

# Is Chronic Pelvic Pain in the female surgically curable by uterosacral/cardinal ligament repair?

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**Abstract: Background.** Learned institutions do not consider symptoms of chronic pelvic pain (CPP) to be surgically curable. The Integral Theory hypothesizes that CPP where no obvious cause is evident, is mainly caused by loose suspensory ligaments; hence it is potentially curable surgically by repairing such ligaments. This type of CPP generally co-occurs with one or more symptoms of bladder and bowel dysfunctions which may occur with even minimal apical prolapse. **Objective.** To test this hypothesis by surgical repair of loose cardinal and uterosacral ligaments in patients who have 2nd degree or greater uterine or apical prolapse. **Material and methods.** This was a multicenter prospective case control audit comprising 614 women, mean age 70 years. **Inclusion criteria:** symptomatic apical prolapse (POPQ stages 2-4), plus OAB symptom(s). **Exclusion criteria:** Comorbid medical problems. **Surgery:** minimally invasive cardinal/uterosacral ligament repair was performed using the TFS (Tissue Fixation System) minisling. **Primary outcome** was uterine prolapse cure. **Secondary outcomes** were bladder, bowel, pain, symptom improvement. **Results.** Prolapse cure was noted in 90% of 614 patients. Symptom incidence and % cure at 12 months (in brackets) were as follows: chronic pelvic pain: n= 197 (79%); urge incontinence: n= 320 (86%); frequency: n= 313 (84%); nocturia: n=257 (69%); fecal incontinence: n= 93 (65%). Statistics:  $\chi^2$ -tests of McNemar to test for significance in symptom incidence-frequency from preoperative to postoperative phase. **Conclusions.** Chronic pelvic pain, bladder & bowel incontinence occur in predictable symptom groupings which are associated with apical prolapse. Application of the Integral Theory System has the potential to improve clinical practice, QoL for women and open new research directions.

**Key words:** Chronic pelvic pain; Urge; Nocturia; Fecal incontinence; TFS; Cardinal ligaments' Uterosacral ligaments.

## INTRODUCTION

The International Continence Society defines Chronic Pelvic Pain Syndrome (CPPS) as: "Genitourinary pain syndromes are all chronic in their nature. Pain is a major complaint but concomitant complaints are of lower urinary tract, bowel, sexual or gynecological in nature where there was no infection or other obvious pathology"<sup>1</sup>. Chronic pain is thought to be associated with changes in the central nervous system (CNS) which may maintain the perception of pain in the absence of acute injury. Such changes may magnify perception in that non painful stimuli are perceived as painful (allodynia); painful stimuli are perceived as more painful than expected (hyperalgesia)<sup>2</sup>.

Chronic pain of moderate to severe intensity occurs in 19% of adult Europeans<sup>3</sup>. The health costs of chronic pain to the community are significant: hundreds of millions of dollars p.a.. In addition, the reported time lost from paid work was 15% with 45% reduced work productivity<sup>4</sup>.

The pathogenesis of chronic pelvic pain is still not well understood. It is hypothesized that there is both peripheral and central hypersensitization<sup>2</sup>. Peripheral hypersensitization describes augmented sensory pain input from the peripheral nervous system. Central hypersensitization describes a predisposition to dysfunctional central regulation of the sensory input<sup>5</sup>. In parallel, there are accompanying symptoms, for example, urinary symptoms or frequently, psycho-social symptoms.

The main treatments at present available include counseling, psychotherapy, physical therapy, medications, psychosomatic therapy laparoscopic uterine nerve ablation, presacral neurectomy, hysterectomy (with or without removal

of the ovaries<sup>6</sup> and more recently, neuromodulation, which reported 40% improvement in pain symptoms and 26% improvement in urinary symptoms at 15 months mean follow-up<sup>7</sup>.

As described in the 1993 publication of the Integral Theory<sup>8</sup>, chronic pelvic pain is linked to a specific symptom complex known as the "posterior fornix syndrome", caused by lax apical support. The "posterior fornix syndrome" variously encompasses chronic pelvic pain and bladder symptoms of urgency, abnormal emptying, nocturia<sup>8</sup>. Such patients rarely present with single symptoms. They occur in predictable groupings. Significant cure of these symptoms was achieved by plication of the uterosacral ligaments, fig1. A classical detailed description of the pain was described in 1996<sup>9</sup>. Initially, an 85% cure rate was reported at 3 month following approximation of the uterosacral ligaments (USL). The etiology of USL laxity is generally attributed to age or birth related collagen damage, or hormone induced depolymerization during pregnancy<sup>10</sup>.

Our primary aim was to investigate whether lax apical support (uterosacral and cardinal ligaments) was a causative factor in chronic pelvic pain by prospectively evaluating their fate. We also hypothesized that peripheral hypersensitisation of the chronic pelvic pain circuit might be potentially reversible by treating the underlying causes, if no central hypersensitisation circuits have been activated.

A secondary aim was to compare the efficacy of the TFS operation as cure of other posterior fornix syndrome symptoms such as urinary urgency, frequency, nocturia, faecal incontinence and anatomical restoration of apical/uterine prolapse.

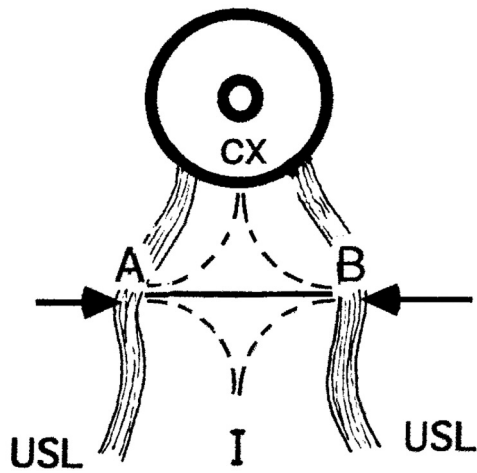


Figure 1. – Approximation of uterosacral ligaments (USL) (9). A 5cm long transverse incision is made in the posterior fornix 3-4 cm below the cervix (A-B). The loose USLs are approximated (arrows) with strong sutures. Reprinted by permission ANZJOG.

PATIENTS AND METHODS

Six tertiary referral pelvic floor centres participated in the study between January 2009 to January 2012. All patients

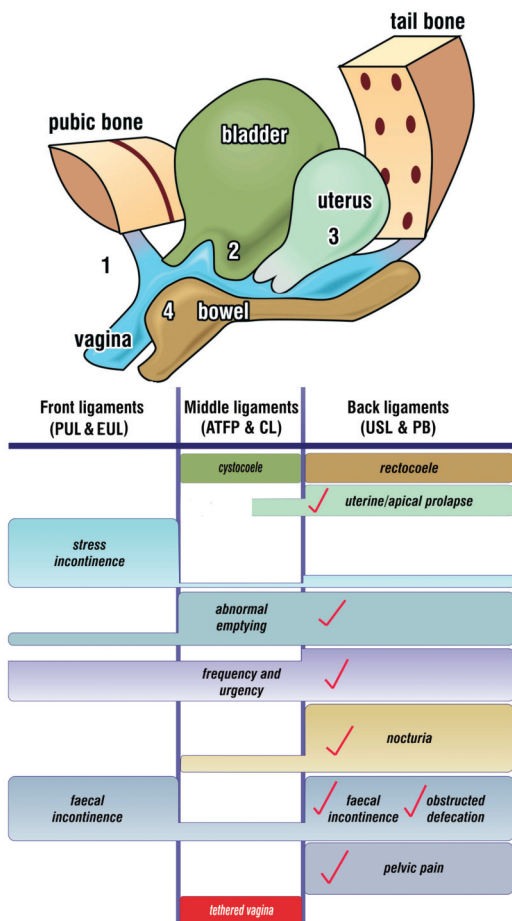


Figure 2. – Simplified diagnostic algorithm relates symptoms and prolapses to damaged ligaments in the front, middle, and back parts of the vagina. PUL-pubourethral ligament; EUL-extraurethral ligament; ATFP = arcus tendineus fasciae pelvis; CL = cardinal ligament; USL = uterosacral ligament; PB = perineal body. Patients rarely present with single symptoms of single ligament loss. The height of the bar indicates presumed prevalence of a symptom caused by the respective anatomical region.

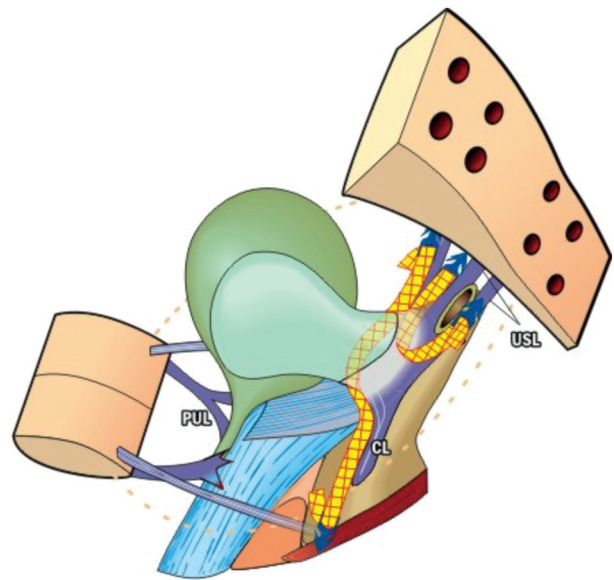


Figure 3. – The cardinal (CL) and uterosacral (USL) ligaments were reconstructed with the TFS mini sling procedure.

completed the validated self-administered ITSQ pelvic symptom questionnaire<sup>11</sup>. The symptom replies were transferred to a pictorial algorithm, figure 2, which guided diagnosis and surgery of ligament damage, figure 3. Vaginal examination confirmed specific ligament damage and degree of prolapse.

*Inclusion criteria:* consecutive patients with symptomatic apical prolapse of 2<sup>nd</sup> or greater degree, (POPQ stages 2-4), and at least two pelvic symptoms:

- *Fecal incontinence* (non sphincteric): Loss of either gas, liquid or solid feces more than once per week<sup>11</sup>.
- *Pelvic pain* symptoms consistent with ICS descriptions<sup>1</sup>.
- *Frequency* Emptying the bladder >8 times/day<sup>1</sup>.
- *Nocturia:* two or more episodes of waking to micturate at night<sup>1</sup>.
- *Urge incontinence:* at least one episode per day of wetting prior to arrival at the toilet<sup>1</sup>.

*Exclusion criteria*

Known causes of fecal incontinence such as external anal sphincter damage; endometriosis; neurological diseases such as multiple sclerosis, proven organ infection, carcinoma or other conditions known to cause pain, bladder or bowel symptoms.

*Intervention*

All 614 patients underwent a cardinal/ uterosacral sling operation (TFS), figure 2.

*Follow-up and end point measurements*

At 12 months follow up, a full assessment was made using the self-administered ITSQ questionnaire<sup>11</sup>, as well as vaginal examination.

*Criteria for a positive response*

- Fecal incontinence:* Zero episodes of soiling.
- Chronic pelvic pain:* A self-assessed 80% improvement over the baseline symptom at the 12 month visit. “On the whole, how much improvement do you experience now compared to your pre-operative symptoms?” We chose this criterion because of concerns that VAS could mislead because of day to day symptom variation.

**Frequency** Eight or less times per day.

**Nocturia:** Reduction from 2 or more episodes per night to one or nil.

**Urge incontinence:** Zero episodes of wetting prior to arrival at the toilet.

**Abnormal emptying:** Self-assessed 80% improvement. The patient was asked to determine, "On the whole, how much improvement do you experience now compared to your pre-operative symptoms"?

**Criteria for anatomical failure** Organ prolapse at POPQ stage 2 or beyond.

**Surgery**

**Cardinal (CL) and uterosacral (USL) TFS sling<sup>12</sup>.** A transverse incision 5cm wide was made 1cm above the cervix or hysterectomy scar to access the CLs and 3-4 cm below the cervix to access the USLs. Bladder and enterocele were dissected clear. The cardinal and uterosacral ligaments were identified. A channel was created through the ligaments, the TFS applicator was inserted into the channel and the anchor released. The procedure was repeated on the contralateral side; the tape was tightened until a resistance was felt.

TFS slings for urinary stress incontinence, cystocele, rectocele and perineal body repairs were performed as required, taking care to avoid any excision of vagina.

**Statistical analysis**

We applied  $\chi^2$ -tests of McNemar to test for significance changes in the symptom incidence-frequency from baseline (preoperative) to postoperative phase. For each symptom the null hypothesis  $H_0: P_{(baseline)} = P_{(12\text{ months after surgery})}$  versus  $H_1: P_{(baseline)} \neq P_{(12\text{ months after surgery})}$  was tested, with P indicating prevalence or incidence rate. An  $\alpha = 0.05$  was accepted as nominal level of significance. Because of multiple testing the p-values of the tests were compared to a Bonferroni corrected  $\alpha$  (say  $\alpha^*$ ) for keeping the type I error less or equal 0.05.

All patients signed informed consent and the principles of the Helsinki Declaration were followed.

**RESULTS**

614 patients with apical prolapse and concurrent symptoms were assessed with 12 month follow up presented. Mean age:  $69.62 \pm 13.17$  years. Prolapse: 2<sup>nd</sup> degree POPQ (n = 210) and 3<sup>rd</sup> /4<sup>th</sup> degree POPQ (n=394). Associated

TABLE 1. Symptoms and apical prolapse at baseline and after 12 months in patients operated by the Tissue Fixation System (TFS). \*\* indicate statistical significance at a Bonferroni corrected level of significance  $\alpha^*$  ( $\alpha^* = 0.05/6 \approx 0.01$ )

	Number of patients with symptom or condition/total patients (%)		significance of the $\chi^2$ values of the McNemar tests when testing: H0 vs. H1
	pre-TFS	post-TFS	
Pelvic pain	197/614 (32%)	42/614 (7%)	*
Nocturia	257/614 (42%)	77/614 (12%)	*
Urge/ Urge incontinence	320/614 (52%)	51/614 (8%)	*
Frequency	313/614 (51%)	55/614 (9%)	*
Fecal incontinence	93/532 (17%)	34/532 (6%)	*
Apical prolapse	614/614 (100%)	63/614 (10%)	*

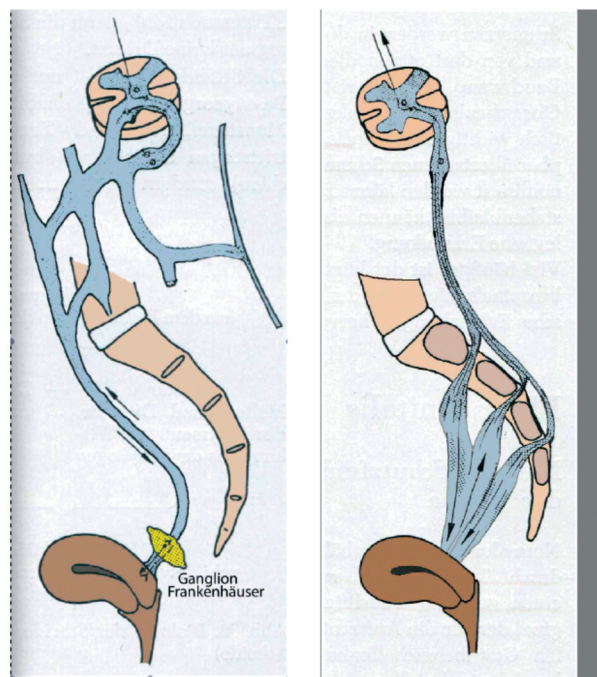


Figure 4. – The visceral pelvic pain pathway. The 1<sup>st</sup> pathway is transmitted from Frankenhauser’s plexus (left) which is situated approximately 2cm lateral to the cervix. It lies at the distal end of the hypogastric plexus. The 2<sup>nd</sup> pathway involves the sacral plexus pains.

symptoms: 93 (15%) had faecal incontinence; 197 (33%) pelvic pain; 257 (42%) nocturia; 320 (53%) urinary urge incontinence; 313 (52%) frequency, Table 1. Applying McNemar tests we obtained for each considered symptom p-values being all less than  $\alpha^*$ , where  $\alpha^*$  a Bonferroni corrected level of significance (table).

**Operative and peri-operative details**

The mean operation time varied between 12.5 and 23 minutes per TFS tape insertion. Mean blood loss per surgery was 21gm. The post-operative pain was minimal. This allowed early discharge from hospital. The mean discharge time from hospital was less than 24 hours (0.4-3 days). The mean return to reasonably normal activities was 2.2 days (1-28). Post-operative urinary retention beyond 24 hours occurred in 5 patients: two for 48 hours, one for 4 days and one for 2 weeks.

**Complications.** There was one rectal mucosal buttonhole injury sustained at initial dissection. It was treated successfully with primary repair. There was one rectal serosal penetration with the prosthesis. It was recognized and removed immediately and successfully without sequelae. Both patients were scarred from previous multiple perineal and posterior compartment surgeries. There were three hematomas which required re-admission to hospital, but these all settled without further surgery. No transfusion was required. Tape erosion at 12 months varied between centres, from minimum 0% to maximum 3%. There was a 40% association of tape erosion with failed surgery. All erosions were trimmed in the outpatient clinic. None required surgical intervention.

**At 12 months following TFS surgery.** Anatomical recurrence of vaginal prolapse: 63/614 (10%) after 12 months. All symptoms improved (% Cure at 12 months in brackets): chronic pelvic pain: n = 197 (79%); urge incontinence: n = 320 (86%); frequency: n = 313 (84%); nocturia: n = 257 (69%); (77%); fecal incontinence: n = 93 (65%). Statistics:  $\chi^2$ -tests of McNemar to test for significance in symptom.

## DISCUSSION

This study is a natural evolution of the 1993 publication of the "Posterior Fornix Syndrome"<sup>8</sup>. In that study, symptoms of urinary urge incontinence, nocturia, pain were cured or improved by surgical repair of the uterosacral ligaments.

The native tissue repair method, figure 1, was initially effective for chronic pelvic pain. The cure rate had deteriorated by 12 months and rapidly thereafter<sup>13</sup>. The failed patients required ligament reinforcement with thin strips of alloplastic material applied exactly along the line of the USLs<sup>14</sup>. Though apical support with sling techniques had previously successfully cured chronic pelvic pain and other posterior fornix symptoms<sup>14-20</sup>, these studies were from single units, with mainly small numbers. The strength of this study derived from much larger numbers from multiple centres, giving greater statistical validity to its conclusions: loose posterior suspensory ligaments are most likely an important cause of chronic pelvic pain and other posterior fornix symptoms such as urgency, nocturia, frequency.

Heinrich Martius described two pathways for CPP, visceral and mechanical<sup>23,24</sup>, figure 4. The pain originating from 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. The second pathway originates from stimulation of the sacral plexus. These pains radiate mainly to the lumbosacral region, the anterior and lateral abdominal wall, the inguinal region and the thighs.

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. According to the Theory, loose USLs fail to support the Frankenhauser and Sacral plexuses and these can fire off whenever tension is applied, either by gravity, intraabdominal contents, or during intercourse ('contact dyspareunia').

### *Peripheral and central hypersensitization<sup>2,5</sup>*

Our results do not support these hypotheses. Cure, when it occurred, was almost invariably immediate, usually by the following day.

### *Cure of co-occurring bladder and bowel symptoms*

Our results confirm that CPP co-occurs with bladder and bowel symptoms and these are usually, but not always, cured at the same time as cure of CPP.

### *Pre-operative confirmation of USL as a cause of CPP*

We discuss two office tests which help predict results of surgery.

*The Bornstein test* (see article this issue) is a definitive test for determining whether CPP may be caused by lax USLs. The question of loose USL as an etiological factor was tested in 10 patients with chronic extreme vulvodynia in 2005<sup>23</sup>. Two ml of 2% lidocaine was injected transvaginally at the junction of USL to cervix. On retesting after 5 minutes, 8 patients 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 disappeared<sup>23</sup>.

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 pre-test in all 3 patients disappeared en-

tirely, or were substantially improved, within 5 minutes of the injection<sup>24</sup>.

*The speculum test* In 2013, a simple office 'simulated operation' test normally used to determine apical cause of urgency<sup>25</sup>, gentle insertion of the bottom part of a bivalve speculum into the posterior fornix of vagina was applied to a patient with feelings of urgency, lower abdominal pain and extreme tenderness in the suburethral area of the vagina<sup>26</sup>. The urge and pain symptoms were immediately alleviated<sup>26</sup>. This test has since been repeated subsequently on patients with CPP including severe low sacral backache with (anecdotally) similar results.

## CONCLUSIONS

The study shows that chronic pelvic pain co-occurs with symptoms of bladder and bowel dysfunction. This is an important diagnostic point. Symptoms of isolated pelvic pain, with no symptoms of bladder and bowel dysfunction very rarely are associated with USL laxity. Along with CPP, very significant cure /improvement was noted in bladder symptoms such as nocturia, frequency, urgency and non-sphincteric fecal incontinence by reinforcing the apical ligamentous supports of the vagina with the TFS minisling.

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*Conflicts* none

*Contributions* All the authors contributed to data, collection, ordering, interpretation, and writing. AY performed the statistical analysis.

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## Commentary

Chronic pelvic pain can have multiple causes and is a complex and challenging clinical dilemma for evaluation and management. It can be a symptom of another disease, or a condition by its own right. In many cases it's not possible to identify a single cause for chronic pelvic pain. In those cases the goal of treatment is to reduce pain and other symptoms and improve the patients' quality of life.

The International Continence Society defines Chronic Pelvic Pain Syndrome (CPPS) as: "*Genitourinary pain syndromes that are all chronic in their nature. Pain is a major complaint but concomitant complaints are of lower urinary tract, bowel, sexual or gynecological in nature where there was no infection or other obvious pathology*".

The theory hypothesized by the authors is that CPP where no obvious cause is evident, might be caused by loose \ stretched main suspensory pelvic ligaments with the concurrence of Pelvic Organ Prolapse (POP) of at least POPQ stage 2 and is hence potentially curable surgically by repairing such ligaments. This type of CPP generally co-occurs with one or more symptoms of bladder and bowel dysfunctions which may occur with even minimal apical prolapse.

The researchers method for alleviating CPP in this clinical circumstance was to perform a surgical correction of the loose cardinal and uterosacral ligaments in those women who suffer from CPP symptoms concomitant with at least stage 2 POP apical defect and have at least two other pelvic symptoms of the lower urinary and lower gastrointestinal tract as mentioned in their inclusion criteria.

The surgical technique used was applying a minimally invasive TFS (Tissue Fixation System) minisling with the primary outcome being uterine prolapse repair and secondary outcomes of improving pain, bladder and bowel symptoms.

In this series 33% (197 of 614) of the women having at least stage 2 POP had symptoms of chronic pelvic pain in addition to their prolapse, bowel and urinary symptoms and the authors describe a possible mechanism for pain relive in those women when they achieved an anatomical and support reconstruction with good improvement rates and acceptable complication rates.

This group of women represents a unique type of women from the spectrum of CPP associated with pelvic organ prolapse and functional lower urinary and bowel symptoms. In this particular group of patients one can expect improvement of the pain symptoms.

From the results here it can be concluded that pelvic surgeons performing POP repairs should pay more attention to pain symptoms which are occasionally underestimated on clinical evaluation prior to surgery in view of significant prolapse degree and its associated spectrum of symptoms.

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