

## Experimental Study No. 6: Correction of abnormal geometry and dysfunction by suspensory ligament reconstruction gives insights into mechanisms for anorectal angle formation

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**Abstract:** Normalization of the anorectal angle after fecal incontinence cure by midurethral and posterior sling surgery is consistent with the hypothesis that a normal anorectal angle requires balanced pelvic muscle forces.

**Key words:** Fecal incontinence; Muscle balance; Obstructed defecation; Anorectal angle; Integral theory.

### INTRODUCTION

It is generally believed that raised intra-abdominal pressure presses the rectum down to increase the anorectal angle.<sup>1</sup> Study No. 3 demonstrated that levator plate contraction was a likely factor in anorectal closure, and therefore would have some influence on the shape of the anorectum. In contrast, study No. 4 indicated that increased abdominal pressure *per se* could not be a factor in anorectal closure, and therefore would have little influence on the shape of the anorectum.

This case report appears to support the Theory's concept that the anorectal angle is a resultant of balanced muscle forces acting against competent suspensory ligaments.

### CLINICAL PICTURE

The patient was 49 years old, para 3. She presented with difficulty with defecation, fecal incontinence, stress urinary incontinence, nocturia and pelvic pain. The patient had second degree vault prolapse, lax rectovaginal fascia and a very deficient perineal body. Pre-operative ultrasound (Fig. 1) showed an acute anorectal angle at rest, which was only minimally responsive to straining. Defecating proctogram demonstrated an acute anorectal angle similar to that in Fig. 1. There was no rectocele or rectal intussusception. Attempted evacuation was accompanied by straining against an uneffaced ano-rectal angle, with no passage of barium. Digital pressure applied to the perineal body under fluoroscopy appeared to support the anterior vaginal wall, and to straighten out the ano-rectal angle. This resulted in slight opening of the anorectal canal, and the passage of a small amount of rectal content.

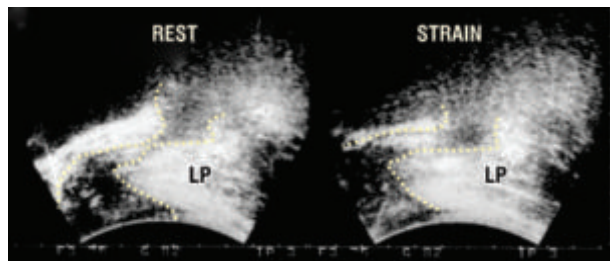


Fig. 1. – Acute anorectal angle at rest and straining. Transperineal ultrasound. Note excessive forward indentation of the posterior rectal wall at rest. On straining, there is no significant change in the ano-rectal angle; the rectum just above the ano-rectal angle appears to be opened out on straining, rather than narrowed as in Fig. 2.

### SURGERY

The patient had a posterior polypropylene sling<sup>2</sup> to reconstruct the uterosacral ligaments, repair of rectovaginal fascia and perineal body for repair of her uterovaginal prolapse. She had an anterior sling to reconstruct the pubourethral ligament for cure of her stress urinary incontinence.<sup>1</sup>

### RESULTS

The patient was cured of urinary and fecal incontinence and was able to defecate normally. The post-operative transperineal ultrasound examination (Fig. 2), demonstrated a return to normal morphology.

### DISCUSSION

It was radiologically demonstrated, in Study No. 2, that the anorectal closure muscles levator plate (LP), longitudinal muscles of the anus (LMA), and puborectalis muscle (PRM), stretch the rectal walls in opposite directions. It is hypothesized:

- (1) That the balance of forward and backward forces determines the shape of the rectum, and anorectal angle.
- (2) That lax pubourethral (PUL) and uterosacral (USL) ligaments will weaken the backward/downward muscle forces, distorting the anorectal angle by unbalanced forward (puborectalis) muscle contraction.

Both LP and LMA (Fig. 3), rely on firm ligamentous insertion points to contract adequately: superiorly, the uterosacral ligaments, 'USL', and inferiorly, external anal sphinc-

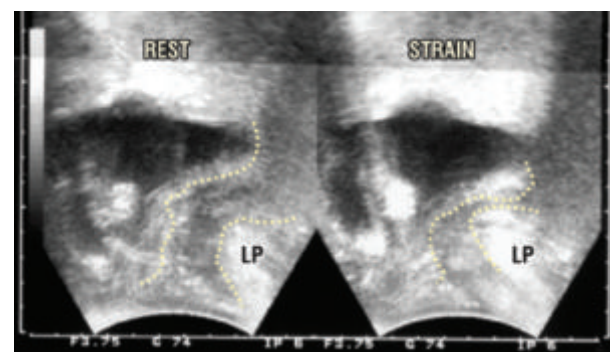


Fig. 2. – Post-operative perineal ultrasound, at rest and straining. Note restoration of normal anatomy. The anorectal angle is now essentially normal at rest. On straining, the rectum narrowed markedly just above the ano-rectal angle, with forward displacement of the anus, and creation of a more acute ano-rectal angle.

ter and perineal body, 'PB' (Fig. 3). This inability to balance the forward contraction of puborectalis muscle (PRM), may explain the acute anorectal angle "A". We explain the use of digital pressure to facilitate evacuation as follows: a

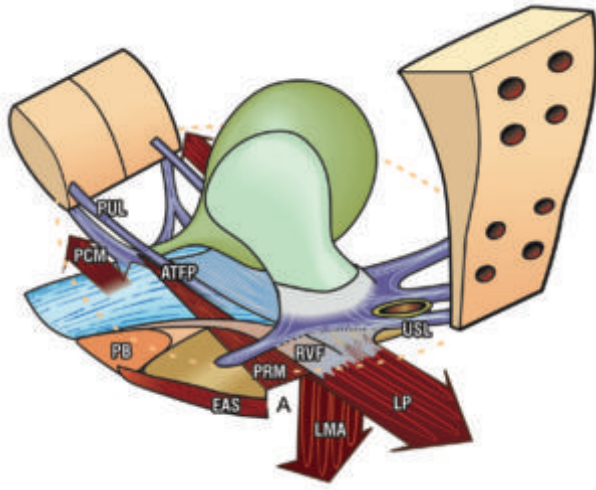


Fig. 3. – Proposed mechanism of an acute anorectal angle. The anorectal angle "A" is formed by balanced backward contraction of levator plate (LP) and longitudinal muscle of the anus (LMA), against forward contraction of m.puborectalis (PRM). PUL and USL laxity will weaken LP/LMA contraction. In relative terms, PRM contracts more strongly. The system becomes unbalanced, and PRM indents the posterior rectal wall, causing an acute anorectal angle. RVF=rectovaginal fascia; PB = perineal body.

lax perineal body will prevent the levator plate from stretching the anterior wall of rectum via a tensioned rectovaginal fascia. This mechanism is a pre-requisite for normal evacuation. Digital pressure on the posterior vaginal wall mimics a firm perineal body, allowing levator plate 'LP', Fig. 3 to stretch the rectovaginal fascia 'RVF' backwards, temporarily restoring the anorectal opening mechanism.

#### CONCLUSIONS

Cut away from their ligament and muscle supports, the pelvic organs have no shape or strength. Like a rope suspension bridge, the forces stretching the organs against the suspensory ligaments (Fig. 3) must be balanced. Any imbalance may change the geometry, and even function of particular organs. Restoration of normal anorectal geometry and function by surgical reinforcement of the suspensory ligaments and perineal body in this case supports this hypothesis.

#### REFERENCES

1. Parks AG. Anorectal incontinence. Proc Royal Soc Med 1975; 68: 681-90.
2. Petros PE. New ambulatory surgical methods using an anatomical classification of urinary dysfunction improve stress, urge, and abnormal emptying. Int J Urogynecology 1997; 8: 270-278.

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