteria was recruited. Of them, 13 patients could not be reached using the listed phone number in the medical file. Fifty patients were reached, and among them, 41 questionnaires were obtained (a compliance ratio of 82%) comprising the cohort for analysis.

**Demographic data:** The mean women's age of the study cohort was 66.87 years old ( $\pm 10.61$ ). All the patients had undergone anterior and posterior colporrhaphy and mesh kit surgery for apical suspension. In 87.8% (35/41) of the patients, a posterior repair was made using a PROLIFT® mesh. In 7.5% (5/41), a posterior PROLIFT and anterior PROSIMA® were used. One patient (1/41) had an anterior and posterior repair using PROLIFT mesh. There were no intra and post-operative mesh complications.

Six months after surgery, 92.6% of the patients stated that intestinal symptoms and 83% stated that pelvic/vaginal symptoms did not limit their ability to perform physical activity, while 58.5% stated that urinary symptoms did not limit their ability to perform physical activity. Among the parameters examined with the PFIQ-7 questionnaire, urinary symptoms during physical activity had the lowest success rate (Figure 1a). Similar success rates were also reported regarding outdoor activity. When asked, 90.2% and 82.9% of the patients stated that they were able to enjoy movies and concerts without any significant intestinal and pelvic bothering symptoms, respectively (Figure 1b). Similar rates of intestinal and vaginal symptoms were reported for a driving-time of up to 30 minutes from the patient's residence (Figure 2a) and for outdoor social gatherings (Figure 2b).

As for urinary symptoms, 61% of the patients felt comfortable enough to enjoy a concert or a movie (Figure 1a), and similar rate felt comfortable about going for a drive (Figure 2a). A higher rate of 68.7% stated that they had up to a mild disturbance at social gatherings (Figure 2b).

The last two questions of the PFIQ-7 questionnaire relate to the mental effect of the POP symptoms. Urinary symptoms had the highest effect on the mental health status of the patients, 66.8% of the cohort stated minimal mental influence due to urinary symptoms (Figure 3a), and following surgery there was a reduction of 73% in frustration levels. More than 90% of the patients stated that intestinal symptoms had none to minimal effect on their mental health (Figure 3b) and an even higher rate

felt almost no frustration at all (Figure 3b). The negative effect of vaginal/pelvic symptoms was found to be lower than that of bowel symptoms and above the desired 80% success rate, as around 83% of patients stated none to minimal effect on their mental health or feelings of frustration from it. The reliabilities calculated were 0.97, 0.993, and 0.981 for the urinary, intestinal and vaginal system, respectively.

Following uterine preserving procedure, the level of (1) urinary symptoms were scored as a median of 33.33 (range: 0–100); (2) bowel symptoms were scored as a median of 0.00 (range: 0–100); (3) vaginal/pelvic symptoms were scored as a median of 0.00 (range: 0–100); and the total score of the symptoms had a median of 42.86 (range: 0–300).

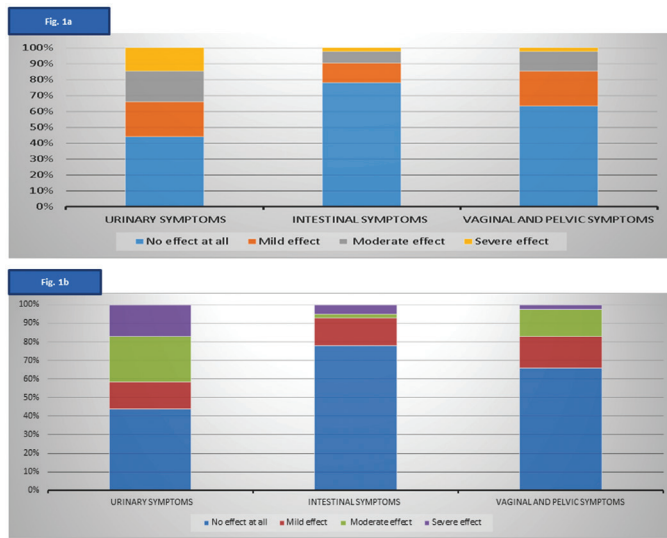
Subsequently, we tested the association between women's age and the level of the symptoms following surgery according to their grading by the patients. There was a significant association between women's age and the level of: (1) urinary symptoms ( $r^2=0.326$ ,  $p=0.019$ ); (2) vaginal/pelvic symptoms ( $r^2=0.266$ ,  $p=0.046$ ); and (3) total score ( $r^2=0.367$ ,  $p=0.009$ ). Women's age was not associated with the level of bowel symptoms following surgery.

## DISCUSSION

The principal finding of this study was that uterine-preserving surgery significantly improves intestinal and pelvic/vaginal functional status and the daily activity of those patients with POP, suggesting that the preservation of the natural anatomical structure while repairing the damaged connective tissues and using surgical mesh as a support has a key role in this improvement.

Our study demonstrated that uterine sparing surgery resulted in an impressive improvement in the urinary symptoms of these patients. Nevertheless, the beneficial effect of surgery did not reach our desired level of 80%. This is in accord with previous reports<sup>1,2,7,16,17</sup> and may require a continuation of treatment – whether conservative or surgical. The resolution of urinary symptoms are more challenging due to the proximity of the prolapsed uterus and the urinary bladder, especially in women with impaired supporting connective tissue.

We found a correlation between the women's age and her symptoms. Younger patients gain a higher level of benefit from the surgery. A possible explanation for this observation is that due to their younger age, these patients' connective tissue is more functional than that of older patients, which contributes to the higher success rate. Older patients, in spite of their relatively high success rates, demonstrated variable results, suggesting that a single surgical intervention for prolonged prolapse for



**Figure 1.** The effect of reconstructive surgery for pelvic organ prolapse on urinary, intestinal, vaginal and pelvic symptoms during: (a) house chores; and (b) physical activity.

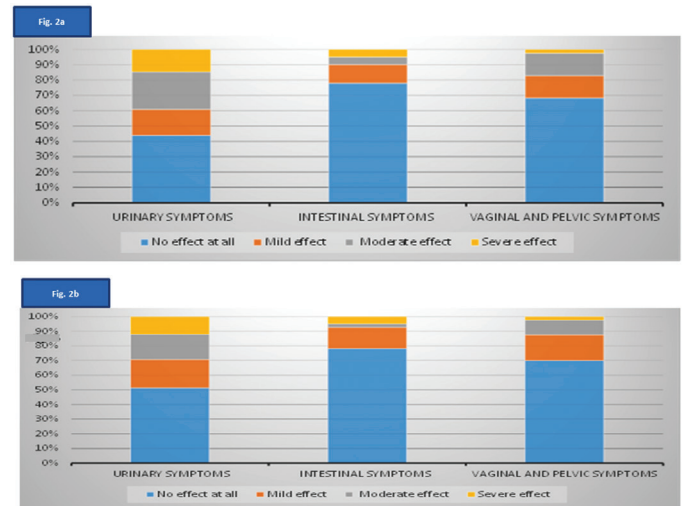
these women might not be sufficient.

Our results are compatible with other results found in medical literature regarding uterine-conserving surgery for POP<sup>1,2,7,16,17</sup> where a significant percentage of the operated patients experienced recurrence of stress urinary incontinence and prolapse-recurrence.

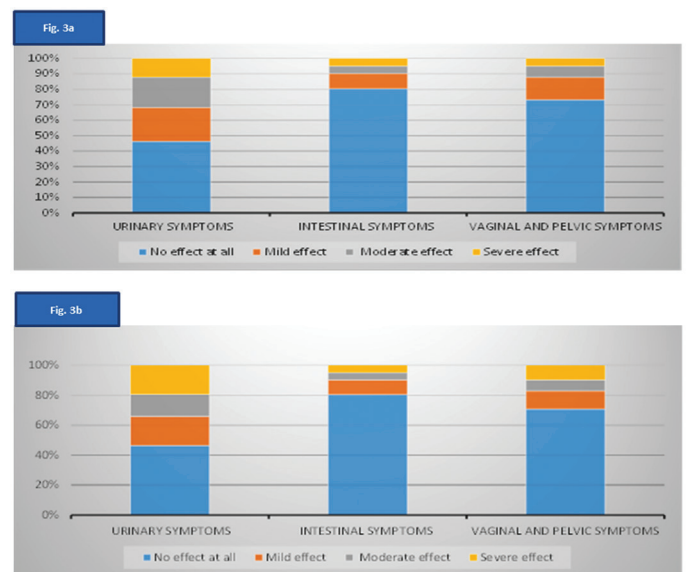
The data and results collected in this study can serve as a reference for future follow-up on the same cohort with the same tool, namely the PFIQ-7 questionnaire. This might shed some insights regarding the long term post-operative progression and change in functional status, including prolapse recurrence rates. Including the same questionnaire in future studies containing different surgical techniques for POP repair will allow for objective and valid comparison between the techniques.

This study has a several limitations. The follow-up period is 6 months after the surgery. A longer follow-up is required in order to evaluate functional status for the long-term. This study though, as mentioned, can be an initial reference point for any future follow-up. On the other hand, 6 months after surgery is a conventional period to assess POP uterine-preserving surgeries and previous studies have shown high symptom recurrence during the first year after surgery.<sup>17</sup> Although mesh kits have been removed from further clinical utilization in most parts of the world, our study presents important information regarding the success of uterine preserving pelvic organ prolapse reconstructive surgery.

Out of the 64 women who met the inclusion criteria, 41 women agreed to participate in the study (82% compliance rate with regards to the women contacted). This is a relatively small cohort



**Figure 2.** The effect of reconstructive surgery for pelvic organ prolapse on urinary, intestinal, vaginal and pelvic symptoms during: (a) distance driving; and (b) attending concert/movie.



**Figure 3.** The effect of reconstructive surgery for pelvic organ prolapse on urinary, intestinal, vaginal and pelvic symptoms during: (a) an outdoor social activity; and (b) mental health.

although many of the studies in the field have a similar sample size.<sup>14</sup> Since POP has a profound effect on both the physical and emotional state of the patients, we presume some refused to precipitate due to inconvenience and reluctance to address their experience while answering personal questions.

The patients' satisfaction and their perception of quality-of-life improvement is the major key point in the assessment of the success of POP surgeries. Given the fact the POP repair surgeries are quality-of-life interventions, the subjective perception of the patient matters even more than the object POP-Q score/measurements. Our observation is in accord with the approach of the posterior fornix syndrome that correction of POP will

improve urinary, vaginal and bowel symptoms.<sup>18</sup> Although mesh implants are no longer approved by the FDA and some European countries, the overall improvement and patients' satisfaction from a uterine preserving surgery is an important topic that supports the continuing practice of sacrospinous fixation for POP with or without small mesh implants.

## CONCLUSION

Uterine-preserving surgery is an effective interventional method for treating symptomatic POP. A high post-operative success rate was found for intestinal and vaginal symptoms. Urinary symptoms are more challenging to overcome, with a lower success rate for those symptoms.

## ETHICS

**Ethics Committee Approval:** This study was approved by Galilee Medical Center IRB (decision number: 0015-16-NHR, date: 06.07.2016).

**Informed Consent:** Informed consent form was obtained from the patients.

**Peer-review:** Both internally and externally peer-reviewed.

## Contributions

Surgical and Medical Practices: M.N., Concept: M.N., Design: M.N., Data Collection and/or Processing: B.S., Analysis and/or Interpretation: E.L., O.E., J.B., Writing: E.L., B.S., M.N., O.E., J.B.

## DISCLOSURES

**Conflict of Interest:** No conflict of interest was declared by the authors.

**Financial Disclosure:** The authors declared that this study received no financial support.

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**Total x 100 x 100 x 100****Scoring the PFIQ-7: =**

All of the items use the following response scale:

0, Not at all; 1, somewhat; 2, moderately; 3, quite a bit **PFIQ-7 Score**

**Scales:**

Urinary Impact Questionnaire (UIQ-7): 7 items under column heading “Bladder or urine”

Colorectal-Anal Impact questionnaire (CRAIQ-7): 7 items under column heading “Bowel / rectum”

Pelvic Organ Prolapse Impact Questionnaire (POPIQ-7): Items under column “Pelvis / Vagina”

**Scale Scores:** Obtain the mean value for all of the answered items within the corresponding scale (possible value 0 – 3) and then multiply by (100/3) to obtain the scale score (range 0-100).

Missing items are dealt with by using the mean from answered items only.

**PFIQ-7 Summary Score:** Add the scores from the 3 scales together to obtain the summary score (range 0-300).

**Pelvic Floor Impact Questionnaire—short form 7 (PFIQ-7)**

Name \_\_\_\_\_ DATE \_\_\_\_\_

DOB \_\_\_\_\_

**Instructions:** Some women find that bladder, bowel, or vaginal symptoms affect their activities, relationships, and feelings. For each question, check the response that best describes how much your activities, relationships, or feelings have been affected by your bladder, bowel, or vaginal symptoms or conditions **over the last 3 months**. Please make sure you mark an answer in **all 3 columns** for each question.

How do symptoms or conditions in the following usually affect your	<b>Bladder or urine</b>	<b>Bowel or rectum</b>	<b>Vagina or pelvis</b>
1. Ability to do household chores (cooking, laundry housecleaning)?	<input type="checkbox"/> Not at all <input type="checkbox"/> Somewhat <input type="checkbox"/> Moderately <input type="checkbox"/> Quite a bit	<input type="checkbox"/> Not at all <input type="checkbox"/> Somewhat <input type="checkbox"/> Moderately <input type="checkbox"/> Quite a bit	<input type="checkbox"/> Not at all <input type="checkbox"/> Somewhat <input type="checkbox"/> Moderately <input type="checkbox"/> Quite a bit
2. Ability to do physical activities such as walking, swimming, or other exercise?	<input type="checkbox"/> Not at all <input type="checkbox"/> Somewhat <input type="checkbox"/> Moderately <input type="checkbox"/> Quite a bit	<input type="checkbox"/> Not at all <input type="checkbox"/> Somewhat <input type="checkbox"/> Moderately <input type="checkbox"/> Quite a bit	<input type="checkbox"/> Not at all <input type="checkbox"/> Somewhat <input type="checkbox"/> Moderately <input type="checkbox"/> Quite a bit
3. Entertainment activities such as going to a movie or concert?	<input type="checkbox"/> Not at all <input type="checkbox"/> Somewhat <input type="checkbox"/> Moderately <input type="checkbox"/> Quite a bit	<input type="checkbox"/> Not at all <input type="checkbox"/> Somewhat <input type="checkbox"/> Moderately <input type="checkbox"/> Quite a bit	<input type="checkbox"/> Not at all <input type="checkbox"/> Somewhat <input type="checkbox"/> Moderately <input type="checkbox"/> Quite a bit
4. Ability to travel by car or bus for a distance greater than 30 minutes away from home?	<input type="checkbox"/> Not at all <input type="checkbox"/> Somewhat <input type="checkbox"/> Moderately <input type="checkbox"/> Quite a bit	<input type="checkbox"/> Not at all <input type="checkbox"/> Somewhat <input type="checkbox"/> Moderately <input type="checkbox"/> Quite a bit	<input type="checkbox"/> Not at all <input type="checkbox"/> Somewhat <input type="checkbox"/> Moderately <input type="checkbox"/> Quite a bit
5. Participating in social activities outside your home?	<input type="checkbox"/> Not at all <input type="checkbox"/> Somewhat <input type="checkbox"/> Moderately <input type="checkbox"/> Quite a bit	<input type="checkbox"/> Not at all <input type="checkbox"/> Somewhat <input type="checkbox"/> Moderately <input type="checkbox"/> Quite a bit	<input type="checkbox"/> Not at all <input type="checkbox"/> Somewhat <input type="checkbox"/> Moderately <input type="checkbox"/> Quite a bit
6. Emotional health (nervousness, depression, etc)?	<input type="checkbox"/> Not at all <input type="checkbox"/> Somewhat <input type="checkbox"/> Moderately <input type="checkbox"/> Quite a bit	<input type="checkbox"/> Not at all <input type="checkbox"/> Somewhat <input type="checkbox"/> Moderately <input type="checkbox"/> Quite a bit	<input type="checkbox"/> Not at all <input type="checkbox"/> Somewhat <input type="checkbox"/> Moderately <input type="checkbox"/> Quite a bit
7. Feeling frustrated?	<input type="checkbox"/> Not at all <input type="checkbox"/> Somewhat <input type="checkbox"/> Moderately <input type="checkbox"/> Quite a bit	<input type="checkbox"/> Not at all <input type="checkbox"/> Somewhat <input type="checkbox"/> Moderately <input type="checkbox"/> Quite a bit	<input type="checkbox"/> Not at all <input type="checkbox"/> Somewhat <input type="checkbox"/> Moderately <input type="checkbox"/> Quite a bit

מס' סידורי \_\_\_\_\_ תאריך \_\_\_\_\_ תאריך לידה \_\_\_\_\_

עד כמה המשפטים הבאים מתארים את תחושתך בהתאם לסוג הסימפטום?	שלפוחית ומתן שתן	יציאות ופעילות מעי	ואגינה ואגן
היכולת לבצע מטלות בית? (בישול, כביסה, ניקיון)	<ul style="list-style-type: none"> <li>• כלל לא</li> <li>• במידה מועטה</li> <li>• במידה בינונית</li> <li>• במידה רבה</li> </ul>	<ul style="list-style-type: none"> <li>• כלל לא</li> <li>• במידה מועטה</li> <li>• במידה בינונית</li> <li>• במידה רבה</li> </ul>	<ul style="list-style-type: none"> <li>• כלל לא</li> <li>• במידה מועטה</li> <li>• במידה בינונית</li> <li>• במידה רבה</li> </ul>
היכולת לבצע פעילות גופנית דוג' הליכה, שחייה או פעילות מאומצת אחרת?	<ul style="list-style-type: none"> <li>• כלל לא</li> <li>• במידה מועטה</li> <li>• במידה בינונית</li> <li>• במידה רבה</li> </ul>	<ul style="list-style-type: none"> <li>• כלל לא</li> <li>• במידה מועטה</li> <li>• במידה בינונית</li> <li>• במידה רבה</li> </ul>	<ul style="list-style-type: none"> <li>• כלל לא</li> <li>• במידה מועטה</li> <li>• במידה בינונית</li> <li>• במידה רבה</li> </ul>
השתתפות בפעילויות דוג' יציאה לסרט או הופעה?	<ul style="list-style-type: none"> <li>• כלל לא</li> <li>• במידה מועטה</li> <li>• במידה בינונית</li> <li>• במידה רבה</li> </ul>	<ul style="list-style-type: none"> <li>• כלל לא</li> <li>• במידה מועטה</li> <li>• במידה בינונית</li> <li>• במידה רבה</li> </ul>	<ul style="list-style-type: none"> <li>• כלל לא</li> <li>• במידה מועטה</li> <li>• במידה בינונית</li> <li>• במידה רבה</li> </ul>
היכולת לנסוע עם רכב או תחבורה ציבורית למרחק העולה על 30 דקות נסיעה מביתך?	<ul style="list-style-type: none"> <li>• כלל לא</li> <li>• במידה מועטה</li> <li>• במידה בינונית</li> <li>• במידה רבה</li> </ul>	<ul style="list-style-type: none"> <li>• כלל לא</li> <li>• במידה מועטה</li> <li>• במידה בינונית</li> <li>• במידה רבה</li> </ul>	<ul style="list-style-type: none"> <li>• כלל לא</li> <li>• במידה מועטה</li> <li>• במידה בינונית</li> <li>• במידה רבה</li> </ul>
השתתפות במפגשים חברתיים מחוץ לביתך?	<ul style="list-style-type: none"> <li>• כלל לא</li> <li>• במידה מועטה</li> <li>• במידה בינונית</li> <li>• במידה רבה</li> </ul>	<ul style="list-style-type: none"> <li>• כלל לא</li> <li>• במידה מועטה</li> <li>• במידה בינונית</li> <li>• במידה רבה</li> </ul>	<ul style="list-style-type: none"> <li>• כלל לא</li> <li>• במידה מועטה</li> <li>• במידה בינונית</li> <li>• במידה רבה</li> </ul>
מידת ההשפעה על בריאות מנטלית (דיכאון, עצבנות וכו')	<ul style="list-style-type: none"> <li>• כלל לא</li> <li>• במידה מועטה</li> <li>• במידה בינונית</li> <li>• במידה רבה</li> </ul>	<ul style="list-style-type: none"> <li>• כלל לא</li> <li>• במידה מועטה</li> <li>• במידה בינונית</li> <li>• במידה רבה</li> </ul>	<ul style="list-style-type: none"> <li>• כלל לא</li> <li>• במידה מועטה</li> <li>• במידה בינונית</li> <li>• במידה רבה</li> </ul>
מידת תחושת התסכול שאת חשה	<ul style="list-style-type: none"> <li>• כלל לא</li> <li>• במידה מועטה</li> <li>• במידה בינונית</li> <li>• במידה רבה</li> </ul>	<ul style="list-style-type: none"> <li>• כלל לא</li> <li>• במידה מועטה</li> <li>• במידה בינונית</li> <li>• במידה רבה</li> </ul>	<ul style="list-style-type: none"> <li>• כלל לא</li> <li>• במידה מועטה</li> <li>• במידה בינונית</li> <li>• במידה רבה</li> </ul>

**הוראות למילוי:** חלק מהנשים מרגישות שסימפטומים הקשורים לשלפוחית השתן, לפעילות המעי ולואגינה משפיעים על הפעילויות, היחסים והרגשות שלהן. עבור כל שאלה, בחרי בתגובה המתארת בצורה הטובה ביותר בנוגע למידה בה הפעילויות, היחסים והרגשות שלך מושפעים מהתסמינים הקשורים לשלפוחית השתן, לפעילות המעי ולסימפטומים הואגינליים **במשך 3 החודשים האחרונים**. הקפידו לסמן תשובה בכל 3 העמודות עבור כל שאלה.

Appendix 2. The translated version of the PIFQ-7 to Hebrew (used while interviewing patients by phone)



# Comparison of laparoscopic high and vaginal uterosacral ligament suspension in the management of apical prolapse

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## ABSTRACT

**Objective:** Currently, the usage of uterosacral ligament suspension (USLS) procedures for apical prolapse is increasing. However, studies comparing the symptomatic outcomes of USLS procedures are lacking. We aimed to compare the anatomical and symptomatic outcomes between laparoscopic high USLS and vaginal USLS.

**Materials and Methods:** This retrospective case control study was conducted with patients who had undergone laparoscopic high USLS and vaginal USLS procedures performed at a university hospital from 2015 to 2020. The operative characteristics, POP-Q stages, Pelvic Floor Distress Inventory-20 (PFDI-20) and Patient Global Impression of Improvement (PGI-I) scores of both laparoscopic high USLS and vaginal USLS cases were compared.

**Results:** There were 35 laparoscopic high USLS and 37 vaginal USLS procedures with a follow-up of 12 months. The complications, operation time, length of hospital stay, POP-Q stages, PFDI-20 and PGI-I scores were similar between the groups ( $p>0.05$ ).

**Conclusion:** Those patients with apical prolapse who had undergone laparoscopic high USLS had similar anatomical success and patient satisfaction rates compared to the vaginal procedure. When making a surgical plan for apical prolapse patients, it is appropriate to decide based on the patient's request, patient's gynecological history, the experience of the surgeon, and the equipment of the operating room.

**Keywords:** Uterosacral ligament suspension, laparoscopy, vaginal, symptoms, pelvic organ prolapse, patient satisfaction

## INTRODUCTION

Apical vaginal prolapse is known as the descent of the uterus or vaginal cuff (after hysterectomy) towards the vagina.<sup>1</sup> Although the most common type of prolapse is anterior vaginal prolapse, apical support loss is usually present in a prolapse exceeding the

hymen.<sup>2</sup> It is increasingly believed that patients with advanced prolapse need adequate support to the vaginal apex for durable and long-lasting surgical repair.<sup>3</sup> Anterior and posterior vaginal reconstructions may be unsuccessful if adequate apex support is not provided to the vaginal apex because the apex provides an important anatomical support to the vaginal wall.

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Surgical correction of the apex level can yield better results with high success rates. Today, apical suspension procedures are mostly performed by the vaginal route. Alternatively, they can be performed via the abdominal route (such as laparotomy, laparoscopy or robotic).<sup>4</sup> Among the various treatment alternatives, which is the most effective is still a matter of debate. In addition, the number of advocates for the use of the uterosacral ligament as a strong anatomical support in apical pelvic organ prolapse (POP) surgery is increasing day by day.<sup>5,6</sup> The uterosacral ligament is anatomically divided into three parts (proximal, intermediate and distal). In the method defined by Shull in 1994, suturing was made to the intermediate part of the uterosacral ligament.<sup>7</sup> To date, various modifications of this method have been developed. However, the distal part of the ligament is often damaged in patients with pelvic organ prolapse.<sup>8</sup> Recently, the high USLS (uterosacral ligament suspension) method was defined by suturing the proximal part of this ligament.<sup>9</sup> USLS procedure is performed without using mesh. Therefore, mesh complications, which may have very serious consequences, can be eliminated. In this study, we compared those patients with laparoscopic high USLS and those with vaginal USLS, and evaluated the symptomatic results of the two procedures.

## MATERIALS AND METHODS

This retrospective case control study was conducted between January 2015 and January 2020 in Muğla Sıtkı Koçman University obstetrics and gynecology clinic with patients who had undergone laparoscopic high or vaginal USLS due to apical POP. The essential data was retrieved from the electronic database of hospital and the follow-up files of the patients. The study procedure was carried out in accordance with the Helsinki Declaration principles and initiated after the approval of the university ethics committee (approval number: 18.06.20-06/IX).

Cases who had undergone laparoscopic high or vaginal USLS due to apical prolapse with Pelvic Organ Prolapse Quantification (POP-Q)  $\geq$ stage 2 were included in this study. Those patients with missing data in the patient files, POP-Q stage  $\leq$ 1, abnormal pap smear, suspicious adnexal mass, malignancy and/or cognitive problems were excluded from this study.

During this period, a total number of 79 patients underwent laparoscopic high USLS or vaginal USLS operation for apical prolapse. The data of three patients who met the exclusion criteria and four patients who could not complete the questionnaires were excluded from the study. Finally, 35 women with laparoscopic high USLS formed the laparoscopy group and 37 women with vaginal USLS formed the vaginal group.

The age, gravida, parity, body mass index (BMI), menopausal status, comorbidity (diabetes, hypertension, anemia), smoking habits, hormone replacement therapy status, intraoperative and postoperative complications, Pelvic Floor Distress Inventory-20 (PFDI-20) and Patient Global Impression of Improvement (PGI-I) scores of the patients were statistically compared between the laparoscopy and vaginal groups. The preoperative and 12<sup>th</sup> month postoperative POP-Q stages were compared between the two groups according to the POP-Q system.<sup>10</sup> The Clavien-Dindo classification was used to assess any postoperative complications.<sup>11</sup> To evaluate prolapse, urinary and bowel symptoms, we used the Turkish validated PFDI-20 questionnaire preoperatively and at the 12<sup>th</sup> month postoperative.<sup>12</sup> The PFDI-20 is a 20-item questionnaire whose subscales are the POP distress inventory-6 (POPDI-6), the urinary distress inventory-6 (UDI-6), and the colorectal/anal distress inventory-8 (CRADI-8). “No symptom” was scored as 0, “not at all” as 1, and “quite a bit” as 4. The scores for each subscale ranged from 0 to 100, with higher scores representing greater distress.<sup>13</sup> Anatomical success was considered evident if the most distal portion of the prolapse was more than 1cm above the level of the hymen at the 12<sup>th</sup> month after surgery.<sup>14</sup> The POP-Q staging was determined according to the clinical evaluation of patients on the day before the operation and at the 12-month postoperative clinical examination. The symptomatic results of the patients were evaluated with the data obtained according to the scores of the questionnaires performed preoperatively (the day before the operation) and at month 12 postoperatively, and comparisons between the two groups were made. All questionnaires were performed either face-to-face at routine clinical check-ups or by phone interview. There are routine 6-week and 12-month postoperative visits at our center.

## Surgical procedure

The laparoscopic high USLS method was performed with the three ports technique.<sup>9</sup> Laparoscopic high USLS was performed with two laparoscopically placed sutures in each of the bilateral proximal uterosacral ligaments. Vaginal USLS procedures were performed transvaginally by using two ipsilateral sutures on the intermediate portion of each side and affixed to the vaginal cuff as previously described by Shull et al.<sup>7</sup> We used no: 2/0 polyglactin (vicryl®) in both the laparoscopic and vaginal methods. When affixing the sutures to the vaginal cuff, we used pubocervical and rectovaginal fascia as a support during the suturing process in both the laparoscopic and vaginal approaches. In the laparoscopic group, the high USLS procedure was performed after total laparoscopic hysterectomy in all cases of uterine prolapse. In patients with cuff prolapse, we only

performed the USLS procedure. We also performed cystoscopy at the end of all USLS procedures. All surgical procedures were performed by two surgeons experienced in pelvic organ prolapse surgery.

### Statistical analysis

All analyses were performed using the SPSS 23.0 program (SPSS for Windows Chicago, IL). In the descriptive statistics of the groups, the mean  $\pm$  standard deviation or median (min-max) values were used. The Kolmogorov-Smirnov test was used in the distribution analysis of the data. In the comparison of the groups, Student's t-test was used for data with normal distribution, and Mann-Whitney U test was used for data with a skewed distribution.  $p < 0.05$  was considered statistically significant.

## RESULTS

The demographic data are summarized in Table 1. The age, gravida, parity, BMI, menopausal status, smoking habit,

comorbidities, history of incontinence or prolapse surgery, complications, operation time and hospital stay results of the two groups were similar. In particular, the mean ages of the women were  $56.57 \pm 5.03$  and  $57.91 \pm 6.10$  years in the laparoscopy and vaginal groups, respectively. The median BMI values were 28 kg/m<sup>2</sup> in both groups. The most common comorbidity was anemia in both groups. According to the Clavien-Dindo classification, no major intraoperative or postoperative complication (such as urinary tract injury, bowel/intestinal injury, or blood transfusion) was detected in the two groups, whereas one patient in vaginal group developed unilateral ureteral kinking postoperatively. In this case, a Double-J ureteric catheter was inserted into the ureter and no other intervention was required. The median operation time in the laparoscopy group was 115 minutes and it was 120 minutes in the vaginal group. There was also no statistical difference in the prolapse types. Twelve out of 35 patients (34.28%) had cuff prolapse in the laparoscopy group and eleven out of 37 patients (29.73%) had cuff prolapse

**Table 1. Demographic characteristics of the two study populations**

Variables	Laparoscopic high USLS (n=35) Mean $\pm$ SD Median (min-max)	Vaginal USLS (n=37) Mean $\pm$ SD Median (min-max)	p-value
Age (years)	56.57 $\pm$ 5.03	57.91 $\pm$ 6.10	0.446*
Gravida (n)	4 (1-8)	3 (2-8)	0.649 <sup>A</sup>
Parity (n)	3 (1-5)	3 (1-5)	0.636 <sup>A</sup>
BMI (kg/m <sup>2</sup> )	28 (25-34)	28 (25-35)	0.417 <sup>A</sup>
<b>Menopausal status (n)</b>			
Postmenopausal (n) (%)	29 (82.85)	33 (89.18)	0.441 <sup>A</sup>
Premenopausal (n) (%)	6 (17.14)	4 (10.81)	
Smoking habit (n) (%)	7 (20)	3 (8.10)	0.148 <sup>A</sup>
<b>Comorbidities (n) (%)</b>			0.197 <sup>A</sup>
No comorbidities	15 (42.85)	7 (18.91)	
Anemia	9 (25.71)	15 (40.54)	
Cardiac disease	4 (11.42)	10 (27.02)	
Hypertension	5 (14.28)	5 (13.51)	
Diabetes	2 (5.71)	4 (10.81)	
<b>Prolapse type (n) (%)</b>			0.121 <sup>A</sup>
Uterine prolapse	23 (65.71)	26 (70.27)	
Cuff prolapse	12 (34.28)	11 (29.73)	
<b>History of prolapse surgery (n) (%)</b>	2 (5.71)	6 (16.21)	0.159 <sup>A</sup>
<b>History of incontinence surgery (n) (%)</b>	6 (17.14)	11 (29.72)	0.212 <sup>A</sup>
<b>Intraoperative complication</b>	0	0	
<b>Postoperative complication</b>	0	1	0.327 <sup>A</sup>
<b>Operation time (min)</b>	115	120	0.296 <sup>A</sup>
<b>Stay in hospital (day)</b>	2	2	0.334 <sup>A</sup>

\*Independent sample t-test, <sup>A</sup>Man-Whitney U-test

USLS: uterosacral ligament suspension; BMI: body mass index; SD: standard deviation; min: minimum; max: maximum; n: number

in the vaginal group ( $p=0.121$ ). The indication for USLS for all these women was pelvic organ prolapse. In those cases that had had a hysterectomy, indications were menorrhagia resistant to medical therapy or causing anemia, postmenopausal bleeding, fibroid disease and adenomyosis. All patients had a follow-up period of 12 months. There was no concurrent prolapse surgery such as anterior and posterior repair or incontinence procedure performed on any patient.

The preoperative and postoperative POP-Q stages of the two groups are summarized in Table 2. In regards to the preoperative POP-Q stages, there were 13 patients with stage 4 in both of the groups. At month 12 of postoperative follow-up, there were no patients in stage 3 or 4 of POP-Q in either group. The

preoperative and postoperative month 12 POP-Q stages were similar between the groups ( $p=0.752$ ,  $p=0.188$  respectively). Using stage 2 of POP-Q as the recurrence criteria, the anatomical success rates reviewed after 12 months were 34/35 (97.14%) in the laparoscopy group and 35/37 (94.59%) in the vaginal group.

The preoperative and postoperative questionnaire scores of the two groups are summarized in Table 3. There was no difference between the two groups with respect to preoperative POPDI-6, UDI-6, CRADI-8 and PFDI-20 scores ( $p=0.777$ ,  $p=0.475$ ,  $p=0.149$ ,  $p=0.521$ , respectively). The laparoscopy and vaginal groups had comparable postoperative POPDI-6, UDI-6, CRADI-8 and PFDI-20 scores ( $p=0.175$ ,  $p=0.090$ ,  $p=0.914$  and  $p=0.244$  respectively). Additionally, no statistically significant difference was observed

**Table 2. Preoperative and postoperative POP-Q stages of two groups**

Variables	Laparoscopic high USLS (n=35) Mean $\pm$ SD Median (min-max)	Vaginal USLS (n=37) Mean $\pm$ SD Median (min-max)	p-value
<b>Preop POP-Q stage</b>	3 (2-4)	3 (2-4)	0.752 <sup>A</sup>
Stage 1 (n)	0	0	
Stage 2 (n) (%)	5 (14.28)	2 (5.40)	
Stage 3 (n) (%)	17 (48.57)	22 (59.45)	
Stage 4 (n) (%)	13 (37.14)	13 (35.13)	
<b>Postop 12<sup>th</sup> month POP-Q stage</b>	1 (1-2)	1 (1-2)	0.188 <sup>A</sup>
Stage 1 (n) (%)	34 (97.14)	35 (94.59)	
Stage 2 (n) (%)	1 (2.86)	2 (5.40)	
Stage 3 (n)	0	0	
Stage 4 (n)	0	0	
<b>Anatomical success rate</b>	97.14%	94.59%	0.228 <sup>A</sup>

<sup>A</sup>Man-Whitney U-test  
POP: pelvic organ prolapse; USLS: uterosacral ligament suspension; Preop: preoperative; Postop: postoperative; SD: standard deviation; min: minimum; max: maximum; n: number

**Table 3. Preoperative and postoperative POPDI6, UDI6, CRADI8 and PFDI and postoperative PGI-I scores of the two groups**

Variables	Laparoscopic high USLS (n=35) Median (min-max)	Vaginal USLS (n=37) Median (min-max)	p-value
POPDI6 pre	75.00 (51.60-100.00)	75.00 (54.10-100.00)	0.777 <sup>A</sup>
POPDI6 post	20.80 (4.16-48.00)	29.10 (4.16-51.00)	0.175 <sup>A</sup>
UDI6 pre	75.00 (54.10-100.00)	75.00 (48-100.00)	0.475 <sup>A</sup>
UDI6 post	29.10 (4.80-63.00)	33.00 (6.36-74.00)	0.090*
CRADI8 pre	66.60 (43.00-100.00)	64.00 (38.00-95.80)	0.149 <sup>A</sup>
CRADI8 post	20.80 (8.30-63.00)	25.00 (4.16-54.00)	0.914 <sup>A</sup>
PFDI20 pre	218.10 (153.20-263.30)	214.30 (155.50-262.40)	0.521 <sup>A</sup>
PFDI20 post	80.80 (25.60-116)	86.30 (45.16-133.50)	0.244*
PGI-I post	1 (1-5)	2 (1-6)	0.304 <sup>A</sup>

\*Independent sample t-test, <sup>A</sup>Mann-Whitney U-test

POPDI-6: POP distress inventory-6; UDI-6: urinary distress inventory-6; CRADI-8: colorectal/anal distress inventory-8; PFDI-20: pelvic floor distress inventory-20; USLS: uterosacral ligament suspension; PGI-I: patient global impression of improvement; Pre: preoperative; Post: postoperative 12<sup>th</sup> month; SD: standard deviation; min: minimum; max: maximum; n: number



in the PGI-I questionnaire scores of the two groups ( $p=0.304$ ). Indeed 20/35 (57.1%) of the patients in the laparoscopy group and 17/37 (45.9%) of the patients in the vaginal group described their post-operative condition as “very much better” after they had the surgery.

In the comparison of prolapse types, no statistically significant difference was detected that affects the results.

## DISCUSSION

Novara et al.<sup>15</sup> compared the anatomical and functional aspects of patients who had undergone 69 vaginal high USLS and 155 McCall Culdoplasty procedures. In the post-operative 12<sup>th</sup> month anatomical evaluation, it was found that those patients in the high USLS group showed better improvement than those patients in the McCall Culdoplasty group. They also noted that prolapse recurrence rates were similar between the groups in their study (1.4% and 2.6%, respectively). Mounir et al.<sup>16</sup> approached the USLS from a different point of view where they compared the short-term results of vaginal extraperitoneal and intraperitoneal USLS. According to this study, the perioperative complication rates were similar between the groups. However, the extraperitoneal approach was found to be more favorable than the intraperitoneal in terms of operation time, bleeding time and hospitalization time. In our study, we applied extraperitoneal USLS to all of our patients and only one patient had a postoperative complication, which was not statistically significant. Turner et al.<sup>17</sup> compared vaginal and laparoscopic USLS and no significant difference was observed between the groups in terms of intraoperative and postoperative major complications.<sup>17</sup> In our research, we did not detect any major complication according to the Clavien-Dindo classification, except one case of ureteral kinking in the vaginal group. The operation time is another parameter to be compared. Mounir et al.<sup>16</sup> found the operation time of the extraperitoneal vaginal USLS group to be  $133\pm 43$  minutes in their study. In our study, the median operation time was 115 minutes in the laparoscopic high USLS group, while it was 120 minutes in the vaginal USLS group. It is noteworthy that there was no statistical difference between the operation times in the two groups. In the study of Turner et al.<sup>17</sup>, the operation time in the vaginal USLS group was statistically significantly shorter than the laparoscopy group. When their study is evaluated in terms of operation time, the fact that the operations were performed in different centers and with different methods suggests that this may have affected the standardization of their study.

In another study, Kadiroğulları et al.<sup>18</sup> applied vaginal USLS to 40 patients with 22 at stage 2 and 18 at stage 3 according to

the POP-Q classification. According to the 24<sup>th</sup> month results of their study, stage 1 cuff prolapse was detected in five (13.8%) out of 36 patients, and stage 2 prolapse was not detected in any patient. Turner et al.<sup>17</sup> conducted a study methodologically similar to our study. In their study comparing 54 laparoscopic USLS and 119 vaginal USLS cases, prolapse recurrence was observed with a rate of 13.2% in the laparoscopic USLS group and 14.8% in the vaginal USLS group with a median follow-up of 21.5 weeks. At the 12-month follow-up in our study, prolapse recurrence was detected in two (5.40%) out of 37 patients in the vaginal USLS group, and only in one (2.86%) out of 35 patients in the laparoscopic high USLS group. According to these results, the lowest recurrence rate was determined in the laparoscopic high USLS group. We think that the reason for this result is that the upper parts of the uterosacral ligament, which are used as a natural suspender, are stronger than the caudal parts which are used in vaginal USLS.

Haj Yahya et al.<sup>19</sup> compared 106 women who had undergone transvaginal hysterectomy with USLS with 53 women who had undergone uterus preserving laparoscopic USLS. According to the results of their study, prolapse exceeding the hymen level was observed at a rate of 2.9% in the vaginal USLS group with a follow-up period of  $14.7\pm 13.23$  months, and at 2% in the uterine preserving laparoscopic USLS group with a follow-up period of  $17.5\pm 15.84$  months. In the POP-Q scoring system performed in both groups, a significant improvement was found in Ba, C and Bp points.

In addition to the technical and anatomical results mentioned above, another important issue for evaluating the success of the operation is patient satisfaction. The number of studies evaluating patient satisfaction with various questionnaires is very limited in the literature. In the study by Milani et al.<sup>20</sup> conducted on patients with transvaginal uterosacral ligament hysteropexy and hysterectomy + USLS, the mean PGI-I scores of the patients after 35 months were compared. As a result of this comparison, the PGI-I score was found to be higher in the hysteropexy group compared to the USLS group ( $1.7\pm 0.9$  vs.  $1.4\pm 0.6$  respectively). However, the authors reported that hysteropexy increased the possibility of central recurrence and reoperation due to elongatio colli. Kadiroğulları et al.<sup>18</sup> applied the PISQ-12 questionnaire to patients who had undergone extraperitoneal vaginal USLS. There was no statistically significant difference between the questionnaire scores applied preoperatively and postoperatively at the 24<sup>th</sup> month. In a study by Novara et al.<sup>15</sup>, vaginal high USLS and McCall Culdoplasty cases were compared using PISQ-12 (Pelvic Organ Prolapse/Urinary Incontinence Sexual Questionnaire), UIQ (Urinary Impact Questionnaire) and PFIQ-7 (Pelvic Floor Impact Questionnaire) questionnaires. Of these questionnaires, positive

improvement was only found in the vaginal high USLS group in terms of UIQ. The authors stated that this situation should be proven by urodynamics in following studies. Moreover, they attributed the lack of a significant difference for PISQ-12 to the similar total vaginal length measurements between the two groups.

Vallabh-patel et al.<sup>21</sup> compared robotic assisted laparoscopic and vaginal high USLS cases in their study. In their study, no difference was found between the two groups in terms of PFDI-20 scoring. In addition, the symptomatic results were similar in both groups. While no complications were encountered in the laparoscopic group with robotic assistance, one patient in the vaginal group had sacral nerve root damage and developed sciatic pain. In a recent study by Panico et al.<sup>22</sup> conducted on 60 patients who had undergone LHUSLS, their patients had a PGI-I score of 1 or 2 in 55 (91.6 %) out of 60 patients. In our study, we also evaluated the PGI-I scores of the patients and their satisfaction level was found to be similar between the laparoscopy and vaginal groups. In addition, it is worth emphasizing that the use of pubocervical and rectovaginal fascia as a support structure during affixing to the vaginal cuff might have affect the anatomical and satisfaction results for the USLS procedure in our study.

### Limitations of the study

The strengths of this research consist of a high examination rate for the patients in the follow-up process and limited selection bias given that all patients who had undergone USLS during the study period were included. All preoperative PFDI-20 questionnaires were answered during the patient's initial office visit. Postoperative PFDI-20 and PGI-I questionnaire answers were collected via telephone interviews, asking patients to answer questions in real time thus avoiding recall bias. The retrospective design and small sample size are the major limitations of our research. However, the surgical operations were performed during the same time session and by the same surgeons. Additionally, these surgeons have extensive experience in vaginal and laparoscopic surgery. The short-term follow-up, especially for physical examinations, is another limitation of our study.

### CONCLUSION

In conclusion, vaginal surgery is generally used more frequently than other approaches for apical prolapse surgery according to the literature. The short-term results of the current study are promising and show a high success rate for USLS for apical prolapsus. When deciding the route of surgery for apical prolapse patients, it is appropriate to decide according to the patient's request, the patient's gynecological history, the experience of the

surgeon, and the equipment available in the operating room. Future prospective and long-term follow-up studies are needed to clarify these outcomes and further explore the feasibility of USLS in the treatment of apical POP.

### ETHICS

**Ethics Committee Approval:** The study procedure was made in accordance with the Helsinki Declaration principles and initiated after the approval of the Muğla Sıtkı Koçman University Ethics Committee (approval number: 18.06.20-06/IX).

**Informed Consent:** Retrospective study.

**Peer-Review:** Internally peer-reviewed.

### Contributions

Surgical and Medical Practices: A.A.S., Concept: B.S., M.F.K., E.A., M.N.A., İ.G., A.A.S., Design: B.S., M.F.K., E.A., M.N.A., İ.G., A.A.S., Data Collection and/or Processing: B.S., M.F.K., E.A., M.N.A., İ.G., Statistical Analysis: B.S., İ.G., Project Development: A.A.S., Writing: B.S., M.F.K.

### DISCLOSURES

**Conflict of Interest:** No conflict of interest was declared by the authors.

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# What is the significance of impaired uterine vein blood flow from prolapse?

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**Citation:** Enache T, Soare DE. What is the significance of impaired uterine vein blood flow from prolapse? Pelviperineology. 2021;40(4):190-193.

## ABSTRACT

**Objective:** Pelvic organ prolapse (POP) has an important impact on pelvic vasculature consisting of obstruction and consecutive stasis with possible multiple effects on different organs.

**Materials and Methods:** We examined a group of 13 patients with 3<sup>rd</sup> and 4<sup>th</sup> degree POP. The subjects were assessed clinically and using a Voluson E8 with a 5 mHz vaginal probe, before and after the gentle reduction of the prolapse. The parameter measured by ultrasound was the resistivity index (RI) on uterine arteries measured transvaginally.

**Results:** Both uterine artery RIs were significantly lower after the reduction the prolapse ( $p < 0.01$ ). This might be interpreted as a pelvic venous stasis associated with POP, which improves after the above mentioned manoeuvre.

**Conclusion:** Uterine vessels are obstructed by POP. Back pressure from obstructed veins due to POP might induce a dilation in low-pressure veins causing haemorrhoids. Prior to the consideration of the surgical excision of haemorrhoids, it may be worthwhile performing a doppler ultrasound test and correcting the prolapse if the result is positive.

**Keywords:** Haemorrhoids; pelvic floor; uterine artery Doppler

## INTRODUCTION

Pelvic organ prolapse (POP) is a disturbing condition with a major impact on a woman's quality of life. The main cause of POP is an alteration of the connective tissue at multiple levels, which leads to a disruption of pelvic anatomy and consecutive function loss.<sup>1</sup> Uterine prolapse is defined as the descensus of the uterus into the vaginal canal. With its relocation, there is significant impact on the uterine vascularization and furthermore on all pelvic vessels.

Uterine descensus causes compression and kinking on the uterine veins with consecutive dilatation which can affect the entire pelvic circulation.<sup>2</sup> If we look at the literature, we discover some articles regarding the pelvic vessels associated with pelvic floor disorders. In 2010, Paradisi et al.<sup>3</sup> mentioned that venous flow is impaired by the protrusion of the anterior rectal wall towards its lumen (Figure 1). Abendstein<sup>2</sup> also concluded that high laxity is an important cause of haemorrhoids, which combined with pelvic venous stasis can explain their presence in women with pelvic organ prolapse<sup>4</sup>. There is also evidence

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that uterine cervical hypertrophy is in fact caused by oedema of the cervix due to venous stasis in POP. Restoration of normal anatomy leads to vascular decompression and a reversal of cervical length.<sup>5</sup>



**Figure 1.** *Left:* Haemorrhoids, pre-operative. *Right:* Haemorrhoids, second post-operative day.

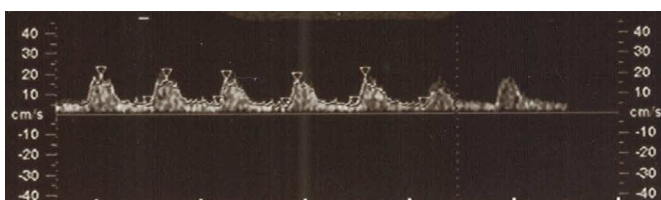
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## MATERIALS AND METHODS

Our aim was to find a measurable, easy-to-use parameter that describes pelvic vascular flow. In obstetrics, it is common to measure the resistivity index (RI) on uterine arteries, its value being associated with the quality of placentation. Therefore, we measured the RI of the uterine arteries in women with POP. We have obtained two different values characterising two different statuses.

We examined a group of 13 patients with third and fourth degree pelvic organ prolapse as well as high-degree hemorrhoidal disease. These patients were assessed clinically and ultrasonically before and after gentle reduction of the prolapse. In doing so, we tried to reproduce the ideal postoperative status of the patient.

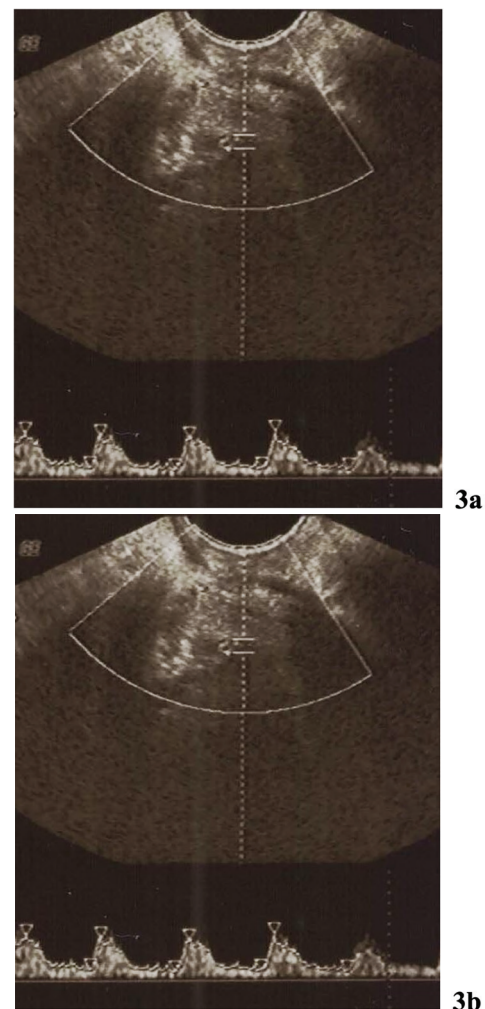
Clinically, we followed the evolution of the haemorrhoidal disease. All patients presented with hemorrhoidal disease and various complaints. In terms of symptomatology, large uterine prolapse and haemorrhoids have multiple similarities. Pruritus can be due to irritation of the haemorrhoidal epithelium as well as vaginal epithelium. Bleeding is a common symptom of haemorrhoidal disease, but it can also occur due to the erosion of the prolapsed uterus. Additionally, rectal fullness or the feeling of incomplete evacuation can be explained by both pathologies. We also used ultrasound Doppler evaluation of the uterine arteries. The usual spectre is shown in Figure 2.



**Figure 2.** The usual spectre in ultrasound Doppler evaluation.

RI is a calculated flow parameter derived from the maximum, minimum and mean Doppler frequency shifts during a cardiac cycle (RI: peak systolic velocity – end diastolic velocity/peak systolic velocity). Peak systolic velocity is the maximum speed achieved during the cardiac systole and end-diastolic velocity is the minimum speed achieved during the diastole. As a vessel narrows and resistance to flow increases, the RI will increase.

Uterine artery Doppler examination was performed using a Voluson E8 with a 5 mHz vaginal probe. Firstly, a sagittal section of the uterus was obtained while also identifying the internal and external cervical os. Subsequently, by tilting the transducer side to side, both uterine arteries were identified and pulsed wave Doppler was used. Before the reduction of the prolapse, the RI was measured for both uterine arteries and a mean RI was calculated. Following this, the prolapse was gently reduced using the vaginal probe of the ultrasound and the measurements were repeated. In Figure 3, we present the findings from a patient, before (a) and after (b) the reduction of the prolapse.



**Figure 3.** The findings from a patient, before (a) and after (b) the reduction of the prolapse.

**Table 1. Results of the measured parameters (peak systolic flow and end-diastolic flow)**

Variable	Probabilistic invariants	Before reduction	After reduction
RI (resistivity index)	M	0.89	0.83
	SD	3.84	1.85
	MSD	0.66	0.32
	<i>p</i> -value	<0.001	
PS (peak systolic flow) (cm/s)	M	12.5	13.6
	SD	1.59	0.87
	MSD	0.28	0.15
	<i>p</i> -value	<0.1	
ED (end-diastolic flow) (cm/s)	M	0.83	2.58
	SD	1.19	0.61
	MSD	0.21	0.1
	<i>p</i> -value	<0.005	

M: mean value; SD: standard deviation; MSD: mean standard deviation for the uterine artery before and after prolapse reduction; *p*-probability

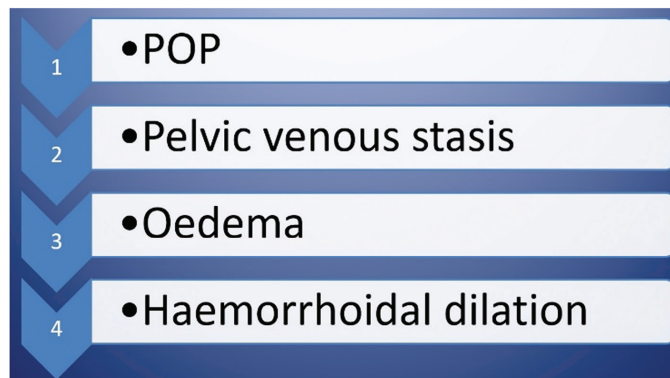
**RESULTS**

Clinically, after 2 minutes, we observed a significant reduction of the haemorrhoidal enlargement. A reduction of 75% was observed in seven patients, of 50% in another five patients and one patient had an improvement of less than 50%. Since there is no standard classification of external haemorrhoids, the initial degree of enlargement and the postoperative outcome are due to subjective analysis. However, in spite of this, the improvement was visible. Overall symptomatology improved in all 13 patients. Both uterine artery RIs decreased after the reduction of the prolapse, with a mean RI of 0.89 before and 0.83 after the manoeuvre (*p*<0.001). The other parameters (peak systolic flow and end-diastolic flow) measured showed no significant difference between the two situations. These results are presented in Table 1.

**DISCUSSION**

Given the significance of the resistive index, after the reduction of uterine prolapse, blood flow improved through the uterine arteries. This shows us that, indeed, the uterine vessels are obstructed by the organ prolapse. Indirectly, we may presume that the veins are also obstructed due to backpressure on their more compressible walls. In our practice, we observed a high incidence of external haemorrhoids in female patients diagnosed with pelvic organ prolapse. We hypothesized that there was a cause-effect relationship which could explain this association.

The haemorrhoidal disease improved significantly after the surgical treatment of pelvic organ prolapse in all 13 patients. Thus, starting from the uterine vessels, we can assume that the entire pelvic venous circulation is affected by the organ prolapse, with an impact also on the veins from the anal cushions. Venous stasis is almost always associated with a certain degree of oedema, leading to an even more severe obstruction. A synthesis of the potential pathogenesis of haemorrhoids in patients with POP is presented in Figure 4. Another probable etiopathological factor adding to venous stasis is kinking of the uterine veins as a consequence of the prolapse. Venous kinking can further increase backpressure on the haemorrhoidal veins. We were not able to assess this on Doppler ultrasound at this stage, but it is a potential direction for research.



**Figure 4.** A synthesis of the potential pathogenesis of haemorrhoids in patients with POP. POP: Pelvic organ prolapse.

We can consider haemorrhoids to have a mixed etiopathogenicity, including collagen dysfunction and pelvic venous stasis. We can find both of these entities in the pathophysiology of pelvic organ prolapse, and furthermore, we can address them. By reinforcing the uterine ligaments and restoring the normal anatomy and thus, restoring normal blood flow, hemorrhoidal disease should also improve. This can also suggest the opposite. Namely, if only the haemorrhoids are treated and a pelvic organ prolapse continues to impair pelvic venous blood flow, this might be a cause of hemorrhoidal relapse.

Complete pelvic examination should be performed in women with hemorrhoidal disease in order to detect if pelvic organ prolapse is present. Treatment of the latter might solve both of the problems in one intervention.

**Limitations and future suggestions**

An important limitation of this study is the relatively low number of participants. Therefore, a larger group should be examined. We had only an indirect view of the pelvic and especially rectal wall blood flow. We could not measure the diameter of the blood

vessels. This would more decisively validate our hypothesis. However, we were able to measure the internal resistance to blood flow, which is a function of the diameter of the vessel (Poiseuille's Law), resistance being inversely proportional to the fourth power of the radius.<sup>6,7</sup> Our study was conducted in women with third and fourth degree pelvic organ prolapse. As a result of such exponential relationships,<sup>6,7</sup> it is possible that hemorrhoidal disease may be associated with more minor pelvic organ prolapse.

## CONCLUSION

Back pressure from obstructed veins due to POP might induce dilation of low-pressure veins and so cause haemorrhoids. In these patients, treatment could aim at the restoration of a normal blood flow (POP surgical cure) instead of focusing on the haemorrhoids only. Prior to consideration of surgical excision of the haemorrhoids, it may be worthwhile performing a doppler ultrasound test and correcting the prolapse if the result is positive. Our findings of uterine vein stasis, though indirect, are suggestive but only sufficient for a hypothesis. We have commenced a protocol to measure the rectal vein flow along with clinical observations before and after mechanical correction of uterine prolapse.

## ETHICS

**Ethics Committee Approval:** Not required since ultrasound is a standard investigative procedure in our hospital.

**Informed Consent:** Approval was obtained for the test and publication of its deidentified results.

**Peer-review:** Internally peer-reviewed.

## Contributions

Medical Practices: T.E., Concept: T.E., Design: T.E., D.E.S., Data Collection: D.E.S., Analysis and/or Interpretation: T.E., Literature Search: D.E.S., Writing: D.E.S.

## DISCLOSURES

**Conflict of Interest:** No conflict of interest was declared by the authors.

**Financial Disclosure:** The authors declared that this study received no financial support.

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# Can interstitial cystitis be improved by the Integral Theory's squatting-based pelvic floor exercises used for SUI, urge, nocturia, and emptying symptoms?

Patricia Margaret SKILLING

Previously Kvinno Centre Perth (Retired)

**Citation:** Skilling PM. Can interstitial cystitis be improved by the Integral Theory's squatting-based pelvic floor exercises used for SUI, urge, nocturia, and emptying symptoms? *Pelviperineology*. 2021;40(4):194-202.

## ABSTRACT

**Background:** The broadening of the Interstitial Cystitis (IC) definition from the traditional Hunner's ulcer to Chronic pain of unknown origin plus one bladder symptom.

**Objective:** This study aims to test the hypothesis that IC as now defined and posterior fornix syndrome (PFS) (symptoms of urge, frequency, nocturia, abnormal emptying) are similar conditions, both potentially curable by strengthening uterosacral ligaments by squatting-based exercises.

**Materials and Methods:** This was a retrospective study of two separate groups comprising 138 women in total who performed squatting-based exercises for SUI (stress urinary incontinence), OAB, pain and emptying symptoms. All patients had validated pelvic questionnaires, pad tests, diaries, ultrasound and urodynamics.

**Results:** Across both groups of mainly premenopausal women, 61%–80% of the women had >50% improvement in symptoms of SUI, urge, frequency, nocturia, abnormal emptying, and post-void residual urine at a 3-month review. Thirty-seven out of 138 women from the 1<sup>st</sup> and 2<sup>nd</sup> studies fulfilled the ICS definition of Interstitial Cystitis (IC), chronic pelvic pain (CPP) and co-occurrence of one bladder symptom, which are the same or similar symptoms, in fact, as those characterizing PFS. The anatomic rationale for the cure was that the squatting-based exercises strengthen the 3 reflex muscles controlling bladder functions and the uterosacral ligaments these muscles contract against.

**Conclusion:** Whether the conditions IC and PFS are one and the same or different, their component symptoms can, in the main, be >50% improved by a squatting-based exercise regime.

**Keywords:** Squatting; Integral Theory; interstitial cystitis; posterior fornix syndrome

## INTRODUCTION

In the early 2000s, we commenced a new method of pelvic floor rehabilitation (PFR) based on the Integral Theory System

of Female Incontinence (ITS) at the PFR section of the Kvinno Centre, Perth Western Australia. This was the first ever squatting-based PFR method. All previous PFR rehabilitations were based

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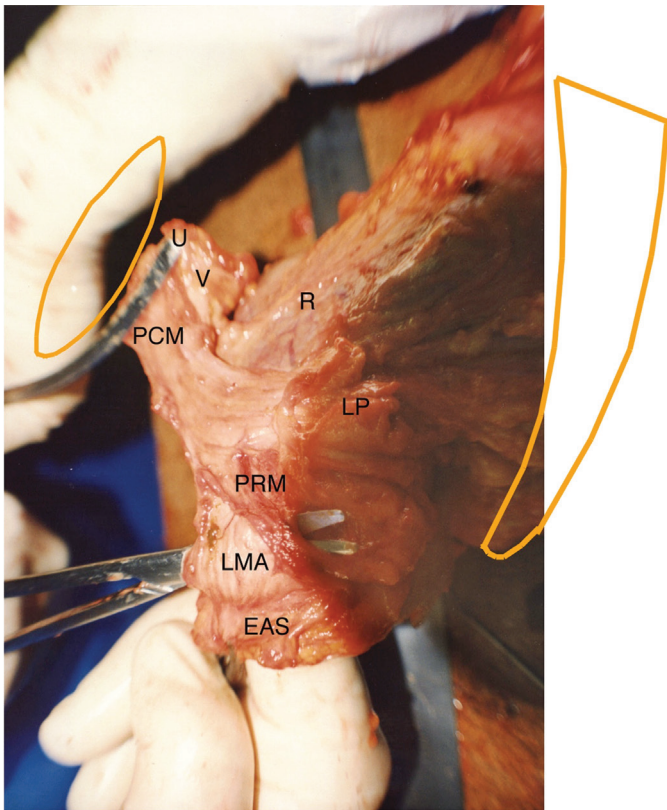
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on the 1948 Kegel method which involves a voluntary squeeze upwards. The ITS PFR method involves straining downwards to exercise the 3 oppositely-acting reflex muscles which were discovered to close and open the urethral tube in 1990. A 3<sup>rd</sup> discovery was that these muscles stretched the vagina like a trampoline to support the bladder base stretch receptors from below and prevent them from firing off prematurely to activate micturition. This is interpreted by the cortex as “urge”.<sup>1</sup> These PFR exercises subsequently became known as the “Skilling Method” for PFR.<sup>2,4</sup> The ITS PFR method is very different from the Kegel method, which trains a 4<sup>th</sup> pelvic muscle, m. puborectalis (PRM), the voluntary “squeezing” muscle (“Kegel” muscle), to lift the bladder, vagina and rectum upwards and forwards. The cadaveric anatomy of PRM and the 3 reflex muscles are detailed in Figure 1, and their functional anatomy in Figures 2 and 3.



**Figure 1.** Cadaveric anatomy: The 4 pelvic floor muscles.

This is an anatomical specimen from a female cadaver, cut away from its bony insertions. Bladder and vagina ‘V’ have been excised at the level of bladder neck. These sweep behind the rectum (R) and merge with the contralateral side to form part of the levator plate (LP) to insert into the posterior wall of the rectum ‘R’. Puborectalis muscle (PRM) which sweeps around behind “R” to insert directly into the symphysis. Note how contraction forwards of PRM would lift rectum, vagina, bladder and PCM itself upwards and forwards as in the X-rays, Figures 2 and 3.

U: urethra; PCM: anterior and lateral portion of the pubococcygeus muscle; EAS: external anal sphincter; LMA: Longitudinal muscle of the anus; PUL: insertion of pubourethral ligament into

A rationale for the ITS pelvic floor exercises requires a brief description of the functional anatomy of urethral opening, closure and urge control. Urethral closure is maintained by the elasticity of the vagina and urethra and the slow twitch muscle contraction of all three directional muscle forces (arrows, Figure 2). With effort, for example straining, the fast-twitch fibers are recruited so that the three muscles (Figure 2) stretch the tissues more tightly.

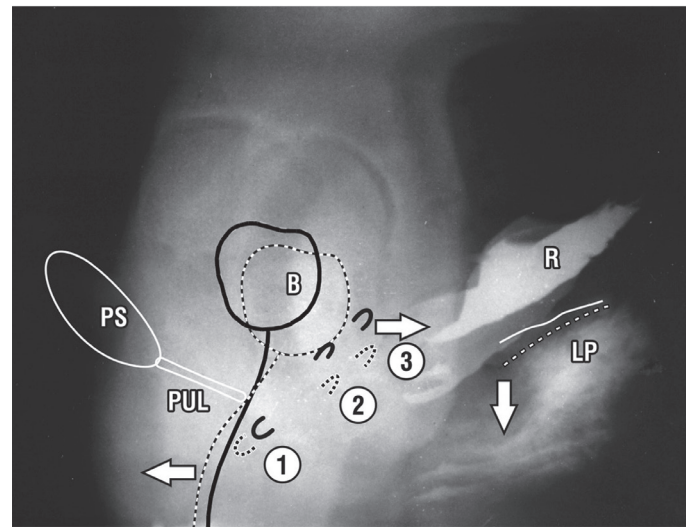
The following transperineal video show the 3 directional forces which close the urethra: forwards, backwards, downwards:

**Video link 1:** <https://www.youtube.com/watch?v=3vjx20vUYe0>

During micturition, the forward force relaxes. This permits the outflow tract to be stretched open by the backward and downward forces (arrows, Figure 2). See the following micturition video:

**Video link 2:** <https://www.youtube.com/watch?v=eiF4G1mk6EA&feature=youtu.be>

Central to this theory are the stretch receptors marked as ‘N’ in Figure 4. The following video from Dr Monteiro, Department of

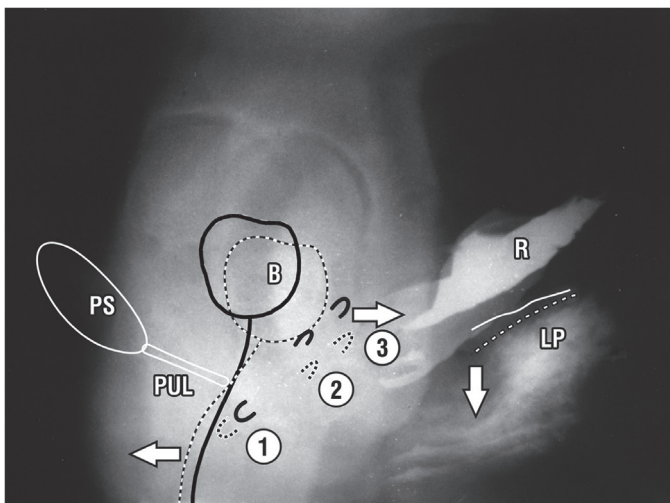


**Figure 2.** Three directional forces contract against their ligamentous insertions during straining. This figure represents a resting standing lateral X-ray superimposed on a straining X-ray in a normal patient. Solid lines = ‘Resting closed’ position of structures and broken lines = straining positions. Vascular clips have been applied to the vagina in the area of midurethra ‘1’, bladder neck ‘2’ and 3–4 cm behind bladder base ‘3’. Radio-opaque dye delineates the Foley catheter balloon (B), rectum (R) and levator plate (LP). position of the pubourethral ligament (PUL); pubic symphysis (PS); white solid lines denote superior border of LP at rest, broken on straining. During ‘straining’, the bladder neck and upper part of vagina (clips ‘2’ and ‘3’) have been pulled backwards and downwards. The distal part of vagina and distal 2/3 of urethra, however, (clip ‘1’), have been stretched forwards by an anterior muscle force (arrow), but also downwards. Note how the downward posterior force (downward arrow), angulates the anterior border of levator plate, acting ultimately against the insertion of USL into cervical ring.

Urology, University of Lisbon, shows how digitally stimulating the bladder base may activate the micturition reflex. Note the urine appearing at the external meatus. “Contracves”: activation of the micturition reflex by stimulating bladder base stretch receptors:

**Video link 3:** [https://youtu.be/dWi4\\_Odhewa](https://youtu.be/dWi4_Odhewa)

How damage or looseness in ligaments or the fascial connective tissue may cause incontinence. The histological composition of ligaments,<sup>1</sup> pubourethral ligaments (PUL), uterosacral ligaments (USL) and the fascial layer of the anterior vaginal wall are very similar: collagen (structure), smooth muscle (contracture/relaxation), elastin (recoil) nerves (innervation) blood vessels. The most vulnerable element in the ligament is collagen, as it alters shape and strength due to hormonal influences. For example, cervical softening during periods allows for the expulsion of menstrual blood. Collagen damage during labour or breakdown and excretion after the menopause weaken the ligaments and the muscle force of the three directional muscles which contract against them. With reference to Figure 4, as the three muscle forces contract against PUL and USL, laxity in PUL and/or USL will weaken the directional forces, hence the urethra cannot be closed with effort (stress incontinence), it cannot be stretched open during micturition (emptying difficulties) or it cannot be adequately stretched like a trampoline to support stretch receptors “N” (Figure 4) to prevent premature activation of the micturition reflex (urgency).



**Figure 3.** ‘Squeezing’ activates a fourth directional force. Same patient and labelling as **Figure 4**. This figure represents a resting standing lateral X-ray (unbroken lines) superimposed on a ‘squeezing’ X-ray (broken lines). Compared to **Figure 2**, the whole levator plate appears to have been lifted upwards and forwards (diagonal arrows), probably by contraction of the underlying puborectalis muscle. This force stretches bladder neck, vagina (clips ‘2’ and ‘3’) and rectum upwards and forwards. Note forward movement of the midurethral part of vagina, clip ‘1’ and upward angulation of the coccyx.

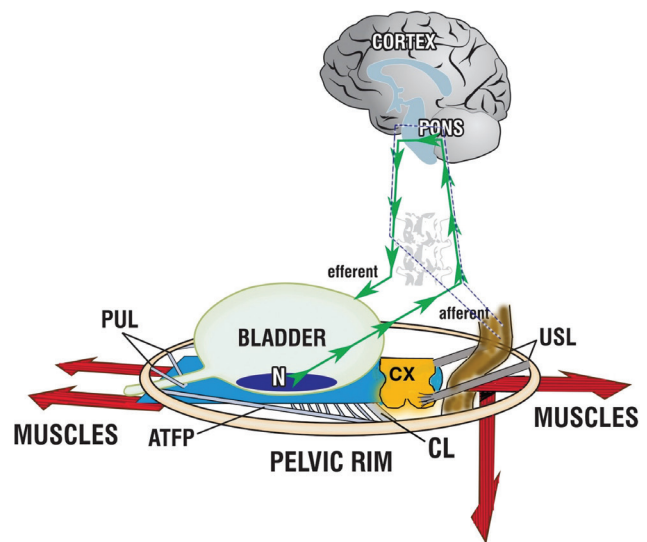
### Anatomical rationale for the development of squatting-based exercises

We knew from transperineal ultrasound testing, and video X-ray studies (Figures 2 and 3) that straining and coughing activate all 3 directional forces (large arrows, Figure 4). We also knew from experimental animal work that endurance training demonstrated increased collagen deposition.<sup>5</sup> Therefore, we knew that squatting-based exercises would strengthen the three reflex muscles and create new collagen for the ligaments which they contract against, namely the PUL and USL, *if the patient was premenopausal*.

These same studies also showed that the Kegel “squeezing” method only trains the voluntary puborectalis muscle which contracts directly against the symphysis. PRM does not contract against any ligaments. However, because PRM is an important muscle for general pelvic floor function, and it has a very important role in anorectal closure and evacuation,<sup>6</sup> we included Kegel exercises in our ITS PFR regime.

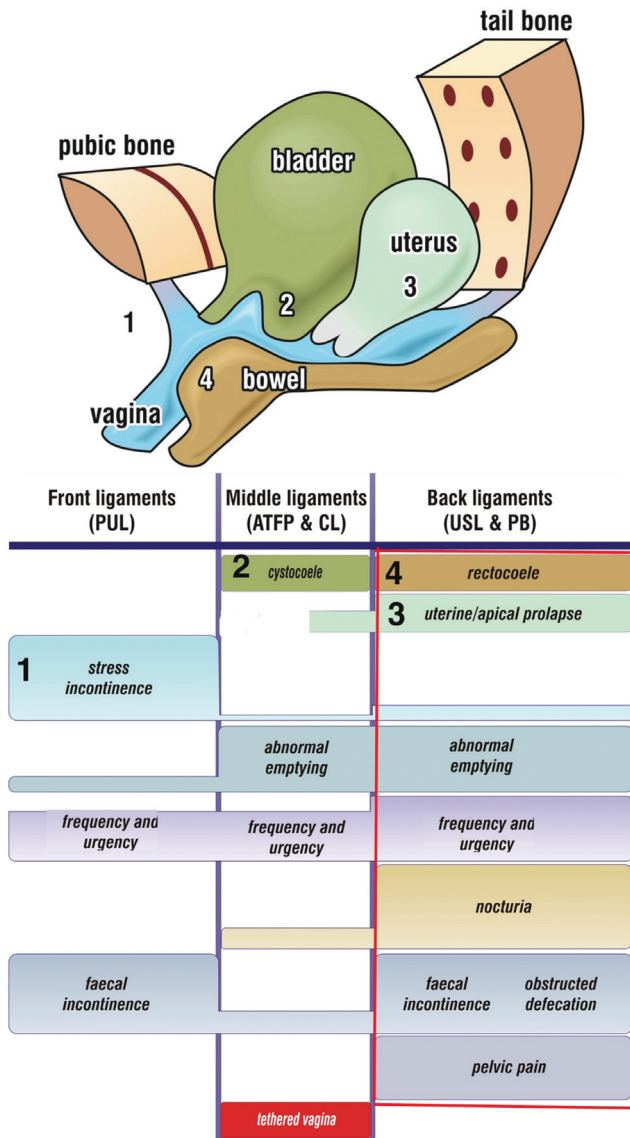
### Aims

The original aim of the ITS PFR regime therefore was to harness the fact that straining causes all three reflex muscles forces to



**Figure 4.** The trampoline analogy for control of urgency. In the normal patient, the stretch receptors ‘N’ sense bladder fullness and send afferent signals to the cortex (green afferent arrows) which are controlled centrally and by opposite stretching of the vaginal membrane by muscle forces (arrows) which support the urine column lessening activation pressure on ‘N’. At a critical number of afferents from ‘N’, central inhibition is overcome and the micturition reflex is activated (green efferent arrows); the forward muscles relax; the posterior muscles open out the posterior urethral wall; the detrusor contracts to empty. A similar feedback control system, opposite stretching of the posterior vectors hypothesized to support the anorectal stretch receptors preventing urge fecal incontinence. CL: cardinal ligaments

contract in order to strengthen them and also the ligaments which they contract against, in order to cure or improve stress urinary incontinence and other symptoms related to PUL and USL weakness as per the algorithm (Figure 5).



**Figure 5.** Pictorial algorithm. Symptoms indicate which ligaments are damaged. The numbers indicate the sites of damage. The height of the bar indicates probability of association of a symptom with a particular zone. The connective tissue structures causing prolapse and pelvic symptoms fall naturally into three zones. *Anterior zone:* external meatus to bladder neck pubourethral ligament (PUL); *Middle zone:* bladder neck to anterior cervical ring. Cardinal ligament (CL); arcus tendineus fascia pelvis (ATFP). *Posterior zone* posterior cervical ring to perineal body (PB): USL uterosacral ligaments; perineal body (PB). The rectangle indicates the symptoms associated with USL laxity and the posterior fornix syndrome. Chronic pelvic pain and nocturia are uniquely caused by uterosacral (USL) ligament laxity.

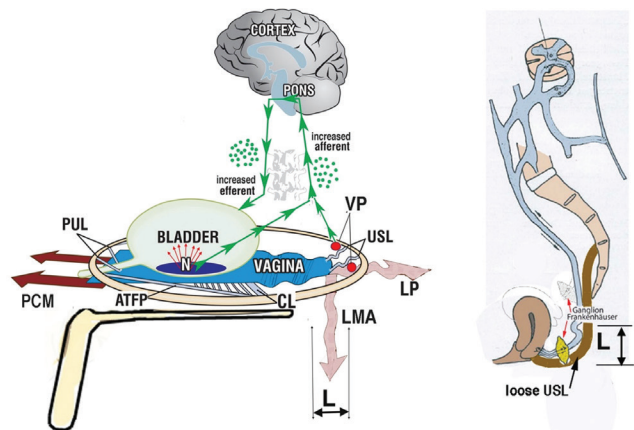
There was no thought of curing interstitial cystitis (IC) at the time of which these studies were performed. At that time, the definition of Interstitial cystitis comprised painful bladder symptoms, evidence of glomerulations and Hunner’s ulcer. However, the new definitions for IC as of 2017 caused us to review our original data from the Kvinno Centre and compare it with published data concordant with the new definitions.

The current International Continence Society (ICS) definition for interstitial cystitis/bladder pain syndrome<sup>5</sup> is “persistent or recurrent chronic pelvic pain, pressure, or discomfort perceived to be related to the urinary bladder, accompanied by at least one other urinary symptom such as an urgent need to void or urinary frequency diagnosed in the absence of any identifiable pathology which could explain these symptoms.” Hunner’s lesion and glomerulations, previously hallmarks of IC, are no longer considered essential for diagnosis.<sup>7</sup>

**MATERIALS AND METHODS**

**Diagnosis**

We used a semiquantitative questionnaire, perineal ultrasound and urodynamic tests to achieve a greater accuracy in diagnosis than that afforded by the simplified pictorial algorithm (Figure 5).<sup>2</sup> Objective stress and 24-hour pad



**Figure 6.** Diminution of urge by “simulated operations”. “Simulated” operations work by mechanically supporting loose or damaged ligaments “L”. Left; The speculum is very gently inserted into the apex of the vagina to mechanically support the uterosacral ligaments (USL) and visceral plexuses (VP) which, unsupported, send afferent impulses to the cortex which it interprets as pain. The mechanical support restores firmness to the USL insertion point, so the vagina can now be stretched by the muscle forces (arrows) to support “N” and diminish afferent impulses to the brain micturition center. These send out afferent impulses which are interpreted as pain. Right; Schematic sagittal view of sacrum, afferent/efferent nerves to the spinal cord. Loose USLs “L” cannot support the visceral plexuses.



tests indicated the severity of the problem. The patient was assessed in terms of age, activity, hormonal status, other disease states, posture, occupation, motivation and commitment to PFR.

## Treatment

We tailored the regime to the needs of the individual patient. Bladder suppressant drugs were rarely, if ever, used. At all times, the patient made the decision as to whether to undergo PFR or keyhole surgery. In general, those patients who lose >2 gm of urine on cough stress testing or >10 gm per 24 hours respond less well to PFR. However, our policy was that all patients should be encouraged to continue PFR. Some successful outcomes had been achieved even in those patients losing more than 30 gm per 24 hours. As vaginal discharge only accounts for 2–3 gm loss per 24 hours, we considered anything more than 4 gm as signifying incontinence, surgically and non-surgically.

Treatment comprised of four visits over a 12-week period, though these could be reduced to three or even two visits for busy or out-of-town women. Based on the algorithm (Figure 5), PFR was carried out in the distal vagina or posterior fornix or both. To assist compliance, the patient was required to complete a daily diary. It was explained to the patient that even if surgery was required, PFR assists by improving the tissues and, in the longer term, maintaining replacement was considered an important factor in management.

Electrotherapy was introduced at the first visit. A specially designed low-cost simplified battery operated electrical stimulator was used, the Pelvitorner 2000 (Medhealth Pty Ltd, Perth WA, Australia). This delivered a square 50 Hz pulse every 2 seconds. The principal aim was to activate and strengthen the fast twitch muscles. Patients were encouraged to contract their muscles in time with the flashing light or to voluntarily contract their muscles on feeling the commencement of the involuntary contraction induced by the electrical stimulation. For posterior defects, the probe was inserted into the posterior fornix for 20 min/day. For stress urinary incontinence (SUI), the probe was placed just inside the introitus for 20 min/day and, also, into the posterior fornix for 20 min/day for a period of 4 weeks.

## Pelvic floor exercises

### First visit

Kegel exercises were performed in lots of 12, six times per day, with legs apart according to the methods of Bo. Endocavity electrical stimulation was used daily for 4 weeks. Squatting was encouraged as a universal slow-twitch exercise, if possible, for a

total of 20 min/day. The aim was to weave this activity into the patient's daily routine. At all times, the patient was to substitute squatting for bending. If a patient had arthritis, she was allowed to sit on the end of a chair with her legs apart. By explaining the principles behind the exercises and encouraging the patients to plan and record their daily routine, compliance was vastly improved.

### Second visit

A reverse downward thrust was taught. The patient pressed upwards with one finger to one side of the urethra, approximately 2 cm inwards from the introitus, and strained downwards. The downward thrust was then alternated with the Kegel squeezes in lots of 12, for a total of six times per day. The downward-acting exercises strengthen the fast twitch fibers of all three directional muscle forces. A simple way to weave the exercises into a daily routine was to recommend that every time the patient goes to the toilet, she was to perform one group of 12 exercises.

### Third visit

The patient compliance was checked (via the diary), how she had incorporated the programme into her daily routine was discussed and the aims and principles of the programme were re-enforced. At the 3-month review (fourth visit), in consultation with the patient, a decision was made whether to proceed to keyhole surgery or continue with the maintenance PFR.

## Maintenance PFR

By the end of 3 months, it was assumed that the patients had incorporated the exercises into their normal routine. Squeezing was alternated with the downward thrust for a total of six sets of 12 exercises per day. Squatting was by now an acquired habit. Electrotherapy was performed 5 days/month. The patients were advised to continue this routine for the rest of their lives.

## RESULTS

The first group who completed the full regime comprised 60 patients aged 15–86 (mean age: 55 years).<sup>2</sup> Assessment at 3 months for specific symptoms was performed independently by an external expert in female incontinence (MK) using the same semiquantitative patient-administered questionnaire. The improvement rates for symptoms are summarized in Table 1. An improvement rate of 50% was taken as the cut-off point for inclusion in Table 1, i.e., a 0-50% improvement was considered a failure and 17% of patients were in this category. The median improvement rate per symptom for the remainder (83%) was 65%. With regard to interpretation of Table 1, 78% of patients reported a minimum 50% improvement in their SI symptoms,



**Table 1. Improvement rates for symptoms**

Study (n=60)		
Condition	n	Improvement (%)
Stress	42	78
Urge	39	61
Frequency	53	62
Nocturia	24	75
Pelvic pain	20	65
Leakage	50	68
Bowel problems	28	78
n: Number		

61% in their urge symptoms etc. Three patients reported significant worsening of their stress symptoms. On a quality-of-life assessment (QOL), only 12% of patients reported less than 50% improvement. On a total symptom basis, the median QOL improvement reported was 66%. Co-occurrence of emptying occurred, but missing data in some patients did not allow for its inclusion in the results. Three patients reported significant worsening of their stress symptoms. These were referred for ambulatory keyhole surgery. These minimally invasive surgical techniques have the same objective as our PFR regime. They create artificial neo-ligaments, using polypropylene knitted tapes<sup>5</sup> positioned in the exact position of the natural ligaments. There were no cases of Hunner's ulcer noted.

The second group comprised 147 patients, mean age 52.5 years (range: 25–76) and mean parity 2.25 (range: 0–5). They commenced the full regime.<sup>4</sup> Ten patients were nulliparous. Surgery included, the dropout rate was 47% over 3 months, leaving 78 patients who completed the study. Improvement rates for individual symptoms are summarized in Table 2. Urine loss for cough stress testing reduced from a mean of 2.2 g (range: 0–20.3 g) to 0.2 g (range: 0–1.4 g),  $p < 0.005$  (Student's t-test), and Urine loss for 24-h pad loss decreased from a mean of 3.7 g (range: 0–21.8 g) to a mean of 0.76 g (range: 0–9.3 g),  $p < 0.005$ . The patients reported that control of urine loss, when achieved, happened even when not “en garde”. The cut-off point for determining frequency improvement was eight times per day and nocturia two times per night.

Total number of frequency events for the twelve patients with only frequency reduced from 140 to 80 per day ( $p < 0.005$ ). The total number of nocturia events for the 32 patients reduced from 98 events per night to 25 per night ( $p < 0.005$ ). In 23 patients with residual urine greater than 50 ml, there was a pre-treatment mean of 202 ml (range: 50–550 ml) and the post-treatment residual was reduced to 71 ml (range: 15–450 ml) ( $p < 0.005$ ). Thirteen patients

(9% of the total) elected to have surgery prior to completion of their course due to non-improvement or worsening of stress incontinence. Three patients reported significant worsening of their stress symptoms, and no improvement was noted in nine others. Three patients reported worsening of their urge symptoms, and no improvement was noted in six others. It was not always possible to predict an outcome. The highest cough stress test loss was 20.3 g and this reduced to 0 g on re-testing. The highest 24-hour test loss was 21.8 g and this reduced to 2.3 g. Yet other patients with far less objective loss required surgery. All patients complied with hormone replacement therapy treatment during the 3-month period.

**Table 2. Fate of individual symptoms\***

Symptom (n=78 women)	>50% improvement
Stress incontinence (n=69)	57 (82%)
Urge incontinence (n=44)	33 (68%)
Frequency only (n=12)	10 (83%)
Nocturia (n=32)	29 (90%)
Pelvic pain (n=17)	13 (76%)
<b>Residual urine &gt;50 ml (n=23)</b>	<b>mean 202 ml to 71 ml</b>
*Most patients had overlapping symptoms. n: prevalence of the syndrome. n: Number	

## DISCUSSION

Thirty-seven out of 138 women from the first and second studies fulfilled the ICS definition of IC, chronic pelvic pain CPP and co-occurrence of one bladder symptom.<sup>7</sup> In the first group, 20 out of 60 women had collective symptoms of CPP and 158 bladder symptoms; 65% reported a minimum 50% improvement in CCP and also bladder symptoms (Table 1). In the second group, 17 out of 78 women had collective symptoms of CPP and 174 bladder symptoms; 76% reported 50% improvement in CPP and bladder symptoms (Table 2).

Though the data for 37 women fit the ICS definition for IC, they also fit the definition of Posterior Fornix Syndrome (PFS): predictably grouped symptoms of urge, frequency, nocturia, chronic pelvic pain and abnormal emptying/retention, rectangle (Figure 5) caused by USL laxity and cured or improved by repair thereof.<sup>8</sup> This group of 37 raises the question, also raised by Scheffler et al.<sup>9</sup> who reported the first validated cure of IC and Hunner's ulcer with a TSF cardinal/USL sling repair, “*Is IC in women the same as PFS?*” It is worth noting that by his own admission, Scheffler did not set out to cure IC. He followed the Integral System's paradigm for cystocele repair: sling for cardinal ligament repair and pubocervical fascia repair (without vaginal excision) and USL repair with a posterior sling and rectovaginal

fascia repair (without vaginal excision). The patient had similar symptoms to those in Tables 1 and 2 (from this study) and Table 3;<sup>10</sup> the Hunner’s ulcer finding was serendipitous as was its cure. Comparison with known IC diagnosis in Table 3 indicates that the prevalence of symptoms from our studies seems very similar to those reported by Butrick<sup>10</sup> in known IC patients who were treated with bladder installations. Butrick<sup>10</sup> reports a high incidence of voiding dysfunction, frequency, urge and SUI.

**Table 3. Similarity between interstitial cystitis symptoms and the Posterior Fornix Syndrome**

<b>Butrick Interstitial cystitis (n=408)</b>	<b>Goeschen Posterior Fornix Syndrome (n=78)</b>
Bladder installations	Squatting-based PFR
Bladder pain/interstitial cystitis (n=157)	Voiding dysfunction (PVR>50 ml) (n=23)
Chronic pelvic pain (n=98)	Urge incontinence (n=44)
Vulvodynia/dyspareunia (n=40)	SUI (n=69)
Voiding dysfunction (n=70)	Chronic pelvic pain (n=17)
Dyspareunia (n=54)	Nocturia (n=32)
SUI (n=24)	
POP (n=21)	
Hunner’s ulcer (n=18)	No Hunner’s ulcer reported
Butrick. Int Urogynecol J Pelvic Floor Dysfunct 2009; 9: 1047-53.	Goeschen K, Gold D. Pelviperineology 2017; 36: 84-8.

**What is the difference between Kegel and squatting-based PFR?**

When stress urinary incontinence (SUI) is cured with squatting-based PFR, the patient does not need to “lift up” before a cough (Kegel exercise). The SUI is naturally cured. Also, other bladder and pain symptoms are cured or improved by the squatting method (Tables 1 and 2).

*It is not anatomically possible for Kegel to cure urge, nocturia, or emptying, as these are caused by lax USLs (Figure 5). Kegel does not contract against USL and therefore, it cannot strengthen it.*

**Differential cadaveric and functional anatomy of PRM and PCM/LP**

With reference to Figure 1 (anatomy), it is clear that puborectalis (PRM) is a very different muscle from pubococcygeus (PCM), which passes behind the rectum to unite with the other PCM and iliococcygeus to form the levator plate (LP), which then inserts into the posterior wall of rectum. In contrast, PRM loops around the rectum and does not insert into it. It attaches directly into

the posterior symphysis medial to the PCM. PRM is sited below the LP. This explains how PRM contraction (squeezing) lifts the vagina, bladder, levator plate and the rectum itself upwards and forwards. It is this forward/upward movement which closes the urethra with squeezing (Kegel) exercises (Figure 3). Clearly, Kegel exercises cannot strengthen either PUL or USL as they do not contract against them. In contrast, on straining, the 3 directional forces contract against both PUL and USL, strengthening the muscle and the ligaments they contract against.

**Are squatting-based PFRs effective in older women?**

Our experience that women well past their menopause do not respond well to squatting-based PFR methods fits with that of Wiegiersma et al.<sup>11</sup> whose RCT between an exercise group and placebo found that the “difference between the groups was below the presumed level of clinical relevance”.

**Why are pelvic exercise results poorer in post-menopausal women?**

The answer may be found in a recent study by Shkarupa et al.<sup>12</sup> who performed native tissue cardinal/uterosacral ligament repair in two groups of women, pre-menopausal and post-menopausal. They reported high cure rates for OAB/nocturia and prolapse at 18 months (Table 4) but extremely poor results in post-menopausal women for the same period. They attributed the poorer results to collagen breakdown and excretion from the ligaments because of estrogen cessation at the menopause. Shkarupa recommended slings for post-menopausal women because they create new collagen to reinforce collagen-weakened ligaments. Shkarupa’s hypothesis was seemingly validated by Inoue et al.<sup>13,14</sup> who reported only a 10% drop in anatomical (and symptom) cure rates at both 4 and 5 years after polypropylene tape reinforcement of cardinal/uterosacral ligaments.<sup>13-24</sup>

**Is it possible to diagnose IC caused by USL laxity?**

A standard test in our clinic was the speculum test (Figure 6). We found 70%–80% of symptoms of CPP and urge can be relieved by the speculum test.<sup>25</sup>

**CONCLUSION**

Looked at from the perspective of the Integral System, patients with symptoms of chronic pelvic pain, urge, frequency, nocturia or abnormal emptying, whether they have been diagnosed as IC or PFS, providing that they pass the speculum test for lax USLs, there is a high possibility that their symptoms can be 50% improved by a squatting-based PFR regime.

**Table 4. Cure rate (%) of POP and overactive bladder symptoms at different points of follow-up**

POP/OAB symptoms	Pre-menopausal group (n=40)	Post-menopausal group (n=48)
<b>3 months</b>		
Frequency	75	62.5
Urgency	87.5	77
Nocturia	95	68.8
POP	97.5	89.6
<b>6 months</b>		
Frequency	77.5	50
Urgency	85	68.8
Nocturia	97.5	62.5
POP	87	52
<b>12 months</b>		
Frequency	62.5	39.6
Urgency	82.5	31.3
Nocturia	75	29.2
POP	80	20.8
<b>18 months</b>		
Frequency	60	14.6
Urgency	67.5	16.7
Nocturia	87.5	18.8
POP	80	16.7
POP: Pelvic organ prolapse; OAB: Overactive bladder; n: Number By permission Shkarupa et al. <sup>12</sup>		

## ETHICS

**Ethics Committee Approval:** Since the National Code on Clinical Trials had declared that ethics approval is not necessary for retrospective studies, it is not obtained.

**Informed Consent:** Retrospective study.

**Peer-review:** Both internally and externally peer-reviewed.

## DISCLOSURES

**Financial Disclosure:** The authors declared that this study received no financial support.

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# 13<sup>th</sup> ISPP'S INTERNATIONAL ANNUAL CONGRESS ON PELVIC FLOOR DISORDERS ABSTRACTS

**Keywords:** After trans-obturator tape, female, functional outcome, myomectomy, natural orifice transluminal endoscopic surgery (NOTES), neurogenic bladder, pelvic floor, pelvic organ prolapse, post-prostatectomy stress urinary incontinence (PP-SUI), presacral tumor, radiotherapy, retrorectal tumor, stress urinary incontinence (SUI), surgery, urinary incontinence, uterocutaneous fistula, uterosacral ligament suspension, vulvar leiomyoma

## PREFACE

Dear Readers;

We held the 13<sup>th</sup> ISPP's International Annual Congress on Pelvic Floor Disorders between the dates of May 29–30, 2021 on a virtual platform.

We were happy with the large number of participants from all over the world.

The congress topics covered all issues of pelvic floor. Hence, the congress days were full and we were able to allocate only one hour for oral presentations.

The reviewers scrutinized the abstracts of these proffered presentations and, due to time constraints, only eleven of them were chosen for oral presentation.

These abstracts are being published in the Journal of Pelviperineology, which is the official journal of the ISPP.

Prof. A. Akin SIVASLIOĞLU, M.D.

Co-President of the 13<sup>th</sup> ISPP Congress

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## DOES RADIOTHERAPY AFFECT THE PELVIC FLOOR?

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### ABSTRACT

In the treatment of female genital tract cancers, surgery, radiotherapy (RT), chemotherapy, or combinations of these treatments are used according to the stage, age, and recurrence risks of the disease. RT is often used as adjuvant therapy in locally advanced cancers. Of course, these treatment modalities have certain side effects and may lead to morbidity in patients. In the literature, although a pelvic floor disorder is very common in women, we noticed that pelvic floor function is rarely investigated in cases with gynecological cancer before or after treatment. Publications report that pelvic floor disorders develop in patients, especially after RT. Urinary incontinence, urgency, fecal incontinence, and sexual dysfunction may develop in patients receiving oncological treatment. Such side effects of RT reduce the quality of life and cause difficulties in daily life, even if the patient survives the cancer. Similar to the mechanism that occurs in pelvic floor disorders in patients without cancer, it is thought that urinary incontinence, fecal incontinence, and prolapse develop as a result of damage to the pelvic floor muscles by radiation beams. The effects of radiotherapy on the pelvic floor occur months or even years after exposure since the functional activity of muscle, nerve and connective tissue is not dependent on constant cell regeneration. Every tissue has a dose of radiation that it can tolerate. If the doses given in cancer treatment exceed the tolerability dose, serious side effects occur. In this study, we tried to explain the prevalence of pelvic floor disorders and its mechanism of occurrence in those patients with gynecological cancer receiving radiotherapy by means of a review of the literature.

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## EVIDENCE OF A COMMON PATHOPHYSIOLOGY OF STRESS- AND URGENCY- URINARY INCONTINENCE

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### ABSTRACT

**Introduction:** Urinary incontinence (UI) in women is categorized as stress urinary incontinence (SUI) and urgency urinary incontinence (UUI). SUI - activity related incontinence - occurs due to an increased intra- abdominal pressure on the bladder which leads to a short opening of the bladder outlet. This can be successfully treated surgically. UUI is considered to be caused by dysfunctional detrusor muscle contractions. Current treatment options for UUI focus on neurological suppression of these contractions.

These treatments can reduce the feeling of urgency but have no effects on UI.

Since prolapse surgery can reduce/cure UUI, we hypothesized that UUI is also caused by an anatomical instability at the bladder outlet leading to incontinence.

**Materials and Methods:** Patients with UUI were asked to specify exactly when (in which body position) they involuntary lost urine after a feeling of urgency.

**Results:** In total, 569 patients were evaluated between 2012 and 2020. Overall, 97% of the patients lost urine when they got up from a sitting position on their way to the toilet.

**Conclusion:** The current treatment options for UUI are based on the hypothesis that UUI is a neurological disorder. This study demonstrated that urinary incontinence in patients with UUI is activity related.

Therefore, UUI is also a kind of SUI. Furthermore, treatment modalities for this form of incontinence should focus on anatomical repair or support.

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## HIGH UTEROSACRAL LIGAMENT SUSPENSION VIA VAGINAL-ASSISTED NATURAL ORIFICE TRANSLUMINAL ENDOSCOPIC SURGERY: INITIAL EXPERIENCE

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### ABSTRACT

**Introduction:** Vaginal natural orifice transluminal endoscopic surgery (vNOTES) has been used for a variety of gynecologic operations in recent years. The aim of this study is to present our initial vNOTES high uterosacral ligament suspension experience for apical prolapse repair.

**Materials and Methods:** All patients (n=15) underwent vNOTES hysterectomy and high uterosacral ligament suspension to treat symptomatic apical pelvic organ prolapse. The information concerning basic characteristics, duration of surgery, intra/post-operative complications, additional prolapse and incontinence surgeries were obtained from the hospital's database. Anterior colporrhaphy was added where it was necessary. All patients were followed up for six months.

**Results:** The median age of the patients was 55 (40–72) years. The median parity was 4 (2–7). The median body mass index was 27.5 (21.1–34.8) kg/m<sup>2</sup>. Pre-operative POP-Q scores were as follows; Aa -2(-2, -3), Ba -2(-2, -3),

C 3(2-4), D 0(-1, 0) Bp -2(-2, -3), Ap -2(-2, -3), Gh 5(4-5), Pb 2(2-3), Tvl 7(6-7). The median total surgery duration was 48 (38–55) minutes. The mean postoperative 6-hour visual analog scale (VAS) score was 6 (5–7) and the 24-hour VAS score was 1 (1-2) for vNOTES uterosacral ligament suspension patients. The mean length of hospital stay was 22 (18–28) hours. There were no intraoperative and postoperative complications. Post-operative 6<sup>th</sup> month POP-Q scores were as follows; Aa -2(-2, -3), Ba -2(-2, -3), C -5(-3-6), D -5(-3, -7) Bp -2(-2, -3), Ap -2(-2, -3), Gh 5(4-5), Pb 2(2-3), Tvl 7(6-7).

**Conclusion:** vNOTES is a feasible approach in high uterosacral ligament suspension for the treatment of apical pelvic organ prolapse.

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## UTEROCUTANEOUS FISTULA AFTER MYOMECTOMY

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### ABSTRACT

**Introduction:** We aimed to discuss uterocutaneous fistula, which may occur after myomectomy.

**Case presentation:** A 40-year-old woman presented to the polyclinic with a complaint of pelvic pain and abdominal mass. Transabdominal ultrasonography and abdominal tomography revealed a large uterus filling the entire pelvis, extending into the abdomen. Its dimensions were 186 x 129 mm and many myomas of various sizes were observed in it. Abdominal myomectomy was performed on the patient. A vertical incision was made on uterus and myoma removed, myometrium was closed in two layers. The patient came back with malodorous discharge and bleeding from the incision site three months after the operation. A fistulous tract with a thickness of 6 mm was observed between the uterus and the abdominal scar in the magnetic resonance imaging (MRI). Intraoperatively, the fistula was observed to extend from the upper part of the uterus to the skin and a fistulectomy was performed. Histopathology of the fistula tract showed that the tract was covered with endometrial epithelization and granulation. The patient was discharged on the 6<sup>th</sup> postoperative day.

**Discussion:** Fistula is defined as an abnormal connection between two epithelial-covered organs. In uterocutaneous fistula due to menstruation, a bloody discharge comes from the path between the skin and the uterus. A definitive diagnosis can be made by ultrasonography, contrast fistulogram, hysterosalpingography, computed tomography and MRI. The period for fistula formation after the procedure is given as being between three months to three years according to the literature.

**Conclusion:** Uterocutaneous fistula following myomectomy is a very rare condition in women. Fistulectomy and intravenous broad-spectrum antibiotics have favorable prognosis.

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## AUTOLOGOUS BULBOURETHRAL SLING FOR POST-PROSTATECTOMY STRESS URINARY INCONTINENCE

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### ABSTRACT

**Introduction:** In view of the increase in use of bulbourethral slings to treat post-prostatectomy stress urinary incontinence (PP-SUI) and the serious potential complications of synthetic materials, we describe our clinical pathway and surgical technique for an autologous sling to treat PP-SUI.

**Materials and Methods:** A clinical, cystoscopic and urodynamic evaluation including voiding diary, pad use, ICIQ-SF and UDI-6 questionnaires is used. We explain the standard alternative treatments to the patient, with possible risks and benefits. The sling is harvested from the rectus fascia through a skin incision of 4–6 cm. It is positioned to compress the bulbar urethra by fixation to the ischio-pubic rami with polypropylene sutures. Compression is measured by retrograde urethral manometry to 60 cmH<sub>2</sub>O.

**Results:** We perform this autologous rectus fascia sling as a day case. Patients reported improvements in the number of incontinence episodes, daily pad use and ICIQ-SF score and these improvements have continued for over 6 months.

The patients receive preoperative information on care at discharge. The harvest site is well tolerated and discreet.

**Conclusion:** We describe a bulbo-urethral sling for PP-SUI that is safe and cost-effective. It is technically simple for surgeons familiar with perineal surgery. Sling compression is controlled by retrograde manometry. Our procedure offers another alternative with an autologous fascia avoiding the potential risks of synthetic materials.

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## BURCH COLPOSUSPENSION IN A CASE OF RECURRENT STRESS URINARY INCONTINENCE: A CASE REPORT

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### ABSTRACT

Stress urinary incontinence, which is common in the world, greatly affects the quality of life of patients. This condition, which has many medical and surgical treatment options, may recur after treatment or there may be situations where it does not benefit from treatment. In this case report, we describe a 45-year-old case of recurrent stress urinary incontinence admitted to an outpatient clinic. The patient, who had previously undergone incontinence surgery seven times in other centers, was diagnosed with tethered vagina syndrome by us. Urethrolisis and Martius flap were applied. However, the patient applied to us again with a complaint of urinary incontinence one year after the operation. Burch colposuspension was performed on the patient. Symptomatic improvement was achieved in the patient with Burch colposuspension.

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## PERI-URETHRAL INJECTION OF PLATELET RICH PLASMA FOR THE TREATMENT OF STRESS URINARY INCONTINENCE

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### ABSTRACT

**Introduction:** We describe the clinical use of Platelet Rich Plasma with Fibrin (PRPF) peri-urethral injections for the treatment of female stress urinary incontinence (SUI). Periurethral injections increase urethral resistance. PRPF is an injectable autologous substance with adhesive, haemostatic, and bulking characteristics.

**Materials and Methods:** Preoperative assessment includes history and physical examination, multichannel urodynamic studies and cystoscopy. We employed a voiding diary, pad use, ICIQ-SF and UDI-6 questionnaires. Our technique was IRB approved. PRPF is prepared from 40ml peripheral blood. This is centrifuged and separated. Just before injection, Calcium is added to increase density.

PRPF injections can be performed retrograde (trans-urethral, peri-urethral) or antegrade via a suprapubic access. Amounts ranging from 0.5 to 2 ml are injected at 3, 6, 9 and 12 o'clock cystoscopic positions to obtain urethral closure at the level of the sphincter.

**Results:** The technique is easily reproducible both in the preparation of PRPF and the injection steps. Patients reported improvements in the number of incontinence episodes, daily pad number use and ICIQ-SF score at week one. There was a reduction in efficacy at three months, yet results were still above baseline levels.

If needed, top-ups can easily be performed as an in-office procedure under local anaesthetic. We are currently prospectively following a cohort in three centres.

**Conclusion:** We describe the clinical use of PRPF peri-urethral injections for the treatment of female SUI. The procurement and preparation of PRPF is accessible and reproducible. The injection procedure is simple and similar to other bulking substances.

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## VOIDING HABITS IN WOMEN: WHAT SHOULD BE MODIFIED?

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### ABSTRACT

**Introduction:** to evaluate voiding habits in Uruguayan women from a wide age-range and different social, cultural and economic environments.

**Materials and Methods:** women of 14 years and older were recruited using an online survey. It included 10 questions. Five of them were about urinary habits: urination with desire, need to push during urination, where the voiding takes place, position to make voiding and the relationship between bladder distention and the emptying moment; and five questions were about social, cultural and economic environments: health insurance, education level, financial income, means of transport and age.

**Results:** Nine hundred and fifty-two women between the ages of 14 and 89 answered the survey completely. The average age was 41 years old. 81.4% have a level of education higher than elementary school, they all have health insurance, and 87% live in an urban area, thus being a representative part of the female Uruguayan population.

21.26% urinate without feeling the need to, 59.86% wait to urinate until they cannot hold it any longer, 77.83% try to urinate at home, and 43.47% push to urinate.

**Conclusion:** Voiding habits which can be prejudicial for urogenital female health were reported at a non-negligible frequency. This proves that we must insist on education regarding voiding habits from an early age in Uruguayan women to avoid dysfunctional voiding in the future.

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## MANAGEMENT OF PELVIC FLOOR DYSFUNCTIONS: COMBINED VERSUS SINGLE SURGICAL PROCEDURE IN A MULTIDISCIPLINARY APPROACH: A RETROSPECTIVE STUDY

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### ABSTRACT

**Background:** The combined and consensual surgical treatment of multiple pelvic dysfunctions in the same surgical operation still causes much controversy. The objective of this study was to compare the outcome of combined surgical treatment of multicompartamental pelvic floor defects versus single procedures within a multidisciplinary path in order to try to clarify what is the most effective surgical approach.

**Methods:** A retrospective series of consecutive patients with pelvic floor dysfunction undergoing single- specialty pelvic procedure (SP=30) was compared to patients operated on at the same institution with

a combined multi-compartment surgical procedure (CP=30) after discussion at a joint pelvic floor multidisciplinary team over a 12-month period in a tertiary referral center.

**Results:** Clinical evaluation of prolapse at 12 months after surgery showed a statistically significant postoperative improvement of prolapse (reduction in POP-Q) compared to the preoperative grade in both groups, but with a statistically significant difference between the SP and CP groups ( $p=0.03$ ). We observed more de novo defects in the SP group ( $p=0.01$ ) 12 months after surgery, especially affecting the posterior compartment. More recurrences occurred in the SP group (33% vs 23%) although the difference was not statistically significant. Only grade I and II complications occurred (SP group: 26%, CP group: 20%) with no differences between the two groups. There was a statistically significant clinical and quality- of-life improvement ( $p<0.001$ ) in both groups after surgery, regardless of the procedure.

**Conclusions:** The multidisciplinary approach is safe and feasible with a better restoration of the pelvic plane anatomy and less need for subsequent correction.

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## PRESACRAL (RETRORECTAL) TUMOR FUNCTIONAL OUTCOME AFTER RESECTION IN ADULTS – A SYSTEMATIC REVIEW

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### ABSTRACT

**Introduction:** Presacral (Retrorectal) lesions and tumors are quite rare. No solid reports about the functional outcome after resection have been reported so far.

The aim of this article is to assess the functional outcome of pelvic organs after resection of presacral (retrorectal) mainly benign tumors.

**Materials:** A systematic review was performed through Pubmed, Medline, and Scopus search to identify functional outcomes of pelvic organs of presacral (retrorectal) tumors after resection.

**Result:** A total of six articles met the inclusion criteria. Two hundred and seventy-one patients were identified. Those patients who suffered from neurogenic bladder made up 15.4% (42), dyesthesia cases were 3.3% (9), fecal incontinence cases were 4.4% (12), massive bleeding cases were 2.5% (7), and retrorectal abscess cases were 1.1% (3).

**Conclusion:** The long-term functional outcome of presacral (retrorectal) resection of mainly benign tumors is rarely addressed in the literature. More studies are needed to estimate complications in benign and malignant conditions.

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## MID-TERM PATIENT QOL AFTER TOT SURGERY FOR MIXED TYPE URINARY INCONTINENCE

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### ABSTRACT

**Aim:** To determine mid-term patient satisfaction and quality of life after trans-obturator tape (TOT) surgery for stress dominant mixed type urinary incontinence (UI).

**Methods:** After informed consent, all patients with TOT surgery for stress dominant mixed type UI and preoperative urodynamics within the last 5 years were included. Patients were asked to fill out 'Incontinence Impact Questionnaire-7 (IIQ-7)' and the 'Urogenital Distress Inventory-6' (UDI-6). They were also asked how they felt "happy or not" regarding surgery and to score their satisfaction level on a visual analog scale (VAS) from 0 to 10.

**Results:** The women (n=33) included in the study had a median age of 55 years with a median follow-up period of 35 months. 73% had  $\geq 1$  comorbid diseases, and almost half were smokers. 39% of them had previous gynecological pelvic surgery. 88% of them were on antimuscarinic medication for urge incontinence. The median number of live births was three with birth-related complications in 42%. Preoperative median bladder capacity was 400 ml. 6% had an early postoperative post-voiding residual volume of 50 to 100 ml. None had urinary retention or stress urinary incontinence postoperatively. 60% of patients were satisfied with the surgery and had a median VAS score of 10 (range: 7–10). The unsatisfied group had a median VAS score of 1 (range: 1–4). UDI-6 scores (11 vs. 3) and IIQ-7 scores (15.5 vs. 0) were statistically higher in the unsatisfied group compared to the satisfied group ( $p=0.001$ , Mann-Whitney U test).

**Conclusion:** Dissatisfaction rate is higher for TOT performed for stress dominant mixed UI after apparently successful surgery. This might be due to unmet preoperative over-expectations of the patients or failure of surgeons to inform their patients adequately regarding surgical outcomes.

**Keywords:** Incontinence, surgery, quality of life, transobturator tape, questionnaire

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## VULVAR LEIOMYOMA: A CASE REPORT

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### ABSTRACT

Leiomyomas constitutes 3.8% of soft tissue tumors. Extrauterine leiomyomas are less common. An example of this situation is vulvar leiomyomas. Vulvar leiomyomas may be asymptomatic or may show symptoms such as compression, itching, or pain. In this case report, we discussed our patient who had a mass of approximately 15cm that started in the right labia major. The patient initially presented with a complaint of constipation. During the operation, the 15cm mass and then a 10cm mass progressing to the gluteal region were excised. Pathological analysis was revealed leiomyoma. The pain and constipation complaints of the patient disappeared with the excision of the mass.

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