

# The Integral Theory System.

## A simplified clinical approach with illustrative case histories

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**Abstract:** *The integral theory:* states that prolapse and pelvic floor symptoms such as urinary stress, urge, abnormal bowel and bladder emptying, and some forms of pelvic pain, mainly arise, for different reasons, from laxity in the vagina or its supporting ligaments, a result of altered connective tissue. *Normal Function:* The organs are suspended by ligaments against which muscles contract to open or close the outlet tubes, urethra and anus. These ligaments fall naturally into a 3 zone classification, anterior, middle, and posterior.

*Dysfunction:* Damaged ligaments weaken the force of muscle contraction, causing prolapse and abnormal bladder and bowel symptoms

*Diagnosis:* A pictorial diagnostic algorithm relates specific symptoms to damaged ligaments in each zone.

*Treatment:* In mild cases, new pelvic floor muscle exercises based on a squatting principle strengthen the natural closure muscles and their ligamentous insertions, thereby improving the symptoms predicted by the Theory. With more severe cases, polypropylene tapes applied through “keyhole” incision using special instruments reinforce the damaged ligaments, restoring structure and function.

*Problems which can be potentially addressed by application of the Integral System:* Urinary stress incontinence; Urinary urge incontinence; Abnormal bladder emptying; Faecal incontinence and “obstructed evacuation” (“constipation”); Pelvic pain, and some types of vulvodynia and interstitial cystitis; Organ prolapse.

**Key words:** Integral Theory; diagnosis; minisling; ligaments; connective tissue; pictorial algorithm.

### INTRODUCTION

*The Integral Theory* states that prolapse and most pelvic floor symptoms such as urinary stress, urge, abnormal bowel and bladder emptying, and some forms of pelvic pain, mainly arise, for different reasons, from laxity in the vagina or its supporting ligaments, a result of altered connective tissue.<sup>1-5</sup> Birth related laxity, fig. 1, compounded by ageing, are the principal causes of ligament laxity.

The Integral Theory has evolved into the Integral Theory System, which applies the damaged ligament theory to

- *Function* – the role of competent suspensory ligaments in organ support and function.
- *Dysfunction*-how damaged ligaments upset the musculoelastic control mechanism to cause prolapse and abnormal bowel and bladder symptoms.
- *Diagnosis*- how to diagnose which damaged ligaments are causing which prolapse and which symptoms.
- *Treatment* - in mild cases, new pelvic floor muscle exercises based on a squatting principle strengthen the natural closure muscles and their ligamentous insertions. With more severe cases, polypropylene tapes applied through “keyhole” incision using special instruments, reinforce the damaged ligaments, restoring structure and function.

### PART 1

#### THE DYNAMIC ANATOMY OF NORMAL FUNCTION

##### *Bladder, bowel and uterus*

Fig. 2 is a schematic view of the bladder, bowel and uterus with the woman in a sitting position. The organs are storage containers. The bladder stores urine, the uterus the foetus, and the rectum faeces. Each organ is connected to the outside by a tube, the urethra, which is about 4cm long, vagina, which is 10-12cm long, and the anus, about 4 cm long. The menstrual blood and foetus pass through the vagina. Urine and faeces pass through the urethra and anus. Muscles compress these tubes to close them, and stretch them open for emptying.

##### *The importance of suspensory ligaments*

“Problems of bladder, bowel, prolapse, and some types of pelvic pain, mainly originate from the vaginal ligaments, not from the organs themselves”- *Integral Theory* 1996.

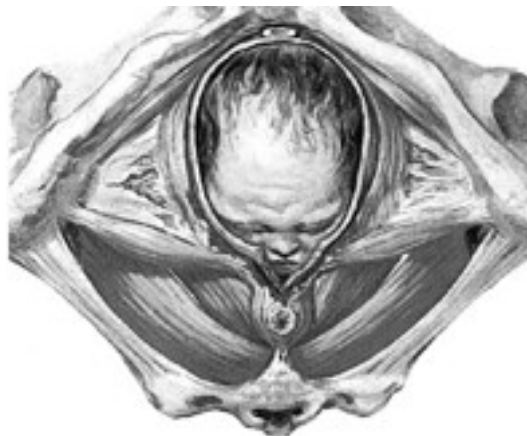


Fig. 1 - Birth-related laxity The diagram shows the baby’s head severely stretching ligaments and other tissues in and outside the vagina. This may cause various degrees of looseness, prolapse of the bladder and bowel, and urine and bowel incontinence. Fundamental to any surgical treatment is the approximation of laterally displaced tissues, and the strengthening of damaged suspensory ligament(s).

The bladder sits on top of the vagina, and is partly attached to it. Muscles pull against the ligaments to close or open the urethra. Therefore loose ligaments may weaken the muscle contraction to cause problems with closure (incontinence)

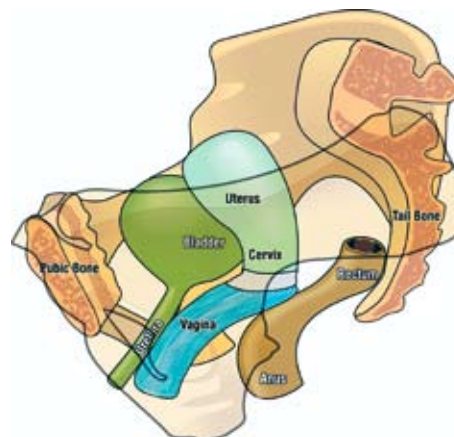


Fig. 2 - The organs and their outlet tubes.

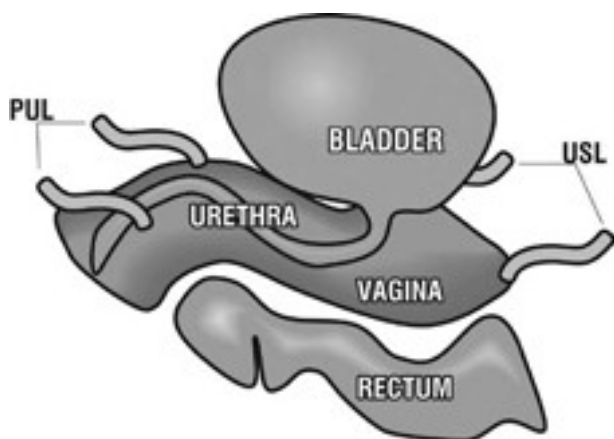


Fig. 3 - Unsuspended ligaments have no shape, strength or function.

or opening (evacuation of urine). Figure 3 indicates what the vagina, bladder, and bowel would look like with no ligaments to suspend them, a blob of tissue, with no form, no structure, no strength, and no function.

A ligament is like a thick cord in a suspension bridge, fig. 4. In fact, the vagina is suspended exactly like a suspension bridge, with the ligaments above, and the muscles (arrows) below. The muscle forces (arrows) contract against the suspensory ligaments to give the bridge form and strength.

The organs, fig. 5, are suspended from above by the vaginal ligaments - exactly like a suspension bridge. All the ligaments are attached to the vagina and/or uterus. The vagina supports the bladder situated above it, and the rectum situated below it, so anything which damages the vaginal structure can also affect the bladder and rectum.

Separating the lower end of the vagina from the rectum is a solid mass of tissue, the perineal body (PB) complex which is about 4 cm long. If this is damaged, the rectum may bulge forwards into the vagina as a rectocele.

*The uterus is an anchoring point for the ligaments - it needs to be preserved where possible*

The role of the uterus in maintaining the structure, fig. 6, and function of the pelvic floor is greatly underestimated. Some doctors routinely recommend removal of the uterus during surgery for prolapse. It is preferable to retain the uterus wherever possible, as many important ligaments are attached to it. During the menopause, the ovaries cease production of oestrogen. Since oestrogen is essential for maintaining the strength of the ligaments, the detrimental effects of hysterectomy on prolapse and incontinence become especially evident after the menopause. Hysterectomy reduces the blood supply to the cardinal and uterosacral ligaments, weakening them further. All these factors



Fig. 4 - The vagina is suspended from above, like a suspension bridge, with the ligaments above, and the muscles (arrows) below. PS=pubic symphysis; S=sacrum; PUL=pubourethral ligament; ATFP=arcus tendineus fascia pelvis; USL=uterosacral ligament.

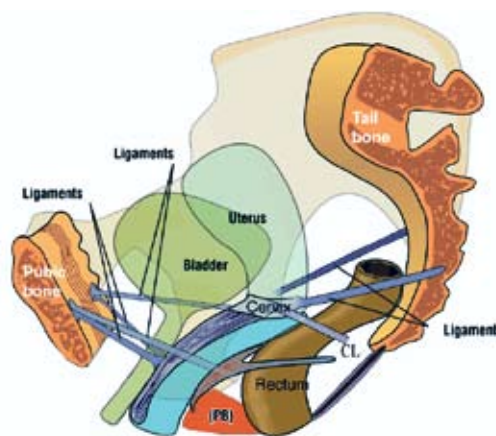


Fig. 5 - Four ligaments suspend the organs from above like a suspension bridge. The perineal body (PB) supports the organs from below. CL=cardinal ligament.

predispose to prolapse, and development of posterior zone symptoms.<sup>6</sup>

*The pelvic muscles* (dark red), fig.7, have a dual function, organ support, and opening and opening and closure of urethra and anorectum. They extend from the coccyx to the pubic bone, and contract to support the vagina, bladder and bowel from below. The red arrows indicate the directions where the muscles contract, backwards to open these organs, forwards to close them.

*An external striated muscle opening and closure mechanism, fig 8,<sup>7&8, 9-17</sup>*

Put simplistically, when the muscles pull backwards (blue arrows), the urethra and anus are pulled open, vastly decreasing intracavity resistance to the 4<sup>th</sup> power, so that the woman can quickly and easily evacuate her urine and faeces; when the muscles pull forwards\* (black arrows), the urethra and anus are closed by a vast increase in resistance to the 4<sup>th</sup> power. Normally all the organs, even the vagina, are kept in the closed position by slow-twitch muscle contraction.

\* The closure mechanism is a little more complex than that depicted in fig. 8, involving a distal and proximal mechanism for closure of the urethral and anal tubes.<sup>7-10</sup>

*How damaged ligaments may cause incontinence or emptying disorders.* We saw from the suspension bridge diagram, that the muscles pull against the ligaments.

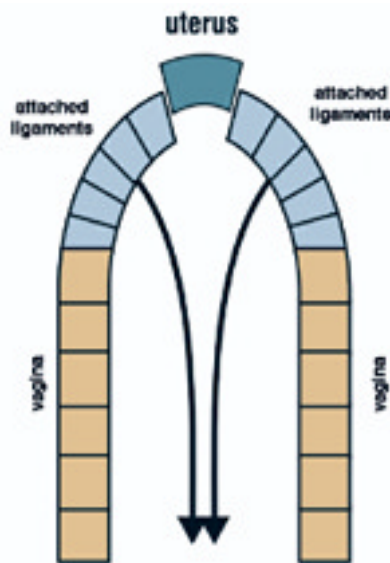


Fig. 6 - The uterus functions like the keystone of an arch. Remove the arch, and the whole structure is put at risk of a downward collapse.

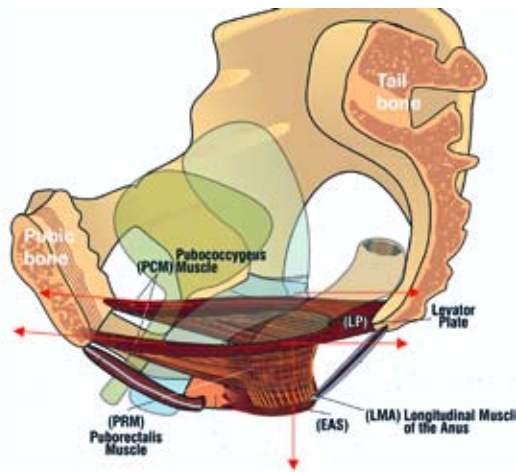


Fig. 7 - The muscles support the organs, vagina, bladder, and bowel from below, and also, open and close them by 3 external directional muscle forces (arrows).

So if the suspensory ligaments are loose, the muscle strength weakens, and may not be able to keep the bladder or bowel emptying tubes closed. As a consequence of this, a patient may feel a leakage of urine, wind or faeces, “incontinence”. Another related condition is failure to close the vaginal tube, so water may enter the vagina during swimming, or complain of vaginal flatus. If the damaged ligaments do not allow the muscles to open these same emptying tubes, a patient may have to strain to empty her bladder or bowel, “evacuation disorder” or “emptying disorder”.

*A Symphony Orchestra*

The vagina, bladder, bowel, muscles, and ligaments, fig. 9, are like instruments in an orchestra\*. The brain is the conductor, and ensures that all the instruments work harmoniously to produce the right music. Every instrument in the orchestra has a specific task. Damage to even one instrument will affect the performance. The brain directs the orchestra to open the bladder (and bowel) or to close it. Depending on what structure is damaged, the bladder may not be able to close properly, and the patient leaks (“incontinence”); or she may not be able empty her bladder, or she may have both problems. Nerves at the base of the bladder (‘N’ in the diagram which follows) sense when the

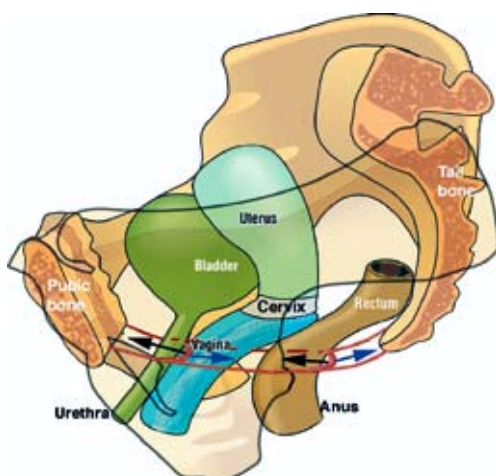


Fig. 8 - An external striated muscle opening and closure mechanism. The red lines represent the pelvic muscles. Fibromuscular extensions from these muscle fibres loop around the urethra and anorectum to activate closure and opening.

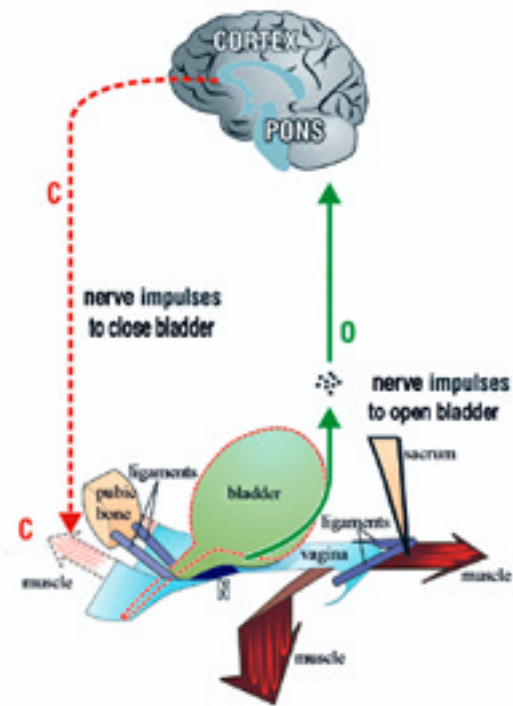


Fig. 9 - The cortex of the brain gives directions for closure (C), and opening (O). Nerves “N”, at the base of the bladder sense when the bladder is full, and send impulses to the brain. Depending on the situation, the brain sends directions either for closure (C), or opening (O). Like instructions from the orchestra conductor, these directions, “C” and “O”, engage all the muscles, nerves, ligaments and tissues required for each function. The Pons, a lower part of the brain, works as a co-ordinating station.

bladder is full, and send impulses to the brain. These are perceived as urgency, a desire to go to the toilet.

\* I am grateful to Dr Alfons Gunnemann for the orchestra analogy

*The brain and its nerves- a sophisticated feedback system*

The brain works like the computer at a big telephone exchange. Think of the nerves as telephone wires going out to the bladder, the vagina and bowel. These organs have sensors which send signals posterior to the brain via another set of nerves, to inform it as to what is happening. The brain receives and processes these signals, and depending on what is required, sends out orders via a series of nerves. Most of this co-ordination occurs in “automatic mode”. The patient is not aware of what is happening. Sometimes, a patient may actually instruct the brain. For example, if it is inconvenient to empty the bladder or bowel, the muscles can be pulled upwards to close off the urethral and anal tubes. Pushing down assist emptying the urine and faeces. During intercourse the vagina can be narrowed by pulling the muscles upwards. This action grips the penis, and increases the sensation for both partners.

**PART 2**

**DYSFUNCTION - THE ROLE OF LAX LIGAMENTS IN THE CAUSATION OF SYMPTOMS AND PROLAPSE**

*The structure of ligaments*

A ligament is a complicated contractile structure which needs to be both elastic and strong, and have the ability to contract or relax according to whether the urethra and anus are being closed or opened. It relies on its collagen content for strength, elastin for flexibility, smooth muscle for contractility, and nerves to co-ordinate all these functions.

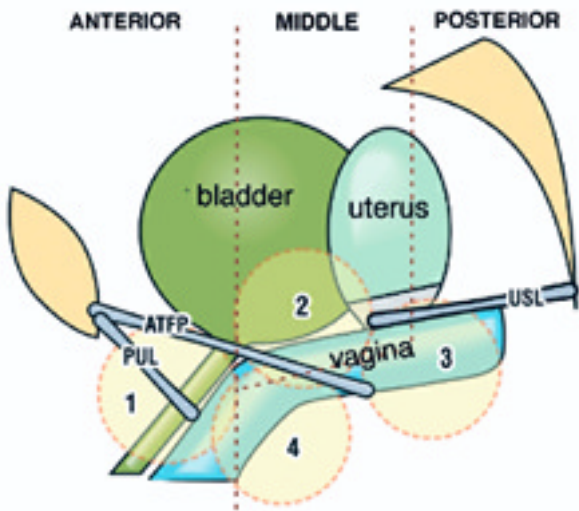


Fig. 10 - The baby's head (circles) may damage the ligaments and vaginal tissues to varying degrees as it descends through the vagina to cause stress incontinence '1', cystocele '2', uterine/apical prolapse '3', and rectocele '4'. PUL=pubourethral ligament; ATFP=arcus tendineus fascia pelvis; USL=uterosacral ligament. Not shown are cardinal ligament (Middle Zone) and Perineal Body (Posterior zone).

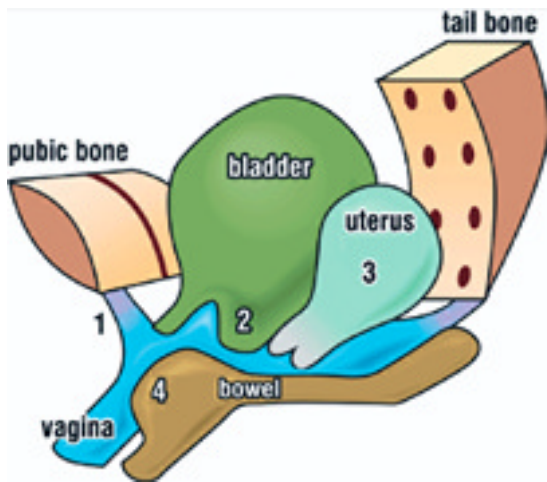


Fig. 11 - This diagram illustrates the cystocele "2", rectocele "4" and uterus "3", all pushing into the vagina, as "lumps", like a glove turning inside out. All are caused by looseness in the suspensory ligaments and their associated tissues.



Fig. 12 - A cystocele bulging out of the vaginal entrance during straining.

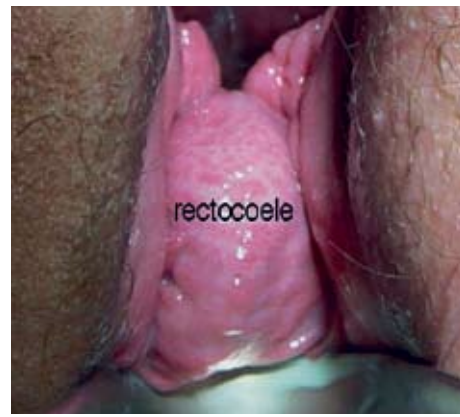


Fig. 13 - A rectocele bulging out of the vagina during straining.



Fig. 14 - A uterus chronically bulging out of the vagina. The white areas are caused by chronic friction.

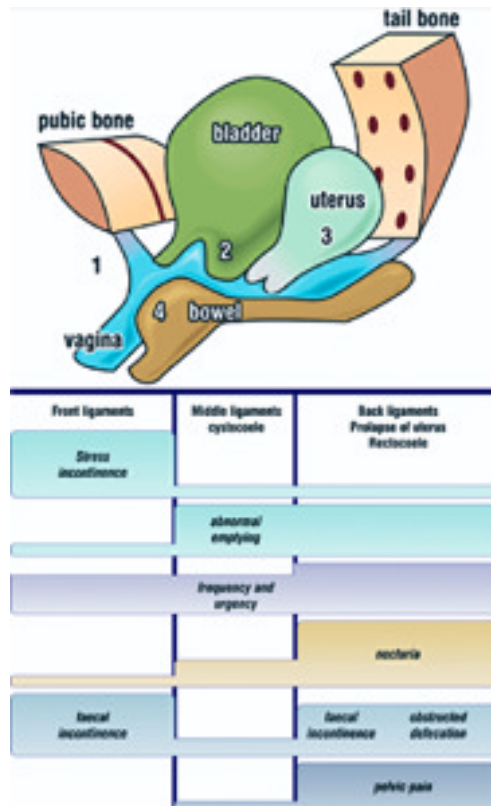


Fig. 15 - Pictorial Diagnostic Algorithm. The anterior (pubourethral) and posterior (uterosacral) ligaments are in purple. The middle ligaments (ATFP & cardinal) are not shown in this diagram. There are 3 columns, one for each ligament group and the symptoms and prolapses (lumps) associated with damage to these ligaments. Labelling is 'front' and 'back' instead of 'anterior' and 'posterior'.

Collagen fibres work like the steel rods in cement. Single collagen fibres are “glued” together to give ligaments strength. The elastin content gives them elasticity. It is the change in collagen which is the ultimate cause of prolapse and incontinence.

#### *How ligaments are stretched and damaged during pregnancy and labour*

As we saw from the suspension bridge diagram, the muscles pull against the ligaments which support the bridge. If the ligaments are stretched and loosened during childbirth, as in fig. 1, a patient may develop a prolapse, a “dragging” pain low in the abdomen, bladder symptoms, for example urgency, frequency, nocturia, or even problems with bowel emptying or faecal incontinence.

Commencing 6 months before childbirth, the “glue” between the collagen rods begins to soften in response to hormones from the placenta (“afterbirth”). This explains the onset of bladder, bowel, and pain symptoms at this time. Some 24-48 hours before delivery, however, this softening accelerates, and the collagen rods lose 95% of their strength.<sup>18</sup> During delivery, the baby’s head greatly stretches these collagen rods. Of course, the rods “re-glue” soon after delivery, but often they “re-glue” in a loose and extended position. Neither the ligaments nor the muscles can now work properly, and this may lead to prolapse of the uterus, cystocele, rectocele, and a wide range of bladder, bowel and pelvic pain symptoms (fig. 11). Women who have had Caesarian sections may also become incontinent, but they have less stretching, and therefore, fewer problems than vaginal delivery patients. Loose ligaments may occur in women who have never had children. Such women are born with loose ligaments, or they may have a congenital defect in their collagen. All these conditions are potentially curable by creation of artificial ligaments, as will be explained later.

#### *The effect of age and menopause*

Both collagen and elastin deteriorate markedly after the menopause, and this explains the vast increase in prolapse and incontinence which occurs after this event. A partly damaged ligament which is only just functioning before the menopause, may lose enough collagen after it, to “give way”. This looseness may result in organ prolapse, abnormal symptoms, or both. The oestrogen hormone replacement therapy (“HRT”) helps to slow down the degeneration of collagen. HRT can be applied vaginally, or by patches, creams, tablets, injections. Though oestrogens may be associated with an apparent increased risk of breast cancer, this has to be weighed against their benefits, prevention of osteoporosis, hip fractures, thickening of the vaginal wall in sexually active patients, even perhaps prevention of heart disease. Vaginally inserted oestrogen tablets are considered safe, as they act locally, and so are advantageous for every post-menopausal woman, even those of the most mature age.

#### *Site of damage and its consequences*

The circles in fig. 10 represent the baby’s head descending through the vagina during childbirth. This may stretch and loosen the ligaments (thick grey lines) in the 3 zones of the vagina. These are, Anterior Zone (meatus to bladder neck), Middle Zone, (bladder neck to cervix), and the Posterior Zone (cervix to perineal body). The numbers 1-4 indicate damage to specific ligaments which may cause

1. Stress incontinence
2. Cystocele
3. Prolapse of the uterus
4. Rectocele.

All may occur to varying degrees in the same patient.

It is evident that a head descending down a vulnerable

vaginal canal, fig. 10, is unlikely to damage just one single structure. All structures will be damaged to a greater or lesser extent. This explains appearance of a cystocele, for example, months or years after apparently successful surgery for prolapse of the uterus. Further prolapse can occur in perhaps 30-50% of cases after a successful vaginal repair. The problem is that once the vaginal tissues are damaged, it is difficult to fully repair them. It is like repairing frayed cloth. The surgeon repairs one area, only to see it give way in another area. That is why we have to create artificial ligaments by using tapes.

A *cystocele* “balloons” out from above, fig. 12. The cause is damage to the middle ligaments (ATFP and/or cardinal ligaments) and the anterior wall of the vagina.

A *rectocele*, fig. 13, balloons out from below. Separating the lower end of the vagina from the rectum is the perineal body, a major supporting structure, as it occupies 50% of the posterior vaginal wall. A rectocele, may be caused by damage to the uterosacral ligaments (high rectocele), and/or rectovaginal fascia & perineal bodies (mid & low rectocele).

*Uterine prolapse*, fig. 14, is caused by damage to the cardinal and uterosacral ligaments.

#### *A perspective on organ prolapse*

The organs bulge to varying degrees. Clearly a severe prolapse, such as the uterine prolapse above, requires treatment. If the bulge is minor, and there are no associated symptoms, there is no need for treatment. However, a patient may have severe symptoms which may require treatment, even though the prolapse is minor.

#### *When are these symptoms and prolapses problematical?*

If a patient answers “yes” to one of the following, she has a problem.

1. You lose urine during exertion or coughing.
2. You can’t “hold on” and you wet yourself.
3. You can’t empty your bladder properly.
4. You have bowel soiling.
5. You feel a lump in your vagina (prolapse)
6. You have lower abdominal or pelvic pain.

#### *How serious is the problem?*

*Assessment by the patient.* This question “how serious is my problem” is not so easy to answer, as symptoms vary, and patients’ perceptions vary. A simple rule is to seek help if it is interfering with the patient’s quality of life. If the problem is mild and not bothersome, no action is required.

*Assessment by the clinic.* The doctor has a different perspective, a) to assess which ligaments have been damaged, and b) to assess the seriousness of the problem. An accurate assessment is paramount. This will vary according to the clinic, but at a minimum, use of the Pictorial Diagnostic Algorithm, examination to assess ligamentous damage in the 3 zones, and “simulated operations”(e.g. midurethral anchoring during coughing in patients with urinary stress incontinence or urge symptoms).

#### *Symptoms – what they mean*

A symptom is a warning bell from the brain that something is wrong with some part of the body. As regards the pelvic floor, many bladder and bowel symptoms are secondary to damage in one or more related ligaments, not from the organ itself. The challenge is to find which ligaments are causing the problem.

*The Diagnostic Algorithm indicates which ligaments are causing symptoms and prolapse*

The Diagnostic Algorithm which follows is a simplified version of that published in the textbook, "The Female Pelvic Floor" 2<sup>nd</sup> Edition (2006), Springer, Heidelberg. To use this diagram, a tick is placed in every column which describes a patient's symptoms, and the diagram will indicate the zone of damage, anterior, middle, or posterior ligaments.

*How to use the Diagnostic Algorithm.* Simply tick every column which describes a symptom. One needs to tick all the relevant columns for symptoms such as urgency and emptying, which may occur in more than one column. In such cases, other associated symptoms which are more specific, will help to guide the diagnosis.

*Definitions for Symptoms*

- *Stress incontinence* Urine loss on effort, such as coughing, exercise.
- *Abnormal emptying* Inability to empty the bladder or abnormal flow.
- *Urgency* An uncontrollable desire to pass urine.
- *Frequency* Going more than 8 times a day to the toilet to pass urine.
- *Nocturia* Getting up twice or more per night to pass urine.
- *Faecal incontinence* Uncontrolled soiling from the bowel.
- *Obstructed defaecation or constipation* Difficulty in emptying the bowel.
- *Pelvic pain.* Pain in the lower abdomen, lower posterior, or during intercourse. Some types of vulvodynia and interstitial cystitis are often associated with pelvic pain.

*Symptoms occur in groups – an aid to diagnosis*

For example, urgency symptoms are indicated in all 3 columns. Symptom grouping is the only way we can deduce which column (ligament) is causing the urgency. Fortunately, urgency almost always occurs in tandem with at least one other symptom.

*Characteristics of pain\* caused by posterior ligament looseness*

- Low abdominal 'dragging' pain usually unilateral, often right-sided
- Low sacral pain (pain near the tailbone)
- Pain on deep penetration with intercourse
- Low abdominal ache the next day after intercourse
- Tiredness
- Irritability
- Pain worsens during the day, and is relieved by lying down
- Pain is reproduced on pressing the cervix or the posterior wall of the vagina if a patient has had a hysterectomy.

\* There is growing evidence that some types of introital hypersensitivity ('vulvodynia') and perhaps even some types of bladder pain ('interstitial cystitis) may be part of the posterior zone symptom complex in figure 15, nocturia, urgency and abnormal bladder emptying.

*Characteristics of 'vulvodynia'*

A burning pain over the entrance of the vagina and anus, with extreme sensitive to touch. This condition is often associated with dragging lower abdominal pain and sometimes painful bladder conditions.

*Characteristics of bladder emptying difficulty*

Typical symptoms are a slow stream, starting and stopping, dribbling after micturition has been completed, a feeling that the bladder has not emptied. Often such patients have chronic urinary infections.

*Characteristics of faecal incontinence*

Typical symptoms, in order of severity, are uncontrolled wind loss, liquid soiling, solid faecal soiling. There are two main categories, patients with faecal incontinence caused by an anal sphincter torn at childbirth, and another where no obvious cause can be found. The anal sphincter constricts the lower part of the anus. It is what a patient feels when she contracts her muscles to delay bowel emptying. Where no obvious cause can be found, it is called "idiopathic incontinence". It is "idiopathic incontinence" which is potentially curable by reconstructing the anterior or posterior ligaments.

*Characteristics of lumps (prolapse) in the vagina*

Initially, these only appear during straining. The three main causes of such 'lumps' are from the bladder (cystocele "2") uterus ("3") and bowel (rectocele "4"), fig. 15. These can only be accurately diagnosed by a vaginal examination, as not all lumps are accompanied by symptoms. Where symptoms accompany the prolapse, the symptoms may give an indication of where the problem is. For example if a patient has a lump plus nocturia, pelvic pain and urgency, it is highly likely that she has weak posterior ligaments, as per the Diagnostic Diagram, fig. 15.

*New time efficient pelvic floor exercises strengthen muscles and ligaments*

In 1995, we first conceived another approach to pelvic floor exercises. We knew from our ultrasound studies that the traditional Kegel methods were NOT addressing the posterior closure muscles, which stretch, rotate, and close the proximal urethra against the pubourethral ligament.

Our ultrasound studies had demonstrated that squatting exercises the very same muscles which close the urethra during coughing. We also reasoned that strengthening a pelvic muscle would also strengthen the ligament against which it contracted, and we knew from the surgery, that it was ligament weakness which was causing the incontinence problems.

We therefore added squatting exercises to the traditional Kegel programme. Our target group of patients were those with symptoms which were bothersome, but not sufficiently to require surgery. The results were dramatic. This patient group reported a more than 60% improvement in such symptoms as urgency, nocturia, pelvic pain, and abnormal bladder emptying. The most interesting observation, however, was that those patients who were cured, did not need to remember to contract their pelvic floor in advance. They coughed, and did not leak.<sup>19,21</sup>

A major problem with pelvic floor exercises is that women with young families and jobs, simply do not have time to perform them regularly. Even with our highly motivated group, the dropout rate was 50%. Because of this, we concluded that the programme required re-analysis. We knew that the slow-twitch muscle fibres were the prime contributors to continence. Sitting on a "fitball" instead of a chair, is a very simple and effective exercise technique, as it requires a balanced upright position, with co-ordinated contraction of abdominal, back, and pelvic floor muscles. Unlike all traditional Kegel exercises which require attention and time, sitting on a "fitball" requires no extra time to be set aside during the day. We have found that the "fitball" method applied alone was well accepted, and results seemed equally effective in the short-term.



Fig. 16 - Sitting on a rubber “fitball” instead of a chair strengthen all the pelvic slow-twitch muscles, and their ligamentous attachments.

### Surgery based on the Integral Theory System

“Tension-free” techniques Beginning in the late 1980s an entirely new surgical method for stress incontinence was introduced. Polypropylene tapes were placed around the middle part of the urethra (best known as the “TVT” operation) to reinforce the pubourethral ligaments, then a little later, the posterior ligaments (infracoccygeal sacropexy, “PIVS”).<sup>5</sup> This method, now known as the “tension-free tape” technique, has revolutionized the treatment of stress incontinence (SI) and prolapse surgery. The operations are conducted via 1cm incisions in the abdominal skin just above the pubic bone, groin or perineum. There is minimal pain, hospital stay is reduced to 1 or 2 days, and patients generally have few problems passing urine after the operation. The cure rate is high in the longer term. Later variations of these operations, include the transobturator (TOT) approach for SI (very successful), and the addition of mesh sheets to the TOT and PIVS techniques (not so successful). The only significant problem with all tape/mesh implant operations, was partial or total rejection of the tape/mesh. More recently, an even less invasive method, the “minisling” has been introduced to address incontinence and organ prolapse.<sup>22</sup>

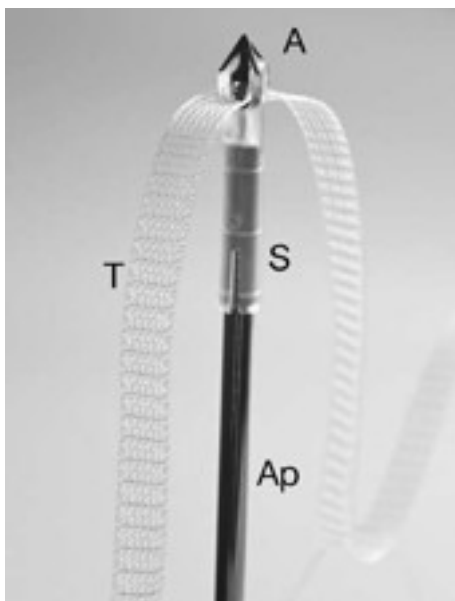


Fig. 17 - TFS applicator ‘Ap’. ‘A’ is the soft tissue anchor which sits on the saddle ‘S’. The tape ‘T’ is a ‘next generation’ non-stretch macroporous monofilament polypropylene tape. The polypropylene tape passes through the unidirectional ‘trapdoor’ at the base of the anchor. This one-way system of tightening brings the laterally displaced ligaments and fascia towards the midline.

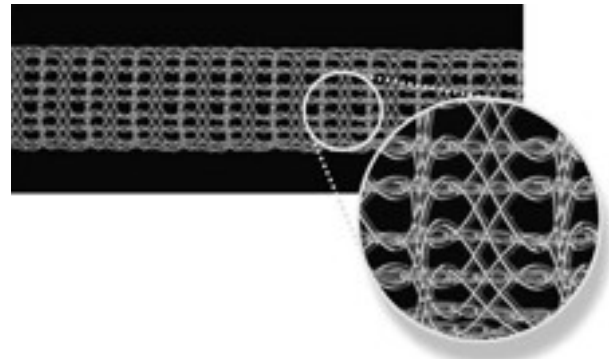


Fig. 18 - An example of ‘next generation’ nonstretch monofilament tape. Such tapes are purpose knitted, not cut from sheets, with finer fibrils, and less weight per unit area. They do not fragment, and are less likely to surface in the wound.

### Minislings- a new horizon for stress incontinence, and repair of cystocele, rectocele, and prolapse of the uterus.

The TFS, fig 17, was the first minisling. It was applied in late 2003 to a patient with stress incontinence and uterovaginal prolapse. Since 2006, there has been a profusion of other minislings introduced for cure of stress incontinence, for example, TVT-Secur, Mini Arc, Ophira, and many others.

Because the TFS is a tensioned sling, it can also address not only prolapse, but also, many symptoms from the Pictorial Diagnostic Algorithm (fig. 15), including urgency, nocturia, abnormal emptying and pelvic pain.

Like other minislings, the TFS uses only small sections of monofilament tape (fig. 18), so it causes less tissue irritation. It uses a bioengineering principle similar to that of a buttressed cathedral ceiling (fig. 19) for cystocele and rectocele repair. It avoids the spaces between rectum, bladder and vagina, and so it is not subject to the adhesive complications seen with large mesh. As with all polypropylene implantations, the main complication is rejection of the tape by the body’s immune mechanisms. However, this occurs only in a small percentage of patients, as only very small segments of tape are used, and the anchor prevents “slippage” into the wound, a major cause of erosion.

### Only a tensioned minisling can reliably improve symptoms

Essential to cure of posterior zone symptoms with the posterior “tension-free” sling was restoration of tissue tension by approximation of laterally displaced tissues.<sup>5</sup> With the infracoccygeal sacropexy (“posterior IVS”), this could only be done with a suture, which was neither sufficiently strong, nor reliable.

The TFS minisling,<sup>22-26</sup> was designed to precisely reconstruct and tension the 5 main structures which support the organs, pubourethral, ATFP, cardinal, uterosacral ligaments, and perineal body, fig. 20, and to approximate laterally displaced tissues.

## PART 3

### ILLUSTRATIVE CASE HISTORIES

The following illustrative case histories are taken from the files of the Kvinno Centre, Perth Western Australia, the first clinic in the world to apply the Integral Theory System.

### ANTERIOR ZONE DAMAGE

In this section, we give a series of typical case reports from patients who came to the Clinic with particular problems which mainly derive from front (pubourethral) ligament looseness, in particular, stress incontinence. We also discuss other less typical problems.

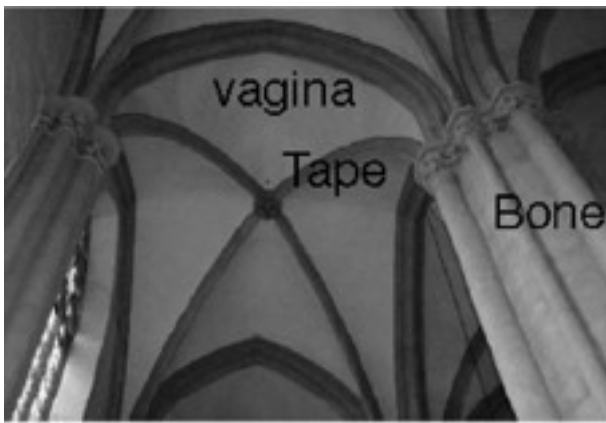


Fig. 19 - The TFS works like a buttressed cathedral ceiling structure. The pillars (bone) provide the anchoring point for the beams (tapes), which in turn provide sufficient support for the weaker plaster board (vagina). Like a wire suspension bridge, tensioned TFS tapes provide a much stronger support than meshes which have a tendency to sag.

*Stress incontinence (leaking during coughing)* is the main symptom for front ligament looseness.

Mrs CYL, was 55 years old, and she had had 3 normal deliveries. The ultrasound showed that her bladder and urethra became one large funnel when she coughed, and the urine just ran out. The Diagnostic Diagram confirmed that the damage was in the front ligament column, fig. 21. Maximal Urethral Closure Pressure was 16cm H<sub>2</sub>O.

*“Mixed” stress and urge incontinence from front ligament looseness*

Mrs JC, was a 38 year para 2. She had stress incontinence, and she also wet with urgency 2-3 times a day before she arrived at the toilet. She had been refused surgery for her stress incontinence because a urodynamic test had shown an “unstable bladder”. With reference to the Diagnostic Diagram, fig. 23, it was evident that she had specific middle or posterior zone symptoms, indicating that her pubourethral ligament (PUL) was probably causing both problems, stress and urge. This was confirmed with a “simulated operation”, gently pressing an instrument upwards on one side in the position of PUL at midurethra, just behind the pubic bone. This controlled her urine loss on coughing, and greatly diminished her urge symptoms. She was cured of both stress and urge with a polypropylene sling placed around the middle of her urethra to strengthen the front ligament.

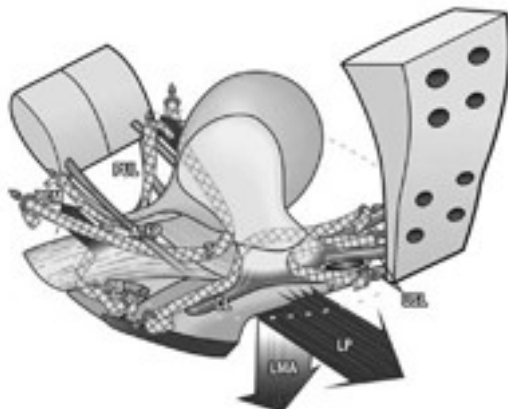
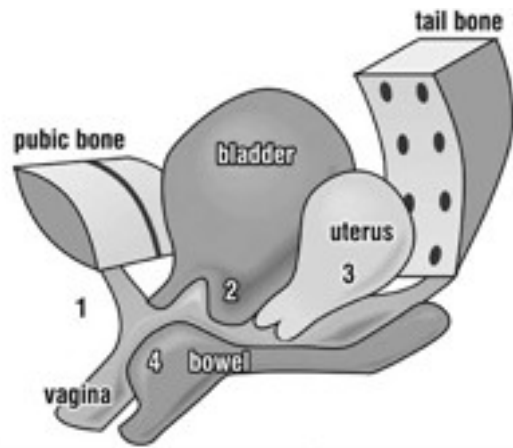


Fig. 20 - The TFS minisling (Tissue Fixation System) a new approach to surgery for prolapse. It works by approximating laterally displaced tissues, and by reinforcing the 4 suspensory ligaments of the vagina, PUL (pubourethral), ATFP, cardinal (CL), uterosacral (USL) and also, the perineal body (PB).



Front ligaments	Middle ligaments cystocele	Back ligaments Prolapse of uterus Rectocele
Stress incontinence		
	abnormal emptying	
	frequency and urgency	
		returia
faecal incontinence		faecal incontinence obstructed defecation
		pelvic pain

Fig. 21 - Anterior Zone defect The tick indicates only front ligament damage. A TFS polypropylene tape was inserted through a very small incision in the vagina to repair the front ligament, fig 22 (23,24). The patient went home the next day entirely dry.

*Bedwetting from childhood caused by a lax front ligament*

Miss M was 25 years old, para 0. She had wet her bed as a child. Bedwetting cleared at puberty, but she still wet with coughing and exercise, and with urge. Ultrasound demonstrated bladder neck rotation, indicating that the front ligament (pubourethral) was loose. Her bladder symptoms were cured with a TFS sling which reinforced her pubourethral ligaments.



Fig. 22 - The “mini” or “micro” sling is inserted exclusively from the vagina. It avoids most complications of “tension-free” slings.



*Bedwetting from childhood and faecal incontinence caused by a lax front ligament*

In contrast, Miss G, 18 years old, had continued wetting wet her bed since childhood, and also had stress urinary and faecal incontinence. On examination, her urine loss was controlled by gentle pressure upwards in the vagina, applied just behind the pubic bone. Transperineal ultrasound demonstrated rotation of bladder neck, indicative of a loose anterior (pubourethral) ligament. At the 6 week post-operative visit, all symptoms were cured, and there was a remarkable transformation in the patient’s psychological state.

*Stress faecal incontinence caused by a lax front ligament*

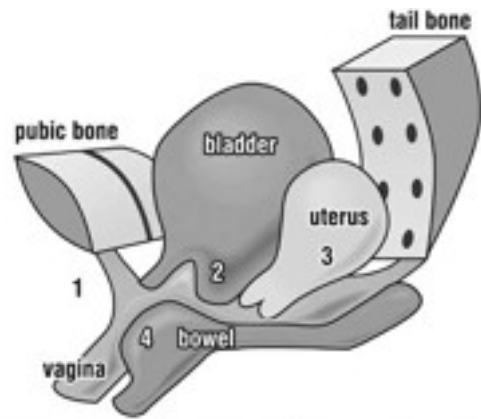
Mrs T, 45years old, came to see us because she lost urine and solid faeces on coughing. Again, symptom grouping gave us the clue that her symptoms originated from pubourethral ligament damage. Her assessment indicated she had damaged front ligaments, which was successfully addressed with a polypropylene midurethral sling.<sup>27</sup>

*Comment*

The bowel works in a similar way to the bladder. If a ligament is loose, the muscles which close the bowel cannot work properly, and the patient may leak wind, fluid or solid faeces

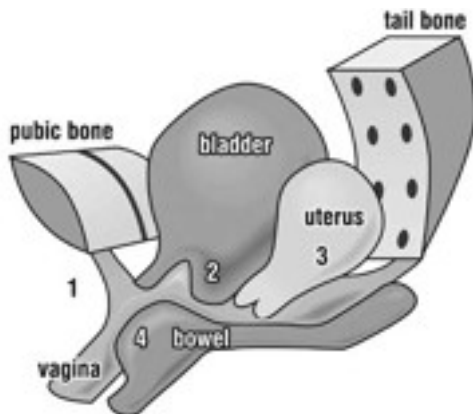
**MIDDLE ZONE DAMAGE (CYSTOCOELE)**

In this section, a series of typical case reports is presented from patients who came to our Clinic with particular problems which mainly derive from middle ligament



Front ligaments	Middle ligaments cystocele	Back ligaments Prolapse of uterus Rectocele
Stress incontinence ✓		
	abnormal emptying	
	frequency and urgency	
		nocturia
faecal incontinence ✓		faecal incontinence / obstructed defecation
		pelvic pain

Fig. 24 - Anterior Zone Defect Stress and faecal incontinence. Grouping of SI symptoms with FI, and absence of other posterior zone symptoms indicates anterior ligament damage.



Front ligaments	Middle ligaments cystocele	Back ligaments Prolapse of uterus Rectocele
Stress incontinence ✓		
	abnormal emptying	
✓	frequency and urgency ✓	✓
		nocturia
faecal incontinence		faecal incontinence / obstructed defecation
		pelvic pain

Fig. 23 - Anterior Zone Defect Stress and Urgency in Mrs JC’s case are both most likely caused by damage to the front ligament. Because urge symptoms may derive from all 3 zones, all 3 spaces are ticked. Diagnosis of anterior zone defect was made by deduction using the presence of SI and absence of other zone-specific symptoms.

looseness. Mostly patients with a cystocele, only complain of a “lump” in the vagina. However, they sometimes have symptoms of urgency and difficulty in emptying the bladder, and chronic bladder infections.

*Urge incontinence caused by cystocele occurring after prolapse repair*

Mrs DV was 53 years old. She had had a successful repair of the uterosacral ligaments for prolapse of the uterus 12 months earlier. She came to see us, stating that her symptoms had reappeared in the past few weeks.

It was noted from Mrs DV’s questionnaire, that the nocturia and pelvic pain she had 12 months ago, remained cured, fig. 25. When she was examined, it was evident that her posterior ligaments (uterosacrals) were intact. There was no prolapse of the uterus. However, a cystocele was seen just inside the vaginal entrance on straining. Her urgency symptoms were relieved by gently supporting the cystocele, indicating that this was the cause of her urge symptoms. The cystocele was cured by TFS ATRP and cardinal ligament operation, fig 26. Relief of urgency, and improved bladder emptying were reported immediately after the surgery.<sup>22</sup>

*Comment* Mrs DV is a good example of what happens in patients with damaged ligaments. In up to 30% of cases, repairing one part of the vagina can be followed by another lump or symptom appearing weeks, months or even years later.

*Recurrent or chronic cystitis – its relationship to abnormal emptying, cystocele and prolapse of the uterus*

Whilst there are many causes of cystitis, this presentation concerns patients who have recurrent cystitis because they

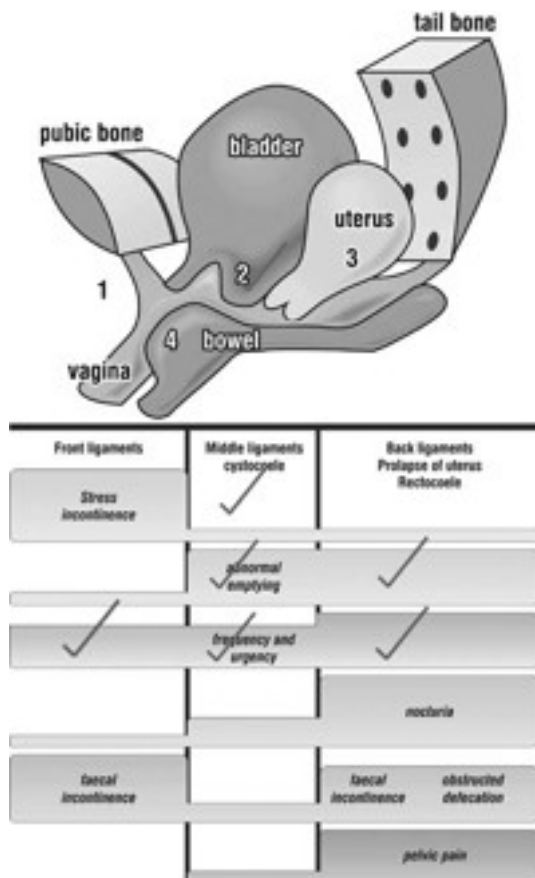


Fig. 25 - Middle Zone Defect The ticks indicated a middle or posterior defect for Mrs DV. The presence of a cystocoele, absence of a prolapse of the uterus and its specific symptoms, nocturia and pelvic pain, indicated it was a middle ligament problem.

cannot empty their bladder adequately due to damaged ligaments in the middle or posterior parts of the vagina. In the author's experience, cystocoele, and prolapse of the uterus are major correctable causes of abnormal emptying and chronic bladder infections.<sup>5</sup>

*Other causes of recurrent cystitis*

Anything which irritates the inside of the bladder, such as a polyp, a bladder stone, or penetration of a plastic mesh after a surgical procedure for incontinence can cause recurrent cystitis. The mesh can cause irritation per se, or become calcified into a stone. Inserting a cystoscope into the bladder is the best method for diagnosing such a problem.

*Other causes of abnormal emptying?*

Anything which interrupts the messages from the brain may cause this problem. One cause which is often stated is diabetes. However, in the author's experience, many patients labelled as "diabetic neuropathy" in fact had damaged uterosacral ligaments which prevented the opening muscles from working properly. Such patients had accompanying symptoms such as nocturia, urgency and pelvic pain, as per the Pictorial Diagnostic Algorithm Diagram, fig. 15, and were able to be cured. A much rarer cause of abnormal emptying, multiple sclerosis, cannot be cured, and often requires intermittent self-catheterization.

*Severe wetting on getting out of bed in the morning caused by excessive scarring from previous surgery "tethered vagina" – a hitherto unrecognised problem*

Mrs EM, 68 years old, was referred with a history of worsening incontinence over the previous 2 years. She had

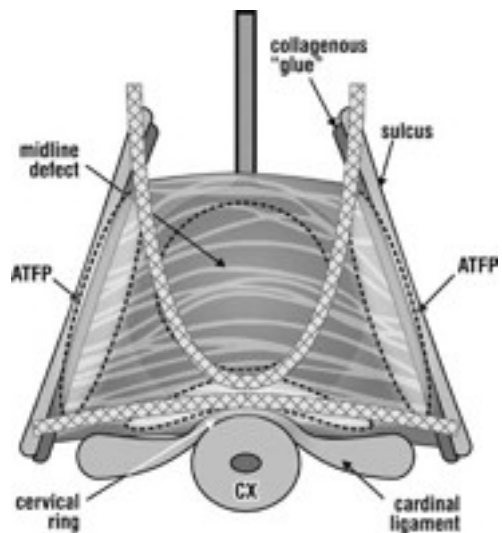


Fig. 26 - The ceiling joist principle for cystocoele repair. Schematic view into the anterior wall of the vagina. The horizontal tape provides structural support to the proximal half of the anterior vaginal wall and recreates the cervical ring. The vertical U-sling joins with existing ATFP structures to provide structural support to the distal half of the vagina.

had 4 previous operations for prolapse and incontinence some years earlier. She offered the cardinal symptom of this condition " my bladder empties uncontrollably immediately my foot touches the floor on getting out of bed in the morning." She also lost urine on standing up from a chair, or bending down.

On examination, she did NOT lose urine during coughing, a common feature of this condition. The large amount of urine measured with a 24 hour pad test validated the seriousness of this lady's problem. There was very little movement of her bladder neck during straining with ultrasound testing, consistent with the thick scarring observed in the bladder neck area of her vagina. This scarring immobilized the muscles and ligaments needed to close the urethra, hence the name, "tethered vagina". A skin graft placed in this area, fig. 28, restored elasticity and vastly improved her incontinence.

*Comment* The "tethered vagina" syndrome is still not a well-recognized condition. It is entirely iatrogenic, and is caused by excessive scarring from previous

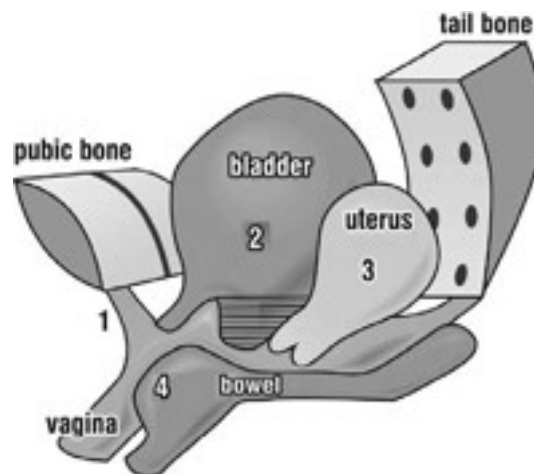


Fig. 27 - The diagram shows how a cystocoele "2", droops downwards in a sac, preventing it from emptying. The urine pool gets infected over time, leading to chronic cystitis.



Fig. 28 - Martius skin graft applied to the bladder neck area of the vagina subsequent to extensive freeing of the urethra and vagina from adhesions to the pubic bone and each other in a case of “tethered vagina syndrome”.

surgeries. It is called the “tethered vagina syndrome” because dense scar tissue in the vagina “tethers” the muscles, and prevents them from closing the urethral tube. This condition was not previously recognized as originating from a scarred vagina. It was thought to originate from the bladder itself, and was (still is, by many!) treated with drugs, which, of course, cannot succeed, as the cause is mechanical. Treatment involves restoration of elasticity in the bladder neck area of vagina, using some sort of skin graft. Restoration of continence following skin graft surgery is the ultimate proof of the Integral Theory .

### POSTERIOR ZONE DEFECTS

In this section, some typical case reports from patients are presented, from problems which mainly derive from posterior (uterosacral) ligament looseness.

#### *Structural and functional consequences of laxity in the uterosacral ligaments*

The problems associated with posterior (uterosacral) ligament damage are usually far more complicated and serious, than those seen with damaged anterior or middle ligaments. Sometimes patients complain of just a “lump” in the vagina without accompanying symptoms. However, symptoms such as pelvic pain, nocturia, and abnormal emptying are found as accompaniments to the prolapse. However, these symptoms may occur without significant prolapse.

#### *Laxity in the uterosacral ligaments associated with uterovaginal prolapse nocturia, urgency, abnormal emptying and pelvic pain*

Mrs LM, 53 years old, stated “ I get up 4-5 times a night. I find this very tiring, as I have to work next day. I have a dragging pain on the right side which can be quite distracting by the end of the day. I am always going to the toilet at

work. My urine dribbles away after I stand up, and I often wet the toilet seat. I have problems with bladder infections”

Mrs LM had symptoms typical of looseness in the posterior ligaments, fig. 29. When we examined her, we noted that she had significant prolapse of the uterus, but it was not protruding. A TFS “minisling” was inserted to reinforce the damaged uterosacral ligaments. The advantage of the TFS method is that it can precisely tighten the vaginal membrane to prevent sensitive nerve endings from firing off at a low bladder volume. It is a very minimal technique, and is performed entirely from the vagina. Mrs LM required only an overnight stay in hospital, and she returned to work in 7 days. When reviewed at 9 months, she was getting up only once per night to empty her bladder. She said that her low abdominal pain was still present, but was 90% better. Her bladder emptying also was not entirely cured, but had improved significantly, and she had not had any bladder infections since the operation.

The posterior TFS “minisling” operation is performed entirely from the vagina, which makes it minimally invasive and less painful than other sling procedures which pierce the skin. It has a one-way tightening system, so it can restore the tension in the ligaments (white arrows). Adequate tissue tension is required to support the nerves which cause pain and urgency symptoms. Without restoring the tension, it is unlikely that such symptoms can be cured.

#### *Comment on the causation of urgency, nocturia and pain by damaged ligaments*

Strong uterosacral ligaments are required to support the pain fibres which run inside them, and to anchor

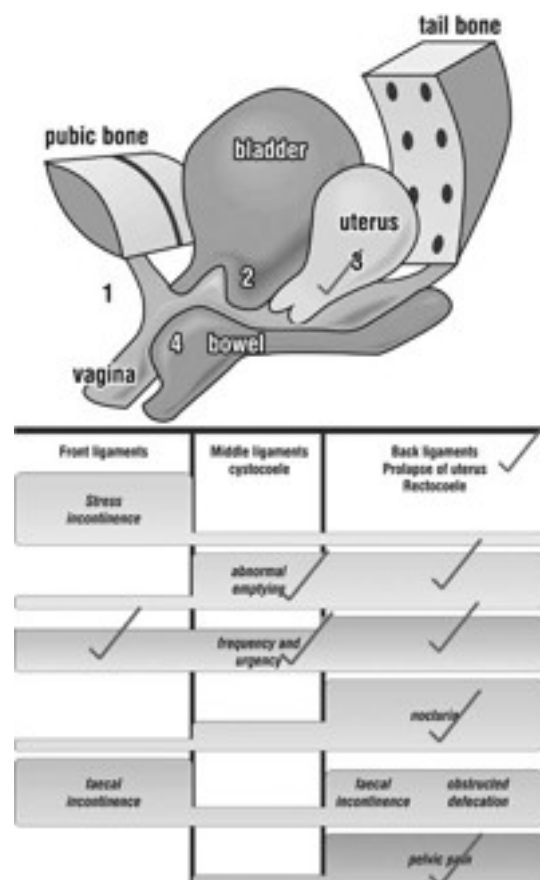


Fig. 29 - Posterior Zone Defect Ticks in the posterior column are typical for symptoms from damaged uterosacral ligaments. Ticks are inserted in all column for urge and emptying. Grouping of symptoms indicates either a middle or posterior defect. Absence of a cystocele on vaginal examination confirmed a posterior defect.

the muscle forces which stretch the vagina to support the nerves and volume receptors at bladder base. Loose tissues will not support the pain nerves, which “droop” and fire off, sending signals of pain to the brain. Like a trampoline with damaged springs, loose ligaments will not allow the muscles to stretch the vagina. The bladder nerves are unsupported, and fire off prematurely causing urge and frequency.

*Pain during intercourse and bowel problems caused by posterior ligament looseness.*

Mrs R M was a 47 year old para 2. She stated “I always have urgency to empty my bowel, but I am also frequently constipated. I get up 3-4 times a night to pass urine. I have problems emptying my bladder. My worst problem is that I can’t have sex any more. Almost every time I have intercourse, my bowels open.

Reference to her Diagnostic Diagram, fig. 29, indicated that most of Mrs RM’s bladder problems may have been caused by damaged posterior ligaments. On examination, however, there was very minimal prolapse. This was consistent with the Theory, which states that major symptoms may be caused by minimal prolapse, and a high rate of improvement (up to 80-%) was possible with a posterior sling. No predictions were made for the urge to empty her bowel, and her constipation. She was advised these could be due to many other causes, so we were reluctant to predict cure for these symptoms. A posterior TFS “minisling” was inserted to repair the posterior ligaments. Mrs RM was discharged the next day with very little pain, and she went to work the following week. She attended with her husband for the post-operative visit. Smiling and confident, she reported cure of all her bowel symptoms, and a major improvement in her other symptoms.

*Comment on losing faeces during intercourse*

This patient was a challenge to us, as some of her symptoms were not the typical symptoms seen in the Diagnostic Diagram. We had encountered women opening their bladder during intercourse before, but never their bowel. In such cases, we rely on the other typical symptoms to guide us as to which ligaments have been damaged, and on the guiding principle of this type of surgery, “repair the structure, and you will repair the function”.

*Comment on pain with intercourse*

Earlier we discussed how a loose ligament will not

support the pain fibres. As the penis thrusts into the posterior part of the vagina, it will cause pain if it stretches the unsupported nerve fibres.

*Severe Pelvic pain caused by uterosacral ligament looseness.*

Mrs D was a 34 year old para2. She attended with severe pain in the right side of her abdomen. Some years previously, she had previously attended a London hospital which had developed an international reputation using psychological tests to prove that such pain was psychological in origin.

Mrs D had read widely on the subject of pain. Her facial expression indicated a person who was guarded. Her face lit up after she answered positively to the following questions, as she knew, that we knew, what her problem was.

“Do you have pain on deep penetration with intercourse?

“Do you get up more than twice per night to pass urine?

“Do you have problems emptying your bladder?

“Do you have urgency?”

Positive answers to at least some symptoms other than pain are required before we can predict that the pain is caused by damage to the posterior ligaments. There are, after all, many other causes of chronic pelvic pain in the 30 plus age group, for example, endometriosis, infection in the Fallopian tubes, problems with large intestine, to name just a few.

This is what she said one week after her pain was cured by a small operation which tightened her posterior ligaments.<sup>28</sup>

“I was almost suicidal after interminable attacks of pain on my right side. It has now been a week since the operation, and I feel like a rabbit that has been released from a trap.

My mind keeps scanning up and down my body searching for the pain which for so long has been my centre and focus.”

The operation, fig. 31, was simple, and it was performed entirely under local anaesthesia. A 3 cm incision was made in the vagina behind the cervix. Two sutures (green lines) were inserted to tighten the ligaments (white arrows).

*Comment*

This condition, severe pelvic pain caused by loose posterior ligaments, is still not well recognized by the majority of gynaecologists. The operation, fig. 31, unfortunately has a significant recovery rate, as it approximates damaged tissue to damaged tissue. Insertion of a polypropylene sling gave a higher symptomatic cure rate, by creating a collagenous reinforcement, better able to support the unmyelinated nerve endings.

*Vulvodynia – pain and burning at the entrance to the vagina caused by posterior ligament looseness.*

Mrs P was 49 years old para3 with chronic pelvic pain diagnosed as having a psychological cause. Her General Practitioner, an empathetic and caring man rang the doctor before she arrived, and asked that we “handle her very carefully”, as she was severely disturbed psychologically, that this was the reason for her pain, and “there was nothing anyone could do for her”. The first impression of this lady did indeed fit the description of her GP. Her face was contorted, she spoke rapidly and with obvious anxiety. She had visited many specialists over the years for her pain. She had undergone several diagnostic laparoscopies, even a hysterectomy, and had attended a pain clinic. None of these treatments had helped her pain. The consensus from other specialists as reported to the GP, was that her problem was psychological. Her replies to the questionnaire gave the first hint that this woman may have a physical cause for her problem, damage to her posterior ligaments. She woke 6 times per night to empty her bladder (nocturia), wore pads

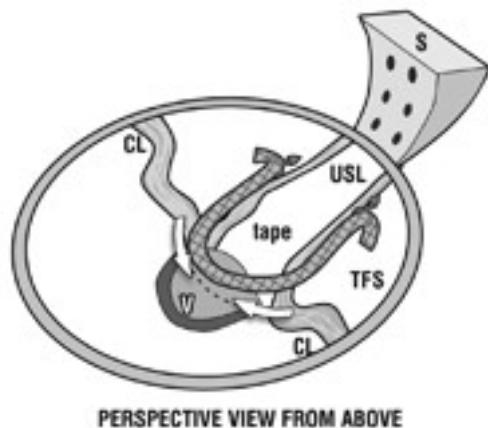


Fig 30 - The TFS posterior minisling repairs and tightens the posterior ligaments (arrows) without penetrating the skin of the buttocks.

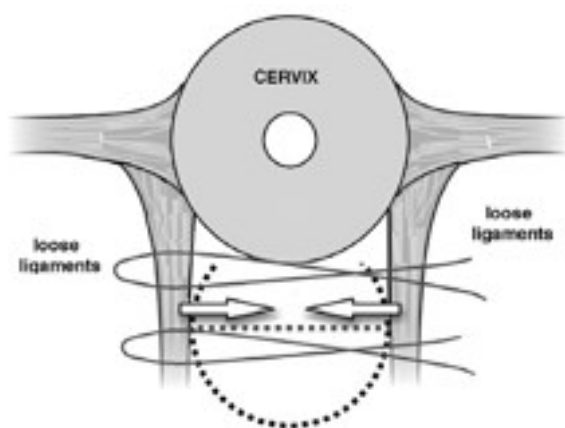


Fig. 31 - Approximation of uterosacral ligaments A small 3cm transverse incision into the vagina just below the cervix gave access for tightening her loose posterior ligaments (white arrows).

continually as she wet 6 times per day, and had difficulties emptying her bladder. She also had faecal incontinence. We asked her if she had told her General Practitioner about her bladder and bowel problems. She said she had only consulted him about the burning pain around her vagina and anus. She said that her vagina was so tender, that she couldn't have sexual intercourse, and sometimes had problems sitting. Examination revealed a prolapse of the posterior part of her vagina. The entrance to the vagina was hypersensitive- she recoiled when gently tested with a cotton bud, the classical test for "vulvodinia" (pain at the entrance of the vagina).

We did not claim that we could cure this lady's pain, as there are many other causes for pelvic pain. Nevertheless, it was explained that her vaginal prolapse needed to be fixed, and that there was a strong possibility that some of her symptoms would also improve with a sling inserted into the posterior part of her vagina, a fairly minor day-care procedure.<sup>29, 30</sup>

The first thing we noticed at the 6 week post-operative visit was the absence of tension in her face. She was smiling and calm. Her pain was gone, as was her urgency and faecal incontinence. Her nocturia had reduced to 2 per night, and her bladder emptying was "60% improved".

A diagnosis that a patient's pain is of psychological origin is not entirely unreasonable. Any type of chronic pain is sufficient to unsettle even the most rational person, and such patients do become "psychologically disturbed". But this disturbance is usually secondary to the pain.

#### Comment

We do not claim that all vulvodinia patients have this causation. However, if other symptoms of posterior ligament looseness such as nocturia, abnormal bladder emptying, and urgency are grouped with the vulvodinia, there is a strong possibility that this pain can be improved in many patients with a posterior sling for repair of the posterior ligaments.

#### *Hysterectomy for lower posterior ache and pelvic pain caused by posterior ligament looseness.*

Mrs JMK developed chronic lower posterior pain and pain with intercourse after a difficult forceps delivery of her second child 50 years ago, when she was 27 years old. The pain worsened after the birth of her third child 3 years later. The pain was constant and debilitating, and she also had heavy menstrual bleeds. By the age of 35, the pain had worsened sufficiently to require consultation with a specialist gynaecologist. He told her that she needed to have

a hysterectomy. By the time Mrs JMK was 65 years old, the chronic pelvic pain and low abdominal ache had returned. She had developed prolapse of the vagina and bladder, with significant bladder symptoms, urgency and nocturia. The return of symptoms can be attributed to age-related loss of collagen, and weakening of the posterior ligaments, a long-term problem in patients who have had hysterectomy.

#### *Abnormal emptying and chronic bladder infection caused by looseness in the posterior ligaments*

Mrs KB, a 32 year para 0 flight attendant, had a long history of inability to empty her bladder, and chronic bladder infections, dating back to her teenage years. She came to us because the infections were becoming more frequent, and were affecting her ability to work on long flights. Her situation had reached a stage where she felt forced to consider leaving her profession. She was diagnosed as having congenitally weak posterior ligaments. She did not respond to our pelvic floor regime, and she requested surgical reconstruction of the ligaments. We agreed, having advised her that she may need a caesarian section if she fell pregnant, as any vaginal delivery could disrupt her operation. Her bladder returned to normal emptying immediately after the surgery, and she reported no further bladder infections even 10 years afterwards

*Comment on abnormal bladder emptying in the younger woman* Congenitally weak posterior ligaments must always be considered as a cause of abnormal bladder emptying in the younger woman, as these women do not generally have a cystocele. Increased difficulty in emptying the bladder at period time in such women is highly suggestive that the cause is looseness in the posterior ligaments. Other symptoms such as pelvic pain, urgency and nocturia are frequently present, and these may become worse during period time. Though not helpful with Mrs KB, good results in young women have been achieved at our Clinic by encouraging such patients to "squat" instead of bending, and to sit on a fitball at work instead of a chair. These exercises work by strengthening the pelvic muscles and ligaments.

#### *An 87 year old woman not able to pass urine, requiring self-catheterisation caused by posterior ligament looseness.*

There is a prevalence of this condition in Nursing Homes. Many patients require indwelling catheters.

Mrs R was 87 years old, and weighed 90kg. She had had a hysterectomy 40 years earlier. For some years she needed to self-catheterize 3-4 times a day, as she could not pass urine adequately. She had large residual volumes (the amount retained in the bladder after passing urine). On testing, we confirmed she also had severe incontinence, with a large measured urine loss over a 24 hour period. She had 3<sup>rd</sup> degree prolapse of the vagina. We inserted a posterior sling, performed a rectocele repair and perineal body repair. She passed urine immediately after the surgery. Her nocturia, previously 5 times per night, reduced to twice per night.

#### *Comment on how age causes ligament looseness and bladder emptying difficulties*

The tissues of the vagina and its supporting ligaments may loosen considerably with age. The effect of this is that many older women, especially those in Nursing Homes, cannot empty their bladder, and they require indwelling catheters. These catheters are a major cause of chronic cystitis, as they introduce bacteria. We have returned many women to normal micturition by reconstructing the posterior ligaments and tightening the neighbouring tissues.

*Faecal incontinence, “constipation” and bleeding caused by posterior ligament looseness.*

Mrs DMV, 63 year old para4, complained of a lump in the vagina. She had a 2<sup>nd</sup> degree prolapse of the uterus, urgency, and nocturia. She also had faecal incontinence, constipation, fig.32, and occasional bleeding from the bowel. She had been investigated for the bleeding by a specialist who found no evidence of bowel cancer. In the early days where the Diagnostic Algorithm was applied, we sometimes encountered patients with symptoms whose origin we did not fully understand. One example of this is the constipation, faecal incontinence and bleeding which had afflicted this lady. Faecal incontinence was not part of the Diagnostic Diagram at that time. In all such cases, we followed the principles of the Theory, “repair the structure, and you will improve the symptoms”. We repaired the prolapse of the uterus by reinforcing the posterior ligaments with a polypropylene sling. Mrs DMV had a good result. Her faecal incontinence was cured, her constipation improved, and her bleeding disappeared.<sup>31,32</sup>

*Explanation for Mrs DMV’s improvement in her “constipation” and bleeding.* The reason for improvement in this lady’s “constipation” and bleeding was discovered some years later by an Austrian colleague, Dr Abendstein.<sup>31</sup> With reference to the diagram fig. 32, it is evident that the uterus, vagina, and rectum (bowel) are suspended by the uterosacral ligaments, like the apex of a tent. If the guy rope of the tent (posterior ligament) is loose, the wall of the tent will sag inwards, in this case, the wall of the vagina and rectum. It is difficult to have a normal bowel motion when the bowel walls are loose and sagging into the cavity of the bowel. Furthermore, the sagging wall of the rectum (bowel) caused congestion of the veins close to the cavity similar to what happens with a haemorrhoid. This congestion caused bleeding into the bowel cavity from time to time.

The tape lifted up and tightened the attachments of the uterus, vagina and rectum to the tail bone in the same way a guy rope does to the apex of a tent. This tightened the tissues, restored the function and improved her symptoms.

*Bowel emptying problems cured by repair of posterior ligaments and perineal body*

Mrs VCD, 46 years, presented with a rectocoele, faecal incontinence and difficulty with emptying her bowel, fig. 32. She stated, “every time I need to open my bowels, I have to press my fingers into the posterior wall of my vagina so I can empty. I find the necessary hygiene after completion quite unpleasant.” In Mrs VCD’s case, we found that her perineal body had been stretched very thinly, and the muscle bellies of this structure had been pushed to the side, allowing the rectocoele to protrude into the vagina as a sac containing faeces. That is why she had to press into the lower part of her vagina to facilitate evacuation.

Her posterior ligaments were repaired with a sling, and her perineal body was repaired in the traditional way, without a sling. The rectocoele and bowel evacuation difficulty were initially cured, but recurred within 6 months, as did requirement to assist evacuation by pressing her fingers into the posterior wall of her vagina. The faecal incontinence remained cured, and we attributed this to the continuing action of the posterior sling. The rectocoele and lax perineal body were repaired by the TFS (Tissue Fixation System) adjustable tape technique, fig. 33. Bowel evacuation returned to normal, and the rectocoele remained cured at her 2year review.

*Comment Why a tape was necessary for repair of the perineal body* There are really 2 perineal bodies joined together with a fibrous band. When these are

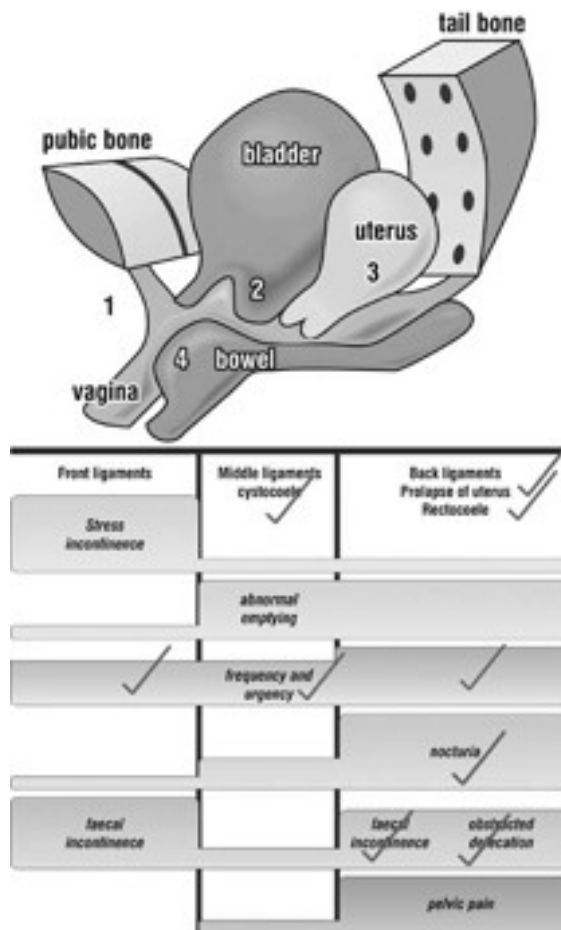


Fig. 32 - Posterior Zone Defect Difficulty with bowel evacuation in a patient with a large rectocoele indicates perineal body damage added to posterior ligament damage. Both needed to be repaired.

pushed aside by childbirth, the rectum protrudes into the vagina. The traditional method relies on suturing damaged tissue to damaged tissue under significant tension. This method is very painful, and is prone to recur. The TFS repair creates an artificial ligament to permanently join the laterally displaced bodies.

*Urinary urgency, pelvic pain and nocturia cured by Pelvic Floor Exercises*

Miss B, 31 years, gave this story. ‘I began to experience symptoms of urgency, pelvic pain and nocturia at the age of 25, sufficiently to seek medical advice. I saw 8 different specialists. I was given drugs to stop the bladder contracting. I spent a small fortune on herbal medicines. Nothing seemed to work’. Finally she contacted our Clinic through an intermediary. She worked overseas, and could not attend the Clinic for a formal assessment. We advised her how to use a large rubber fitball as a substitute for a chair, and to develop good pelvic floor habits such as squatting wherever possible, (instead of bending), erect posture, and exercise. The result was remarkable- virtually all her symptoms disappeared, and she remained cured at last contact 4 years later .

*Comment Non-surgical treatment of posterior ligament symptoms* A vast improvement in symptoms such as pelvic pain, urgency, abnormal emptying and nocturia has been achieved in many patients attending our Clinic, by the regime utilized by Miss B, in particular, substituting a “fitball” for a chair, and squatting instead of bending. This regime is especially effective in the younger woman.

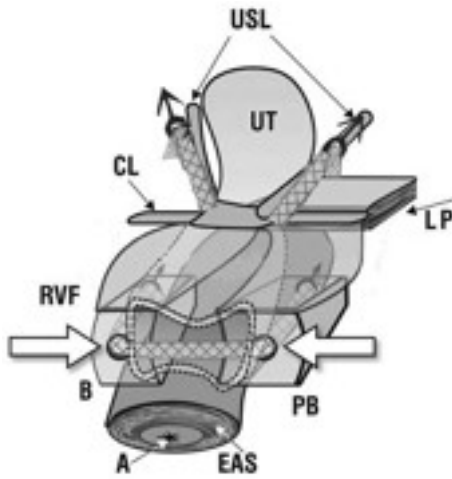


Fig. 33 - Large rectocele repair. Approximation of the perineal body (PB) and uterosacral ligaments (USL) by tightening the TFS, effectively blocks entry of the rectocele into the vagina. A=anus; RVF=rectovaginal fascia; CL=cardinal ligament.

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