

Pelvic Floor Dysfunction, Body Excreta Incontinence and Continence

Abdel Karim M El Hemaly^{1*} and Laila ASE Mousa¹

¹Professor of Obstetrics and gynaecology, Faculty of Medicine, Al Azhar University, Cairo, Egypt

***Corresponding Author:** Abdel Karim M El Hemaly, 1Professor of Obstetrics and gynaecology, Faculty of Medicine, Al Azhar University, Cairo, Egypt.

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Abstract

Anatomy: Pelvic floor dysfunction, better called pelvic organs dysfunction, is widely present in women particularly around menopause. We believe that every organ in the body has a strong collagen chassis. Injury of the chassis will distort the organ, lead to dysfunction, abnormal position and chronic pain. The strongest layer of the pelvic floor is the second layer, which is a fibro-muscular layer. It consists of the pelvic diaphragm muscles and the strong endopelvic fascia. The endopelvic fascia consists mainly of collagen tissue and has condensation of the collagen creating the pelvic ligaments (the utero-sacral, the great transverse cervical and the pubo-vesical ligaments). The strong second layer keeps the pelvic organ's tracts in their proper site. Any weakness in the second layer leads to displacement of the pelvic organs and chronic pelvic pain.

Micturition and the IUS: The internal urethral sphincter (IUS) is a collagen-muscle tissue cylinder that extends from the bladder neck down to the perineal membrane in men and women. The muscle has its nerve supply from alpha sympathetic fibers from T10- L2. After training, in the second stage of micturition, there is high alpha sympathetic tone that keeps the IUS contracted and the urethra closed and empty all the time except on voiding.

Defecation and the IAS: The internal anal sphincter (IAS) is a collagen-muscle tissue cylinder that surrounds the anal canal, with the external anal sphincter surrounding its lower part. The nerve supply to the IAS is alpha-sympathetic nerves from T 10 to L2. Training creates high alpha-sympathetic tone at the IAS that keeps it contracted and the anal canal closed and empty all the time.

Pathophysiology: Injury of the pelvic collagen leads to voiding troubles, urinary incontinence (UI), fecal incontinence (FI), genital prolapse and chronic pelvic pain.

Keywords: Pelvic floor dysfunction; Women; Menopause; Urinary Incontinence

Introduction

The pelvic floor consists of all the structures closing the pelvic outlet from the peritoneum superiorly to the skin inferiorly. It consists of three strata. The first stratum is the pelvic peritoneum. The second stratum is the pelvic diaphragm, which is a funnel-shaped fibro-muscular partition. It consists of the pelvic diaphragm muscles and the endopelvic fascia. The endopelvic fascia consists mainly of collagen fibers, with its condensations, the pelvic ligaments (the utero-sacral, cardinal transverse cervical and pubo-cervical ligaments). The third stratum is the perineum, which consists of the perineal membrane, perineal muscles, fascia, and the skin.

Pathophysiology: 2-29

The endopelvic fascia with its condensations, the pelvic ligaments, consists mainly of collagen. Estrogen supports the vitality and strength of the pelvic collagen, so that estrogen deficiency leads to weak atrophic pelvic ligaments with its sequel genital prolapse.

The female pelvis contains three major tracts that lie on and traverse the pelvic floor. These tracts are the urinary bladder and the urethra anteriorly, the female genital tract in the middle, and the rectum and anal canal posteriorly.

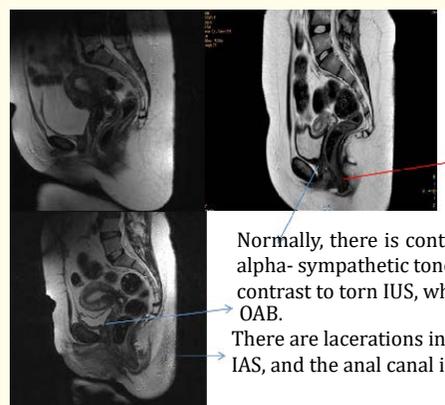
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We believe that every organ in the body has strong collagen chassis. Injury of the collagen chassis will lead to abnormality in the shape, site, and the functions of that organ. The contributions of the pelvic floor to the structural support and the functions of the three major tracts have been the subject of controversy. With increasing age, women can develop voiding troubles, such as urgency, overactive bladder (OAB), frequency, nocturia, and stress urinary incontinence (SUI). Other concomitant troubles that occur are genital prolapse, fecal incontinence (FI), and chronic pelvic pain (CPP). All these symptoms can be associated to a greater or lesser extent with pelvic floor defects 1. We think that these troubles are, more accurately, associated with defects in the pelvic organs 2, 5 & 8. Childbirth is the main traumatic factor to the pelvic organs and the pelvic floor. The trauma is more severe especially after difficult labor, instrumental labor, frequent and repeated labors. Infections, (uro-genital), chronic and recurrent infections, can cause degeneration of the pelvic collagen adding to its weakness. Estrogens support the pelvic collagen, so estrogen deficiency leads to its atrophy that adds to its weakness. Rarely there is congenital weakness of the collagen leading to virginal genital prolapse.

Urinary Incontinence: 2, 3, 4, 5, 6, 8, 9, 10, 11, 22, 28 & 29.

The internal urethral sphincter (IUS) is a collagen-muscle tissue cylinder that extends from the bladder neck down to the perineal membrane in men and women. The muscle has its nerve supply from the thoraco-lumbar alpha sympathetic chain, fibers from T10- L 2.

Micturition has two stages, the first stage, before training, as the bladder is full, stretch receptors send impulses along pelvic sensory nerves, S 2, 3 & 4 to the sacral centers. The sacral para-sympathetic nerves, S 2, 3 & 4 induce contraction of the detrusor muscle and emptying of the bladder. The second stage: the mother starts to teach and train her infant/child how to hold up and not to void until she puts her/him on the pot, and with growing up, in the toilet according to social circumstances. After training, in the second stage of micturition, there will be an acquired high alpha sympathetic tone that keeps the IUS contracted and the urethra closed and empty all the time until favorable social circumstances. On desire/or need, the person voluntary will inhibit the acquired high alpha-sympathetic tone at the IUS, relaxing the sphincter allow the flow of urine. The external urethral sphincter is a voluntary muscle innervated with somatic nerves. Injury of the IUS or its nerve supply will lead to voiding troubles. The lacerations usually affect the collagen tissue layer of the IUS mostly caused by childbirth. The lacerations usually affect the whole length leading to mixed type of urinary incontinence. We can demonstrate this by pelvic floor imaging (ultrasound, MRI, CT scan). On imaging, (figures 1-7) there will be seen an open urethra with irregular torn wall. If the laceration is mainly in the upper part of the cylinder of the IUS, this will allow urine to enter the upper part of the urethra on stress, that will initiates a sudden desire to void, over active bladder (OAB) (figures 1B, 2A, 3B & 5), otherwise urine will leak, urge and urgency incontinence. If the injury affects mainly the lower part of the IUS, this will lead to “genuine stress urinary incontinence” (figure 4).



Normally, there is contraction of the IUS due to the acquired high alpha- sympathetic tone. The urethra is closed and empty. This is in contrast to torn IUS, which affects the upper part causing OAB.
There are lacerations in the walls of the IAS, and the anal canal is open

Figure 1: MRI pictures of the pelvis, (A) there is lacerations of the IAS which leads to an open anal canal. There is a small funneling of the urethra. Image (B), both the IUS and the IAS are intact leading to a closed empty urethra and a closed empty anal canal. Image (C), both the IUS and the IAS are torn with an open urethra in its upper end (funneling), this leads to OAB; and an open anal canal, which leads to FI.

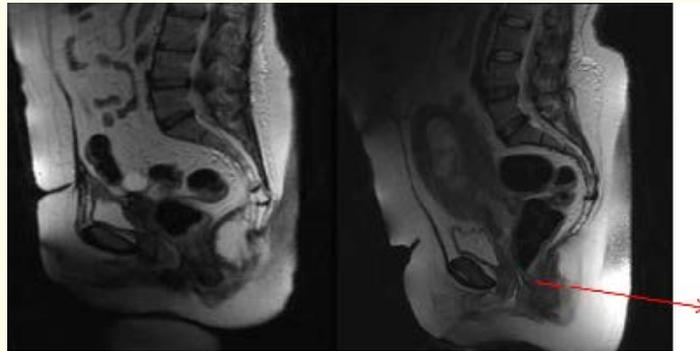


Figure 2: MRI images, sagittal sections; Image (A) there are torn both IUS, which causes funneling of the bladder neck leading to OAB; and torn IAS that leads to FI. In image (B), there is an intact IAS with closed and empty anal canal, but there is torn IUS in its upper end causing funneling of the bladder neck that leads to urge and urgency incontinence.

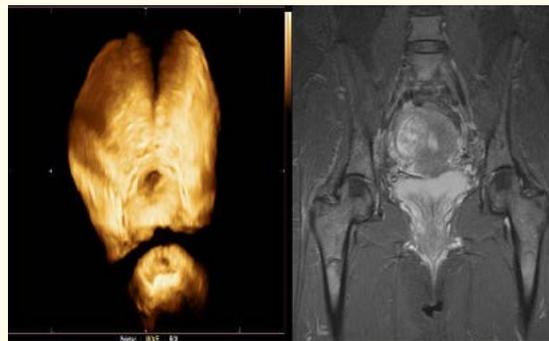


Figure 3: Image (A) is 3Dimension ultrasound (3DUS), that shows torn IUS with an open urethra, especially its upper end with funneling of the bladder neck. Image (B) is an MR image, which shows torn IUS, the lacerations affect the whole length.

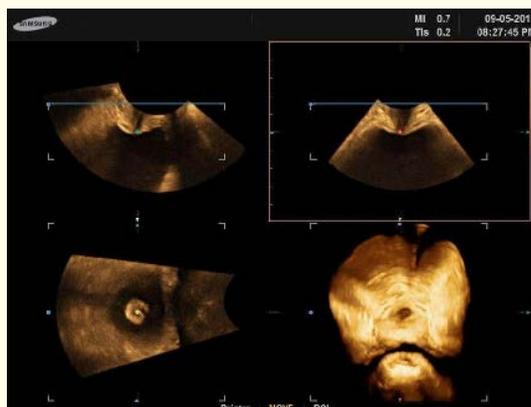


Figure 4: An image with 3DUS, that shows an open urethra with torn IUS more marked in its lower part. The patient suffers from genuine SUI.



Figure 5: An image with 3DUS, it shows an open urethra with torn IUS. The lacerations are all through the entire length of the IUS. The patient complains of mixed type of UI.

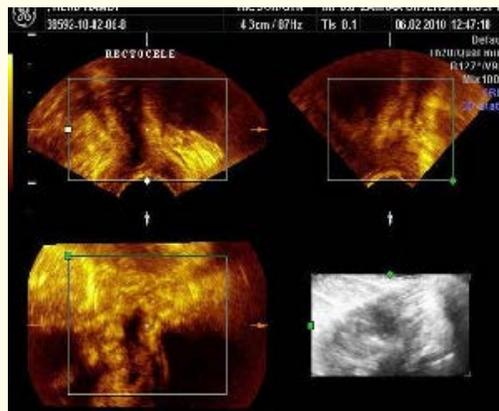


Figure 6: An image with 3DUS, it shows an open anal canal with torn IAS. The lacerations are all through the entire length of the IAS, which cause FI.

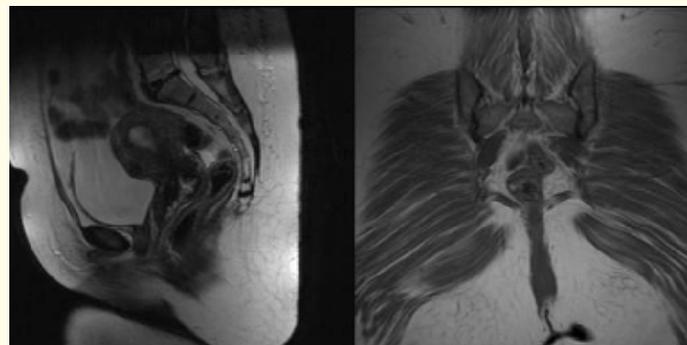


Figure 7: MR images (A) is sagittal section, which shows an open anal canal with torn IAS in a patient who suffers FI. Image (B) is a coronal section, which shows an open anal canal with torn IAS, with some stool leaking.

Fecal Incontinence: 2, 3, 4, 5, 7 & 14; figures 1A, B & C, 2B, 6 & 7)

The internal anal sphincter (IAS) is a collagen-muscle tissue cylinder that surrounds the anal canal, with the external anal sphincter surrounding its lower part. The nerve supply to the IAS is alpha-sympathetic nerves from T10 to L2.

Defecation has two stages, the first stage, before training, as the rectum is full, stretch receptors send impulses along pelvic sensory nerves, S 2, 3 & 4 to the sacral centers. The sacral para-sympathetic nerves, S 2, 3 & 4 induce contraction of the rectal and pelvic colon muscles and emptying of the rectum irrespective of time and place. The second stage: the mother starts to teach and train her infant/child how to hold up and not to defecate until she puts her/him on the pot, and with growing up, in the toilet according to social circumstances. After training, in the second stage of defecation, there will be an acquired high alpha sympathetic tone that keeps the IAS contracted and the anal canal closed and empty all the time until favorable social circumstances. On desire/or need, the person voluntary will inhibit the acquired high alpha-sympathetic tone at the IAS, relaxing the sphincter allow the passage of flatus and/or stools.

Training creates high alpha-sympathetic tone at the IAS that keeps it contracted and the anal canal closed and empty all the time. Childbirth may cause injury and lacerations of the collagen chassis of the IAS leading to its weakness and subsequent leak of flatus and/or feces on rise of abdominal pressure, fecal incontinence (FI). Sometimes, childbirth causes complete perineal tear (third and fourth degree tear) where anal sphincters, the internal and external are torn leading to FI. Repair of the external anal sphincter and missing to repair the torn IAS explains the poor results of the repair done. Estrogen deficiency and chronic or repeated infections lead to weakness of the collagen layer of the IAS. This will aggravate the IAS weakness. Another important traumatic factor of torn weak IAS is anal intercourse.

The pelvic diaphragm muscles, mainly the levator ani muscles keep an acute angle between the rectum and the anal canal during rest; this is another factor of maintaining fecal continence. On defecation the levators relaxes turning the rectum and the anal canal into one axis to facilitate the passage of flatus and/or the feces.

Genital Prolapse: 4, 5, 8 & 10.

The vagina is a cylinder of collagen-elastic-muscle tissues that extends from the vulva externally, in an upward and backward direction. The uterus, pierce its upper end from the front. The strong collagen sheet is an important factor of keeping the up-backward direction of the vagina. The pelvic ligaments support the upper part of the vagina and keep their site to the lateral pelvic walls. Torn weak pelvic ligaments will lead to vault and uterine prolapse. Childbirth trauma causes stretching of vaginal walls with injury of the collagen chassis leading to vaginal prolapse. The IUS is intimately lying on the anterior vaginal wall and laceration will affect its collagen chassis as well. This will lead to anterior vaginal wall prolapse and urinary incontinence, (UI).

Similarly, childbirth trauma will lacerate the collagen chassis of both the posterior vaginal wall and the IAS. The result is posterior vaginal wall prolapse and fecal incontinence, (FI).

Conclusion: 2- 29.

Every body organ has a strong collagen chassis. Injury of the chassis will lead to anatomical, functional disturbances and pain until treated. The pelvic diaphragm is an essential element in keeping the pelvic organs in situ to perform their functions properly. In addition, the state of the pelvic organs and their nerve supply are essential factors in their proper anatomy and functions. Lacerations and weakness of the IUS lead to UI. Lacerations and weakness of the IAS cause FI. Lacerations of the endopelvic fascia and its condensations the pelvic ligaments induce uterine, vault prolapse and chronic pelvic pain. Lacerations and laxity of the vagina produce vaginal prolapse.

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