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The GenitoUrinary system in chiropractic: The neuroanatomy of the muscle-organ-gland correlation

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Abstract: As used in chiropractic applied kinesiology (AK), manual muscle testing (MMT) procedures are diagnostic tools in the examination of a system frequently ignored and even unexamined by traditional physicians today: the reproductive system of both men and women. Using AK MMT we can work directly with the position, motion, innervation, nutritional needs, tissue tone and functional capacity of the reproductive organs, their motor nerves, as well as their adjacent and supportive tissues. AK MMT procedures permit us to restore proper tone and structure/function relationships throughout this critical area, and to improve its potential for health. The genitourinary system needs not be viewed differently than other body systems, i.e., it does not need to be ignored as a specific clinical entity and therapeutic target of care.

This paper argues that it makes no sense for the chiropractic profession to deliberately shy away from the genitourinary system in its patient recruitment, history taking, functional examinations or therapeutics. We possess methods within our therapeutic system that permit us to evaluate and treat the genitourinary system; with respect, reverence, sensitivity, and skill. Visual and laboratory inspection of the tissues and fluids of the reproductive organs is only one aspect of the proper evaluation of this integrative neuro-endocrine system.

The relationship of applied kinesiology to the endocrine system is one that creates success for the clinician where other manual modalities might fall short. Each of the endocrine organs has been given diagnostic tests, therapeutic protocols, nutritional correlations, and treatment monitoring methods. The endocrine glands are of course controlled by the nervous system, and this is why chiropractic has proven to be helpful throughout its history for endocrine-related disorders.[1] But applied kinesiology offers an exhaustive and repeatably accurate way to monitor both the endocrine symphony and the effect of our natural therapies upon it. This system of chiropractic diagnosis and treatment offers us as much *endocrinology for the general practitioner* as will be found anywhere.

Indexing Terms: Piriformis; genitourinary; manual muscle test; muscle imbalance; Applied Kinesiology (AK); diagnosis.

Introduction

First of all, it must be admitted that it is very difficult to localise and distinguish between the various palpated and tested tissues in the pelvic area. Only by having a thorough knowledge of both the external and internal anatomy of the pelvis can this be accomplished. Most states in the US and countries around the world do not allow chiropractors to palpate the internal anatomy of the genito-urinary system. However the pelvic tissues can be specifically tested using non-invasive AK MMT procedures, and the muscle inhibitions found can be anatomically interpreted by the physician as to the

... Cuthbert provides a comprehensive clinical narrative to simplify a chiropractor's approach to genito-urinary issues in the female patient with some notes on the male. The role of the piriformis is given in detail along with all forms of MMT for assessment.

location of the primary involvement: segmental level, muscle myotome, viscerosomatic reflex, organ-gland, pelvic articulation, myofascia bands, nutritional deficiency, lymphatic or vascular pooling, cranial-sacral involvement, and more.

Gray's Anatomy makes the contention of this integrative chiropractic approach very clear:

> *'The term 'autonomic' is a convenient rather than appropriate title, since the functional autonomy of this part of the nervous system is illusory. Rather its functions are normally closely integrated with changes in somatic activities, although the anatomical basis for such interactions are not always clear…A more realistic notion is that these sets of neurones represent an integrated system for the coordinated neural regulation of visceral and homeostatic function…Rises in blood pressure and pupillodilation may result from the stimulation of somatic receptors in the skin or other tissues.'* (1)

There is increasing interest about the possible involvement of the autonomic nervous system (ANS) in initiation and maintenance of chronic muscle pain syndromes of different aetiology. Epidemiological data show that stresses of different nature, e.g. work-related, psychosocial, etc., typically characterised by SNS activation, may be a co-factor in the development of muscle dysfunctions (inhibition), muscle spindle activity, pain syndromes, and negatively affect the duration and severity of symptoms. Dysfunctions arising from myofascial trigger points have been linked to sympathetic nervous system inputs.

The claim that spinal disorders ('*subluxations*' in chiropractic; '*somatic dysfunction*' or the '*osteopathic lesion*' in osteopathy) have no effect upon visceral function appears to be dissolving, with evidence emerging from neuroscience research involving both human and animal studies. (2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16) This research confirms and partially validates what has been seen clinically among chiropractic, osteopathic, naturopathic, homeopathic, acupuncture and particularly applied kinesiology clinicians for centuries.

Changes in autonomic nervous system activity have been offered as one explanation for the remote effects of manual therapies, particularly spinal manipulation. (10, 11, 12) Rome (another constant contributor to this *Journal*) has presented a broad overview of the published literature referring to spine-related neural reflexes upon organic symptoms, signs and conditions - the somato-autonomic influence.

According to Rome '*There appears to be extensive if not overwhelming evidence as to the potential for a manual model for positively influencing the autonomic nervous system and through that, internal pathophysiology and symptoms*'. At this time and from this mountain of evidence that manual treatment can beneficially influence neurological, circulatory, immune, eliminative, hormonal, biochemical and psychosocial function, the long-history of applied kinesiology physicians evaluating and treating viscerosomatic/musculo-visceral dysfunctions will likely continue.

Masarsky and Masarsky (who employ AK in clinical practice and have published a great number of AK outcome studies and is a regular contributor to the *Journal*) have elegantly and exhaustively summarised this research in their influential book Somatovisceral Aspects of Chiropractic: An Evidence-Based Approach. (10)

> *'The somatovisceral aspects of the [chiropractic] vertebral subluxation complex have too often and for too long been given short shrift within the profession while attention has been lavished on the musculoskeletal aspects. This reflects an artificial division between the neurology of the musculoskeletal system and the neurology of*

the viscera. Nature does not recognize this sharp division. Instead, the natural world has produced a nervous system that is a wonder of integration. Under the influence of this master integration system, smooth and striated muscle, activity and stillness, thought and emotion all contribute to the texture of life in a whole being.'

Browning (17) introduces a disorder known as mechanically induced pelvic pain and organic dysfunction (PPOD) syndrome. Browning claims that '*Of all the organic disorders that have been reported to benefit from chiropractic intervention, pelvic pain and various disturbances of bladder, bowel, gynecologic, and sexual function are among the most frequently described*.'

Duffy (6) elaborates on the fundamental contribution Goodheart and AK have made toward the diagnosis of functional visceral disorders.

'Throughout much of the written history of the healing arts, there has existed a collection of points on the body regarded as "reflex" points which have been used empirically as symptomatic indications of visceral dysfunction. Such points can be found in most medical dictionaries…such as "Boas' point" (tenderness at the left of the 12th thoracic vertebrae in gastric ulcer), or "Brewer's point" (tenderness over the costovertebral angle indicative of kidney infection), etc. Evidence has been in existence for long periods of time which relate points on the surface of the body with internal organs …

Goodheart has removed "reflex" point information from the realm of empiricism and rendered it more objectively useful. The capability is now available to diagnose the existence of the need for treatment of these reflex points. What is most important, for the manipulative arts, is that the techniques are: non-invasive; do no harm; and give immediate, reproducible, demonstrable, diagnostic information without the need for complicated, expensive equipment that can be quickly repeated to assess the effectiveness of whatever corrections have been made.'

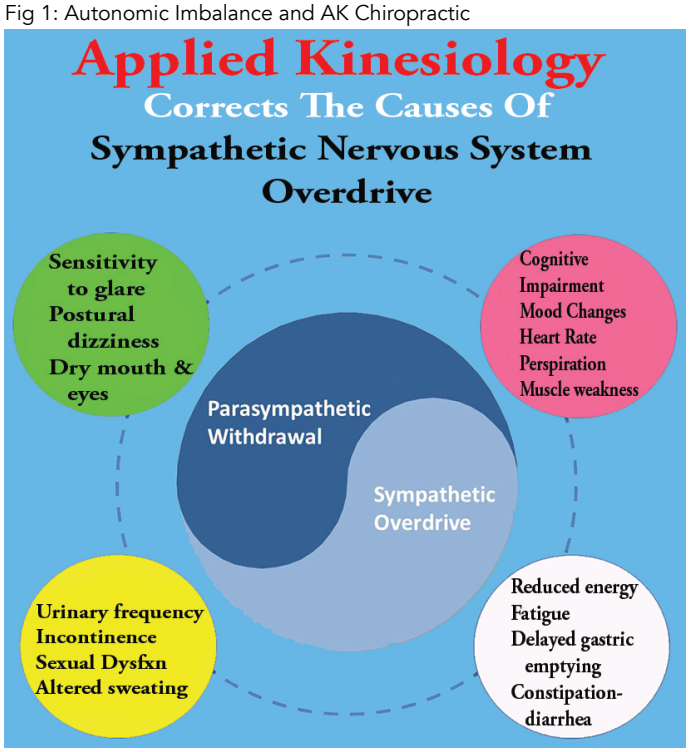
Applied kinesiology is employed in the treatment of patients with a wide range of diseases and conditions, unrelated to obvious biomechanical problems. This situation emphasizes a basic requirement of AK practice – the necessity to consider the individual features of each patient and condition and the background of chronic stressors (biomechanical, biochemical, and psychosocial) that a patient brings to the examination. It is also important to recognize that viscerosomatic reflex activity occurring in a patient's musculoskeletal system may be determined before any symptoms of visceral change are evident and that this phenomena (the muscle inhibitions resulting from viscerosomatic reflexes) has potential prognostic and diagnostic value.

In patients who come to physicians for care, pain receptors (nociceptors) transmit their distress to the dorsal horn of the spinal cord and, if the intensity of this stimulation from the periphery is strong enough and sustained, pain will be registered in the brain. Simultaneously, stimulation of motor neurons at the ventral horn will insure a change in muscular tone and sympathetic responses will alter circulatory profusion through the muscles. (2)

The sympathetic nervous systems contribution to deep tissue pain has been recognised for a long time.

Cervical afferents may also influence the sympathetic nervous system via beta-receptors within muscle tissue. Conversely, sympathetic nerve stimulation may have direct effects on the muscle spindles. (Figure 1)

Fig 1: Autonomic Imbalance and AK Chiropractic



The AK Breakthrough for Chiropractic Management of the Genito-Urinary System

The triad of health model in AK helps the clinician ameliorate each of the factors that may feed into ANS disturbances and into each other, for example: low blood sugar levels, increased progesterone levels, sympathetic arousal, toxic factors, adrenal stress or over-stimulation, metabolic acidosis, climatic conditions, altitude, emotional stimuli, allergic and digestive reactions, etc.

The integration of applied kinesiology principles with the principles of chiropractic neurology may help the physician to get a more complete view of a patient's cortical neurological status. In so doing, these therapies are suggested to help the patient achieve their optimal improvement in neuron metabolic function, and to overcome the problems created by cortical hemispheric dominance.

When an AK MMT reveals a weak muscle, there must be an inhibited central integrative state (CIS) at the alpha-motoneurons (alpha-MNs) that are the origin of the nerve to that muscle. The afferent inputs to alpha-MNs include collaterals from the intermediolateral (IML) column motoneurons which are the primary autonomic MNs. Autonomic function which originates at the hypothalamus is transmitted to the reticular formation and this information descends to the spinal cord via reticulospinal tracts which affect both IML MNs and alpha-MNs. Therefore, changes in autonomic function will affect, in a predictable, specific fashion, the CIS of alpha-MNs and hence, muscle strength and weakness patterns during MMT.

If there is a connection between the genitourinary system and the muscles of the pelvis we should find an immediate improvement in pelvic muscle strength and lumbar and femoral ROM upon application of the appropriate sensory-receptor challenge or correction. We should discover in a moment the difference this correction will make upon the tissues of the pelvis.

To immediately improve (by a particular therapeutic trial) the tissue tone surrounding the sacral plexus, for instance, or the tissue tone of muscles through which the pudendal arteries and veins pass, or the tissue tone of the suspensory ligaments of the uterus, ovaries, bladder, rectum, or vagina is a real benefit in the evaluation and treatment of any genitourinary involvement. Demonstrating this change to a patient is an excellent way to increase your practice and your reputation.

All too often women who suffer from pelvic or gynaecological disorders see themselves condemned to the conventional regimen of painkillers and anti-inflammatory drugs until the inevitable trip to the surgeon. This is so common in the patients who come to our practice that a large book could only begin to cover the subject. The 600,000-plus hysterectomies performed annually in the U.S. indicate the severity of these problems … and approximately 20 million U.S. women have had a hysterectomy.

Thirty to forty percent of menstruating women are also affected by premenstrual syndrome. The use of antidepressant drugs such as Prozac has become a dominant medical treatment for

PMS. (18) Large pharmaceutical companies have realised the huge potential market in this area and have sponsored clinical trials using drugs to treat PMS symptoms (e.g., antidepressants such as *Prozac* and *Zoloft*, anti-anxiety drugs related to *Valium*, and gonadotrophin releasing hormone), despite the fact that risks due to side effects far outweigh the benefits. (19)

Added to these statistics would be the 46% of post-menopausal women who take or have taken hormone replacement therapy (HRT). Continental Europeans are notably less enthusiastic about medication, the figures there falling into the teens, while in Japan a mere 6 percent of post-menopausal women take HRT, perhaps because they bring enough oestrogen into their bodies through the foods they eat, notably that well of phytoestrogens, soy. The most common complaints of menopause are hot flashes, headaches, atrophic vaginitis, frequent urinary tract infections, cold hands and feet, forgetfulness, and an inability to concentrate. In the US, 60 to 80% of menopausal women experience hot flashes to some degree. In most cases, hot flashes are most uncomfortable in the first and second years after menopause. As the body adapts to decreased oestrogen levels, the hot flashes typically subside.

Numerous case-series reports have demonstrated the AK management of menopause in patients both female and male with severe symptoms. (20, 21, 22, 23, 24)

In 2013, I published a report about 10 women in Colorado who suffered menopausal symptoms. Each patient was evaluated with *Salivary Hormone Tests* simultaneously with their AK MMT evaluations, potentially demonstrating the hormone imbalances underlying and correlating with their chiropractic presentations. Nutritional and chiropractic treatment produced excellent results in all 10 cases, as measured by the Menopause Rating Scale, an established tool for measuring the effects of treatment upon menopausal symptoms. Based on the findings of this report, the basic disturbances in these menopausal women appeared to involve stress physiology, adrenal gland hormone imbalances, thyroid dysfunction, compromised liver biotransformation of hormones, spinal joint disturbances, and nutritional deficiencies. Each of these impairments was detected with AK and confirmed by salivary hormone tests. The conservative chiropractic management were very helpful for this cohort of menopausal women. (20)

Another AK research team (23, 24) has published several case reports about the chiropractic and AK management of menstrual symptoms. A time-series study of a 55y woman with a four year history of hot flashes related to natural perimenopause is reported. A distinct downward trend in the frequency of hot flashes, based on entries from the patient's diary and clinical records, was noted following intervention with cervical and upper thoracic adjusting. (23)

The same authors presented the case of a 31y female patient experiencing hot flashes following injections of *leuprolide acetate* which artificially induces menopause. In this case, adjustments primarily in the upper cervical and cervicothoracic segments resulted in resolution of both hot flashes and concomitant neck pain. (24)

There are fifty million women in the United States over the age of fifty, and all of them are potential candidates for hormone therapy. If every one of them were to take hormone pills for the next thirty years, to the age of 80 which is close to the current female life expectancy that amounts to 1.5 billion woman-years of drug consumption for genitourinary related problems. Only in the past several decades, when pharmaceutical gigantism has come to characterise western health care around the world, has a drug regimen been proposed on such a scale.

Piriformis: The neuro-anatomy of the muscle-organ-gland correlation

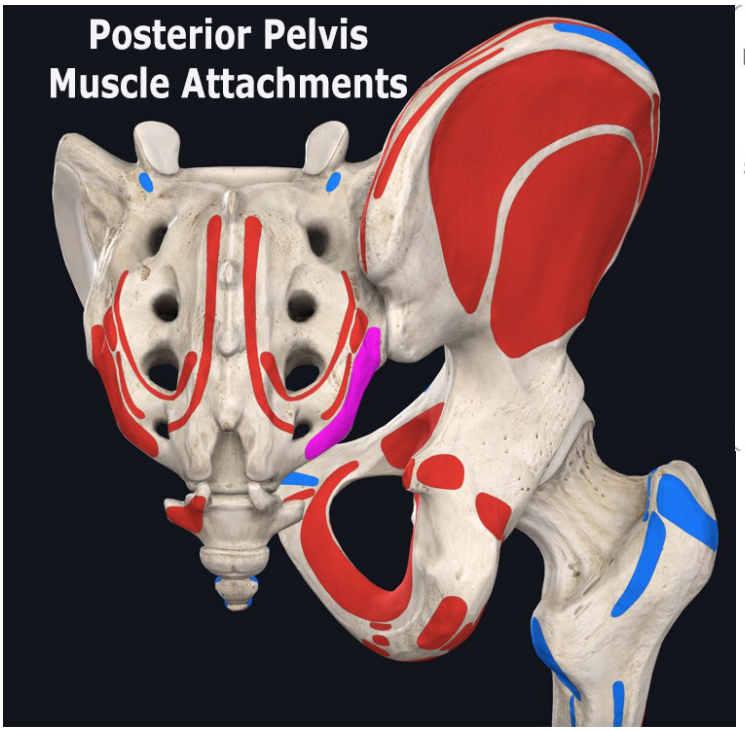
The anatomy, endocrinology and physiology of this area is intricately complex and wonderfully simple (to borrow a thought from Dr. Goodheart). The anatomical inter-relationships between the pelvic organs and the pelvic muscles are of great importance in the analysis and treatment of tissue malfunctions in the pelvis and genitourinary system. Some of these relationships will be

discussed in this paper. I hope that this will enable us to comprehend and visualise the extent of the interdependence between the musculoskeletal system and the functioning of the pelvic organs.

The *piriformis* muscle originates from the anterior surface of the sacrum by fleshy digitations between the first to fourth anterior sacral foramina. Some fibres may attach to the margin of the sciatic foramen at the capsule of the sacroiliac joint and some fibres may attach to the sacrospinous ligament. The muscle inserts into the superior border of the greater trochanter, just posterior to the *obturator internus* and the *gemelli*. This tendon of insertion often blends with these two muscles. (Figures 2, 3)

The fifth lumbar and *first* and *second sacral nerves* innervate the *piriformis*. Because of its sacral insertions (S1-S4), its triangular shape, and the way it runs outward and downward and its anterior position, the piriformis muscle has an immediate stabilising action on the sacroiliac articulation. The piriformis muscle is an abductor of the thigh, an external rotator, and a minimal extensor of the femur. As far as the low back and sacrum are concerned, it is a major source of trouble. By itself this one muscle, when hypertonic, can extend sciatica down to the popliteal space at the knee. Taut bands in this muscle may entrap the *peroneal* part or all of the *sciatic nerve*. (25, 26)(Figure 4)

Figs 2, 3: Piriformis muscle



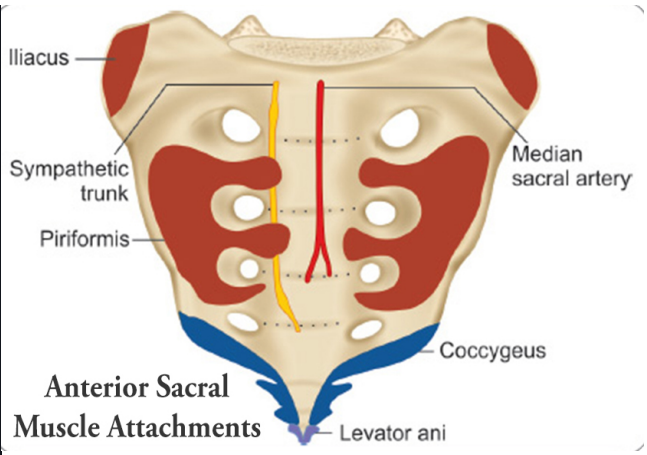
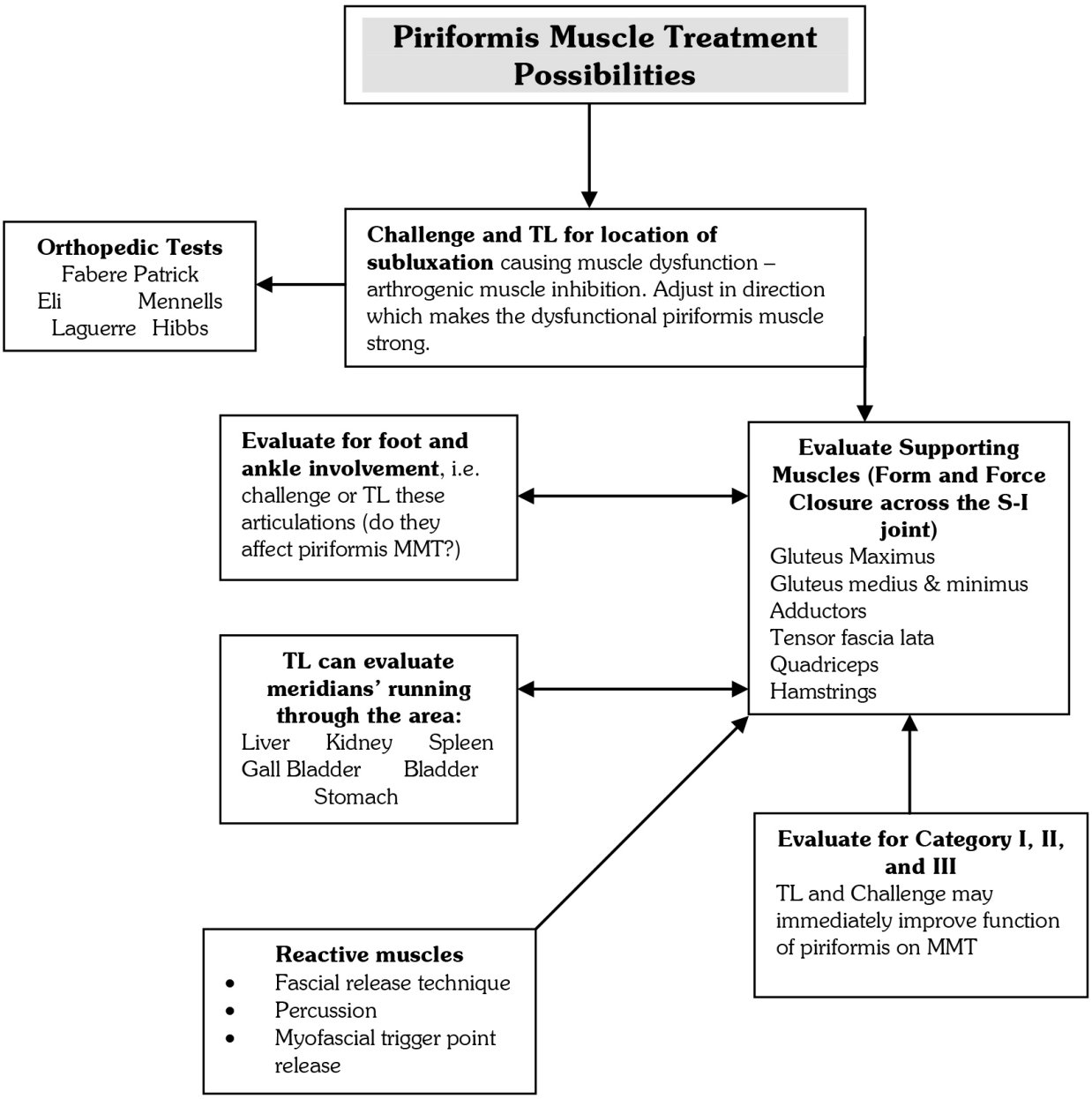


Fig 4: Mental concept for applying MMT to *piriformis*

Fig 5: Piriformis Muscle Algorithm of Assessment and Treatment in AK



In chiropractic practice, the frequency with which piriformis muscle problems are confused with sacroiliac subluxations is due to the fact that the muscle lies deep to this area. When the muscle is dysfunctional and engaged, especially when moving or lifting the leg, pain will be found at the points of attachment of the muscle. These points of attachment are on either side of the sacroiliac joint, thus causing the confusion in diagnosis for many therapists. Referred pain from trigger points in the piriformis may radiate into the sacroiliac region, producing confusion once again. The piriformis muscle and its contiguous fascia are often the site of painful inflammatory processes involving the toxic products of the circulating blood and lymph. The muscle itself will produce some of this irritating chemistry when it is dysfunctional.(27)

Specific MMT offers us the best way to differentially diagnose a piriformis muscle problem from other problems in this area. AK MMT, palpation of the muscle, and ROM testing are effective means for differentiating the source of a sacroiliac dysfunction.

Figure 5 (above) presents an algorithm for applying AK-methods of assessment of *piriformis*.

A unilateral weakness of the *piriformis* induces the sacrum to make a torsional movement on its oblique axis. The base of the sacrum moves backward and upward on the weakened side, while the apex of the sacrum on the opposite side is displaced forward and upward; this movement will be determined by the geometry of the auricular surfaces of the patient's sacrum. This sacral deviation will usually be mirrored by the occiput. Another finding that results from an oblique rotation of the sacrum may be a rotoscoliosis of the lumbar vertebrae. Numerous other distortion patterns will follow that affect the entire spinal column, including the shoulders, upper cervical and cranial areas. A '*scoliosis capitis*' may correlate with the oblique sacrum produced by a unilateral weakness of the *piriformis*.

The integrative model of the chiropractic subluxation suggests that each of the following can produce piriformis muscle dysfunction:(5, 28, 29, 30, 31)

- Subluxation, or pelvic category I through III involvement
- Local muscle injury (trigger or tender points; origin-insertion micro-avulsions)
- Cranial-sacral respiratory faults (nutation and counter-nutation of the sacroiliac mechanism)
- Viscerosomatic reflex weakness
- Endocrine-muscular effects
- Gait mechanism imbalances
- Foot and ankle subluxations
- Lymphatic congestion
- Nutritional deficiencies
- Vasoconstriction of the blood supply
- P.R.Y.T. modular body imbalances
- Oculo-Basic faults

With piriformis pain, it is usually possible to palpate the taut rope of the muscle through the overlying gluteus maximus. Neuromuscular spindle cell problems, micro-avulsions, trigger points or tender points in the muscle will usually have positive therapy localisation on testing and will also be palpable. The muscle stretch reaction or the maximum muscle contraction tests from AK will reveal these dysfunctions if present in the muscle.

Another method for the discovery of *piriformis* involvement has been described by Pace and Nagle.(32) They use a functional test for the *piriformis* by placing the hands on the lateral aspects of the patient's flexed knees and asking the patient to push the hands apart. Definite pain, faltering, or weakness on resisted lateral hip rotation will be elicited. This piriformis pain is local to the hip, does not radiate, and can also be elicited by pulling the bent knee across the body. This kind of pain may be found in female patients who complain of dyspareunia while in the so-called missionary position. Pain is produced in this position because of dysfunction in the piriformis muscle. Pudendal nerve entrapment by the piriformis muscle may cause impotence in men as well. (33, 34)

Pudendal nerve

The *pudendal nerve* leaves the pelvis between the *piriformis* and *coccygeus* muscles. It supplies much of the external genitalia and related peroneal musculature in both males and females. When the *pudendal nerve* and blood vessels are involved in *piriformis* muscle entrapment, there may be a lack of genital sensation, pain, incontinence, or impotence. (35) Figures 6-10 show the piriformis and somato-autonomically related muscles attaching to the sacrum which are testable using chiropractic MMT.

Figs 6-10: Showing *piriformis* and somato-autonomically related muscles attaching to the sacrum which are testable using chiropractic MMT.

Fig 6: *piriformis* prone MMT

Fig 7: *piriformis* supine MMT

Fig 8: *piriformis* seated MMT

Fig 9: *piriformis* preferred MMT, by Walther

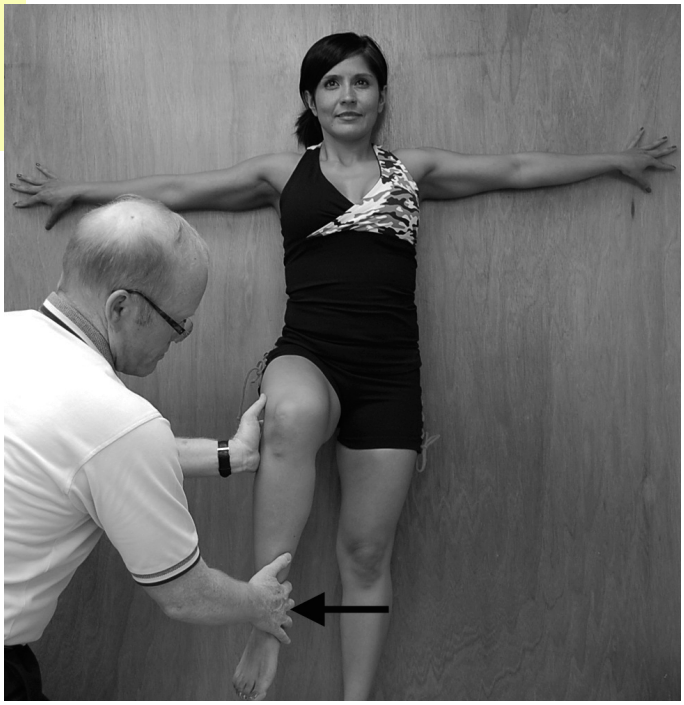


Fig 9: *piriformis* standing MMT

P*udendal nerve* entrapments in Alcock's canal of the pelvis. (35, 36) Skillern (37) explained the mechanism of piriformis dysfunction as coming from peripheral irritation caused by minor strain of the sacroiliac joint. Fourteen cadavers were studied by Freiberg and Vinke to establish the relationship of the sacroiliac joints with the sacral and lumbar plexus and the sciatic nerve to the piriformis. There is a very intimate relationship of the branches of the plexus with the blood vessels. They are so closely interwoven that it is difficult to separate them. Some symptoms of piriformis syndrome may occur from local inflammation and congestion caused by the muscular compression of small nerves and vessels, including the pudendal nerve and blood vessels, which emerge at the medial inferior border of the piriformis muscle. (1)

Assessment

The first phase of examination includes palpation of the *piriformis* muscle's insertion and around the greater trochanter for tenderness. From this insertion proceed toward the sciatic notch to palpate the piriformis muscle mass. The sciatic notch is located approximately 2" (5cm) lateral and 1" (2.5cm) caudal to the posterior superior iliac spine.

Another critical area of importance in any functional evaluation of the pelvis must be mentioned: the lumbosacral junction. This area must be examined thoroughly for any patient with genitourinary involvements. The upper two nerves that supply the *piriformis* muscle pass through this area, which is sometimes called Marcelle's triangle, lateral to the body of the 5th lumbar vertebrae.

The medial boundary of this triangle is formed by the body of the 5th lumbar vertebra, the lateral by the medial border of the psoas major, and its base by the upper part of the sacral ala. The floor is formed by the anterior portion of the transverse process of the fifth lumbar vertebra and the *iliolumbar* and *lumbosacral* ligaments. The lateral sympathetic chain ganglia pass through this triangle, as well as a large branch passing to the hypogastric plexus and the *genito-femoral* and *obturator* nerves from the lumbar plexus. Within the triangle on the left side are the common iliac lymphatic glands, the ureter, the internal spermatic or ovarian vessels, and the terminal portion of the inferior mesenteric artery that becomes the superior hemorrhoidal. The internal and external iliac veins unite to form the left common iliac vein, while the left common iliac artery divides to form the external and internal iliac arteries, and the *ilio-hypogastric* artery. These arteries directly supply the genitourinary system. (1)

All of the rotators of the hip attach to the ilium, ischium, sacrum, and femur. Although they are small, short and deep, they powerfully influence the basic structural relationships of the pelvis when they are weak or in spasm. The fascial sheets of the *erector spinae*, *quadratus lumborum*, *psoas*, *piriformis* and pelvic floor are all continuous. This myofascial blending travels laterally to form the connective tissue covering of the abdominal oblique muscles and the *rectus abdominus*. The myofascia of the *psoas* is continuous with those of the lower border of the *diaphragm*. The fascia of the *psoas* via the *iliacus* is also continuous with that of the *obturator internus*, which then blends into the pelvic diaphragm.

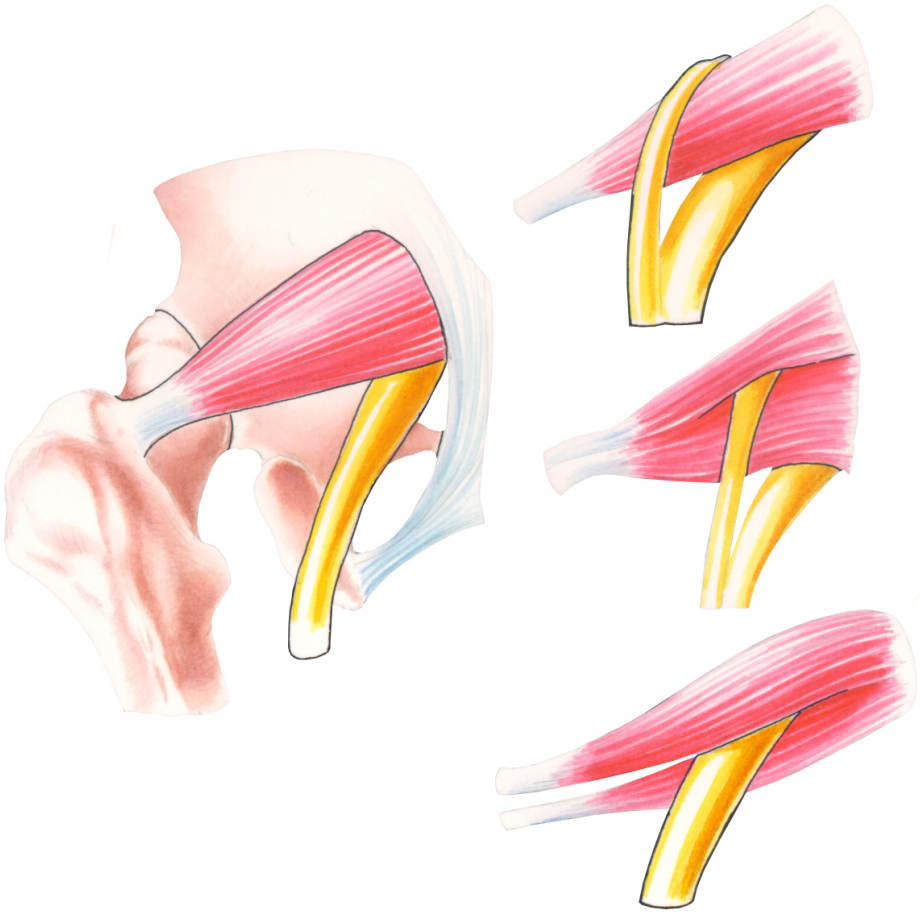
Even this partial list of the muscles of the pelvis makes it obvious that they and their fascia form an interconnected web; the muscles are not layered like a cake, but interwoven like a mesh. A reasonable working knowledge of local anatomy gives us an understanding of the tissue layers and direction of muscle and fascial fibres producing the body distortions we find by measurement, palpation, challenge, and therapy localisation (TL). This knowledge also allows us to determine which nerve, organ, lymph, blood, or bony distortion is most likely implicated in the muscle imbalances that we find by testing.

Drs. Travell and Simons (33) in their masterful chapter on the piriformis muscle review the critical importance of this muscle's functional tone to the neurovascular complex that passes

through the greater sciatic foramen with it. The *superior gluteal nerve* and blood vessels pass between the superior border of the *piriformis* and the upper sacroiliac rim of the foramen. This nerve supplies the *gluteus medius*, *gluteus minimus*, and *tensor fascia lata* muscles. The *sciatic nerve* that we are all familiar with exits between the *piriformis* muscle and the rim of the greater sciatic foramen. It supplies the skin and muscles of the posterior thigh and most of the leg and foot.

Also exiting the pelvis along the lower border of the *piriformis* muscle are the *pudendal nerve* and vessels. Proper function of this nerve and the structures it supplies is critical to normal sexual function. The *inferior gluteal nerve* to the *gluteus maximus muscle*, the *posterior femoral cutaneous nerve*, and the nerves to the *gemelli*, *obturator internus*, and *quadratus femoris* muscles also pass through the greater sciatic foramen with the *piriformis*.

Fig 11: The variable passage of the *sciatic nerve* through the *piriformis* muscle.



Drs. Travell and Simons close this section of their chapter on the piriformis muscle by saying '*It is apparent that chronic compression of these nerves would cause buttock, inguinal, and posterior thigh pain, as well as pain lower in the limb*.'

Pelvic nerve supply and the myofascia of the piriformis

It must be understood that most of the nerves of the pelvis that emerge from the spinal canal actually pass through and are surrounded by skeletal muscle. The contractile forces of these skeletal muscles of the pelvis exert a profound influence on the metabolism and excitability of its nerves. (35) In this environment the nerves are subject to considerable mechanical and chemical influences of various kinds, including compression, stretch, angulation, torsion, oedema, and many others.

Enmeshed in the myofascia of the piriformis lies the sacral plexus, which is formed by the anterior primary divisions (ventral rami) of L4 and L5 (lumbosacral trunk), S1-S3, and part of S4. The anterior primary division of S4 also contributes to the coccygeal plexus. The critical neuro-anatomic importance of this fact will be described below.

The branches of the sacral plexus are listed below (contributing spinal cord segments appear in parentheses). (1)

- *Posterior cutaneous* nerve of the thigh (S1-3)
- *Pudendal* nerve (S2-4)
- *Sciatic* nerve (L4-5, S1-3)
- *Superior gluteal* nerve (L4, 5,S1)
- *Inferior gluteal* nerve (L5, S1, S2)
- Nerve to the *obturator internus* and superior *gemellus* (L5, S1, S2)
- Nerve to the *quadratus femoris* and *inferior gemellus* (L4, L5, S1)

If we study the course and final innervation of these nerves, we will find that the pelvic organs have a shared nerve supply with the muscles described in the applied kinesiology muscle-organ/gland correlation to the reproductive system: the *gluteus maximus*, *medius*, *minimus*, *piriformis*, *anterior tibial*, and *adductors*. (35) The nerves listed above are extremely important in maintaining normal genitourinary function. Viscero-visceral hyperalgesia is thought to be due to two or more organs with overlapping sensory projections, of course these sensory projections are connected functionally with the muscles and autonomic functions they are anatomically tied to. From the *piriformis* and pelvic pain perspective it is interesting how the bladder afferents overlap with the uterine afferents and the uterine afferents with the colon afferents. (38)

To cite just one example:

> *The pudendal nerve gives off a branch called the inferior rectal nerve that supplies a muscular branch to the external anal sphincter and sensory fibers to the lower portion of the rectum, the skin surrounding the anus, and the distal third of the vagina. The pudendal nerve then divides into the dorsal nerve of the penis (or clitoris), and into another branch called the perineal nerve. From its point of origin in the pelvic floor, the dorsal nerve runs anteriorly to supply sensory fibres to the distal half of the penile shaft and the clitoris. The perineal nerve then divides into the posterior scrotal or labial nerve, which sends sensory fibres to the posterior two thirds of the scrotum or labia majora and a muscular branch that innervates the muscles in the anterior half of the pelvic floor that include the bulbospongiosus, ischiocavernosus, deep and superficial perineal muscles, the urethral sphincter, and portions of the external anal sphincter and levator ani.*

Mechanical interference or compression of the pudendal nerve and blood vessels (along any portion of its course through the pelvis) can produce real trouble in the functioning of the genitalia of both sexes. These facts should be kept in mind the next time you MMT any muscle that crosses the pelvis.

Many disturbances have been attributed to mechanical interferences to the sacral nerve roots. These include pelvic pain (inguinal, pubic, anal, coccygeal, rectal), urinary frequency, urgency, dribbling, incontinence, difficulty, sluggishness, retention, nocturia, enuresis, dysuria, repeated infections, inability to sense vesicle filling, constipation, diarrhoea, excessive gas, painful anal sphincter or urethral spasm, fecal incontinence, mucorrhea, inability to feel rectal filling, spontaneous miscarriage, painful and irregular menstruation, vaginal spotting, persistent vaginal discharge, menstrual migraine, genital pain and/or paresthesias, decreased genital sensitivity, anorgasmy, dyspareunia, deficient lubrication during coitus, pelvic pain during orgasm, loss of libido, and impotence.

Throughout the profession's history chiropractors have reported improvement in chronic pelvic pain and in genitourinary system dysfunction with chiropractic treatment of pelvic and lumbar subluxations in countless case reports and studies. (35)

A genuine understanding of the neurology of the pelvis should encourage us to increase our scope of practice.

Pelvic blood vessels and the myofascia of the piriformis

Although very slight pressure on an artery may not produce occlusion, it does produce turbulence to flow or other serious hemodynamic consequences. With respect to venous supply and drainage we have a critical physiological point to make because the venous pressure is extremely low, and slight congestion of the vessels as they pass through the sacral foramina or the sacral muscle masses can cause some damming back into the areas of venous drainage.

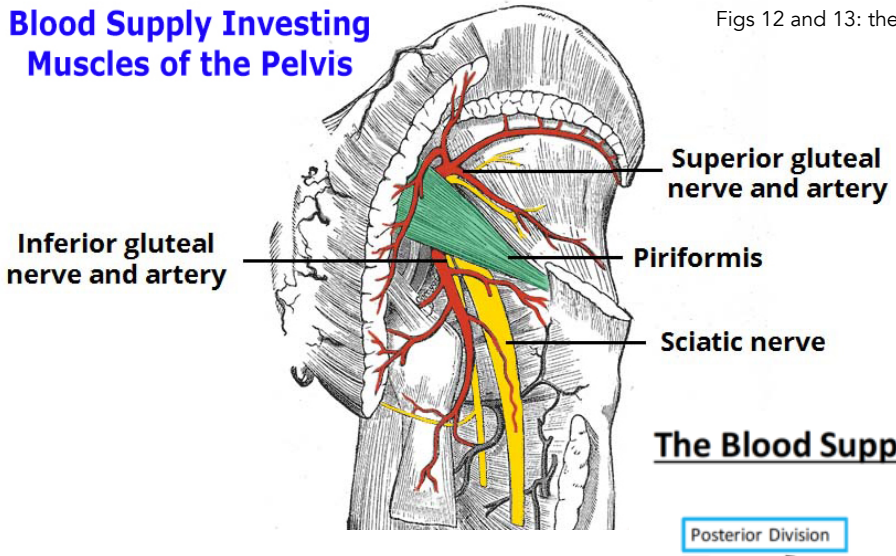
Deformation of a nerve or spinal root almost inevitably produces deformation and even occlusion of the vessels supplying the nerve, and vice versa. The degree of ischemia and neural dysfunction vary, but changes in the blood supply to the nerves of the pelvis may not be salutary.

We are not only concerned here with the damage resulting from vertebral trauma or herniated discs, but also subtle deformations, pressures, and circulatory changes (oedema, congestion, compression, angulation, and ischemia, to name a few). These mechanical disturbances may be due to very slight forces exerted by relatively slight tissue changes near the intervertebral foramina and in the paraspinal muscles.

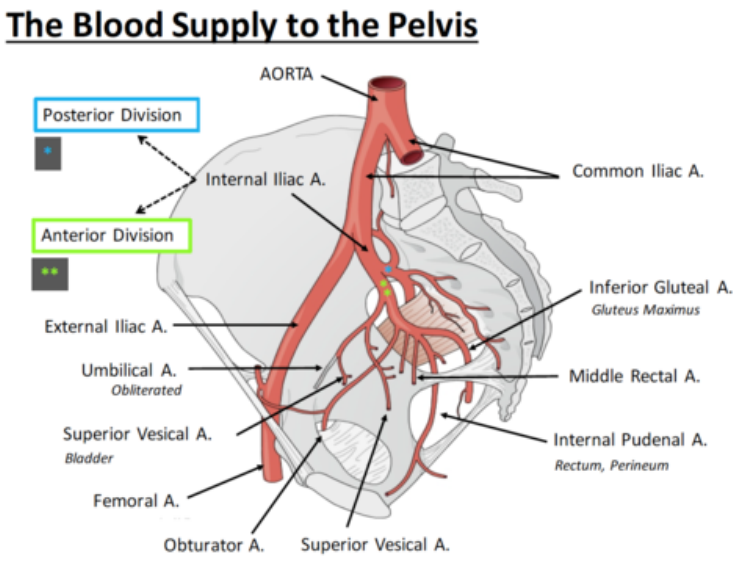
The *piriformis* muscle of the pelvis forms part of the pelvi-trochanteric musculature and blood supply (iliolumbar, sacral and gluteal arteries) and therefore plays a part in pelvic and gynaecological circulatory disturbances. This arterial and venous system supplies blood to the uterus and ovary blood system; consequently it is of great importance in the physiology and physiopathology of the uterus and ovaries.

Figures 12 and 13 depict the clinical vascularisation of the pelvis. Note that all of the pelvic blood vessels have myofascial sheets anchoring them to nearby structures. The arteriovenous system of the pelvic organs is the same system that supplies and traverses the *piriformis* muscle masses.

The myofascial complex of the *piriformis* is traversed by the following arteries: the *internal iliac*; *lateral sacral*; *internal pudendal*; *middle rectal*; *umbilical*; *superior* and *inferior vesical*; *inferior gluteal*; and *obturator arteries*.



Figs 12 and 13: the clinical vascularisation of the pelvis



I want to emphasise that the only muscles in the body possessing an arterial and venous system linked with the genitourinary system are the muscles attaching to or passing in front of the anterior portions of the sacrum or ilia:

- The *piriformis*
- The *psoas*
- The *iliacus*
- The *obturator internus*
- The *gemelli*
- The *levator ani* and *coccygeus*

The arteries and veins listed below supply the reproductive system and are embedded in the myofascial matrix of the muscles listed above. (1, 35)

1. The *iliolumbar* arteries irrigate the general lumbosacral mass and arise at the level of L4 (Marcelle's triangle) from the abdominal aorta.
2. The left and right *internal iliac* arteries bifurcate at the L4 level also and supply all the pelvic organs.
3. The *internal iliac* artery also branches to become the *lateral sacral* artery and is a major source of blood to the sacrum, the sacral foramina, and nerve roots. This artery provides spinal branches that enter the vertebral canal through the IVF; it vascularises the meninges, ligaments, osseous structures, roots, and rootlets.
4. The *internal iliac* artery branches to become the *superior gluteal* artery and supplies the gluteal region.

5. The *inferior gluteal* artery also supplies buttocks and thigh.
6. The *internal pudendal* artery has a long, tortuous course through the pelvis, and divides into the deep and dorsal arteries of the penis.
7. The *inferior vesical* artery in the male is called the *vaginal* artery in the female; it supplies the inferior aspect of the bladder.
8. The *obturator artery* has a long intra-pelvic course before exiting the pelvis at the obturator foramen. It then supplies the adductor region of the thigh: another relationship in the muscle-organ-gland correlation of AK is the *adductor* muscles and the reproductive system.
9. The *uterine* and *vaginal* arteries are found only in the female. The *uterine* artery, veins, and lymph vessels pass through the pelvic diaphragm and can be disturbed by imbalances in the pelvic floor muscles.
10. The *ovarian* artery and the *uterine* artery are complementary because they anastomose at the level of the horn (cornu) of the uterus and irrigate the utero-ovarian system. Their course is long within the abdomen and pelvis.
11. The *ovarian* artery begins at the level of the *abdominal* aorta, just below the *renal* artery. It then passes towards the ovaries, and one of its branches anastomoses with the *uterine* artery. It passes to the uterus which it reaches at the level of the cervix of the uterus, then ascends to the base where it divides into two terminal branches (*fallopian tubes* and *ovarian* artery).
12. The *median sacral* artery courses along the anterior surface of the sacrum and sends branches to the anterior sacral foramina.

The venous drainage of the sacrum, coccyx, and the pelvic organs flows in the opposite direction as the arterial supply and drains into the internal iliac vein.

All of the pelvic blood vessels have myofascial sheets anchoring them to nearby structures. Of particular interest are two structures primarily associated with the *internal iliac* artery, called the sacrogenital folds. These ligaments run from the middle of the sacrum (S2, S3, S4) to the pubes, through the sub-peritoneal space. They are called the uterosacral ligaments. These sacrogenital folds attach to the rectum, isthmus of the uterus, superior vagina, and bladder, and contribute to the strong connection between these organs. Local tissue problems in this area may bring about local vasoconstriction as well as visceral spasms, with an associated slowing down of arterial, venous, and lymphatic flow.

The close approximation of the internal iliac, iliolumbar, inferior *vesical* or *vaginal* arteries and veins to the anterior sacral muscles and to the osseous structures of the pelvis makes the possibility of mechanical interference with optimal blood flow through the pelvis a strong possibility.

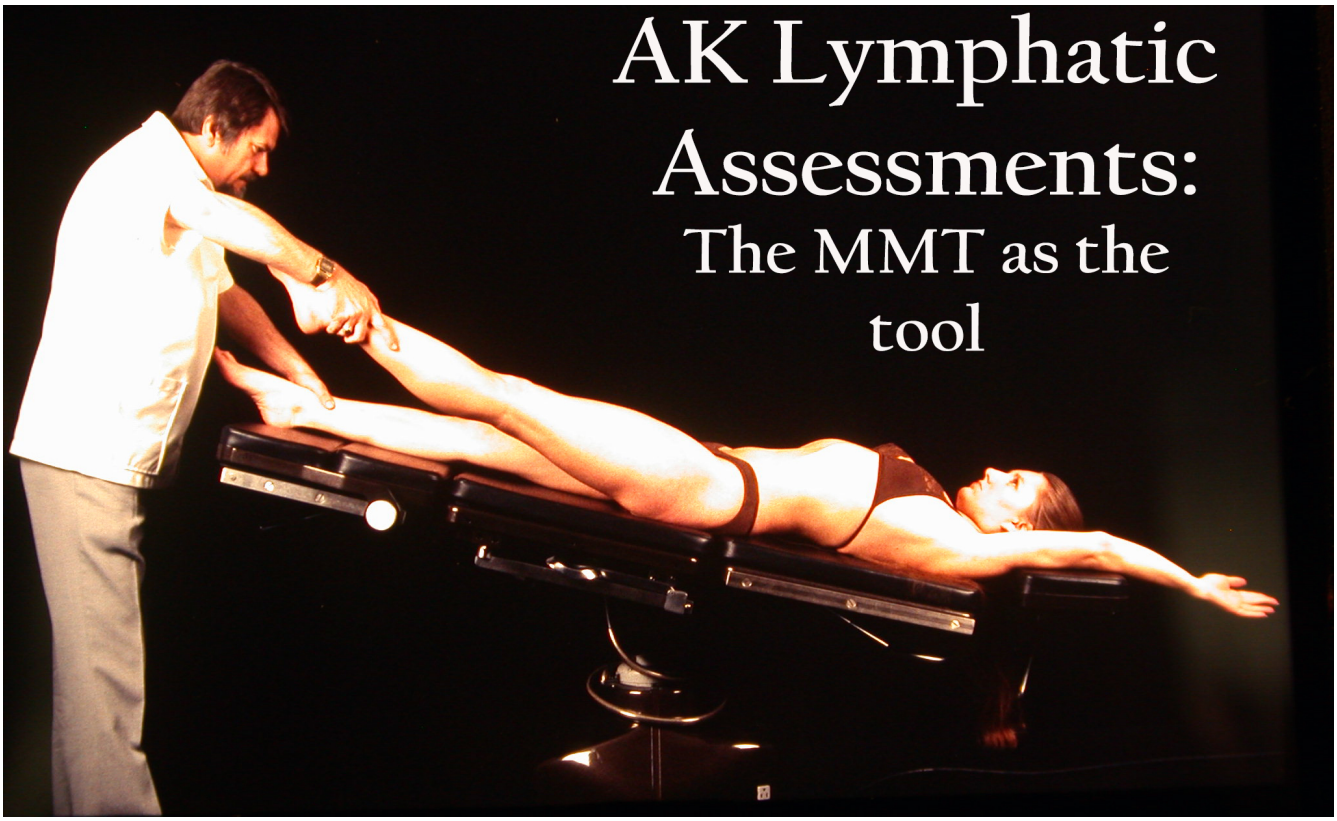
A muscle when working mobilises 6 to 10 times the quantity of blood compared to the same muscle at rest. (35) Poorly perfused tissues succumb to infection far more frequently than tissues with good nutrition. It has been shown that it takes very little improvement in circulation and only small increases in tissue oxygen levels to achieve large increases in the resistance of body tissues to infections. (35, 39, 40) For proper blood flow to occur in the pelvis, muscular balance is necessary.

Therefore what has to be done is to act on the pelvic muscle masses, the nerves, arteries and veins that are linked with those of the utero-ovarian-penile systems. Treating the tonicity of the pelvic muscles is the best way of affecting the pelvis' nerve, vascular and fluid systems. With improved balance of muscle tone here, an improvement in the smooth muscle tonicity of the

pelvic organs and blood vessels should be expected, as well as a reduction in the perfusion imbalances that occur with hypo- or hyper-tonicity. The result will be an increased blood flow, that is to say a decongestion spread over a potential area of 2,400m^2 of capillaries, thus influencing the local vascular condition of the pelvis and subsequently the general state of health. (35)

A note should be made about the sacral lymph system. The sacral lymph nodes are separated on each side of the rectum on the anterior surface of the sacrum. Some are always found on the median line, between the *piriformis* muscle's insertions, along the middle sacral artery. The pelvis is full of loose connective tissue that is capable of holding excessive fluid. Many of the pelvic plexuses described elsewhere in this paper pass through this loose connective tissue during part of their course through the pelvis. Retardation in the lymphatic circulation may occur, creating chronic passive congestion of the pelvic tissues. Varicosities, haemorrhoids, swelling in the legs, ankles, or knees, frequent urination due to mechanical pressures on the bladder, and disturbances in the elimination of fecal material can all result from this situation. Retrograde and anterograde lymphatic findings may be present in these cases. Muscle and fascial tone, as well as fluid content, once again becomes important.

Fig 14: Assessment of lymphatic system in AK



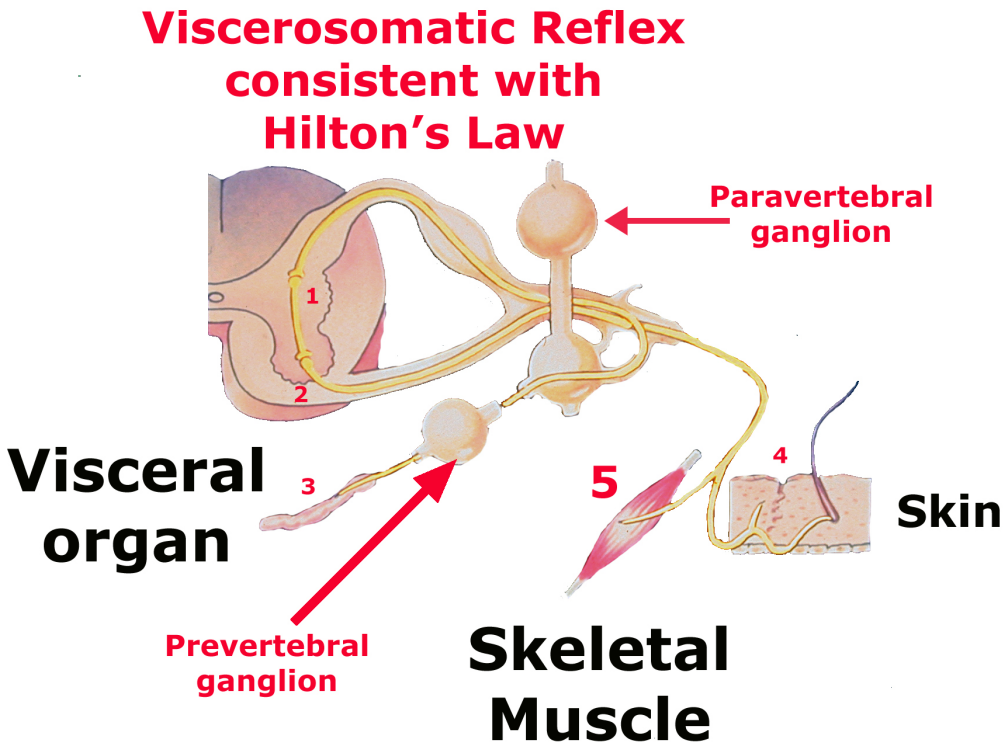
Viscerosomatic Reflexes

Neural control of pelvic organs is affected by a unique coordination of somatic and autonomic motor nervous systems; sensory information and feedback is supplied by both visceral and somatic sensory fibre systems. The existence of polysynaptic viscerosomatic and somatovisceral reflexes implies that visceral afferent fibres are involved not only with the mediation of visceral functions, but also with the functions of somatic effectors, that is, skeletal muscles. (1, 9, 10, 35) Visceral pain fibres are mainly associated with the sympathetic nerves (for example, the

hypogastric). The inputs from a malfunctioning viscus can come to dominate a segmental zone of the spinal cord, traversing the ganglia without synapse and entering the cord through the dorsal roots along with somatic sensory fibres. The facilitation produced here extends to the neurons supplying the somatic structures, producing muscular weakness, spasm, vasomotor and sudomotor changes, referred pain and tenderness. Many physicians have mapped these '*visceral referred pain zones*' over the past 100 years. One example of this type of viscerosomatic reflex would be the contraction of the abdominal skeletal musculature after excessive distention from a large meal or the inflammation of peritonitis or the prevalent '*open*' ileocecal valve.

Fig 15: Diagrammatic representation of the visceral reflex arc. The neural system between one visceral organ and another are indicated. This schematic is a representation of the possible neural connections involved in the chiropractic subluxation complex.

1. mediolateral autonomic cells
2. anterior horn of the spinal cord
3. visceral organ
4. skin over the paravertebral musculature
5. The connected muscles of the body.



Experiments on rabbits have shown that stimulation of organs such as the renal pelvis and small intestine cause reflex paravertebral muscle contractions. In addition, some pathologic conditions (e.g., coronary artery disease) cause stimulation of afferent fibres that produce not only skeletal muscle contractions, but also concurrent activation of autonomic effectors in somatic tissue that results in cutaneous vasomotor and sudomotor changes. From these experiments involving the viscerosomatic and somatovisceral reflexes, it has been concluded that poor health and physiological dysfunction may be ascribed to a breakdown in the communication between the two major components of the body, the visceral and the somatic (musculoskeletal). (41)

Pelvic muscle tone and organic function

In a patient who presents with subluxations of S1/S2, for instance, all of the tissues in the corresponding dermatomes, myotomes, and sclerotomes are likely to have abnormal tone. This affects the nerve supply to the pelvis, the facilitation of the autonomic system, arterial, venous, lymphatic circulation, and the chemical balance of the area as well. In this way any trauma, chemical or emotional irritating agent to the subluxated area may provoke a physiochemical response out of proportion to the cause. (42)

A satisfactory structural environment for an organ requires that the tissue tensions surrounding it be well balanced. Disturbance of a single component can change the overall balance and produce widespread visceral effects. As with all the organs of the body, the pelvic organs are held together by reciprocal tensions. In the pelvis, no muscle weakness or tissue injury can be isolated; the consequences can be surprisingly far-reaching anatomically. The slightest disturbance of a tissue may destabilise the reciprocal tension of all the supple (and adaptive) elements of the organism.

With any rotational, oblique, inferior or superior misalignment of the sacrum, the nerve supply to the pelvic organs will be disturbed. Further, the utero-sacral suspensory ligament system, which also supports the ovaries, rectum, and bladder, will produce an abnormal position and mobility in these organs due to disturbed articular relationships. The uterus is anchored tightly into the bony pelvis by eight distinct ligaments. The uterus lies just below the pelvic brim, is almost 3" (7.6cm) long (including the cervix), and is hollow and muscular and lined with endometrium.

To cite one example:

> *the round ligaments connecting the uterine horns to the inguinal canal may be disturbed when the* category II subluxation *is present. Tension in the inguinal ligament will be transmitted through to the round ligament and on to the uterus by the same subluxation process. It might be that the greater the leg length inequality found with the* category II subluxation*, or the greater the inguinal tension found with the* category II subluxation*, the greater will be the corresponding tension placed upon the round ligaments supporting the uterus.*

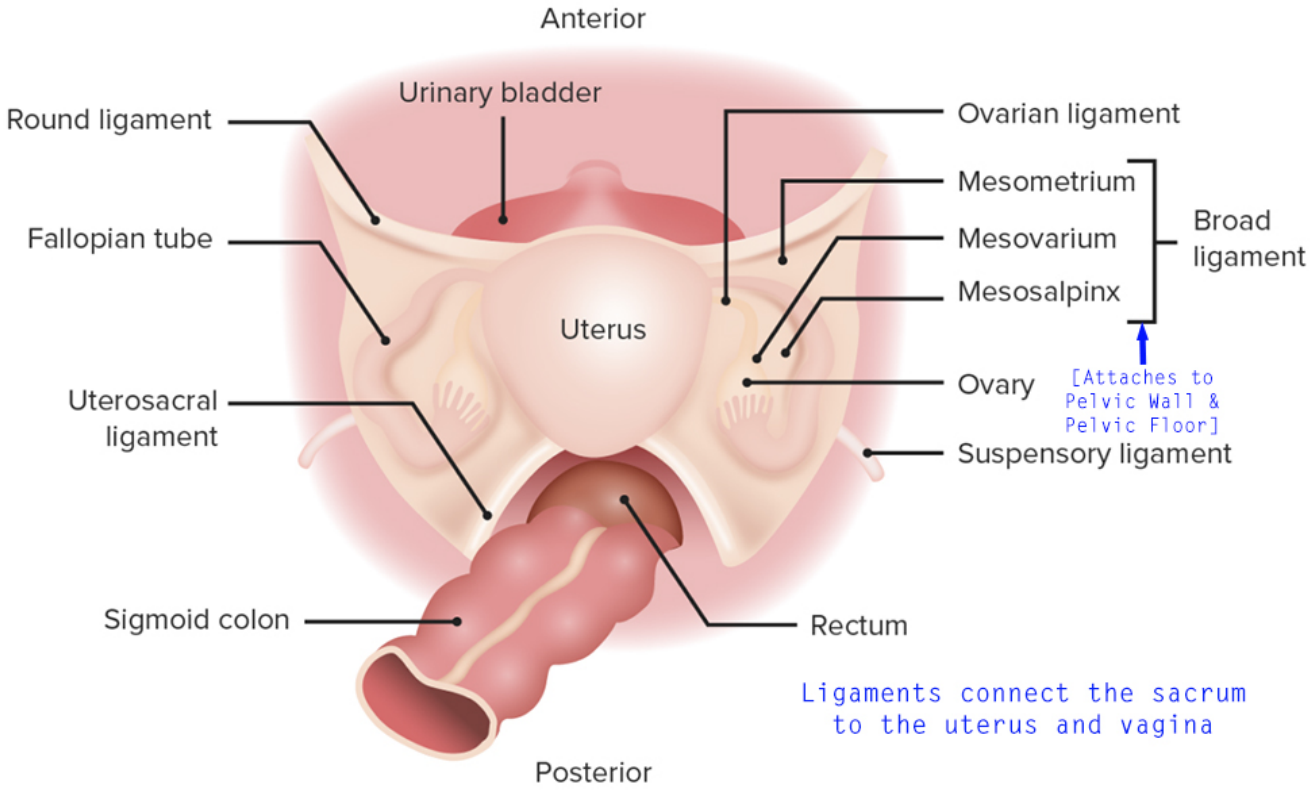
Normal genitourinary functioning is also impaired if the uterus is ante-verted and ante-flexed or if its surrounding myofascia is restricted. Uterine ante-version or ante flexion will force the body and cervix to press hard against the bladder, increasing bladder pressure and lessening sphincter resistance. The '*uterine lift technique*' has been helpful for many women in the clinic over the years. (35)

In order for the pelvic floor to function properly with movement, in visceral support, in the propulsion of the cranial-sacral rhythm, and in digestive and sexual functions, there must be good tone and elasticity of the *sacrospinous* and *sacrotuberous* ligaments, the *coccygeal* muscles, *levators*, *perineum*, and the muscles that attach the pelvis to the femur.

If the pelvic floor is hypotonic, the uterus, bladder, vagina, rectum, and other pelvic tissues will tend toward prolapse and descend toward their orifices. The female cervix is secured within the vagina by the concentric muscles of the pelvic diaphragm and by ligaments that secure it to the sacrum. With any imbalance in the uterine ligaments, the cervical portion of the uterus, or the cervix, may tip away from the centre of the vaginal canal. The pelvic floor muscles also guide the baby into the mother's pelvis and through the birth canal. If the pelvic floor musculature is too weak or too tight, it will be difficult for either the mother or the baby to force the cervix open in the last stages of labor. A baby that experiences in-utero constraint, due to imbalances in the ligaments that hold the uterus in place, will have to fold his body to accommodate the reduction

in available space. The moulding of the child's cranium during birth will be deeply affected by the muscle and ligament tone surrounding the uterus.

Fig 16: Suspensory ligaments of the genitourinary system. Sacro-uterine ligament; sacrospinous ligament; broad and round ligaments; sacro-vaginal ligament. Articular misalignments of the sacrum or ilia will disturb the pelvic organs' position and movement. The pelvic organs are supported by the peritoneum, by the ligaments spanning the pelvis, and by muscles, aponeuroses, and other related connective and myofascial tissues. The ligaments of the pelvis also contain contractile fibres



With sacral respiratory faults, the tone and angulation of the pelvic floor is changed. If sacroiliac breathing movement is restricted, the continual massage of the pelvic fascias, which occurs with sacral respiratory motion, may not take place, thereby allowing venous and lymphatic congestion to occur in the pelvis. Neither lymph nor blood should be allowed to pool or stagnate anywhere in the body.

Sacral base extension

Sacral base extension, a sacral inspiration assist fault, is the most common problem found clinically. To correct this, the doctor encourages a movement of respiratory flexion in the sacrum that will help the pelvic diaphragm to be lowered. At the same time, the doctor asks the patient to draw in a breath in order to lower the *thoracic diaphragm*. The doctor can ask the patient not to breathe for a few moments while finding the point of equilibrium in the tissues beneath the hand. The tension within the anterior sacral tissues and the intra-spinal membranes beneath the hand are improved by this correction.

Prolonged weakness of the *piriformis* muscle(s) will change the angle at which the sacrum rests within the pelvis between the ilia; thus long-term imbalances here may be transmitted to the coccyx. The effects of coccygeal subluxations upon the cranial-sacral mechanism have been written about extensively. Dr. Fulford called this the '*recto-respiratory reflex*' and considered it

fundamental in the treatment of many disorders of the central nervous system, especially those of childhood. The ramifications of a malpositioned coccyx may also manifest through the *ganglion of Impar*, which lies just in front of the coccyx and has influence over the hypogastric plexus and the sympathetic tone throughout the pelvis.

Pick, in the previous issue of this Journal, in a masterful paper showed the immediate and powerful interactions going on between the sacrum and the occiput.

Fig 17: Cranial manipulation and immediate sacral response (Note: the figure numbers given in this Figure 17 are those of the figures in the original publication)

Figure 7: Demonstrates the hand application posture for bilateral, lateral to medial pressure.

Figure 8: Demonstrates the location of targeted pressure application.

Figure 9: Exposes the sacral dura below L5, around the level of S1 without the application of cranial pressure.

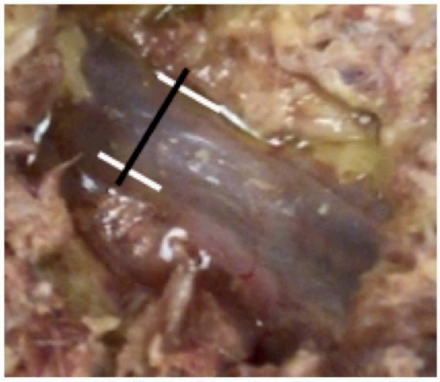


Figure 10: Same image as figure 9, but with markers to set dimensions of dural sac's width.

These views are visualizing the sacral dural sac (S1 level) from a 5° posterior oblique lateral perspective with the posterior sacral wall removed by a bilateral laminectomy.

Figure 11: Exposes the sacral dura below L5, around the level of S1 with the application of cranial pressure.

Figure 12: Same image as figure 11, but with markers to set dimensions of dural sac's width.

Coccyx subluxations or respiratory faults influence the bilateral tone of the pelvic floor muscles and their associated tissues. A misalignment of the coccyx will change the length and tension of the *coccygeus*, *levator ani*, and the myofascia of the perineal floor bilaterally. The bladder, external urethral orifice, muscles and sphincters in the rectum, vagina, and uterus will all be impaired in their function should the coccyx be impaired in its function.

The coccyx may also be impaired from *coccygeus* muscle imbalance, from some fibres from the *piriformis*, *internal obturator*, the *sacrotuberous* ligaments, and perineum. The common myofascial *gelosis* problems of the lateral sacrococcygeal area are part of this coccyx pattern. With lateral or side-bending subluxations of the coccyx, you can release the coccyx externally with your thumb in order to balance the para-coccygeal tissues. These restrictions are often unilateral and require appropriate correction (a *Logan Basic* evaluation and treatment (42) is a very effective method to balance the pelvic floor). Brieg states the primary source of adverse mechanical spinal cord tension is '*set up directly by virtue of its anchorage at its two extremities, namely the brain and cauda equina*.' (43) Balanced elasticity of the *sacrotuberous* and *sacrospinous* ligaments is also critical, and a good indicator of the balance in the pelvic floor musculature.

Craniosacral and endocrine involvement

The relationship between the *piriformis* muscle's strength on AK MMT and the respiration of the cranial-sacral system is demonstrated on a daily basis in clinical practice. I recently published a case report on the chiropractic-endocrine system's correlation with AK MMT findings for a patient with severe menstrual disorders. A comprehensive collection of AK and endocrinology case-reports and controlled clinical trials have been previously published. (44, 45)

The sacrum and ilia exert a strong influence on the bones of the head, especially those that make up the cranial base, namely the occiput, sphenoid, ethmoid, temporals, and frontal. The upper cervical spine is also frequently implicated in sacral problems. Tension around the upper cervical nerve roots as they exit posteriorly from the upper cervical joints can be felt to dissipate during pelvic corrections. With proper pelvic corrections we have seen remarkable effects on the cranium, such as headaches of several weeks' duration clearing up immediately. Sinus congestion may clear up within an hour of proper sacroiliac treatment. TMJ muscular involvements can be eliminated with proper treatment to the pelvis.

Another remarkable interconnection is found occasionally in the form of a phenomenon possibly related to endocrine interactions within the muscle system. Weak cervical flexor or extensor muscles will occasionally strengthen dramatically with therapy localisation to the neurolymphatic reflex for the piriformis muscle. Almost any variety of body pain can be implicated in the numerous sacral deviations.

The sacrum moves in a compound, sinuous, and multi-dimensional way as we walk, and it is affected by the reciprocity between the anterior and posterior lumbar and pelvic muscles as well as the tension imparted to the pelvis by the thighs. The piriformis and gluteus maximus muscles both cross the sacroiliac articulation and are drawn out in the direction of the oblique axes of the sacroiliac's motion and play an important part in establishing this motion. This '*gyroscopic*' movement is in harmony with the anatomy of the auricular surfaces of the sacrum. The sacrum moves with the craniosacral fluctuation, with every movement of the legs, and with every breath. The *PiLUS* testing technique evaluates the relationship of the piriformis muscle to the cranial-sacral system's tensions very effectively.

Dr Sutherland suggested that any limitation in the movements of the pituitary body in the sella tursica brought about by mechanical, membranous restrictions of the reciprocal tension membranes that hold the pituitary in place would be a significant cause of pituitary secretory

disturbances. Normal sphenoid flexion and extension movements act to 'milk' the pituitary of its excessive venous blood, optimising hormonal function. (46, 47, 48, 49, 50, 51)

Figs 18-26: Dural tension in the pelvis is transmitted to and from the spine and cranium. Pelvic tissue tension and organ function is thereby mechanically related to cranial respiratory function. Alterations in endocrine function are physiologically connected to cranial and dural tension dysfunctions, which are readily measured using chiropractic AK.

Fig 18: Cranial dura (after Leonardo)

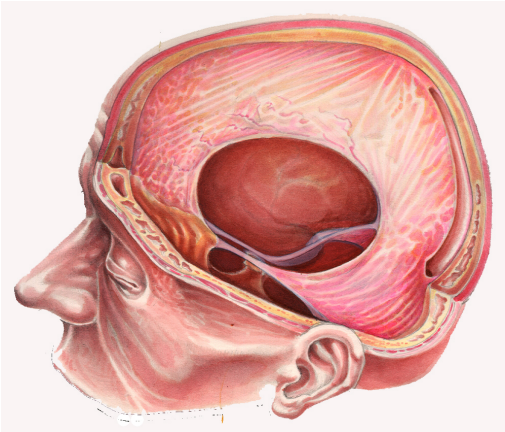


Fig 19: GJG dura quotation

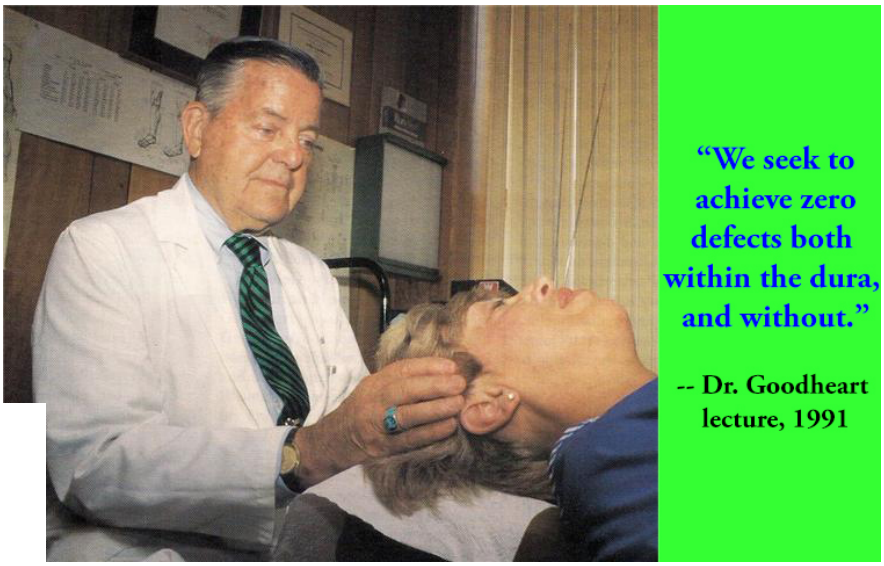


Fig 20: Superior view of cranial base (normal)

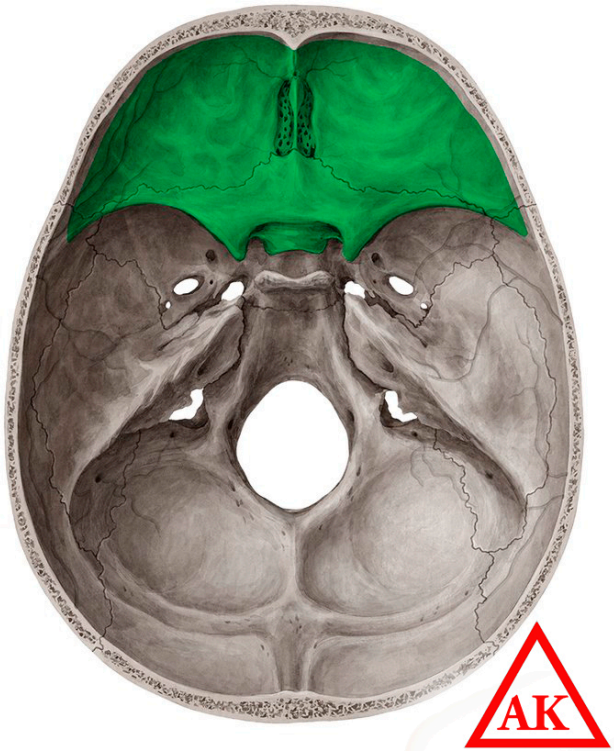


Fig 21: Sensory innervation of the dura

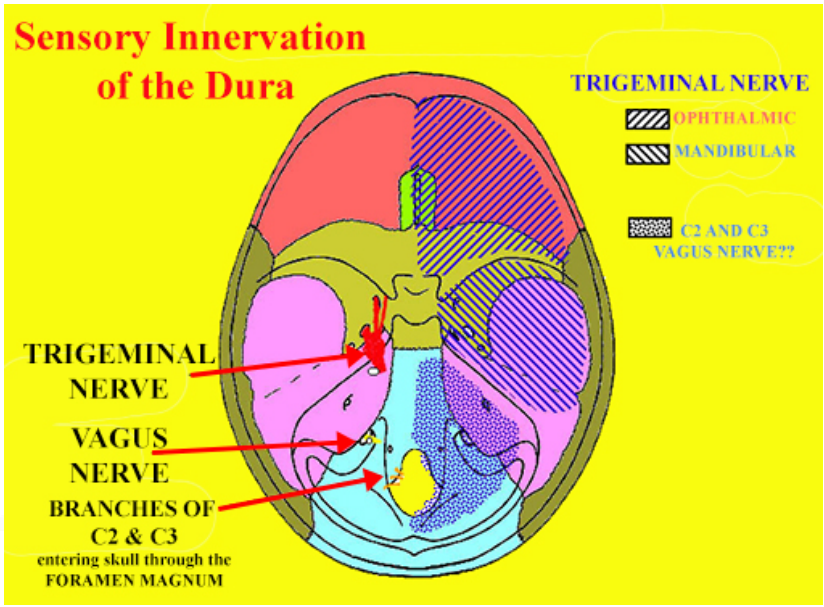


Fig 22: Muscles and cranial dura

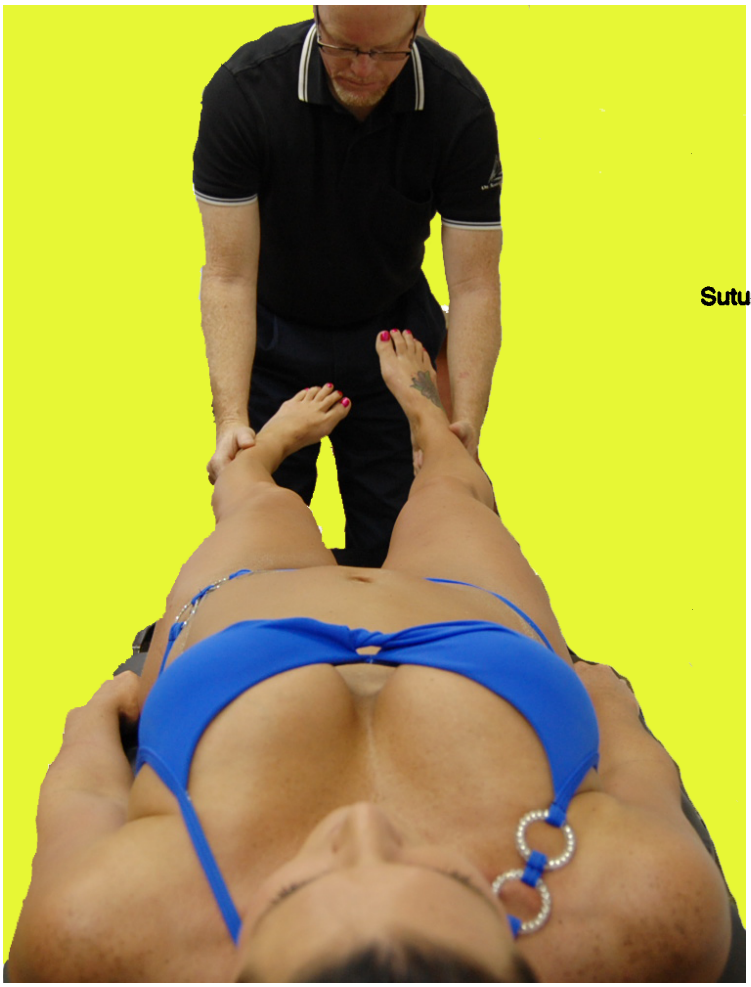


Fig 23: AK dural tension, 'leg turn-in' test

Fig 24: CSF moving the cranial bones (mechanism)

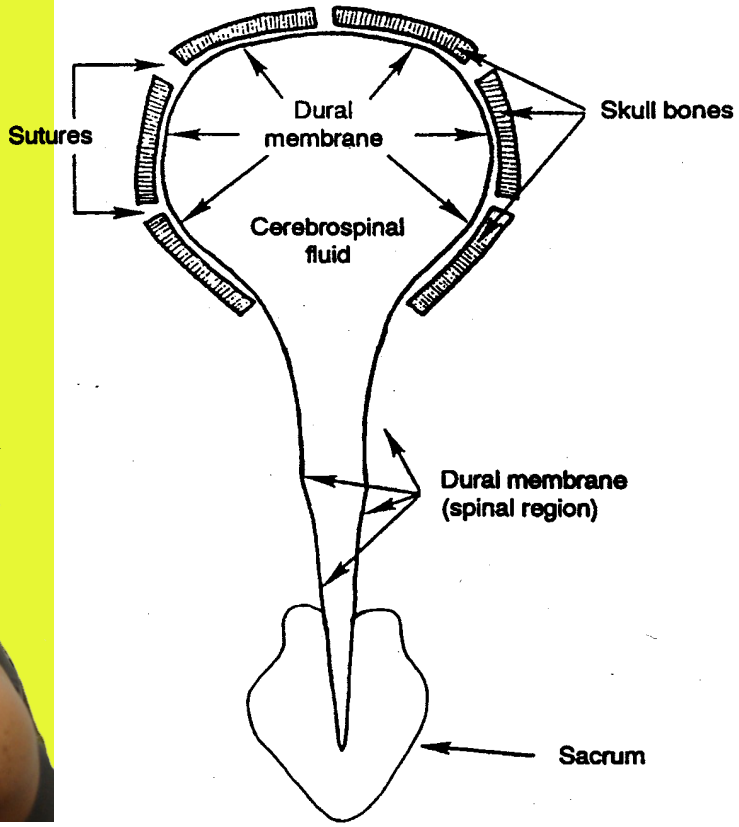


Fig 25: 'Hack' dura; connection

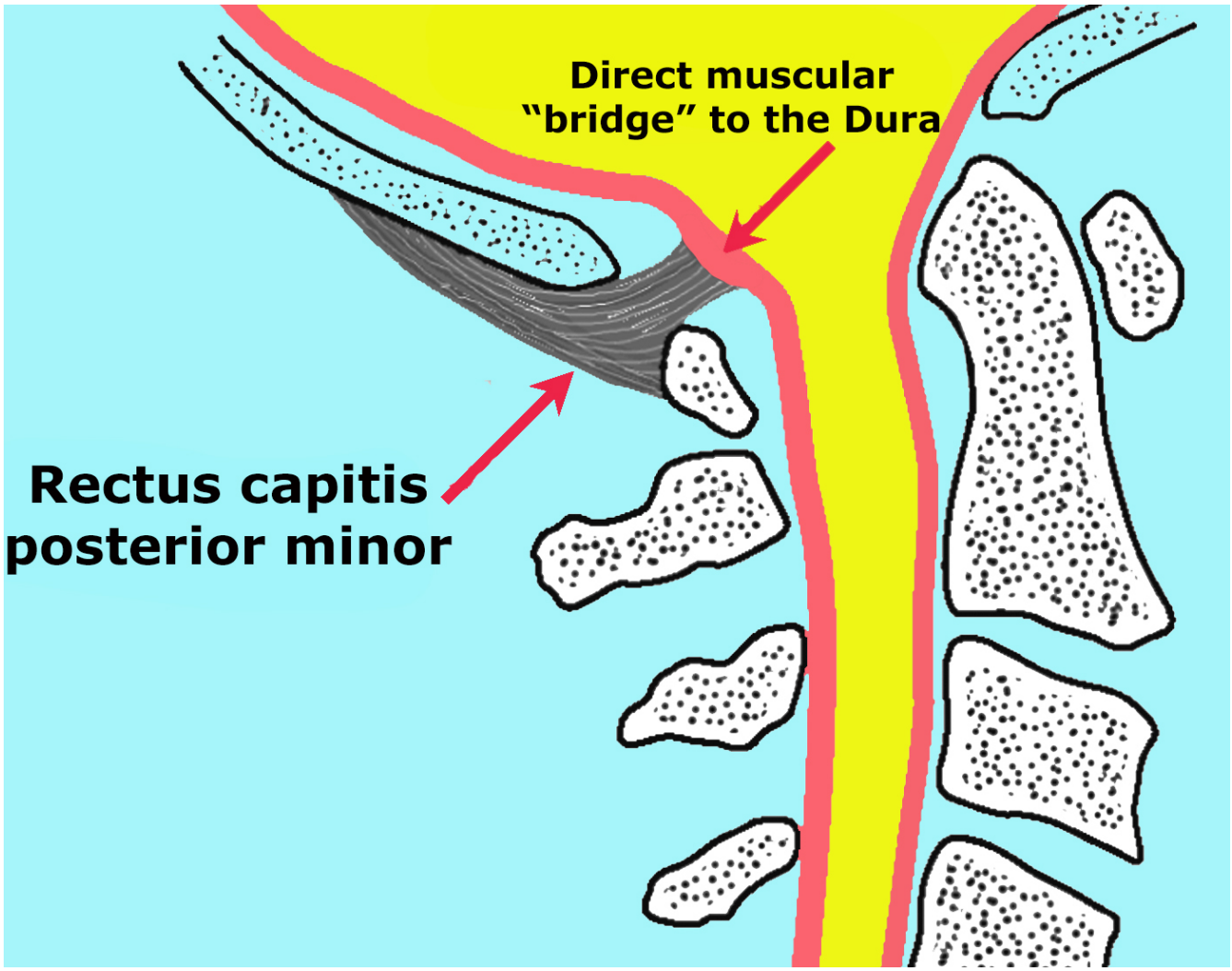


Fig 26: Dural tension, seated neurodynamic 'slump' test

The mechanics of a sphenobasilar distortion may play a role in the passage of fluid from the pituitary system into the rest of the brain. The AK approach to pituitary gland function and its mechanical and chemical correction has been effective for many patients, and has been a genuine advancement in the treatment of this area. Pituitary function is very important in gynaecological conditions. Any encroachment at the borders of the gland, especially at the *cavernous sinus* or *diaphragma sella*, can disturb the menstrual cycle, menopause, the mechanisms of labor, in fact the entire endocrine system.

The temporal bulge cranial dysfunction, the inspiration and expiration assist cranial dysfunctions, the sphenobasilar and frontal cranial dysfunctions, the universal, glabellar, and naso-sphenoid cranial dysfunctions from applied kinesiology, which includes the side-bending and torsion faults of the osteopathic world … any of these faults in the cranial mechanism may place undesirable effects and stresses upon the hypothalamic-pituitary relationship (with consequences throughout the endocrine system). This mechanical fault at the centre of the autonomic and endocrine systems is crucial to normalise in the genitourinary patient's physiological makeup, if possible.

The pituitary is the commander-in-chief of the endocrine system. The subject of endogenous endocrinology is so vast, however, and has been covered so extensively in books devoted to the subject, that I only hope to touch on it here.

Foundational integrative nutritional endocrinologists like Harrower, Rubel, Barnes, Lee (52, 53, 54, 55, 56) and many others have demonstrated the inter-connections that exist between the pituitary-hypothalamus and the ovaries, uterus, prostate and testes. This is why MMT frequently demonstrates a relationship between certain cranial faults and weaknesses of the *piriformis* and reproductive system muscles in cases of hypothalamic-pituitary-reproductive system imbalances. These inter-connections are very important to a patient with genitourinary imbalances, but often require astute clinical investigation to discover them. Unless someone spends years studying the endocrine system and knows the multiplicity of signs, symptoms, and indicators to look for, discovering these connections between the parts of this vast system would be intimidating.

Using AK MMT procedures, the primary dysfunctional organ in the endocrine complex can be found during an office visit. Drs. Goodheart, Schmitt, Walther, and others have written about this extensively.

In brief

To find the primary endocrine gland, therapy localise to each of the endocrine neurolymphatic reflex points to find which one strengthens the other inhibited endocrine gland related muscles. This point of therapy localisation indicates the primary organ or gland needing treatment. With a degree of understanding of the interrelationships of the endocrine glands and their connection to particular muscle-organ-gland relationships, the value of these considerations can be clinically shown.

The uterus and ovaries are major parts of the endocrine system, that macramé of glands, organs, and brain structures that secrete and respond to hormones. These organs are enmeshed biochemically with the adrenals, the hypothalamus, the thyroid, and the pituitary. The value of strengthening an inhibited *piriformis* muscle goes beyond improving the function of the nerves and vessels supplying the reproductive organs: the entire endocrine system may benefit. Two-point therapy localisation helps you 'find the major' for the most effective treatment of this complex system.

In the 1930s, Dr. Charles Owen stated in his book on *Chapman's Reflexes*, '*an innominate lesion always indicates an endocrine disturbance*.' (55) Later in his work he shows how the endocrine secretions of the pelvic organs influence the thyroid, induce acidosis, affect the urine, and set up

digestive disturbances. The *piriformis* muscle is very frequently involved in the innominate lesion, and it may be that this muscle frequently tests weak due to disturbances in the endocrine and more particularly the genitourinary system.

An oestrogen/progesterone imbalance may also adversely affect the proper functioning of pelvic region. Once again, Drs. Goodheart, Schmitt, Walther, and many others within AK have discussed the relationship of the reproductive system with hormonal imbalances and the muscles of the pelvis for the past 30 years.

The female's reproductive system is an even contest between two well-matched, muscled ladies: oestrogen and progesterone. Their harmonious apposition keeps this very fertile and complex system working well month after month, between 450 and 480 cycles in one lifetime. If for some reason an imbalance occurs between these two reproductive sisters and oestrogen becomes the dominant force, then the hormone will throw the muscle cells of the uterus and pelvis into a state of electrical excitation. Oestrogen makes them twitch. A uterus that twitches too much is a uterus that expels a foetus. And so, even as the uterus is urged to expand by oestrogen, the myometrium must also be tranquillised. That is the job of progesterone, the so-called hormone of pregnancy. Progesterone means pro-gestation. Progesterone inhibits the contractibility of muscle cells. Throughout the whole nine months of baby making, as well as during the monthly menstrual cycle, the negotiation between oestrogen and progesterone is a dynamic one.

Chiropractors have reported on many cases where patients had been trying to have a child for quite some time, not using any type of contraception, but who were unable to conceive. In many others, miscarriages had repeatedly occurred. In most of these case reports, the patient became pregnant after chiropractic treatment for pelvic and lower back pain. In my own practice, several of these women were found with inhibited muscles in the reproductive area that responded to both *Wheat Germ Oil* and *Chlorophyll*. (56) Pelvic, cranial, and other spinal subluxations were also corrected as needed. Menstrual irregularities are constantly found in the patients we treat, and improvements in their problem is a regular outcome for our patients.

AK combined with clinical nutrition has also been successful in resolving amenorrhea. (57)

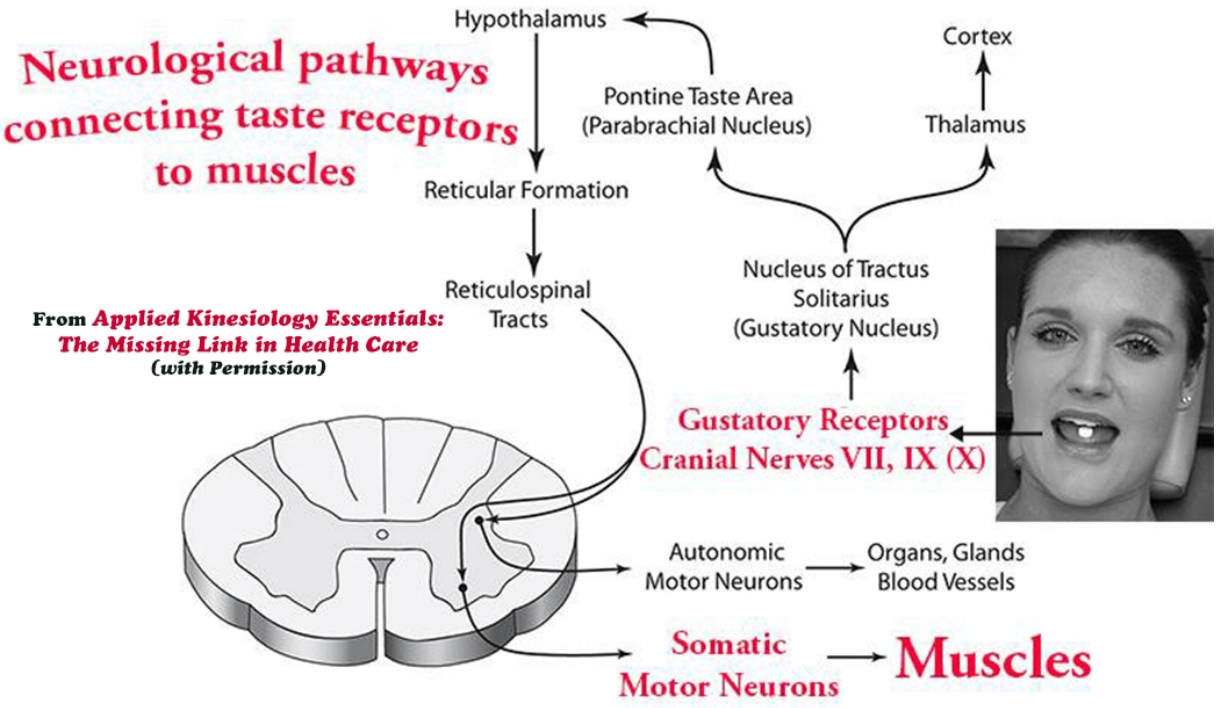
Chiropractic-specific nutritional assessments of endocrine dysfunction

Ingesting nutrition targeted to a particular organ has been found to more reliably improve muscle strength using AK MMT than placebo, supporting both the organ-muscle relationship model of applied kinesiology and the usefulness of nutrient testing in AK, especially when the information is incorporated with other clinical observations. Evidence for the AK approach to nutrition is expansively supported in *Applied Kinesiology Essentials: The Missing Link in Health Care.* (45) AK nutritional testing reflects the nervous system's efferent response to the stimulation of the gustatory and olfactory sensory receptors. See Figure 27.

AK MMT appears to be a useful method of observing the biochemistry of the organism in that it has shown impressive accuracy for determining food allergies (90.5%) and immunological status when compared to lab tests, though the outcomes of studies have been conflicting.

Cuthbert and Walther (45) and many others have written extensively about this phenomenon; more complete descriptions are beyond the scope of this chapter. However nearly 1,000 case and case series reports over the past 50 years have been given by the members of the ICAK around the world regarding the successful use of nutritional therapies using AK diagnostic means, and are available from many platforms. (ICAKUSA.com, 2022)

Fig 27: Neurology of taste receptors and muscle function



Given how drastically hormonal imbalances affect our health, happiness, and the speed at which we age, it is paramount to work to bring your hormone levels back into balance. Unfortunately, it seems to be the general consensus that women are going to have trouble when they enter menopause. You should be advised on the contrary that the normally functioning female does not have significant problems with the condition. This problem, as well as most female health problems, responds well to natural health care if treatment is sought before irreversible pathologic conditions develop.

The answer, contrary to popular belief, does not necessarily lie in hormone replacement therapy (HRT).

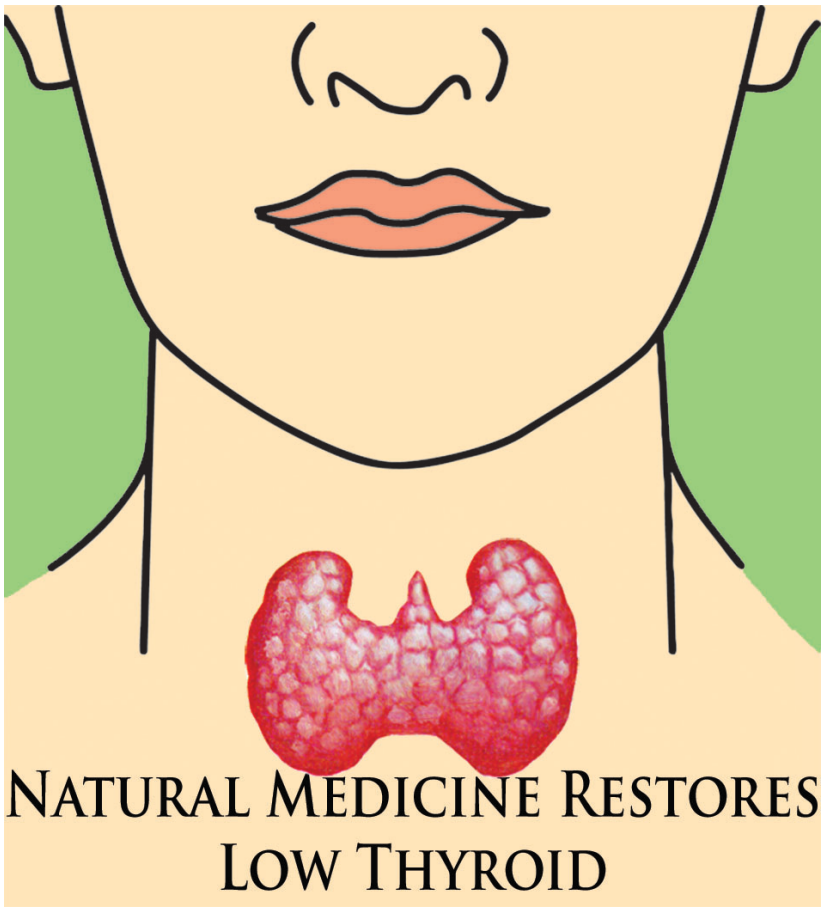
HRT can create dangerously high levels of hormones that can cause a host of other problems, such as receptor site resistance and poor communication between the brain and the hormone glands. For many years after its creation, the synthetic oestrogen drug *Premarin* was prescribed (made, incredibly, from horse urine) to women without any accompanying progesterone. The result was an epidemic of uterine cancer. This eventually led to *Premarin* being prescribed in tandem with synthetic progesterone called *Provera* to protect the uterine lining. Much more recently these two were bundled together and marketed as a new combination drug called *Prempro*. The combination of *Premarin* with *Provera* has become the most widely prescribed synthetic HRT in the world. It must be repeated that HRT has been shown to raise the risk of embolisms, coronary heart disease, dementia, urinary incontinence, gallbladder disease, strokes, and other complications.

Meanwhile … the reasons for female hormonal imbalances are totally ignored using this approach. It is far better to address the root causes of hormonal imbalances, which the majority of time is our favourite culprit, blood sugar imbalances from a high carbohydrate diet.

Most hormone imbalances are due to stress physiology, adrenal imbalances, blood sugar handling problems, compromised liver biotransformation of hormones, or essential fatty acid responses. I would be very reluctant to use bio-identical hormones for hormonal deficiencies without first investigating the causes of your problem. I prefer to discover the cause of oestrogen

excess or deficiency, such as poor adrenal function or insulin insensitivity, and address this specifically. When hormones are used, however, it is important to use natural, bio-identical hormones (Figure 28) instead of synthetic ones because the bio-identical hormones show up on lab tests, synthetics do not, so that the patient's levels can be monitored. When the natural products are regulated properly, the adverse effects of the synthetic drugs are avoided and the results are very good indeed.

Fig 28: Natural medicine and the thyroid



The importance and relevance of thyroid function in cases of abnormal menstruation should be mentioned. According to Schmitt (a regular contributor to this *Journal*), (31) graphing basal temperature for a complete menstrual cycle can give insight into the relative balance and ratios between progesterone and oestrogen.

Schmitt also states that scanty menses can indicate high thyroid, low oestrogen, and/or high progesterone levels, whereas heavy menses can indicate a low thyroid, high oestrogen, and/or low progesterone. Additionally, short menstrual cycles (<26 days) typically have a high oestrogen/ progesterone ratio, whereas long menstrual cycles (>29 days) typically indicate low oestrogen/progesterone ratio. Goodheart suggests that a menstrual cycle of more than 28 days indicates a hypothyroid condition, and one of less than 28 days indicates a hyperthyroid one. These observations have been congruent with my clinical experience and can be a useful complement to physical exam and laboratory findings.

The thyroid gland plays an essential part in one's health. According to the *American Association of Clinical Endocrinologists*, more than 27 million Americans suffer from thyroid dysfunction, half of which go undiagnosed. Of the detected cases of hypothyroidism, more than half are due to an

autoimmune disorder called *Hashimoto's* disease, in which the immune system attacks and destroys thyroid gland tissue.

Though it weighs only an ounce (28.4g), the butterfly shaped thyroid on each side of the trachea is the spark plug for energy production. This gland maintains body temperature, controls the rate of energy production (the rate at which the body builds up and tears down), and deeply influences brain chemistry as well as moods and emotions.

The established symptoms of low thyroid function are increased weight, fatigue when dieting, sensitivity to cold, chronic constipation, mental fatigue, being depressed and moody, hair loss, a thin or absent outer portion of the eyebrows, dry, itchy skin, crying for little reason, menstrual problems, low libido, infertility, swelling, and elevated cholesterol or triglyceride among many others. If this gland enlarges, it is known as a '*thyroid goitre'*. It should be remembered that Colorado was once part of the '*goitre belt*' in the United States. In the 1920s the government mandated that iodine (the primary nutrition of the thyroid gland) be added to our table salt. This helped lower the incidence of goitre across the country. However, many people still do not have enough iodine available through their diets in Colorado and iodine deficiency continues to be an important public health problem in cities such as Pueblo, the city of my previous clinic.

The thyroid gland is monitored by a signal coming from the brain (TSH, or thyroid stimulating hormone). Having been sent this signal (TSH), the thyroid responds by making T4 and T3. Now the thyroid gland makes a lot of T4, and the T4 is converted peripherally in the body by the liver and kidneys to T3. Although there is far more T4 than T3, T4 by itself does practically nothing. It must convert to T3, the active power house hormone.

Interestingly, if one is diagnosed with low thyroid function they usually are prescribed *Synthroid*, which is T4. So what good does it do giving *Synthroid* unless you can convert it to T3? Not much! So T4 must be converted to T3, and T3 is a dynamite regulator of just about everything in your body. Cognition improves; heart stability, weight, metabolism, GI tract motility are all improved, and balancing of sex hormones are improved as well.

Remember that physicians have been trained to lower the labs that are high and raise the labs that are low. This is an outdated form of scientific evaluation, but it is still in practice. So as that practice relates to the thyroid gland, the most important lab would be a free T3, not just a T3, T4 or TSH. If the free T3 is low and/or you are having symptoms of hypothyroidism, holistic treatment should be initiated.

Standard American healthcare, both conventional and alternative, often treats the thyroid gland like a part of your car that simply needs replacing. Thyroid replacement hormones are a first line of defense for a majority of doctors, prescribed with the promise of wiping out a number of symptoms in one fail swoop. The drugs may make some people feel better, but for many others the relief is short-lived, if it occurs at all … even with normal blood test results. (58) By taking that approach neither the physician nor the patient is challenged to discover what caused the thyroid to become depressed in the first place. In most cases, poor blood sugar control, gut infections, adrenal problems, other hormone imbalances and irregular immune function significantly depress thyroid function. Remember too that those who are low in iodine, zinc, magnesium or B vitamins, are going to have a difficult time converting T4 to T3. Additionally, if those on an antidepressant or a beta blocker will have dramatically affected thyroid function.

It is now understood that the best practice is to address the conditions that cause the thyroid to slow down in the first place; then supporting the gland itself requires only basic nutritional treatment for a few months. The conditions creating the hypothyroid symptoms, however, more likely call for lifestyle changes and lasting nutritional support. If the check-engine light on the car lights up, which would be smarter: To investigate the engine or remove the lightbulb? Failing to ask why the thyroid gland has stopped working adequately and prescribing *levothyroxin sodium*

(*Synthroid*, *Armour* or *Levoxyl*) is like simply removing the red engine light in your car when it starts blinking. When medications are used there is no control to regulate the up and down levels necessary from hour to hour during the day.

When we as chiropractors start addressing the underlying causes of hypothyroidism in our practice, patients begin to enjoy not only symptom relief, but also a return to true health. The best approach is to return the thyroid to normal function by improving the body's energy patterns, and/or using nutritional supplementation. Natural health care considers the body as a total, integrated whole and is an essential approach if the thyroid gland problem is to be corrected.

It should also be observed that for every female who is using hormone replacement or contraceptives, vitamins B6, B12, and/or folic acid deficiency should be considered in women using hormone replacement or contraceptives.

Male sexual function and chiropractic

Men are also increasingly under attack from their own imbalanced hormones. When male testosterone levels are nor normal the patient can become overweight and libido is less than it used to be.

Low testosterone is common these days, with one in four men over 30 showing low testosterone, which means that nearly 17 million American men in the United States today are affected. Erectile dysfunction also affects 15 to 30 million men, with the rate having tripled in the last 20 years. Male 'breasts' and 'hips' are becoming increasingly common as men's oestrogen levels soar too high, even in teenage boys.

The frontal lobe of a man's brain is loaded with receptor sites for testosterone. (59) Symptoms of this kind of frontal lobe testosterone deficiency are memory problems, loss of cognitive function, and even progression to the dementia in Alzheimer's disease. Less severe symptoms include depression, lack of motivation or drive, and 'grumpiness'.

As with oestrogen, stress (the adrenal glands) plays a major role in testosterone levels. The adrenal hormone cortisol stops testosterone synthesis right from the start. Even worse, cortisol destroys the Leydig cells in the testicles responsible for making testosterone.

As with women and oestrogen, it is more important to know why a hormone is deficient in a man rather than just spreading on a hormone cream in what amounts to a risky form of Band-Aid therapy. Once again, systemic inflammation (adrenal gland dysfunctions) and blood sugar imbalances are most likely behind the problem.

For the male, prostate gland dysfunction is also a part of a man's urinary and sexual organ systems. It's about the size of a walnut, crescent-shaped like a flattened cone, and it surrounds the urethra which exits the bladder. The urethra has two jobs in males. The first is to carry urine from the bladder. The second function is to carry semen during sexual climax.

Realise that over 50% of men will develop an enlarged prostate in their lifetime. Any man over 50 having problems urinating usually has an enlarged prostate or benign prostatic hypertrophy (BPH). As men get older, there is a tendency for the prostate to grow. As it grows, it squeezes the urethra. Since urine travels from the bladder through the urethra, the pressure from the enlarged prostate may affect bladder control.

BPH is marked by one or more of these symptoms:

- A frequent and urgent need to urinate that occurs first at night
- Trouble starting a urine stream, needing to strain to get the urine flowing
- A weak stream of urine taking longer to urinate than expected
- Erectile dysfunction

- Small amount released when urinating
- There may be the feeling that there is still have more urine 'inside' even when just finishing urinating
- Leaking or dribbling
- It is often recommended that men over the age of 40 have yearly prostate exams. The exam involves a doctor inserting a gloved finger into the rectum and feeling the lower part of the prostate for any abnormality. However, in the case of BPH, often the prostate has not enlarged to a point that can be recognised by physical exam. Ultrasound measurements are the best diagnostic method, and then a blood test is used to differentiate an enlarged prostate from the more serious prostate cancer.

Is an enlarged prostate a serious disease? By itself, an enlarged prostate is not a serious condition, unless the symptoms are so bothersome that they affect Quality of Life. Similar symptoms can occur in some individuals after taking over-the-counter cold or allergy medicines.

How is prostate enlargement treated?

Watchful waiting: It is often said that most patients diagnosed with prostate cancer are more likely to die with the disease than from it. The majority who have this typically slow-growing cancer are older: an estimated 80% of men in their 80s have cancerous cells in their prostate gland, yet only 3% of American men will die from the disease. For these reasons, many physicians recommend '*watchful waiting*' as the first course of action for less-aggressive forms of prostate cancer. If the symptoms are not too bothersome the patient may choose to live with them rather than take medication or undergo surgery.

Prescription medications: The evening news usually has ads for medications that help this condition. Be aware of the possible side effects.

Surgery: If the problem becomes too severe, surgery to remove a piece of the prostate can be done through the urethra or in open surgery, which requires cutting through the skin above the base of the penis. Surgery for the prostate may have only temporary, but sometimes permanent effects on sexual function. Most men recover complete sexual function within a year after surgery. The exact length of time depends on how long symptoms had been present before surgery was performed, and the type of surgery. Side effects include erection problems and loss of bladder control. Another common side effect is that semen does not go out of the penis during orgasm. It goes backwards into the bladder.

The *Journal of Nutrition* (60) advises people with prostate cancer to eliminate milk from their diet. This is a good idea for many other reasons as well. Cruciferous vegetables, lycopene from tomatoes, watermelons, and other fruits and vegetables with bright red colours are also protective for the prostate. Drinking pomegranate juice and an antioxidant found in green tea called EGCG has been shown to kill prostate cancer cells. Correcting essential fatty acid deficiency in the clinic relieves many benign prostatic hypertrophy cases.

Finally, *Saw Palmetto* is an herb that has been shown in clinical studies to have an important role in maintaining a healthy prostate. *Saw Palmetto* is only one of several herbs and plant compounds that are potentially useful in maintaining a healthy prostate gland. One of the most impressive aspects in the studies on these natural approaches to prostate health has been the improvement in quality-of-life scores. Many men who suffer from an enlarged prostate suffer from sleep deprivation. By improving the very bothersome symptom of sleep deprivation, a man's mental outlook is dramatically improved.

Usually symptoms resulting from mild-to-moderate prostate enlargement respond more readily to these treatments than symptoms due to severe enlargement. No significant side effects

have been reported in the medical literature from these natural treatment methods. This is similar to the old oil filter commercial where the car owner was told, '*you can do a little now or a lot later*.' If your prostate enlarges enough, you will have no option except for medications or surgery with the possibility of permanent side effects.

A final word on piriformis

The *piriformis* generates leg pain in a number of ways, commonly including entrapment of the *sciatic* nerve and, rarely, the *superior gluteal* nerve, (61) both of which give rise to nerve root pain signs and symptoms. There is also dull buttock and thigh pain secondary to dysfunction, including trigger point development, within the muscle itself. The variable collection of signs and symptoms has been termed *piriformis syndrome* since 1928, yet there is little consensus on its diagnosis and treatment. (62)

The *piriformis* is a postural (type II) muscle and shortens when stressed. (63 p. 374) Postural signs therefore include external foot flare on the involved side. A shortened muscle may be accompanied by weakness in its opposite. The assessment for trigger points is conducted with the patient lying with the involved side up. The hip and knee are flexed to about 45° and the knee of the involved side rests on the table. (Figure 29)

The practitioner takes a square stance anterior to the patient at the level of the pelvis and constructs an imaginary line between the greater trochanter of the involved leg (up) and the S2 tubercle. This approximates the midline of the muscle. The first trigger point lies about one-third of the distance medially along the line from the greater trochanter. This location is in the myotendinous junction of the muscle and the trigger point is best palpated with a transverse motion across the fibres. The second trigger point lies a further third along the line towards the sacrum. This is within the muscular belly of the *piriformis* and is palpated with deep but gentle digital pressure.

The pain referral patterns are about the buttock and the posterior thigh. (Figure 30) The common practice of digging into the buttock in the prone patient is a crude and non-specific provocation of many painful structures in the area and is far from an acceptable approach to the piriformis.

The AK of chiropractic diagnosis for MTrPs can be of great value to the examiner. It is called the '*muscle stretch reaction*'. (Figure 31)The general muscle stretch reaction testing procedure is simple for the *piriformis* m. Test the muscle by the usual method to determine its strength. If the test appears normal, stretch the muscle to its full range of motion and apply slight additional stretch at the end. Immediately re-test it. In the presence of a positive stretch reaction, the muscle which previously tested strong will now dramatically weaken, and palpation will usually find a taut band in the muscle, the *Locus In Quo* of the MTrP.

The beauty of this method is that first, it uses a fairly objective test to detect a significant muscle impairment resulting from MTrPs. Second, it confirms whatever palpatory findings may be present for MTrPs which can be vague, complex, or slight. Third, on reexamination it demonstrates for the examiner and the patient that treatment to the MTrP eliminated the muscle weakness that was previously generated by stretching or using the muscle with the MTrP within it.

Finally, according to *Simons et al* the basic reason why therapy provides only temporary relief for MTrPs is because perpetuating factors have not been adequately addressed. Systemic perpetuating factors for MTrP problems encompass many conditions that compromise muscle energy metabolism. *Travell & Simons* presented these metabolic, structural, and psychosocial factors in both editions of their classic textbook. Each of these factors of dysfunction has been

given specific chiropractic treatment approaches, making the comprehensive treatment of these 'perpetuating factors' of MTrPs especially amenable to treatment using chiropractic methods.

The muscle's physical relationship to the autonomic system (64) demands we pay due attention to the *piriformis* in all genitourinary presentations.

Fig 29: Patient position to assess for TrPs in *piriformis*

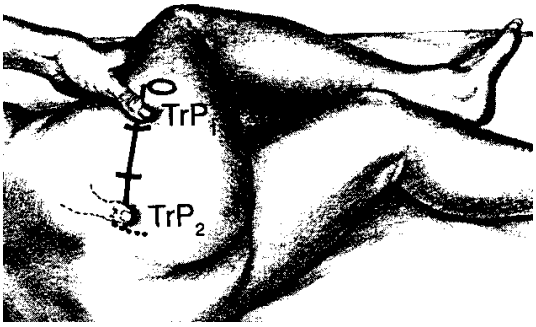


Fig 30: Pain referral from TrPs in *piriformis*

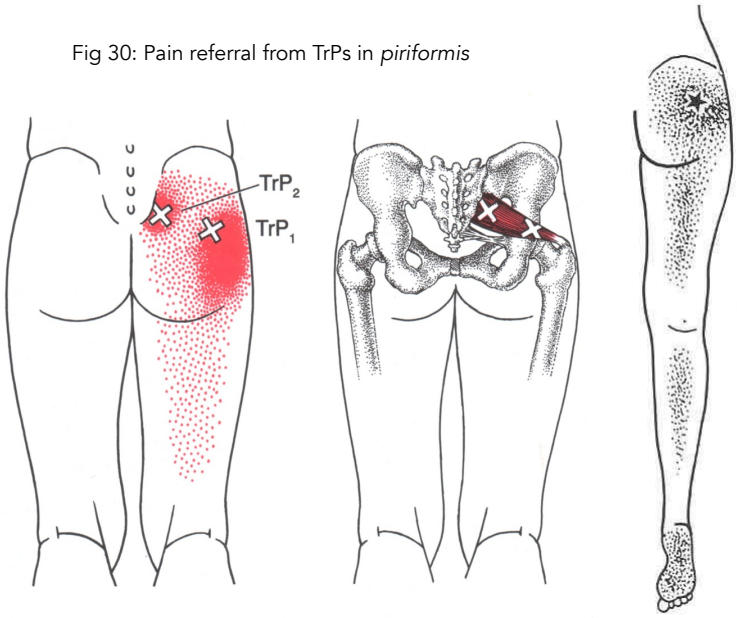


Fig 31: AK muscle stretch reaction

Conclusion

Due to the communication systems in the body between the nervous, circulatory, and muscular tissues, a disturbed portion of the musculoskeletal system can impair the function of other tissues and organs, especially those with which it is neurologically most closely related. In this paper the focus has been on the genitourinary system and its communication with the nerves and blood vessels of the *piriformis* muscle area.

From the diagnostic viewpoint AK MMT has great significance because it makes possible the detection of a '*dis-ease*' process far in advance of the emergence of symptoms in the genitourinary system. Whether the muscle inhibitions we find on AK MMT in the pelvis are primary (as in a postural subluxation) or of secondary reflex origin (as in a visceral disturbance), we must recognise that this component in the genitourinary system's function is a contributing, exacerbating, and perpetuating influence, that must be given effective treatment regardless of the primary aetiology. Because it is the most recognisable and responsive component in the disease process, it is the one through which a capable physician can influence the disease process in the genitourinary system itself, and thereby interrupt the vicious cycle of somato-visceral and viscero-somatic impulses.

The genitourinary or reproductive system is not often high on the list of priorities in many chiropractic clinics. Yet we know that our skills can help people with genitourinary problems. Objective, carefully applied AK MMT can convince ourselves, our patients, and those who watch us work that what we are doing is effective, reproducible, scientific, and occasionally miraculous. (45)

It is very difficult however to produce definitive proof of the effectiveness of our techniques, even though applied kinesiologists have been actively researching and effectively treating the genitourinary system for many years. The kind of immediate improvements we achieve in MMT evaluation (using sensory receptor stimulation) of the genitourinary system, however, and the improvements we achieve clinically with these patients are both good signs of the effectiveness of our AK procedures as they have been developed up to this point in time. But this research has been done privately in our clinics and thus is of little use in persuading skeptics in the scientific community. We have been able to demonstrate to our patients' (and our own) clinical satisfaction the effects of our work on many of the problems in the genitourinary system, but our research into this fascinating area must continue.

Chiropractic work on the genitourinary system for both women and men requires great subtleness and respect for the patient. Our work in this area, using the procedures described in AK over the past 30 years to relieve problems that might otherwise require H.R.T. or surgery, makes us indispensable for the health, happiness, fertility and longevity of women everywhere.

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About the author

Scott Cuthbert, DC practices in Dauin, Negros Oriental (Philippines) and is Associate Editor with the *Journal*. He has served on the Board of Directors of the *International College of Applied Kinesiology USA*. He is the author of three textbooks on applied kinesiology (in addition to 15 papers cited by *Index Medicus*, and over 50 peer-reviewed research papers) on applied kinesiology approaches to functional health problems.

As this clinical narrative demonstrates, Dr Cuthbert practices chiropractic with Mastery of the AK approach.

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