

Vaginal apical prolapse repair using two different sling techniques improves chronic pelvic pain, urgency and nocturia – a multicentre study of 1420 patients

FLORIAN WAGENLEHNER¹, ION-ANDREI MULLER-FUNOGEA², GIANPAOLO PERLETTI³, BURKHARD ABENDSTEIN⁴, KLAUS GOESCHEN⁵, HIROMI INOUE⁶, YUKI SEKIGUCHI⁷, AKIN SIVASLIOGLU⁸, MAX HAVERFIELD⁹, PETER RICHARDSON¹⁰

¹ Clinic for Urology, Pediatric Urology und Andrology, Justus-Liebig-University Giessen, Germany

² Pelvic Floor Unit, Clinic for Gynaecology, Marien Hospital Duesseldorf, Germany

³ Biomedical Research Division, Department of Theoretical and Applied Sciences, University of Insubria, Varese, Italy; Department of Basic Medical Sciences, Ghent University, Ghent, Belgium

⁴ Department of Obstetrics and Gynaecology, Bezirkskrankenhaus Hall in Tirol, Austria

⁵ Carpe Vitam, Center of Reconstructive Pelvic Floor Surgery, Hannover, Germany

⁶ Urogynaecology Center, Shonan Kamakura General Hospital, Kamakura, Japan

⁷ LUNA Pelvic Floor Total Support Clinic, Women's Clinic LUNA Group, Yokohama, Japan

⁸ İzmir Katip Çelebi University Atatürk Training and Research Hospital, Gynecology and obstetrics clinical, İzmir, Turkey

⁹ Department of Gynaecology, The Northern Hospital, Melbourne Victoria, Australia

¹⁰ University of Central Queensland, Australia

Abstract: *Introduction:* Chronic pelvic pain (CPP) occurs in approximately 20% of women. Pathophysiology includes peripheral and central hypersensitisation. The CPP syndrome variously encompasses chronic pelvic pain, urinary urgency, frequency, nocturia or faecal incontinence, causally linked to lax apical support of the vagina. *Aim:* To test the hypothesis that surgical repair of the apical support of the vagina improves CPP, urinary urgency, frequency, nocturia and/ or faecal incontinence. *Materials and methods:* Multicenter, multinational, prospective cohort study including female patients attending pelvic floor centers, presenting with apical vaginal prolapse and at least two symptoms of CPP, urinary urgency, frequency or nocturia. Pelvic floor reconstruction performed vaginally, using two different posterior sling techniques restoring apical support: Infracoccygeal sacropexy (PIVS) and Tissue Fixation System (TFS) of uterosacral and cardinal ligaments. Assessments at baseline and 12 months after surgery using the Integral Theory Symptom Questionnaire and the half-way system. Primary endpoint was improvement of symptoms. Statistical analysis by paired binary response data (per-patient presence/absence of specific sign/symptom before vs. after surgery) using McNemar's test, with null hypothesis of no treatment effect. *Results:* 1420 patients from 8 pelvic floor centers were included. 809 patients had PIVS, 611 TFS surgery. % cure/improvement at 12 months in the PIVS (TFS) cohort was as follows: pelvic pain 68 (78) nocturia 63 (83), urge incontinence 70 (85), frequency 79 (82), faecal incontinence 76 (65), apical prolapse 93 (90). Limitation was the non-randomized design. *Conclusions:* Restoration of apical support improves CPP, nocturia, urgency/ urge incontinence and/or non-sphincteric fecal incontinence.

Key words: Integral theory; Apical prolapse; Posterior fornix syndrome; Chronic pelvic pain; Nocturia; Urgency.

Abbreviations: CPP – chronic pelvic pain; PIVS – Infracoccygeal sacropexy; TFS – Tissue Fixation System; ICS – International Continence Society; USL – uterosacral ligament; CL – cardinal ligament; PUL – pubourethral ligament; EUL – extraurethral ligament; ATFP – arcus tendineus fasciae pelvis; PB – perineal body; ODS – Obstructive Defecation Syndrome.; PC – m. pubococcygeus; V – vagina; PB – perineal body; LP – m. levator plate; R – rectum; IS – ischial spine; PS – pubic symphysis; S – sacrum.

INTRODUCTION

Chronic pelvic pain (CPP) syndrome is a major health and societal problem^{1,2}. The 2002 definition by the International Continence Society (ICS) includes concomitant complaints of lower urinary tract, bowel, sexual or gynecological in nature where there is no infection or other obvious pathology^{2,3}. It is thought that CPPS is associated with changes in the central nervous system (CNS) that may maintain the perception of pain in the absence of acute injury and magnify its perception so that non-painful stimuli are perceived as painful (allodynia) and painful stimuli are perceived as more painful than expected (hyperalgesia)².

Chronic pain of moderate to severe intensity occurs in 19% of adult Europeans, seriously affecting the quality of their social and working lives⁴. Significant health costs are attributed to this problem. In a 1996 study, the estimated direct medical costs for outpatient visits alone for this group in the U.S. was \$881.5 million per year. In addition, 15% reported time lost from paid work and 45% reported reduced work productivity⁵.

The pathogenesis of chronic pelvic pain is still incompletely understood. Mechanisms proposed include peripheral and central hypersensitization of the nervous system².

Peripheral hypersensitization describes an augmented sensory pain input from the peripheral nervous system and central hypersensitization describes a predisposition of a dysfunctional central regulation of the sensory input⁶. In parallel, accompanying symptoms such as urinary symptoms or psycho-social symptoms are also frequently found.

Up to now there is no gold treatment standard of CPP in women. Currently the main approaches to treatment in women include counseling or psychotherapy, surgery to interrupt nerve pathways such as laparoscopic uterine nerve ablation and presacral neurectomy, or hysterectomy - with or without removal of the ovaries⁷ – and, more recently, neuromodulation, where patients reported 40% improvement in their pain symptoms and 26% improvement in their urinary symptoms at 15 months mean follow-up⁸. Recent developments aim to diagnose and treat the clinical phenotypes of patients by different approaches, including physical therapy, medications and psychosomatic therapy amongst others.

As part of the 1993 publication of the Integral Theory, chronic pelvic pain was linked to a specific symptom complex known as the “posterior fornix syndrome” caused by lax apical support of the vagina⁹. The syndrome variously

encompassed chronic pelvic pain and bladder symptoms of urgency, abnormal emptying, nocturia⁹. Patients rarely presented with single symptoms⁹. Essential to this theory, is the concept that loose ligaments interfere with the muscle-mediated central-peripheral control reflexes. For symptoms of overactive bladder (e.g. urgency, frequency, nocturia), loose ligaments prematurely activate the micturition reflex¹⁰. For pain, inability to support the sympathetic and parasympathetic nerves is expressed by referred pain to various sites and symptoms are not always proportional to the degree of the anatomical failure¹¹. In 1996, a description of the pain was published. This included site (lower abdomen, sacral, deep dyspareunia) severity, variability, relieve on lying down. Surgical intervention consisted of the approximation of the uterosacral ligaments (USL) under local anesthesia. This resulted in an initial 85% cure/ improvement of CPP at 3 months¹¹, Figure 1. The cause of the pain was hypothesized to be inability of lax USLs to support the nerves in the USL¹¹. The ultimate etiology of USL laxity is attributed to age or birth related collagen, in association with smooth muscle and sympathetic nerve fiber damage^{8,9}, aided by hormone induced depolymerization during pregnancy¹².

The primary aim of the present study was to investigate whether lax apical support (uterosacral and cardinal ligaments) was a causative factor in CPP and other symptoms of the posterior fornix syndrome (e.g. urinary urgency, nocturia, faecal incontinence) by prospectively evaluating these symptoms using two different surgical techniques which restored apical support of the vagina. Inherent in this work was our hypothesis that the peripheral hypersensitisation of the CPP and micturition circuits might be potentially reversible by treating the underlying cause as hypothesized, lax uterosacral ligaments.

MATERIAL AND METHODS

Eight Female Pelvic Floor tertiary referral centres participated in the study. Ethical approval for data acquisition was received by the ethics committee of the Justus-Liebig-University Giessen, Germany (ethical vote 74/10).

At the first consultation, all patients completed a self-administered validated patient questionnaire¹³, whose answers

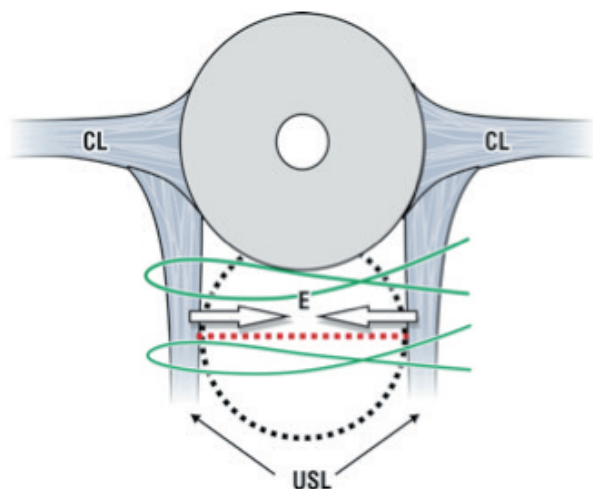
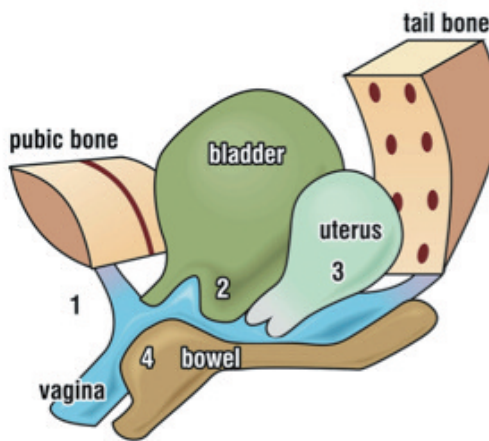


Figure 1. – Simple posterior fornix repair¹¹. A transverse incision is made in the posterior fornix 3-4cm below the cervix, A large No1 needle is inserted widely laterally below the vaginal skin and the loose uterosacral ligaments (USL) are approximated (arrows) with strong sutures. USL= uterosacral ligament; CL=cardinal ligament; E=enterocele.



	Front ligaments (PUL & EUL)	Middle ligaments (ATFP & CL)	Back ligaments (USL & PB)
		cystocele	rectocele
			uterine/apical prolapse
stress incontinence			
		abnormal emptying	
			frequency and urgency
			nocturia
faecal incontinence			faecal incontinence
			obstructed defecation
			pelvic pain
			labeled vagina

Figure 2. – Simplified diagnostic algorithm. As applied in this study, it related symptoms (ticks) to prolapse and damaged ligaments in the apical parts of the vagina. PUL=pubourethral ligament, EUL=extraurethral ligament (anatomical zone 1); ATFP=arcus tendineus fasciae pelvis, CL= cardinal ligament (2); USL=uterosacral ligament, PB=perineal body (3 and 4). The height of the bar indicates prevalence of a symptom caused by the respective anatomical region.

were transferred to the Pictorial Diagnostic Algorithm [Figure 2], which served as a guide to surgery. All patients underwent a vaginal examination to assess the degree of prolapse and to detect specific anatomical defects. Given the fact that there are no routine tests to diagnose peripheral and/or central hypersensitisation, patients with symptomatic vaginal prolapse were included in this study. No attempt was made in the present study to differentiate between peripheral and central hypersensitisation.

Inclusion criteria

Consecutive patients with apical prolapse of any degree¹⁴ and two or more posterior fornix syndrome symptoms (e.g. chronic pelvic pain, urgency, abnormal urine emptying, or nocturia) were included.

Exclusion criteria

Patients with endometriosis, proven organ infection or other conditions known to cause chronic pelvic pain were excluded. Patients not suitable or not willing to undergo surgical pelvic reconstruction were also excluded.

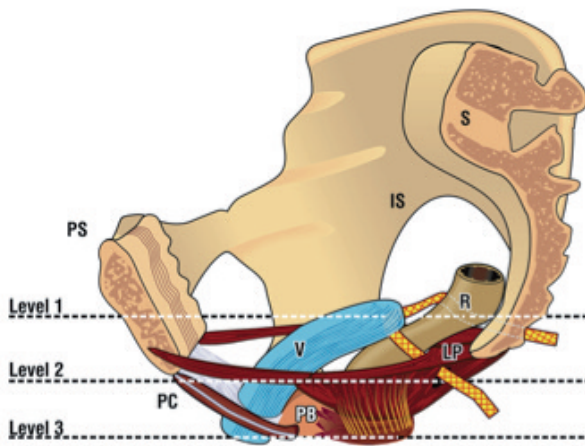


Figure 3. – Infracoccygeal sacropexy or “Posterior IVS”. The apex is suspended to the sacrospinous ligaments. PC=m. pubococcygeus; V=vagina; PB=perineal body; LP=m. levator plate; R=rectum; IS=ischial spine; PS=pubic symphysis; S=sacrum.

Symptoms were defined as follows:

- Pelvic pain; consistent with the 1996¹¹ and other descriptions¹⁻³.
- Nocturia was defined as by the ICS: two or more episodes of micturition per night^{1,3}.
- Urge incontinence: at least one episode per day of wetting prior to arrival at the toilet.
- Fecal incontinence (non sphincteric): Loss of either gas, liquid or solid feces more than once per week.

Intervention

All patients underwent a posterior sling operation, depending on the standard operation performed at the participating centre, an infracoccygeal sacropexy (posterior IVS)¹⁵⁻¹⁶ (Fig. 3), or a TFS sling operation of the cardinal and/ or uterosacral ligaments¹⁷ (Fig. 4).

Data acquisition

Between January 2007 and January 2012, eight pelvic floor centres with experience either in the infracoccygeal sacropexy or TFS sling techniques participated in this trial.

Follow-up and end point measurements

Outcome measures were assessed at the individual study level. At 12 months follow up a full assessment was made using the self-administered Integral Theory System Questionnaire¹³, as well as vaginal examination.

Criteria for a positive response

- Pain: Because of widely varying pain intensity, often from day to day, patients were asked to give a global self-assessed 80% improvement over the baseline symptom at the 12 month visit.
- Nocturia: Reduction from 2 or more episodes per night to one or none.
- Urge incontinence: Zero episodes of wetting prior to arrival at the toilet.
- Fecal incontinence: Zero episodes of soiling prior to arrival at the toilet.

Every centre used the Integral Theory System Questionnaire¹³, examination technique, intervention algorithm and either the infracoccygeal sacropexy with tapes attached to the sacrospinous ligament,¹⁵⁻¹⁶ or posterior TFS technique, with tapes directly applied to the cardinal/uterosacral ligaments¹⁷.

In patients who were subjected to infracoccygeal sacropexy, a special tunneller was inserted into the per-

ineum on both sides, through the ischiorectal fossa and was brought up medial to the ischial spine just below or through the sacrospinous ligament, attached to the cervix or vaginal apex and tightened, as previously described (Figure 3)¹⁵⁻¹⁶.

In patients who were subjected to TFS sling¹⁸, the cardinal and uterosacral ligaments (USL) were identified, incorporating a horizontal transvaginal incision approximately 3 to 4 cm in length. A channel was created through or adjacent to the ligaments to the pelvic skeleton, the applicator carrying the TFS tape was inserted into the channel, and the anchor released. The procedure was repeated on the contralateral side and the tape was tensioned in the midline until a resistance was felt. The excess tapes were trimmed and the vaginal mucosa closed in layers, figure 4.

Cystocele, rectocele and perineal body repairs were performed using native tissue or TFS as required.

Statistical analysis

Paired binary response data (per-patient presence/absence of a specific sign/symptom before vs. after surgery) in the total study cohort were analyzed with a McNemar’s test, with a null hypothesis of no treatment effect¹⁹.

The GraphPad Quickcalcs platform was used for this analysis (<http://graphpad.com/quickcalcs/mcNemar1/>). The sample size (https://www.statstodo.com/SSizMcNemar_Pgm.php) was deemed sufficient to assume a Chi-squared distribution. The Chi-square was calculated with one degree of freedom.

Post-hoc estimation of the study power was performed, assuming an alpha error equal to 0.01 (https://www.statstodo.com/SSizMcNemar_Pgm.php). In all cases the estimated power for this comparison exceeded 0.95 (table 1).

To evaluate differences between the proportions of patients showing or not a specific sign/symptom when treated with different surgical techniques (posterior intravaginal slingplasty vs. tissue fixation system), the Z-ratio and the 95% confidence interval for the difference between independent proportions were calculated²⁰.

The VassarStats platform was used for this analysis (www.vassarstats.net).

RESULTS

1420 patients presenting with pelvic floor dysfunction due to apical prolapse and amenable to pelvic floor recon-

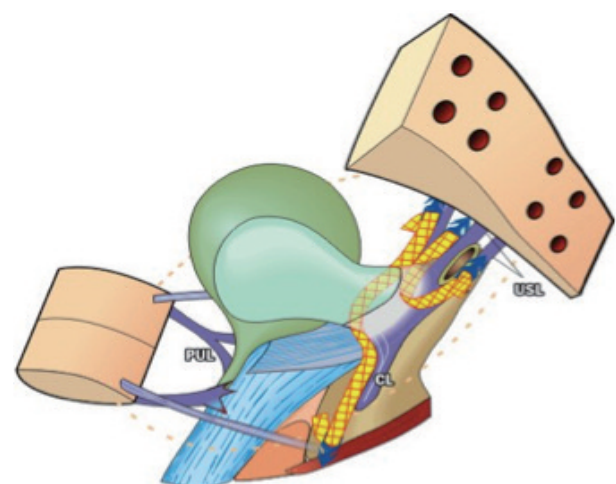


Figure 4. – Reconstruction of the cardinal and uterosacral ligaments with the TFS mini sling procedure. PUL=pubourethral ligament, CL= cardinal ligament; USL=uterosacral ligament

TABLE 1. Signs and symptoms (pelvic pain, nocturia, urge incontinence, frequency, faecal incontinence, apical prolapse) at baseline and after 12 months in patients operated by Infracoccygeal Sacropexy (PIVS) or Tissue Fixation System (TFS).

	Number of patients with symptom or condition/total patients (%)				Confidence interval of difference between proportions*		Probability (two-tailed)**	
	pre-PIVS	pre-TFS	post-PIVS	post-TFS	pre-PIVS vs pre-TFS	post-PIVS vs post-TFS	pre-PIVS vs pre-TFS	post-PIVS vs post-TFS
Pelvic pain	405/809 (50)	194/611 (31)	131/809 (16)	42/611 (7)	0.13 to 0.23	0.06 to 0.12	< 0.0001	< 0.0002
Nocturia	286/809 (35)	254/611 (41)	59/809 (13)	77/611 (7)	0.011 to 0.11	0.021 to 0.085	0.017	0.0008
Urge/ Urge incontinence	322/809 (40)	317/611 (52)	100/809 (12)	51/611 (8)	0.069 to 0.17	0.007 to 0.071	< 0.0002	0.015
Frequency	233/549 (42)	310/611 (51)	48/549 (9)	55/611 (9)	0.025 to 0.14	-0.03 to 0.035	0.0047	0.87
Faecal incontinence	69/324 (21)	93/532 (17)	17/324 (5)	34/532 (6)	-0.015 to 0.094	-0.023 to 0.042	0.167	0.49
Apical prolapse	809/809 (100)	611/611 (100)	56/809 (7)	63/611 (10)	-0.006 to 0.005	0.0047 to 0.064	//	0.022

*No continuity correction

**Z-test comparing PIVS vs TFS, before or after surgery (www.vassarstats.net)

structive surgery were consecutively included by the centres from January 2007 to January 2012, Table 1. Only data of patients presenting for a 12 months follow up are presented. Mean age was 64.62 ± 13.17 years (grand mean ± square-rooted pooled variance).

% cure/improvement at 12 months in the PIVS (TFS) cohort was as follows: pelvic pain 68 (78), nocturia 63 (83), urge incontinence 70 (85), frequency 79 (82), faecal incontinence 76 (65), apical prolapse 93 (90).

Due to the non-randomized design of this study, baseline symptoms – with the exception of faecal incontinence – were characterized by statistically significant imbalances between patients undergoing PIVS or TFS surgery.

In particular:

- pelvic pain was present at baseline in a higher fraction of PIVS-treated patients vs. TFS;
- nocturia was present in a higher fraction of TFS patients at baseline vs. PIVS;
- urge incontinence was present in a significantly higher fraction of TFS patients at baseline vs. PIVS;
- frequency was present in a higher fraction of TFS patients at baseline vs. PIVS.

Due to this baseline imbalance, the postsurgical results in the follow up after 12 months of the two different cohorts (patient undergoing PIVS and TFS, respectively) are evaluated separately and presented individually for each cohort (table 1).

DISCUSSION

This is the first large scale multicentre study to report on the improvement of chronic pelvic pain and other “Posterior Fornix Syndrome” symptoms by repair of prolapsed vaginal fornix. The data supports our hypothesis that damaged pelvic ligaments could be a potentially curable cause of chronic pelvic pain, bladder and bowel symptoms. The data from both cohorts indicates that if central hypersensitisation circuits had been activated in the pain, bladder and bowel domains, they were most probably secondary to peripheral (ligament) defects and not permanent, at least for the majority of our patients.

The native tissue method, figure 1, was initially effective, however cure rates had deteriorated by 12 months and rapidly thereafter¹¹. It was therefore replaced by sling techniques using alloplastic material. In 2008, Abendstein et al. expanded the scope of Posterior Fornix Syndrome symptom causation with their report of cure/improvement of Obstructive Defecation Syndrome (ODS), severe sacral

and abdominal CPP and non-sphincteric fecal incontinence with a posterior sling^{11,21-22}. Though apical support with sling techniques had previously successfully cured chronic pelvic pain and other posterior fornix symptoms^{15,18,21-25}, these studies were from single units, with small numbers. The strength of this study was the application of two different surgical methods with large numbers collected from multiple centers, giving greater statistical validity to its conclusions: loose posterior suspensory ligaments are most likely an important cause of chronic pelvic pain and other pelvic symptoms. A limitation of this study is the baseline imbalance between the two study cohorts, which is presumably due to the non-randomized design of the study. However both (PIVS and TFS) gave very significant cure/improvement rates for chronic pelvic symptoms. From an anatomical perspective, both PIVS and TFS techniques restore apical support, albeit differently^{16-17,23}.

Heinrich Martius stated that in about 30% of cases, backaches are provoked by damaged suspending or supporting ligaments of the pelvic organs²⁶⁻²⁷. He did however not associate CPP with other “Posterior Fornix Syndrome” symptoms such as urgency, nocturia, abnormal bladder emptying. Martius described two pathways for CPP, visceral and mechanical. The visceral pathway was transmitted from Frankenhauser’s plexus which is situated approximately 2cm lateral to the cervix. It lies at the distal end of the hypogastric plexus. These pains radiate mainly to the lumbosacral region, the anterior and lateral abdominal wall, the inguinal region and the thighs.

The second pathway involves stimulation of the sacral plexus pains. These pains radiate mainly to the lumbosacral region, characterized by low dragging abdominal pain or deep sacral backache. The pelvic pain addressed by this study, is consistent with both of these descriptions.

Other possible causal relationships to deficient apical support

It is possible that other pain conditions may have a similar etiology.

In a group of 408 patients, Butrick et al reported findings on 4 equal groups: Interstitial Cystitis, CPP, Vulvodynia/dyspareunia and “Other”. They found a high rate of complaints of voiding dysfunction, dyspareunia, pain, urgency, frequency²⁸. These are similar to the descriptions of the Posterior Fornix Syndrome⁹.

The question of loose USL as an etiological factor was tested in 10 patients with chronic extreme vulvodynia. Two ml of 2% lidocaine was injected transvaginally at the junction of USL to cervix. On retesting after 5 minutes, 8 pa-

tients reported complete disappearance of introital sensitivity and this was confirmed by two separate examiners. In the other two patients, direct testing confirmed that the allodynia (exaggerated sensitivity) had disappeared on one side, but remained on the other. Re-testing the patients at 30 minutes confirmed that the blocking effect on the pain had disappeared²⁹.

A similar test was made in 3 patients with CPP and symptoms of bladder pain syndrome. The abdominal, urethral, introital and cervical tenderness which were demonstrated objectively on pre-testing in all 3 patients, improved significantly shortly after the injection³⁰.

A simple office 'simulated operation' test, insertion of a 6x3x3cm pessary in the vaginal apex, normally used to determine apical cause of urgency³¹, or gentle insertion of the bottom part of a bivalve speculum into the posterior fornix often immediately improves the urge and pain symptoms³²⁻³³. All these observations suggest that central hypersensitisation may be secondary and the cause of the symptoms potentially reversible.

In summary, defective adequate apical support of the vagina seems to be an important cause for CPP and also, nocturia, urgency and non-sphincteric fecal incontinence.

These symptoms are potentially curable by reconstructing the apical ligamentous supports of the vagina.

Summary

Chronic Pelvic Pain, nocturia, urgency/ urge incontinence and/or non-sphincteric fecal incontinence can be improved by surgical reconstruction of the apical ligamentous supports of the vagina. Both surgical techniques evaluated in this study (Infracoccygeal sacropexy or Tissue Fixation System) achieved similar improvements.

CONFLICT OF INTEREST, FINANCIAL DISCLOSURES

All authors indicate that they have no conflict of interest regarding this publication.

REFERENCES

- Abrams P, Cardozo L, Fall M, Griffiths D, Rosier P, Ulmsten U, et al. The standardisation of terminology of lower urinary tract function: report from the Standardisation Sub-committee of the International Continence Society. *Am J Obstet Gynecol* 2002; 187 (1): 116-26.
- Fall M, Baranowski AP, Elneil S, Engeler D, Hughes J, Messelink EJ, et al. EAU guidelines on chronic pelvic pain. *Eur Urol* 2010; 57 (1): 35-48.
- Abrams P, Cardozo L, Fall M, Griffiths D, Rosier P, Ulmsten U, et al. The standardisation of terminology of lower urinary tract function: report from the Standardisation Sub-committee of the International Continence Society. *Neurourol Urodyn* 2002; 21 (2): 167-78.
- Breivik H, Collett B, Ventafridda V, Cohen R, Gallacher D. Survey of chronic pain in Europe: prevalence, impact on daily life, and treatment. *Eur J Pain* 2006; 10 (4): 287-333.
- Mathias SD, Kuppermann M, Liberman RF, Lipschutz RC, Steege JF. Chronic pelvic pain: prevalence, health-related quality of life, and economic correlates. *Obstet Gynecol* 1996; 87 (3): 321-7.
- Kairys AE, Schmidt-Wilcke T, Puiu T, Ichesco E, Labus JS, Martucci K, et al. Increased brain gray matter in the primary somatosensory cortex is associated with increased pain and mood disturbance in patients with interstitial cystitis/painful bladder syndrome. *J Urol* 2015; 193 (1): 131-7.
- Stones RW, Mountfield J. Interventions for treating chronic pelvic pain in women. *Cochrane Database Syst Rev* 2000 (4): CD000387.
- Zabihi N, Mourtzinos A, Maher MG, Raz S, Rodriguez LV. Short-term results of bilateral S2-S4 sacral neuromodulation for the treatment of refractory interstitial cystitis, painful bladder syndrome, and chronic pelvic pain. *Int Urogynecol J Pelvic Floor Dysfunct* 2008; 19 (4): 553-7.
- Petros P, Ulmsten, U. The posterior fornix syndrome: a multiple symptom complex of pelvic pain and abnormal urinary symptoms deriving from laxity in the posterior fornix. *Scandinavian Journal of Urology and Nephrology* 1993; 27 (Supplement 153 - PART IV): 89-93.
- Petros PE, Ulmsten U. Bladder instability in women: a premature activation of the micturition reflex. *Neurourol Urodyn* 1993; 12 (3): 235-9.
- Petros PP. Severe chronic pelvic pain in women may be caused by ligamentous laxity in the posterior fornix of the vagina. *Aust N Z J Obstet Gynaecol* 1996; 36 (3): 351-4.
- Petros PE. Pelvic pain in pregnancy may be caused by uterosacral ligament laxity and may be associated with nocturia, urgency and abnormal bladder emptying. *Acta Obstet Gynecol Scand* 2011; 90 (9): 1050; author reply 1051.
- Wagenlehner FM, Frohlich O, Bschleipfer T, Weidner W, Perletti G. The Integral Theory System Questionnaire: an anatomically directed questionnaire to determine pelvic floor dysfunctions in women. *World J Urol* 2014; 32 (3): 769-81.
- Baden WF, Walker TA. Genesis of the vaginal profile: a correlated classification of vaginal relaxation. *Clin Obstet Gynecol* 1972; 15 (4): 1048-54.
- Petros PE. New ambulatory surgical methods using an anatomical classification of urinary dysfunction improve stress, urge and abnormal emptying. *Int Urogynecol J Pelvic Floor Dysfunct* 1997; 8 (5): 270-7.
- Sivaslioglu AA, Ilhan TT, Aydogmus S, Uzun M, Dolen I. The comparison of the anatomical and symptomatic outcomes of sacrocolpopexy and posterior intravaginal slingoplasty. *Int Urogynecol J* 2011; 22 (11): 1363-8.
- Petros PE, Richardson PA. Tissue Fixation System posterior sling for repair of uterine/vault prolapse — a preliminary report. *Aust N Z J Obstet Gynaecol* 2005; 45 (5): 376-9.
- Petros PE, Richardson PA. Midurethral Tissue Fixation System sling — a 'micromethod' for cure of stress incontinence — preliminary report. *Aust N Z J Obstet Gynaecol* 2005; 45 (5): 372-5.
- Fagerland MW, Lydersen S, Laake P. Recommended tests and confidence intervals for paired binomial proportions. *Stat Med* 2014; 33 (16): 2850-75.
- Newcombe RG. Interval estimation for the difference between independent proportions: comparison of eleven methods. *Stat Med* 1998; 17 (8): 873-90.
- Abendstein B, Petros, P.E., Richardson, P.A. Ligamentous repair using the Tissue Fixation System confirms a causal link between damaged suspensory ligaments and urinary and fecal incontinence. *J. Pelviperineology* 2008; 27: 114-117.
- Abendstein B, Brugger, B.A., Furtschegger, A., Rieger, M., Petros, P.E. Role of the uterosacral ligaments in the causation of rectal intussusception, abnormal bowel emptying, and fecal incontinence—a prospective study. *J. Pelviperineology* 2008; 27: 118-121.
- Farnsworth BN. Posterior intravaginal slingplasty (infracoccygeal sacropexy) for severe posthysterectomy vaginal vault prolapse — a preliminary report on efficacy and safety. *Int Urogynecol J Pelvic Floor Dysfunct* 2002; 13 (1): 4-8.
- Goeschen K, Gent, H-J. Das posteriore Fornixsyndrom. *Frauenarzt* 2004; 45: 104-112.
- Sivaslioglu AA, Gelisen O, Dolen I, Dede H, Dilbaz S, Haberal A. Posterior sling (infracoccygeal sacropexy): an alternative procedure for vaginal vault prolapse. *Aust N Z J Obstet Gynaecol* 2005; 45 (2): 159-60.
- Martius H. Über einen häufigen gynäkologischen Symptomkomplex. *Archives of Gynecology and Obstetrics* 1938; 166: 332-335.
- Martius H. Geschlechtseigentümliche gynäkologische Schmerzen. In: Thieme, editor. *Lehrbuch der Gynäkologie*. Stuttgart 1946. p. 85-96.

28. Butrick CW, Sanford D, Hou Q, Mahnken JD. Chronic pelvic pain syndromes: clinical, urodynamic, and urothelial observations. *Int Urogynecol J Pelvic Floor Dysfunct* 2009; 20 (9): 1047-53.
29. Bornstein J, Zarfati D, Petros P. Re: Causation of vulvar vestibulitis. *Aust N Z J Obstet Gynaecol* 2005; 45 (6): 538-9.
30. Petros PE. Interstitial cystitis (painful bladder syndrome) may, in some cases, be a referred pain from the uterosacral ligaments. *Pelvipiperineology* 2010; 29: 56-59.
31. Petros P. Chapter 3, diagnosis. In: *The female pelvic floor. Function, dysfunction and management according to the integral theory*. Heidelberg Springer; 2010, p. 77-117.
32. Petros PE, Gunnemann, A. The role of vaginal apical support in the genesis of anterior rectal wall prolapse. *Techniques in Coloproctology* 2014; 18 (5): 517-518.
33. Wu Q, Luo, L., Petros, P.E. Case report: Mechanical support of the posterior fornix relieved urgency and suburethral tenderness. *Pelvipiperineology* 2013; 32: 55-56.

Correspondence to:

Florian Wagenlehner
Clinic for Urology
Justus-Liebig-University Giessen (Germany)
E-mail: wagenlehner@aol.com

Multidisciplinary Uro-Gyne-Procto Editorial Comment

To improve the integration among the three segments of the pelvic floor, some of the articles published in *Pelvipiperineology* are commented on by **Urologists, Gynecologists, Proctologists/Colo Rectal Surgeons or other Specialists**, with their critical opinion and a teaching purpose. Differences, similarities and possible relationships between the data presented and what is known in the three fields of competence are stressed, or the absence of any analogy is indicated. The discussion is not a peer review, it concerns concepts, ideas, theories, not the methodology of the presentation.

Uro... According to the Standardisation of Terminology in lower urinary tract function proposed on 2002 by the International Continence Society (ICS), Pelvic Pain Syndromes (PPSs) are all chronic in their nature. Pain is the major complaint but concomitant complaints are of lower urinary tract, bowel, sexual or gynaecological nature. Pelvic organ prolapse (POP) can occur in association with urinary incontinence and other lower urinary tract and pelvic dysfunction and it is difficult, if not impossible, to find cause and effect in that. The Integral Theory proposed by Petros, argues that laxity of the uterosacral ligaments and uterus supporting structures can lead to PPSs. Thus, restoring these supporting structures, could represent a therapeutic option for addressing pelvic pain. Both Infracoccygeal Sacropexy (PIVS) and posterior Tissue Fixation System (TFS), gave very significant cure/improvement rates for chronic pelvic pain symptoms in women with vaginal apical prolapse. Unfortunately there is a lack of scientific data from good quality published reports on this topic in the literature. Moreover, although this approach may be beneficial for this kind of patient, it can be largely dependent on the accurate identification of patients with pain, reproducible upon traction of the prolapsing structures. Because POP is typically not associated with pain primarily, patients should be well counselled on the possibility of persistence of pain despite surgical anatomic correction. On the other hand, it is not known whether or not the insertion of a polypropylene tape, could be complicated by the occurrence of pain in women without this complaint before surgery.

MARIA ANGELA CERRUTO
Urology OUI of Verona, Italy
mariaangela.cerruto@univr.it

Gyneco... This article emphasizes how ligamentous laxity is important in the onset of syndromes involving the three compartments front, middle and rear. In particular the weakening of the utero-sacral ligaments is responsible for pelvic pain and functional symptoms as well in bladder and rectal emptying, regardless of the degree of genital prolapse. Patients with lesser degrees of prolapse associated with these symptoms are usually recommended for rehabilitation or pharmacological therapy or to wait for a more severe anatomical defect in order to indicate surgery. The restoration of the apical vaginal support with the TFS sling represents a minimally invasive innovative approach allowing cure in symptomatic cases, which are not particularly severe from the anatomical point of view, thus expanding the surgical indications in case of chronic pelvic pain and bladder symptoms (hyperactivity and abnormal emptying). This multicenter study suggests that in the evolution of the clinical picture, early surgery might prevent chronicity of symptoms that probably occurs through the peripheral and subsequently central hypersensitivity. What remains unexplained is that there are patients with higher degree pelvic organs prolapse, and thus with ligaments definitely weak and inefficient in countering muscle action, that do not report symptoms except vaginal fullness.

LUISA MARCATO
Department Obstetrics Gynecology, Azienda Ospedaliera, Padova, Italy
marcato.luisa@sanita.padova.it

Procto... Pelvipiperineal chronic pain (PPCP) is often observed in a proctologic practice both in males and females, being simply named as proctalgia. Nevertheless it may affect other nearby organs, and it occurs with variable intensity, dysfunctions and emotional involvement. Nosography itself is imprecise and ill-defined in the various forms extending from the pubic bone (pubalgia) to the coccyx (coccydynia). The choice of therapy is difficult as well, being a real challenge for all specialists interested to the pelvic floor. A recent unpublished study (Pelvis Center, Padua, Italy) between 2015 and 2016 has selected 100 female patients with PPCP over a population of 812 women (12.3%), average age 49 (16 -82), mean NRS 4 (2-7), 48 in menopause (8 HRT), with the following localizations: vulva-vagina 90, dyspareunia 60 (sexually active 80), anus and rectum 48; 80 parous, average deliveries 1.7 (1-5). Patients claimed to be anxious in 56%, appearing actually anxious in 46%, admitted to be depressed in 12%, appearing depressed in 24%. The trigger points most frequently mentioned as painful were: vaginal vestibule (60), posterior fornix (35), anal canal (30), Douglas pouch (25), bladder (20), coccyx (12), pudendal nerve /ischial spine (10); in 19 women a descending perineum was observed. The main pathologic conditions in the anterior/central compartment were POP/2-4 Half Way System (14), urinary incontinence (12), hysterectomy (6), endometriosis (6), recurrent cystitis (1), interstitial cystitis (1); in the posterior compartment constipation (55), fecal incontinence (18), dyssynergia (10), rectal mucosal prolapse (32), rectal intussusception (20), low rectocele (14). At present only the Integral Theory (IT) helps us to interpret these cases in which there are no lesions evident at physical examination or imaging. The Integral Theory System offers as well a chance of surgical treatment after 'simulating' the proper operative procedure as follows: by insertion of the lower blade of a bivalve speculum to mechanically support the apex. If the pain improves, surgery to reinforce the posterior ligaments is indicated.

GIUSEPPE DODI
Colorectal surgeon, Padova, Italy
giuseppe.dodi@unipd.it