



# Wide-bore polyester suture ligament repair- a low-cost solution to the aged incontinence crisis?

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In every developed nation, the population is ageing rapidly, notably in Japan.<sup>1</sup> Ageing brings collateral medical problems including pelvic organ prolapse and incontinence.<sup>2</sup> The result is poor quality of life and escalating community and government health costs. Bladder/bowel dysfunctions are said to be responsible for 50% of all admissions to nursing homes.

The crisis is in full sight. The prevalence of urinary incontinence is now up to 70% in care homes.<sup>3</sup> The prevalence of nocturia in women aged 60 to 70 years is between 11% and 50%. At 80 years, prevalence rises to 80-90%.<sup>4</sup> Hip fractures can occur in 4.6% of nocturia women, occurrence increasing with age.<sup>4</sup> Inability to empty can occur in up to 59% of women.<sup>5</sup> In a survey of women greater than 40 years of age, the prevalence of faecal incontinence is 24%.<sup>6</sup>

To solve this ageing incontinence crisis, it is first necessary to understand the pathogenesis of bladder/bowel dysfunctions. Learned bodies, gynaecology, urology, coloproctology, state and teach, that these conditions have unknown pathogenesis and cannot be cured. Each subspecialty has widely varying methods for treating the symptoms which arise from these conditions.

Yet, these same learned bodies all teach that bladder, bowel and pain symptoms co-occur. Common sense alone would suggest a common origin! The Integral Theory system offers a potential

solution to the crisis. The scientific breakthrough for the bladder began in 1990: The causation of urinary incontinence was from outside the bladder,<sup>7,8</sup> mainly from the vagina and its supporting ligaments, because of damaged collagen at childbirth and old age. In 2008, It was discovered that anorectal function and dysfunction had similar ligament pathogenesis.<sup>9</sup> A second discovery in 1990, was that ligaments could be reinforced by harnessing the collagen produced by a foreign body reaction to an implanted material, for example, a polyester tape.<sup>10</sup> This discovery is the basis for the gold standard operation for cure of stress urinary incontinence, with 10 million operations to date world-wide.<sup>10</sup>

The key point of the integral theory system is the binary control system, Figure 1. Cortically-directed reflex muscles contract against suspensory ligaments, pubourethral (PUL) anteriorly and uterosacral (USL) posteriorly to close the outlet tubes (urethra and anus) for continence, open them for evacuation, and to stretch the organs in opposite directions to support their stretch receptors "N" from below, Figure 1; this mechanical support of "N", prevents afferent impulses from prematurely activating the micturition and defecation evacuation reflexes (green arrows), Figure 1. If the ligaments are weak or loose, some or all of these functions are diminished, and the dysfunctions are

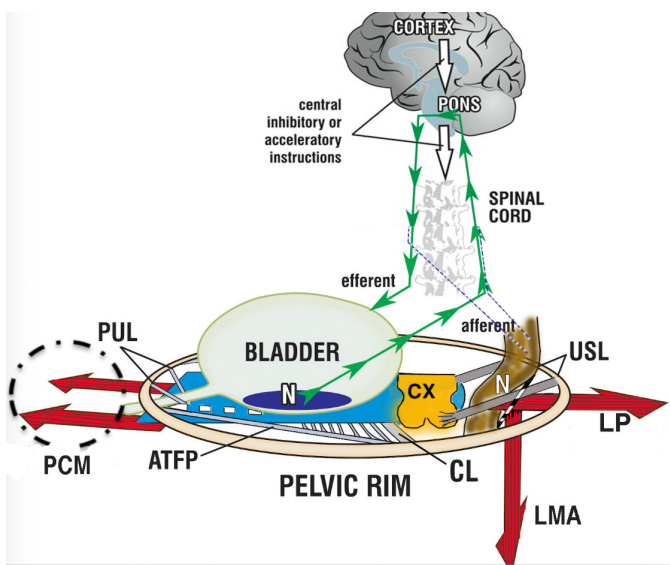
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**Figure 1.** The binary cortico/peripheral control systems of bladder and bowel are virtually identical. Afferent impulses from stretch receptors “N” in the bladder and bowel proceed to the cortex which interprets them as “fullness”. By reflexly stretching bladder and bowel bidirectionally (large arrows), the muscles tension the underlying supports of the stretch receptors “N” of each organ to prevent them from firing off emptying impulses prematurely, thereby controlling inappropriate activation of the micturition and defecation reflexes, which is sensed by the cortex as urgency. If convenient to empty, the closure reflex shuts down, and the emptying reflexes (micturition and defecation) are activated. The posterior walls of the urethra and anorectum are actively pulled open (broken lines) by LP/LMA immediately prior to evacuation. This external opening exponentially decreases resistance to flow, thereby facilitating evacuation.<sup>4</sup>

Dysfunction Anatomical damage to any part of the system may interfere with the binary control of all the above functions. CORTEX: facilitatory or inhibitory centres; NERVES: afferent or efferent (for example MS); PERIPHERAL: ligament or muscle damage (mainly ligaments); LOCAL: mucosal prolapse, tumours

expressed clinically as stress incontinence on effort (urinary, fecal), inability to evacuate (urinary, fecal), and inability to “hold on” due to premature activation of the evacuation reflexes, urge incontinence (urinary, fecal).

High cure rates have been recorded for all these conditions, simply by repairing damaged pelvic ligaments, mainly PUL and USL, using precisely inserted slings. Table 1 is an example of how pelvic symptoms, (bladder and bowel symptoms in particular) co-occur: 611 women were cured of prolapse, bladder and fecal incontinence with USL repair by a TFS minisling.<sup>11</sup>

A more recent development is the use of No2 or No3 polyester sutures to directly repair the ligaments.<sup>12</sup> Calculations based on an explanted failed aortic graft from the author’s doctor of surgery thesis<sup>13</sup> indicated that the collagen created in reaction to

**Table 1. Anatomical and symptom cure following TFS uterosacral minisling repair**

|                         | Number of patients with symptom or condition/total patients (%) |              | Significance of the $\chi^2$ values of the McNemar tests when testing: $H_0$ vs. $H_1$ |
|-------------------------|---|--------------|--|
|                         | pre-TFS   | post-TFS     | <b>CURE</b> *  |
| Pelvic pain             | 194/611 (31%)   | 42/611 (7%)  | <b>77%</b> *   |
| Nocturia                | 254/611 (41%)   | 77/611 (13%) | <b>68%</b> *   |
| Urge/ Urge incontinence | 317/611 (52%)   | 51/611 (8%)  | <b>85%</b> *   |
| Frequency               | 310/611 (51%)   | 55/611 (9%)  | <b>83%</b> *   |
| Fecal incontinence      | 93/532 (17%)  | 34/532 (6%)  | <b>65%</b> *   |
| Apical prolapse         | 611/611 (100%)  | 63/611 (10%) | <b>90%</b> *   |

an implanted No2 polyester suture was two orders of magnitude greater than the breaking strength of ligaments. Application of this direct ligament repair method is already being applied to all the main ligaments, PUL (for SUI), cardinal (for cystocele), USL (for uterine prolapse) and deep transversus perinei (for perineocele and descending perineal syndrome). These are minor very low cost procedures which can be performed under local anesthesia, and, if proven to have long-term effect, will likely become the gold standard surgery for pelvic symptoms and organ prolapse. The cost is a few dollars per patient, a far cry from the many hundreds (or thousands) of dollars for mesh kits.

**Keywords:** Pelvic organ prolapse; bladder dysfunction; rectal dysfunction; wide-bore polyester sutures; integral theory

## ETHICS

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

## DISCLOSURES

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