Selected Articles From Dr. Rolf's Collection, Summarized, Part I

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Thomas Findley, MD, PhD, has extensive training in complementary medicine, beginning with training in acupuncture and homeopathy while a medical student at Georgetown in 1975. He currently is a Certified Advanced Rolfer™ and maintains an active clinical practice in Rolfing® Structural Integration in addition to his research activities at the East Orange VA Medical Center. Dr. Findley has played numerous roles related to research in Rolfing, including Research Director of the Rolf Institute® of Structural Integration, and executive director of the Ida P. Rolf Research Foundation and the International Fascia Research Congress. He is currently focusing on the role of fascia in cancer.

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When the Rolf Institute® was preparing, in 2003, to move to Gunbarrel, CO, from the old green building at the end of Pearl St. in Boulder, a file box belonging to Dr. Rolf was rediscovered. The box contains copies of nearly 100 articles ranging from 1915 to 1971. The majority of the articles come from journals of osteopathic medicine or anatomy and deal on the whole with fascial anatomy, physiology, and function from the perspectives of allopathic and osteopathic medicine. Many of them contain interesting illustrations, though a portion of them are not well reproduced in the scanned copies.

It is hoped that exploring the information that Dr. Rolf collected may offer new details about her thinking, interests, and influences, and may also illuminate less-explored or forgotten avenues of practice or research to be rediscovered. This article describes 27 of the collection which have the strongest relationship to fascia, and which were reviewed by Dr. Findley for preparation of his keynote address at Rolf Institute® of Structural Integration annual meeting August 2013, "My Travels with Fascia." The scanned articles are posted in full on the members' section of the International Association of Structural Integrators website. Please see the endnote for instructions to access the articles. We are providing short summaries of each paper to help you choose which ones you may want to read in their entirety. Many of the copies in Dr Rolf's files are faded, and we have found clean copies when possible.

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Teachings of Dr. Still: The Science of Osteopathy
(McConnell, 1915)

McConnell quoted Dr. A. T. Still on the subject of fascia. Still was convinced that it was in fascia that the processes governing disease and health took form. He discussed fascia as an essential arena of fluid exchange and potential stagnation thereof, describing an interrelationship among fluid vessels and sensory, motor, and "nutrient nerves" (p. 584) that depended on healthy fascia for its positive action. Still went on to connect the subject of fascia to the development of the embryo ("it leaves one parent as an atom of fascia") in the fascial system of the mother, "flourishing in the womb . . . the center, origin, and mother of all fascias" (p. 584). The excerpt concluded with Still asserting that fascia was the arena where life and nourishment took place and where the inevitable end of life began.

Research Notes: Fascia—Tension—Light (Millard, 1923)

The author began with homage to Dr. A. T. Still and discussed the importance of proper lymphatic function to the organism. He presented the idea of fascia as an inner skin with pores through which lymph was permitted or hindered from flowing. Millard maintained that proper sitting (upright, alternating which side is more weighted) and walking (on the balls of the feet, "never on the heels") were crucial for keeping flexible and healthy fascia:

> *My ideal of a healthy man or woman is one whose anatomy is such that when they walk it means that it is a gentle exercise, moving the limbs, arms, head, and spine, from side to side, so that, especially the fascia, by this means, is in action or evenly distributed throughout the entire body.* (p. 405)

The author went on to consider tension in the body as antithetical to health and primarily derived from the mind:

> *All tension in every physiological and pathological functioning of the physical body is due to some form of intellectual concentration. Health is absence of tension in the nervous, muscular, organic, and anatomical systems of the human body . . . Vice is the worst form of tension.* (p. 416)

Millard made an observation on the energetic basis for physiology: "A human being is not so much an animated anatomy as a human being is a consciousness . . . It is not so much a proposition of flesh and bones as it is of energies, forces, and power" (p. 416). He continued by noting again that thought fundamentally influenced physiology, especially through breath. Finally, Millard considered light energy as a fundamental nourishing force for the body. He contended that light energy, while possibly not penetrating deeply in the body, was conducted by the nerves throughout the body—the lungs, kidneys, and glands in particular were said to require abundant light energy for health. He recommended sun baths.

Studies in Osteopathic Pathology. II (McConnell, 1928)

McConnell discussed known and theorized physiological processes that accompanied osteopathic lesions with special attention to the connective tissues. He emphasized the osteopathic principle that structural lesions were of primary importance,

> *in vivid contrast to that of the chemical hypothesis of other schools, wherein the chemism of the cell is considered supreme. In other words, these chemical changes are effects of structural disability or so-called osteopathic lesions; for no part can be greater than the whole.* (p. 167)

The author went on to discuss typical signs of lesions in the connective tissue—fibrosis and acidosis—and the vicious cyclic effects these produced on nearby tissues, most importantly the nerves. He highlighted fibrosis as a possible corrective measure by the body and the true target of most osteopathic intervention. Fibrosis "invariably maintains and perpetuates the bony displacement" (p. 168).

McConnell pointed out that any structural intervention necessitated the involvement of the slower healing and metabolic processes of the body—that "[T]echnic is not altogether a simple matter of mechanics. On the contrary it is a complex operation of physiological physics . . . . [The physician] is operating on living tissue; not on an inert machine. This should be fully realized" (p. 168). He continued with some discussion of inflammatory and fibrotic process in subcutaneous tissue. McConnell asserted that much intervention at the sacroiliac joint was misplaced when it focused on the joint itself, which was by nature very mobile. Instead, he suggested that lesions there were more often caused by fibrosis in the surrounding tissue. He noted in passing, "The majority of pelvic distortions are due to sacrolumbar lesions . . . [B]ut there are primary pelvic distortions" (p. 169).

A discussion of the anterior and posterior spinal ligaments followed. In this context, McConnell argued that changes in structural tension were of primary importance: "Abnormal variation in tension contains innumerable pathologic possibilities, depending upon how delicate or vulnerable an area the tensed tissue encroaches. Tension of ligaments, muscles, connective tissue and fascia comprise a field but little investigated . . . ." (p. 169). "In the final analysis," McConnell wrote, "the broad field of osteopathic or structural lesions is founded upon variation in tension," adding that bony position is "but part of the picture" (p. 169).

The Trained Tactual Sense (McConnell, 1931)

McConnell asserted the absolute importance of skilled palpation in assessing the "exact character and the direction" (p. 2) of immobility of the various tissues (not just bone) in a given lesion. He wrote that "the feel of tissue to skilled fingers is in a class by itself. There is no substitute. It is, in a sense, a world apart [from other diagnostic tools], for there is no other sense perception to take its place" (p. 2). He went on to say that the tactual sense was of prime importance not only in palpation but that it was the "guide which directs" (p. 2) throughout the application of any intervention. McConnell emphasized "continuously free and smooth methods" available when "both patient and operator are at ease. To borrow a term, the stance should be right . . . ." (p. 3).

> ". . . the feel of tissue to skilled fingers is in a class by itself. There is no substitute."
> (McConnell, 1931)

The Role of Fascia in Osteopathic Problems
(Kerr, 1936)

Kerr reminded readers of the importance Dr. A. T. Still placed on fascia in addition to bone alignment. He outlined four layers of fascia: subcutaneous fascia in superficial and deep layers, and subserous fascia in deep and superficial layers. Paradoxically, the superficial subserous layer was the deepest, lying closest to the internal organs. The deep layer in the abdomen was identical with the transversalis fascia. Kerr asserted that it was the superficial, not the subserous, layers that were of most concern to osteopaths, and he outlined their anatomy and histology. He discussed the relationship between the lymphatic system and these two layers: the lymphatic capillaries began in the superficial fascia and perforated the deep fascia to meet larger channels and nodes. Kerr discussed the role that fascial tension could have on impairing lymph function as well as that of nerves. "The first step in treatment consists in removing the cause of tension on the fascia . . . . This, in the majority of cases, is not sufficient to produce maximum results. Additional benefit is obtained by gently stretching and loosening the fascia on tension" (p. 420) taking care not to damage the lymph nodes.

Fundamental Fragments IV. Fascia
(McConnell, 1939)

The author presented a view of fascia as the first site of disturbance that resulted in osteopathic lesion: "the first tangible structural change" (p. 204). He wrote of the "innumerable fascial mechanisms" throughout the body whose activity was "indispensable" for the proper functioning of body physiology. "The first strains of lesion inception are probably registered in this extensive supporting framework: and through continued impact and cumulative effect they gradually culminate in osseous malalignment and regional distortion" (p. 204).

The Clinical Significance of the Cervical Fascial Planes
(Cashberg, 1950)

Cashberg outlined the three major layers of deep cervical fascia: superficial, pretracheal, and prevertebral. Their continuity with other structures was mentioned, including that of the prevertebral fascia with the axilla. Structural spaces in the region were defined where infection and tumors occurred; surgical interventions for these were outlined.

Facts About the Transversalis Fascia: A Surgeon's Viewpoint
(Zieman, 1950)

Zieman deplored the incomplete description of the transversalis fascia in anatomy texts, which tended only to describe it at the inguinal region. He described instead a much farther-reaching scope of this complex sheet of fascial fibers. According to Zieman, the transversalis fascia encapsulated the abdominal region, forming a "caulking off" of the openings superiorly and inferiorly where vessels of the abdomen communicated with the thorax and the legs. It merged with the diaphragmatic fascia and formed conical attachments around each structure that penetrated the diaphragm (e.g., aorta, vena cava, esophagus). These attachments extended along those structures in both directions, reaching a short distance inferiorly as well as superiorly into the thorax.

Similarly, he observed that the transversalis encapsulated the vessels and nerves that exited the abdomen into the leg, sealing the contents of the abdomen from the leg itself. "The fascia, moreover, continues out into the leg, contributing to formation of the fascia of that structure . . . ." (p. 226). In the superior and posterior area of the abdomen, Zieman described continuity of the transversalis fascia in the falciform ligament of the liver, the fibers overlying the diaphragmatic crura, the aponeuroses of the psoas major and quadratus lumborum, and the encasement membrane of the kidneys called Gerota's fascia.

Inferiorly, Zieman derided the term "pelvic fascia" for the aponeurotic covering of the iliac fossa, which was essentially the same transversalis fascia.

Likewise, the transversalis fascia was continuous with the "white line" of the pelvic floor and formed three sheaths around the muscles of the pelvic floor as well as the lower pelvic organs.

"Assuredly it is against all principles of good pedagogy to fail to recognize the structure [of the transversalis] as a unit, generally distributed throughout the abdomen and the pelvis" (p. 227).

Fascial Variants of the Trigonum Lumbale (Petiti)
(Cooper, 1952a)

The trigonum lumbale Petiti (inferior lumbar triangle) had been described elsewhere as having a single fascial layer not distinct from the outer fascia of the internal oblique. Instead, these dissections showed that in all infants and a few adults, the region had not only the outer fascia of the internal oblique as a floor, but a second, distinct double layer of fascia covering that. This outer double layer bifurcated to form the inner and outer coverings of the latissimus dorsi and external oblique. A potential space existed between this layer and the internal oblique beneath. The adult bodies with only one apparent layer in the triangle were older subjects. The author surmised that fascial adhesions had caused the illusion of a single layer. A brief allusion was made to structural similarities between the fascia of the inferior lumbar triangle and that of the occipital triangle.

Of note is the Cooper's emphasis on adhesions and aging in altering the apparent anatomy of an area, and the use of infant cadavers to assess the true anatomy.

Fasciae Dorsi Variants
(Cooper, 1952b)

Cooper presented a study on full-term newborn and adult bodies to address inconsistencies between anatomy textbooks and observations of fascia of the back. Lumbar fascia was found to extend more superiorly than had been recognized. It bifurcated into anterior and posterior layers as it extended superiorly. These layers enveloped the anterior and posterior surfaces of the splenius cervicis and capitis muscles. A smaller, third layer of the superior leaves of lumbar fascia beneath formed the dorsal covering of the spinalis, semispinalis, and longissimus under the splenii, and thickened over the semispinalis capitis in the occipital triangle. Detailed descriptions of his findings are in the summary for Cooper's "Fascial Variants of the Trigonum Lumbale (Petiti)" (Cooper, 1952a).

It was emphasized that "the large fascial cleft filled in" by the "serratocostal fascia" (p. 469) was important clinically and surgically. Presumably this referred to the potential space between serratus anterior and costal fascia.

The Chief Insertion of the Bicipital Aponeurosis Is on the Ulna: A Study of Collagenous Bundle Patterns of Antebrachial Fascia and Bicipital Aponeurosis
(Congdon & Fish, 1953)

The authors questioned the supposition that many aponeuroses attached to deep fascia (aponeuroses are much stronger than muscular fascia) and examined the bicipital aponeurosis as an example. Careful description of the anatomy of the collagenous attachments of the aponeurosis in several preserved arms showed that the majority of them attached to the periosteum of the ulna itself in an insertion averaging four inches long. "Delicate collagenous bands" (p. 400) kept the aponeurosis from slipping across the tendons of the pronato-flexor muscles.

The Surgical Significance of the Transversalis Fascia
(Anderson, 1954)

The author sought to clarify the anatomy of the transversalis fascia with attention to surgical and pathological problem areas. He discussed four major areas: the sub-umbilical, epigastric, loins, and inguinal regions. Transversalis fascia was deep to the transversalis muscle, really associated with peritoneum, less so the transversalis muscles itself: The fascia acted as a bursa protecting peritoneum from the overlying muscle. It was most clearly defined below the umbilicus. Ventral hernia resulted from failure in surgery to close the transversalis fascia along with (or after) the peritoneum—much more so than from the pressures of pregnancy and obesity, etc. The author discussed the action of transversalis fascia in containing disease in various locations and its involvement in various hernias.

Glenard's Syndrome and the Sutherland Fulcrum
(Becker, 1954)

Becker related that the autonomic distress pattern called Glenard's syndrome was ameliorated by lifting the lower abdomen. He considered the psoas to be a great part of the support of the abdominal organs, structurally as well as through its proximity to sympathetic nerve ganglia. He described the psoas fascia as a part of a chain extending from the pelvic fascia all the way through the diaphragm, mediastinum, cervical fascia, and to the cranium. The *central mechanism* was outlined, internally, from the tentorium and falx through the spinal dura and, externally, from the base of the occiput through the prevertebral fascia, anterior longitudinal ligament, and sacrum. Autonomic ganglia ran in close proximity with the external portion. The author noted that not just these but "all structures that contribute to the maintenance of posture, from the toes to the Sutherland fulcrum, are to be evaluated in the broad picture which Glenard's syndrome presents" (p. 176).

"Seven, *[sic]* thousand liters of fluid, it is estimated, pass through the extravascular spaces of our tissues every day. Surely only a structure that is dynamic in its everchanging ebb and flow can efficiently handle such a tremendous load" (p. 176).

Becker used the broad outline of the central mechanism and its relationship to the autonomic nervous system to emphasize that Glenard's syndrome was an example of the "withering field" (p. 177): a loss of equilibrium in fascial and autonomic systems; a consequent loss of vitality in those systems and the organs themselves, and the various symptoms that they presented. Symptomatic control did nothing to rebalance the system, which presented "an ever shifting panorama of stress and strain within a dynamic ligamentous-articular and membranous-articular mechanism" (p. 178).

Malalignment of the Sternum and Fascial Strain
(Hitch, 1954)

The author described the structural relationships of the thorax involving the sternum and the technique of sternal lift. The sternum reflected rotations in the thoracic spine transmitted through the ribs. A rotated vertebra would depress one side of the sternum and elevate the other. There was continuity of the middle cervical fascia with the mediastinum and thereby to the lumbar fascia. Drag on any portion of this continuity would interfere with normal breathing.

Hitch made the following statement with regard to fascia:

> *We may assume with very good reason that the fascia is the substance that permits the adaptive behaviour of the body mechanism. The mechanism has a fundamental tendency to so arrange its patterns that in relation to its environment it becomes stable. There is however, a tendency for the stable to replace the unstable (the post-treatment return to a compensatory pattern by the mechanism thereby frequently causing reactions). Fascial release, the allowing of the shifting of the fulcrum during treatment and letting it reach its physiological conclusion, is of great importance in the securing of maximum therapeutic benefit, and in the avoidance of discomfort following treatment. Fascial release allows the physiological forces within to manifest their 'unerring potency' in aiding the recovery process.* (p. 172-173)

Hitch mentioned reflex mechanisms being affected by fascial strain and concluded with a description of a technique for sternal lift as a means for releasing cervical fascial tension.

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Fascia in the Writings of A. T. Still
(Magoun, 1954)

The author compared some current observations on fascia by both osteopaths and allopathic researchers with Dr. Still's writings, emphasizing Still's prescience and accuracy and highlighting how much contemporary research had yet to live up to the comprehensive depth of Still's understanding. Magoun dwelled momentarily on a few contemporary statements about the inseparability of structure and function in the body, comparing them with Still's perspective on the nearly infinitely complex structure of fascia as "the framework of life, the dwelling place in which life sojourns" (p. 161-2).

The author then critiqued two examples of modern inquiry he saw as falling far short of the more complete, systemic understanding of pathology that osteopathy and Still's understanding offer. He criticized surgical intervention to relieve fascial contracture and related pain for its focus only on symptoms and not root causes. He took trigger point therapy researchers to task for apparently being mystified as to the causes of the relationship between trigger point and affected area when, from an osteopathic point of view, there were clear fascial and neural relationships present. Magoun emphasized Still's belief in the importance of the health of the fascia in regulating, at the capillary and cell level, the interchange of fluids and thereby having immense importance on the health of the organism as a whole.

Embryology and Physiology of Fascia
(Snyder, 1954)

The article summarized the current understanding of fascia, emphasizing at the outset that while anatomists think of fascia as "a dissectible mass of fibro-elastic connective tissue" (p. 148), fascia as a category unto itself was arbitrary—there was a seamless continuum of connective tissue from dense bone to fluid mucus tissue. "The function of binding and support is only one of the vital roles played by this widely distributed tissue in the body economy" (p. 148). Snyder discussed the embryology of fascia and the role that mesenchymal (stem) cells played in its formation and in adult tissue. He outlined the major known cell constituents of fascia: mesenchymal, macrophage, mast, and fibroblast cells.

Collagen and contemporary theories of its production were discussed. Snyder emphasized several times the importance of the connective tissue matrix as an intermediary between capillary and parenchymal tissue—that chemical and structural alterations in ground substance and fibers could greatly hinder or assist nutrient and waste transfer. He went on to discuss current knowledge of fascia's relationship with hormones and tumor growth.

> *What is ordinarily called "fascia" does serve a supportive and packing function for other tissues and organs; however when we consider that this same tissue, in a broader sense, presents the immediate environment for all the cells of the body, it assumes new implications as a physico-chemical entity which may effect, directly or indirectly, the activities of all other tissues in both health and disease.* (p. 158)

The Aponeurosis of the Prime Movers of Right Antrio-Ventricular Plane in the Human Heart
(Brandt, 1956)

Brandt described the connective tissue that crossed the boundary of the right atrium and right ventricle and which structures were responsible for its movement during systole. This tissue functioned as an aponeurosis for the prime movers of both the right atrium and right ventricle and moved in response to their alternate contraction. Details for the structural mechanics of this movement were enumerated.

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Fasciae — Applied Anatomy and Physiology
(Snyder, 1956)

The author discussed connective tissue's importance and the growing detail that the various technologies of study shed on its roles in the body. He outlined two views of connective tissue. The first view was the more limited and mechanical one, which included the osteopathic sense of interconnecting planes that related sometimes distant parts of the body together. The second view was more broad, including "not only the gross sheaths and reflections around and between organs, but also that vast amount of tissue which surrounds every living cell of the body and that fluid which fills joint cavities and serous spaces" (p. 67).

A discussion of the major components of connective tissue ensued: cell types, fiber types (and then-current theories on their production), and ground substance. The author noted that the ground substance was distinct from tissue fluid, listed the varieties of chemicals comprising it, and mentioned gel and sol states based on the complexity of the molecular aggregates present. Noticeably, the author did not mention relative hydration of the ground substance in relation to gel and sol states.

Snyder stated that connective tissue neighbored every living cell in the body, and since it intervened between every capillary and every cell in various forms, it could be considered enormously important for every metabolic process. He proposed that connective tissue could significantly alter transport of some substances from blood to cell depending on its makeup. Enzymes and hormones were said to influence connective tissue in disease and health. Hyalauronidase and cortisone were connected with permeability of connective tissue and suppression of its production, respectively, with important implications for the spread of disease and its treatment. Other hormones' effects were mentioned as well, and it was noted that their effects were usually both local and systemic throughout the connective tissue of the body. Snyder asserted that since the connective tissues were responsive to a wide array of stimuli, an abnormality may have been the result of any of several disparate causes.

Fasciae of the Masticator Space
(Gaughran, 1957)

The author used the dissections of 50 half heads to clarify the fascial anatomy of the masticator space, particularly the anterior boundary where there was some discrepancy among anatomists over time. A continuity of fasciae—the deep temporal, the lateral pterygoid, and the interpterygoid fasciae—compartmentalized the masticator space into a more medial and more lateral region. The author pointed out the importance of this compartmentalization as a barrier against infection. It is worth noting, based on the author's detailed description, the number of structures that this interconnected fascial plane involved. Bony attachments for the combined fasciae included sphenoid both at the pterygoid plate and at the temple, temporal, mandible, and maxillary and zygomatic. Myofascial connections included the buccinator, temporalis, masseter, and lateral and medial pterygoid. Additionally, the fasciae invested numerous vessels and nerves in the area. The author also defined a new anatomical term, *the temporo-buccinator band*, which he described as bridging the deep temporal fascia to the buccinator muscle and possibly serving to keep the cheek free from the teeth in biting. The masticatory fat pad (*corpus adiposum buccae*) was said to occupy a space defined by fascial planes and possess several extensions.

Regional Variations in the Innervation of Deep Fasciae and Aponeuroses
(Stilwell, 1957)

The author described the deep fasciae as presenting an area where superficial and deep nerves communicated with each other. He examined hand, forearm, lower leg and thigh, lumbodorsal, masseter, and abdominal fascia, using human cadavers, monkeys, and rabbits. The deep fasciae were usually found to be dually innervated by both superficial and deep nerves, which connected with each other at or near fascial layers, sometimes forming plexi. The fascia itself tended to be "sparingly supplied" by free and encapsulated nerve endings. He found that the type and frequency of nerve endings in the deep fascia was more varied than others had previously assumed. Stilwell posited a kinesthetic function to retinacula and aponeuroses because of the presence of proprioceptive nerve endings in them and the direct communication with nerves exiting nearby muscles.

Myofascial Therapy: An Approach to Musculoskeletal Problems
(Jenkins, 1961)

The author outlined the key concepts of *myofascial therapy*, which used postural analysis as the basis for improving the balance and stability of the overall structure. He presented a view of local musculoskeletal disorder as cause and result of global myofascial and postural disorder: "Treatment, therefore, to be rational, must be directed toward restoring or creating good economy of motion in the body and its parts—not just . . . the affected region alone" (p. 181). The intervention consisted of pressure applied at the myotendinous junctions of the appropriate muscles based on postural analysis of the erect and supine body. Except for being part of the named therapy, fascia was hardly mentioned in the article. Instead, the mechanism for change was described in terms of arresting muscular contracture by inducing muscle fatigue and provoking a change in the balance of muscle tone over time.

Jenkins wrote that the work had a permanent effect on posture once the nervous system had adopted the new, balanced pattern, i.e., "homeostasis is achieved" (p. 182). He mentioned that challenging the new pattern with activities that had been problematic before was useful for establishing the new order more securely: "Results can be evaluated in terms of increased resistance to damage in repeated subjection to the original stress" (p. 181). Six case studies were presented, the majority of which consisted of eight to ten sessions given.

Surgery of Deep Fascia of the Leg—I: Subluxation of the Deep Fascia of the Leg, Its Relation to Primary Varicose Veins, and Its Surgical Treatment
(Askar, 1965)

The author proposed that the deep fascia of the leg was of prime importance in maintaining the health of the venous system in the lower extremity. He wrote that the deep fascia of leg, rich with elastic fibers, acted like suspended stockings, with the fasciae of the iliotibial tract and hamstrings acting as suspenders. He suggested that it had a construction like a Chinese finger-trap: Longitudinal tension acted to constrict it, providing a pressure-resistant wall that encouraged venous return. Conversely, relaxation of this fascia was said to be correlated with varicose veins in the following steps:

- Fluid was inadequately returned because the pressure cuff of fascia was too loose.
- Deep veins filled, preventing their valves from closing normally.
- The built-up pressure escaped through the deep fascia and into the superficial veins.
- The superficial veins overfilled; their valves failed, and they became varicose.

Askar indicated that normal valves were oriented perpendicular to skin and membrane surfaces, while parallel-oriented valves were pathological and failed to function properly. He discussed surgical techniques to tighten the deep fascia and remove the above-stated causes of varicose veins.

The Surgical Anatomy of the Deep Fascia of the Human Leg
(Askar & Abou-El-Ainen, 1963)

The authors offered a detailed description of deep fascia of the lower leg, from surgical experience as well as fresh and preserved cadaver dissection. The deep fascia was said to have elastic fibers in abundance. They emphasized its continuity, including its relationship with tendons of the thigh and as an origin for some muscles of the lower leg. Anatomic variability among the 60 cases observed was mentioned. They described fasciculi of deep fascial fibers which were more observable in adults and "poorly marked in children" (p.120). There existed two distinct layers of deep fascia of the lower leg. The layer originating from sartorius, iliotibial tract, and biceps femoris in veterinary anatomy was referred to as a *tarsal tendon of insertion* for those muscles. In humans, the same layer of fascia inserted onto the deep fascia of the leg itself, appearing to act on that fascia like the suspenders of women's stockings of old: assisting the pumping and containment of hydrostatic pressures in the lower leg. The authors asserted that the deep fascia was "a complete sealed investment to the whole leg," (pp. 123-4) in contrast to anatomy books like *Gray's*. They mentioned the possibility of the fascial fibers exerting "valvular control" over the veins piercing them.

Antagonism of Temporal Fascia to Masseteric Contraction
(Eisenberg & Brodie, 1965)

In this remarkable example of animal cruelty in the name of science, the authors removed temporal fascia from one side of the heads of monkeys, inserted gold plates to prevent healing, injected them with (highly toxic) lead acetate three times over the course of several weeks (to observe bone growth patterns) and allowed them to continue living (and chewing, presumably, in grossly compromised fashion) for eight weeks. They then were pleased to observe that, yes, a fascia that inserts on the zygomatic arch was indeed an important component of the structural stability of the arch and, when removed, caused not only extreme distress and pain to the owner of the arch, but also a great deal of remodeling of the bone of the arch.

The article described the initial failed experimental attempt on one monkey whose temporal fascia kept reattaching with copious scar tissue, and the subsequent successful experiment. Essentially, in the compromised zygomatic arch of each monkey, a great deal of bone remodeling went on in response to the pull of the masseter muscle, confirming the authors' hypothesis that the temporalis fascia served as an antagonist to the masseter and preserved the structural stability of the zygomatic arch.

In a further teaser of in vivo cruelty, the portion of the article following this one in Dr. Rolf's copy is a study of the glans penis of the dog in which the researchers discovered that severing the dogs' spinal cords was a convenient way of obtaining erections more easily.

The Clinical Importance of Fascia
(Cathie & England, Eds., 1968)

The article presented an overview of fascia from an osteopathic point of view. Fascia's clinical significance was broken down into four categories: protection and support, musculoskeletal system, metabolism, lesioning and degeneration. The article considered fascia in posture and the particular challenges of the upright human posture for organs, its ubiquity in the body, and its continuity, in a manner very reminiscent of the view of structural integration.

Among the key concepts discussed in this overview were:

- Use of fascia by the body in restraining, balancing, shaping, coordinating, and concentrating muscle activity.
- Restrictions in fascia causing distant restrictions elsewhere as a result of its continuity.
- Fascia in circulation, functioning as a means both of keeping veins open and of squeezing them, aiding in venous return.
- Fat storage (within the fascia) and the effect of excess fat on the upright body structure and venous return.
- Fascia in its relationship to fluids of the body: interstitially, as a boundary, and as a structure enclosing blood vessels, nerve, and lymph vessels. Similarly, fascia's importance in affecting the essential processes of osmosis and diffusion of nutrients and wastes at every level, including the cellular.

Many of these articles indirectly or directly address fascia's significance in biomechanical function and posture . . . they also reflect a great deal of consideration and speculation on the fundamental physiological significance of fascia and connective tissue to body function, health, and disease.

The paper presented a histological overview of fascia as comprising three of seven categories of connective tissue. Roles of various cell types, particularly fibroblasts and various immune cells were discussed. Fascia was said to be an important location for infection control. The authors outlined the process of lesion and degradation involving the fascial system, by causes including traumatic injury and infection and the sequence of responses to trauma from initial inflammation to fibrosis.

Fascia and Fascial Spaces of the Head and Neck
(Hollinshead, 1968)

The author considered that "spaces" defined by fascial sheaths or areas of areolar tissue surrounding organs and vessels functioned in the same way as far as infection containment and surgical safety were concerned. What was loose, areolar tissue in the living body may have appeared as denser fascia in surgery and dissection as tissue collapsed and took on a denser, thicker, more laminar appearance.

Following this observation was an exhaustive survey of the fasciae of the neck. The true superficial fascia was mentioned, but most discussed was the deep (cervical) fascia and its three major layers: superficial, pretracheal (investing), and prevertebral. The spaces these layers defined in the neck and mandibular area were described, some being potential spaces, some being more truly spaces (housing loose, areolar tissue), and some being spaces in name only (e.g., fascia that split to form the covering of a gland created a "space" taken up entirely by that gland).

Of the spaces described, a few were particularly continuous with further reaches of the body. Between the two leaves of the prevertebral fascia was a potential space which extended from the base of the skull all the way to the level of the diaphragm, called by some a "danger space" because of its potential as a conduit of infection. Just anterior to this, between prevertebral and pretracheal fasciae, the retropharyngeal/retrovisceral space extended from the base of the skull to approximately T4 to T6. (And the pretracheal fascia, it was mentioned, fused inferiorly with the fibrous pericardium.) Surgical drainage of infection and an infectious condition called Ludwig's angina were also discussed in relation to this anatomy.

Toward More Effective Manipulative Management of Chronic Myofascial Strain and Stress Syndromes
(Little, 1968)

The author stated that the essential element of traditional osteopathy—assessment of musculoskeletal patterns—had all but died out in the practice of most osteopaths of the day. The article presented a model of various body systems, divided into a primary *neuromusculoskeletal system* and a secondary *visceral system* conceived as functioning in a supportive role. "Ill health is a breakdown in this adaptive adjustment [to internal and environmental change], with inadequate communication between the primary and secondary machinery, and produces disturbances in the machinery or in its patterns of response" (p. 97).

The author described three aspects of the myofascia: motive and supportive, biochemical, and bioenergetic. He emphasized the essential physiological unity of the whole system: "Normal muscle action is the patterned response of groups of muscles. Muscles may have anatomic individuality, but they do not have functional individuality" (p. 98). The fascia as an arena for biochemical activity of all kinds was mentioned. The author relied on quotations from R. B. Taylor in *Bioenergetics of Man* to discuss the body as a thermodynamic system. Taylor discussed posture in relation to gravity and a resultant systemic loss of energy as tissues were subjected to stress and strain. The tissues most susceptible to energy loss were those of the ground substance and the fascia. Little mentioned thixotropy as an indicator of the amount of energy in a gel.

Little took the position, sweepingly and without bothering to support it, that:

> *Thus, loss of energy is the origin of pathologic processes. Reverse the process, restore energy, and health will result. Health is the result of normal energy interchange. Disease is the result of abnormal energy function. The problem then becomes how best to restore and maintain normal energy flow. Taylor has also stated positively that manipulative pressure and stretching are the most effective ways of modifying the energy potentials of abnormal tissues.*
>
> (p. 99)

Little concluded the section on bioenergetics by stressing the importance of the energies of the physician-patient interaction and the energetic skill and awareness of the practitioner.

The scanned articles are posted in full on the members' section of the International Association of Structural Integrators website.

Conclusion

About a fourth of the collected articles from Dr. Rolf's file box are summarized above. This selection reflects one of Dr. Rolf's central concerns: Anatomy and continuity of the fasciae of the *core* are detailed in multiple anatomical studies but not linked conceptually by the authors as a functional space, as Dr. Rolf herself did.

Many of these articles indirectly or directly address fascia's significance in biomechanical function and posture, which was obviously Dr. Rolf's concern. But they also reflect a great deal of consideration and speculation on the fundamental physiological significance of fascia and connective tissue to body function, health, and disease—from A. T. Still's venerating and poetic teachings on fascia to discussions of the histology and function of connective tissue in inflammation, infection, and metabolic function.

Quite a few of these articles, in particular those by osteopaths, decry the ignorance by contemporary practitioners of the significance of fascia and the holistic nature of the function of the body in health and disease. Clearly, Dr. Rolf was in agreement.

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Endnote

Instructions for accessing PDF files of the articles:

- Go to www.theiasi.net.
- Click "Login" in the upper right corner.
- Enter your user name and password.
- Click "Member Only Section" in the left hand toolbar, which opens a drop down menu.
- Click "IASI Reference Library" in the drop down menu.
- Click "Dr. Rolf's Article Collection" to be directed to a page with the article titles.