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PHYSIOLOGIC REGULATION THROUGH MANUAL THERAPY

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CORRECTION AND REGULATION

Manual therapy can be divided into two distinct conceptual approaches to treatment: specific adjustments for correction of anatomic issues (structure) and adjustments for physiologic regulation (function). In recent years, the primary emphasis of most practitioners has been on finding structural problems associated with musculoskeletal issues and correcting anatomic findings (“lesions” and “subluxations”). Less emphasized has been the capability for manual therapy to regulate physiology, reestablishing equilibrium and balance among the various systems and processes of the body. Historically, however, the origins of both osteopathy and chiropractic can be traced to positive outcomes in the treatment of systemic dysfunction. A. T. Still, founder of osteopathy, used an “inhibition” technique (lying with his head in a sling) to relieve his own headaches; D. D. Palmer, founder of chiropractic, first treated a patient with a hearing impairment.

Recognition of the structure versus function choices within manual therapy dates to the early days of osteopathy. For example, Hazzard (1899), a prominent early osteopathic physician, acknowledges both of these approaches in his textbook *Principles of Osteopathy*:

In our treatment of a spine there are two points which we may take into consideration; two objects which we may have in view. In the first place, we may wish to TREAT THE SPINE ITSELF

[anatomic correction]. In the second place, we may wish to REACH, BY TREATING THE CENTERS ALONG THE SPINE, THE VISCERA TO WHICH THESE NERVES RUN [physiologic regulation]. It is not always possible to disassociate these in your practice.²³

The textbooks of the early 1900s emphasized regulation,^{2,5,11,19,23,30a,51,60} yet by 1991, Kuchera and Kuchera state: “The majority of DOs do not use manipulation. Many of those physicians who do so use it primarily for treating musculoskeletal complaints. They do not use manipulation for its homeostatic benefits [regulation] to the body’s physiology.”³⁰

Johnston points out that there are aspects of osteopathic manipulation in which spinal segment dysfunction is not necessarily the focus for diagnosis and treatment.²⁵ These include direct manipulation of the visceral organs themselves, influencing cerebrospinal fluid flow, and adjustment of postural influences on visceral support systems. All of these are interventions that regulate physiology.

The general lack of awareness of regulatory techniques and effects can complicate the interpretation of research. For example, Balon et al. compared active and simulated chiropractic manipulations as an adjunctive treatment for childhood asthma.⁴ They concluded that, because there were no significant differences in response to the active and simulated treatments, chiropractic spinal manipulation provides no benefit. However, the so-called simulated or sham treatment involved “soft tissue manipulation and gentle palpation to the spine, paraspinal muscles, and shoulders.” Additional manipulations were applied to the head, ankles and feet, gluteal region, and occipital protuberance. “Low-amplitude, low-velocity impulses were applied in all these nontherapeutic contacts,” in contrast to the standard high-velocity chiropractic manipulation. Unfortunately, this simulated treatment resembles a traditional general osteopathic regulatory treatment.^{5,17,23} The Early American Manual Therapy Web site provides easy access to several such examples from the traditional manual therapy literature.³² Figure 1, which dates back to 1909, demonstrates such a technique. In the Balon study, both treatments produced positive effects. The authors note, “We are unaware of published evidence that suggests that positioning, palpation, gentle soft-tissue therapy, or impulses to the musculature adjacent to the spine influence the course of asthma.”⁴ Richards et al. and Nelson et al. have, however, shown that there is substantial published evidence that such techniques are effective in regulating a large number of physiologic parameters.^{41,50}

Despite the low level of awareness, there is a substantial body of regulatory technique in historical materials, and there are osteopaths still very much concerned with this aspect of manual therapy.³⁰ There is also a strong linkage between this broader approach to manual medicine and the growing interest in complementary and alternative medicine. Edgar Cayce, to whom the *Journal of the American Medical Association* traced the roots of modern day holism,¹⁰ strongly advocated osteopathy as a very helpful treatment system, especially for maintaining coordination of the nervous system. Cayce indicated the osteopathy is “not merely the punching in a certain segment or the cracking of the bones, but is the keeping of a balance—by the touch—between the sympathetic and the cerebrospinal system! That is real osteopathy!”³⁶

One approach, used by the Kucheras, groups systems of the body by their common autonomic and lymphatic elements.³⁰ It explores selected structural and functional considerations in osteopathic medicine, with an emphasis on physiology and reflexes. The goal is to enhance the body’s homeostatic mechanisms. Their book discusses a variety of techniques and clinical experience of effectiveness, for each system of the body. The Kucheras provide techniques to enhance circulation and



FIGURE 1. Manipulation of the muscles in the back, in general treatment of the spine from *A Manual of Osteopathy* by Eduard W. Goetz, D.O., published in 1909. Soft tissue manipulation was often used by the early osteopaths for a wide range of systemic disorders. Typically, paraspinal massage and manipulation were included in the osteopathic general treatment format to improve nervous system coordination and drainages throughout the system. This type of soft tissue technique is similar to the “simulated” (control) treatments given in a study for childhood asthma.⁴ (From Goetz EW: *A Manual of Osteopathy with the Application of Physical Culture, Baths and Diet*. Cincinnati, Nature’s Cure Company, 1909.)

drainages. Each section discusses (1) sympathetic and parasympathetic innervation and relevant reflexes, (2) lymphatic drainage patterns, and (3) manipulative treatment for influencing sympathetic, parasympathetic, and lymphatic drainage to augment homeostasis.

In this chapter, we address four key concepts affecting regulation: coordination, centers, reflexes, and drainage. We draw on the historical osteopathic and chiropractic literature for techniques and examples and review research that demonstrates the effectiveness and explores the mechanisms of these techniques.

FOUR KEY CONCEPTS: REFLEXES, COORDINATION, CENTERS, AND DRAINAGE

Reflexes

To go beyond diagnosing and treating musculoskeletal complaints and to treat the entire person, manual medicine requires the existence of physiologic linkages between the surface/somatic areas and the deeper viscera. These reflex connections exist in the form of viscerosomatic reflexes, in which dysfunction in the viscera is expressed as somatic dysfunction, and somatovisceral reflexes, in which dysfunction or treatment at the surface of the body is reflexively conveyed to the viscera.⁵⁴

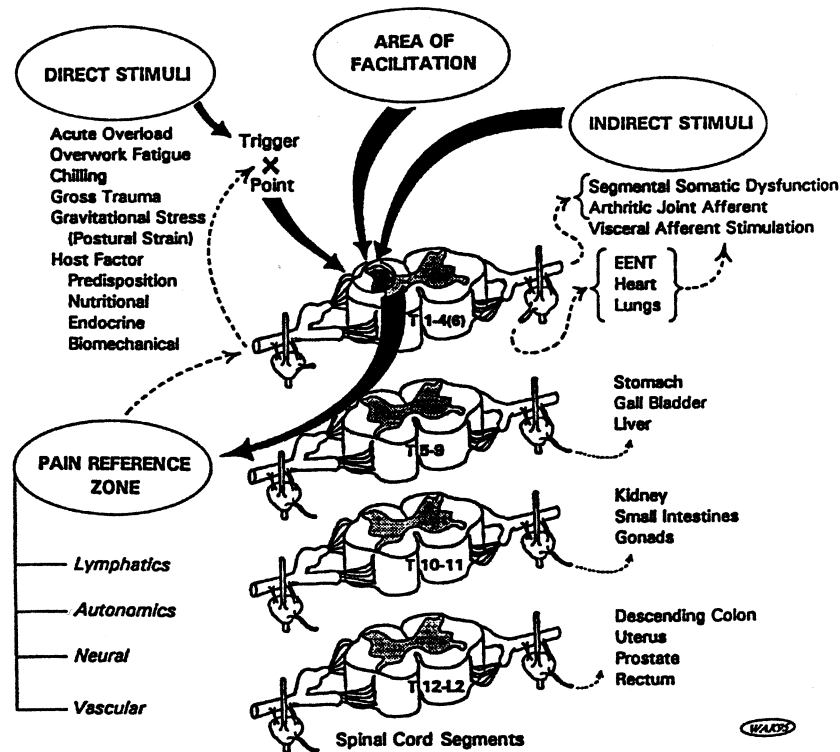


FIGURE 2. Spinal cord as “neurologic lens” for a variety of stressors to initiate somatic and/or visceral symptoms. (From Ward RC (ed): Foundations for Osteopathic Medicine. Baltimore, Williams & Wilkins, 1997, p 916; with permission.)

Furthermore, the spinal cord behaves as a “neurologic lens” for a variety of stressors and acts as an “organizer” of disease and dysfunctional processes that initiates both somatic and visceral symptoms.²⁸ This is illustrated in Figure 2.

Although the locations of many of the centers are obviously correlated with the segmental anatomy of the body, there also exist reflexes that may cut across segmental boundaries and affect areas far removed from the point of manipulation. “Referred pain” is one obvious form of a viscerosomatic reflex. For example, gallbladder dysfunction is often experienced as muscle pain in the right shoulder. There is a direct relationship between certain segments of the spine and various internal organs (Table 1).

Diagnosis in osteopathy can rely heavily on viscerosomatic reflexes. While the primary focus here is on physiologic regulation through somatovisceral reflexes, it is worth noting the evidence for viscerosomatic reflexes, because it provides a feedback mechanism for the practitioner, and diagnosis and treatment are often carried out simultaneously. Beal reviews the clinical and experimental evidence related to this and provides a detailed table of the findings of a large number of studies, including double-blind studies of palpation in diagnosis.⁶ Viscerosomatic reflexes also have been demonstrated experimentally in several studies in animals⁵⁴ and have been shown to be clinically relevant in humans since Korr’s work in 1947.²⁷ Measuring surface temperature reflexes has emerged as a way to track visceral function.⁵³

TABLE 1. Relationship between Spine Segments and Internal Organs

Organ	Spine Segment
Heart	T1–T4
Lungs and Airways	T1–T6
Spleen	T3–T10
Stomach	T6–T9
Small Bowel	T8–T11
Liver	T8–T10
Colon	
Cecum and appendix	T10–T12
Transverse colon	T12–L1
Descending colon	L1–L2
Kidney	T6–T12 (mainly T11–12)
Bladder	T11–L2

Somatovisceral reflexes have received little attention yet are significant for physiologic regulation. Among the more important reflexes for regulation of physiology are Chapman's reflexes. In the late 1930s, Frank Chapman, D.O., first published his findings identifying specific neurolymphatic reflex points that correspond to particular organs and glands. There is a discussion of the diagnostic and therapeutic application of Chapman's reflexes in the text *An Endocrine Interpretation of Chapman's Reflexes*.⁴³ Most of these points are located on the front of the body between the ribs next to the sternum and on the back along the spine between the spinous processes and the tips of the transverse processes. Palpation of Chapman's points can be used for assessment of lymphatic function with correlation to specific organs. Stimulation of Chapman's points can influence the motion of the lymph and can also influence visceral functions through nervous system reflexes. Stimulation of Chapman's points is performed by firm pressure in a gentle circular motion on the point. Owen thought that Chapman's reflexes exerted a particularly profound influence on the glandular system.⁴³ Kuchera and Kuchera interpret palpatory changes in Chapman's points as indicating functional involvement of the sympathetic nervous system.³⁰

Patriquin gives practical guidelines for diagnosis and treatment using Chapman's reflexes.⁴⁵ For example, for irritable bowel syndrome, Chapman's reflexes for the colon are found along the anterior aspect of the iliotibial bands, a 2-inch strip on the lateral side of each thigh. The anatomic location of the reflex ganglioform masses found can be correlated with specific portions of the colon. These can be treated with soft tissue kneading, a mechanical percussion hammer, or other types of vibration to produce a somatovisceral influence on the sympathetic innervation to the colon.

Some of the Chapman's points bear an obvious segmental relationship to the target organ. For example, the anterior point for bronchitis is the intercostal space between the second and third rib close to the sternum. The posterior point is located at the second dorsal (thoracic) vertebra, midway between the spinous process and the tip of the transverse process.⁴³ On the other hand, some of the Chapman's points bear little obvious relation to the target organ. For example, the anterior points for the eye problems of retinitis and conjunctivitis are located on the front of the humerus.⁴³

It is not clear how Chapman's reflexes actually work physiologically. Some have a segmental relationship, but some are aberrant (e.g., the eye-humerus reflex cited above). Patriquin is uncomfortable relating Chapman's reflexes to autonomic responses, because in his view, the autonomics, by the time they reach the surface, tend to be quite diffuse (the thermodiagnosis movement, which relies on surface temperature findings to make specific diagnoses, would tend to counter this).⁴⁵ Chapman's reflexes, on the other hand, are very localized, small, distinct areas. Patriquin also notes that Chapman himself saw the reflexes as neurolymphatic, but this could not be confirmed by biopsy. Patriquin admits, "I think we're trying to influence the visceral disturbance by treating some part of a reflex arc, even though we haven't the foggiest notion what reflex arc it is."⁴⁴

Despite the unclear anatomic justification for Chapman's reflexes, there is a solid experimental physiologic basis for regulation of visceral function by manual surface stimulation and inhibition. Sato explored somatic-autonomic reflexes in animals.⁵⁴ Sato and his colleagues, working with anesthetized animals, traced reflexes from various types of mechanical, thermal, and chemical stimulation of the skin to visceral effector organs including the heart, stomach, sweat glands, bladder, and adrenal medulla. For example, heart rate can be increased in anesthetized cats by stimulation of any one of a variety of skin areas. This reflex is produced mainly by an augmentation of cardiac sympathetic efferent nerve activity. Similarly, in the anesthetized rat, Sato demonstrated inhibition of gastric contractions by stimulating the abdominal skin. Conversely, noxious stimulation of a hind paw sometimes augments gastric motility, mediated by reflex facilitation of gastric vagal efferent nerve activity.

Coordination

The body's physiologic processes normally operate in a coordinated manner, and the goal of manual therapy is to restore coordination. For example, Gregory (1922) equated coordination with health and incoordination with disease: "It is the existence and continuation of the normal equilibrium, and of perfect coordination and reflex action, which maintain perfect health, and it is the existence of some variation and loss of the perfect equilibrium of nerve action which engenders derangement of function, and the resulting incoordination, and their consequences, which is disease."¹⁹

Modern systems theory, when combined with the concept of energy, leads to the prediction that the various parts of the body may interact not only physiologically, but also energetically and therefore informationally.⁵⁷ This interaction can reach the level of harmonic integration, which has been termed *entrainment*.³³

How, then, does manual therapy accomplish coordination? Two techniques bear mentioning. First, physiologic regulation and coordination are accomplished through stimulation and inhibition of centers along the spine and at other locations on the surface of the body. Goetz defines the two types of manipulation that regulate physiology: stimulation and inhibition.¹⁷ To stimulate is to manipulate the parts thoroughly. To inhibit is to desensitize or hold the part for 1–3 minutes. According to Ashmore, "Stimulation usually consists of a quick stroking or rotary massage. Inhibition consists of slow, steady pressures, often applied with stretching of the underlying or adjacent tissues."²² Sato demonstrated this phenomenon with somato-endocrine reflexes.⁵⁴ Pinching stimulation of the lower chest of the anesthetized rat increases the rate of secretion of adrenaline and noradrenaline by the adrenal medulla. In contrast, innocuous brushing of the same surface area decreases the rate

of secretion. Barber indicated that “with a thorough knowledge of the various nerve-centers, and the innervation of the different tissues and organs, the osteopath is able to coordinate the nerve-force of the body. He can increase the nerve-current to almost any part of the being, and can quiet an excessive one as well.”⁵

A second technique to accomplish coordination, which needs further researching, may date to the influence of what historically has been called “magnetic healing” in the practice of osteopathy. It involves holding the practitioner’s hands over certain spinal centers at the completion of treatment to coordinate them rhythmically. The harmonizing of coupled oscillators into a single, dominant frequency is frequency-selective entrainment. Skilled practitioners may enhance this transfer with the use of empathetic, meditative, centered states.³³

Control theory may help us better understand coordination within the body. A control system is a connection of elements that communicate with each other to produce a specific effect. Control systems with negative feedback regulate; those with a positive feedback system do not regulate but can disrupt the status quo.³⁷ An example of the former are the muscle spindles that control postural balance, and an example of the latter is the tickle in one’s throat that can produce reflexive coughing. Systems with both types of feedback, such as the body, can be influenced by nonlinear dynamics, or chaos as it is commonly called. This can be helpful in understanding how small perturbations, such as a facilitated spinal segment, can impact the system exponentially. It can also help explain how manual therapies can alter the dynamics of the larger system.

Centers

The concept of centers is inherent in the osteopathic model of treatment. From the beginning of the profession, osteopathy recognized the significance of certain nerve ganglia as important centers that influence and regulate the vital processes of the body such as circulation, assimilation, and elimination. Barber (1898) states:

We all agree upon the one great point, that man is a machine, and that nerve-centers have been discovered upon which a pressure of the hand will cause the heart to slow or quicken its action, from which we can regulate the action of the stomach, bowels, liver, pancreas, kidneys, and the diaphragm. The thousands of people snatched from the grave by an application of these never-failing principles are proof positive that at last the keynote has been struck; and a school [osteopathy] established that can explain intelligently why certain manipulations produce certain results.⁵

The early osteopaths found a number of locations along the spine whereby the physiology of specific viscera could be affected by stimulation or inhibition of the center. According to Tasker (1903):

An osteopathic center is that point on the surface of the body which has been demonstrated to be in closest central connection with a physiological center, or over the course of a governing nerve bundle. No portion of the nervous system ever functions absolutely independently. The action of every portion affects all other portions, but certain areas in the brain and spinal cord seem to be somewhat set apart to govern or coordinate the physiological activity of certain organs. Physiology has demonstrated a large number of these centers.⁶⁰

Many centers correspond to locations on the chain of sympathetic ganglia, from which nerves go to the viscera. Different books give different numbers of centers. For example, Ashmore identified primary and secondary centers.² Korr diagrams the centers along the spine, with connections to the viscera.²⁸ There are areas in the cervical,

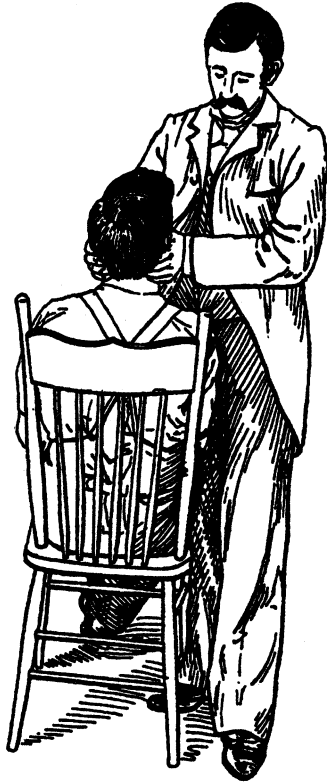


FIGURE 3. Headache—holding the vaso-motor from *Osteopathy Complete* by E. D. Barber, D.O., published in 1898. In addition to its use for relieving headaches, this treatment was valued as a means of regulating physiology. “It is impossible for the osteopath to reach directly the center in the medulla oblongata. The same results are attained, however, through so-called “reflex action,” by a pressure upon the upper cervicals—where is situated the most important subsidiary center—at the same instant tipping the head backward, thus bringing the neck into such a position as to throw a pressure upon the nerves over the cervical vaso-motor center. A steady pressure at this point for a few moments—reduces the general blood pressure, slows the action of the heart, and will reduce the temperature of the body in one-half the time required by any other known method.” (From Barber ED: *Osteopathy Complete*. Kansas City, MO, Hudson-Kimberly Publishing, 1898.)

upper thoracic, mid-thoracic, and lumbar regions where the ganglia are fused: C2–3, T4, T9, and L4. Cayce indicated that these may be especially important regulatory centers in the coordination between the sympathetic and central nervous systems.³⁶ An example of treating one of the centers, using an inhibitory technique as discussed in the coordination section above, is shown in Figure 3.

Drainage and Circulation

Like the concepts of centers and reflexes, the concept of drainage dates back to the early days of osteopathy. Riggs (1901), in a textbook section entitled “Brain Troubles,” states:

The Osteopath’s work is directed toward two primary objects: First. The equalizing of the general circulation of the blood. Second. The continued control of the blood supply to the brain and correlative drainage. To accomplish these ends the circulatory centers are first thoroughly treated; the muscles, ligaments and tissues which surround them are relaxed by pressure and by movements which will stretch the tissues. The next treatment is a stimulation put upon the deeper structures so as to secure the action of the heart and arteries.⁵¹

Numerous techniques are given in osteopathic texts for controlling circulation and drainage. Chapman’s reflexes are one example that has already been mentioned. Kuchera also gives ideas for detailed treatment of lymphatic system dysfunction. The three basic goals are:

- To promote the free flow of lymph through its lymphatic vessels and fascial pathways
- To improve function of the abdominal diaphragm, the extrinsic pump for the lymphatic system
- To reduce sympathetic outflow³⁰

Treatment techniques include manipulation of the thoracic inlet, stretching the abdominal diaphragm, fascial releases, thoracic lymphatic pump, liver pump, and splenic pump, among others. Kuchera and Kuchera have this to say regarding lymphatic drainage and the lungs:

There is no argument about the importance of maintaining lymphatic flow from the lungs in disease or in health. Basic research, as well as medical and osteopathic research, has proven that chronic lymphatic congestion with resultant poor oxygenation of the cells is associated with increased infection, increased mortality, increased healing time, and increased fibrosis and scarring if healing does occur. Studies have shown that tissue congestion decreases the effectiveness of medical therapy. Respiratory therapy, pulmonary toilet and osteopathic manipulative treatment all have substantial effect on the prognosis of a patient with a respiratory infection when their inclusion is applied to enhance homeostasis.³⁰

Thoracic lymphatic and splenic pump techniques have proven especially useful, as discussed in the research section below. Similarly, in glaucoma, the build-up of pressure has been linked to poor lymphatic drainage of the eye. "Where the sclera, cornea, iris and ligamentum pectinatum meet is defined as the angle of the anterior chamber of the eye. 'Upon the integrity of this angle depends the proper circulation of lymph to nourish the anterior portion of the eye;' glaucomatous changes have frequently been linked to poor lymphatic drainage of the eye."⁶²

The four key concepts can be used for specific therapeutic purposes or as part of a general treatment. A description of a general treatment described by Barber in 1898 is provided in Table 2. A good general treatment has been considered a tonic to the overall system, stimulating the nervous and circulatory systems. It requires about 20 minutes.¹⁷

RESEARCH ON PHYSIOLOGIC REGULATION

Research on physiologic regulation is scattered through the osteopathic, chiropractic, and massage literature. Selected studies demonstrating regulation of a variety of body systems are included here. The studies vary from clinical case reports to double-blind, controlled experiments.

Much research has been done on the thoracic lymphatic pump, a technique that regulates circulation and drainage. The use of lymphatic pump techniques goes back to the early days of osteopathy.³⁸ The thoracic lymphatic pump has been shown to modify immune function^{24,34,35,46} and to improve respiratory function.^{7,56} Wallace et al. provide a good overview of the lymphatic pump.^{61a}

Measel cites several studies from 1910 to 1934 demonstrating an effect of osteopathic stimulation of the spleen on immune function.³⁴ Measel investigated the effect of the lymphatic pump on the immune response of normal male medical students. He used two serologic tests to assess immune response to pneumococcal polysaccharide as an antigen. The lymphatic pump group had a statistically greater immune response than the control group, which received no treatment. In a later, double-blind study, Measel and Kafity demonstrated a significant change in bone marrow (B) and thymic (T) derived cells in peripheral blood, with the lymphatic pump technique.³⁵

TABLE 2. General Osteopathic Treatment

1. Place the patient on the side; beginning at the upper cervicals, move the muscles upward and outward, gently but very deep, the entire length of the spinal column, being very particular in all regions which appear tender to the touch, have an abnormal temperature, or where the muscles seem to be in a knotty, cord-like, or contracted condition. Treat the opposite side in a similar manner.
2. With the patient on the back, place the hand lightly over the following organs, vibrating each two minutes, respectively: lungs, stomach, liver, pancreas, and kidneys.
3. Flex the lower limbs, one at a time, against the abdomen, abducting the knee, and abducting the foot, strongly as the limb is extended with a light jerk.
4. Grasping the limb around the thigh with both hands, move the muscles very deeply from side to side the entire length of the limb. Treat the opposite limb in a similar manner.
5. Place one hand upon the patient's shoulder, pressing the muscles down toward the point of the acromion process; with the disengaged hand grasp the patient's elbow, rotating the arm around the head.
6. Holding the arm firmly with one hand, with the other rotate the muscles very deep the entire length of the arm; also grasp the hand, placing the disengaged hand under the axilla, and give strong extension. Treat the opposite arm in a similar manner.
7. Place one hand under the chin, the other under the occipital, and give gentle but strong extension.
8. Place one hand under the chin, drawing the head backward and to the side; with the disengaged hand manipulate the muscles which are thrown upon a strain. Treat the opposite side in a similar manner. Also manipulate, thoroughly and deep, the muscles in front of the neck.
9. Place the patient upon a stool; the operator placing the thumbs upon the angles of the second ribs, an assistant rising the arms slowly but strongly above the head as the patient inhales; press hard with the thumbs as the arms are lowered with a backward motion, patient relaxing all muscles and permitting elbows to bend; move the thumbs downward to the next lower ribs; raise the arms as before; and repeat, until the fifth pair of ribs have been treated in a similar manner.

From Barber ED: *Osteopathy Complete*. Kansas City, MO, Hudson-Kimberly Publishing, 1898, pp 306-307.

Jackson et al. explored the effect of lymphatic and splenic pump techniques on the antibody response to hepatitis B vaccine.²⁴ The experimental subjects (n = 20) received the lymphatic and splenic pump procedures three times per week for 2 weeks after each vaccination. The control subjects (n = 19) received vaccine but no osteopathic manipulative therapy (OMT). Fifty percent of the subjects in the treatment group achieved protective antibody titers on the 13th week; only 16% of the control subjects had positive antibody responses. This is further evidence that the lymphatic and splenic pumps enhance immune response.

Sleszynski and Kelso explored the value of the lymphatic pump in alleviating respiratory distress following abdominal surgery.⁵⁶ They compared two 21-patient groups of postoperative cholecystectomy patients in a 1-year, randomized, researcher-blinded trial. Patients treated with the thoracic lymphatic pump (TLP) technique had an earlier recovery and quicker return to preoperative values of two respiratory parameters than patients treated with incentive spirometry, a mechanical respiratory aid. The authors believe that the TLP treatment enhances three mechanisms: lymphatic drainage, deep inspirations, and stimulation of a physiologic reflex controlling the respiratory center.

A particularly interesting historical study cited by Kuchera and Kuchera looked at the outcomes from conventional medical therapy compared with OMT in the flu epidemic of 1918:

The effectiveness of osteopathic manipulative support for patients who were not receiving effective medications was clinically tested during the flu epidemic of 1918.

Antibiotics had not yet been discovered to help patients fight bacterial complications. Even today, antibiotics are ineffective against viral infections. In this study of 100,000 people with influenza, Smith reported that patients who received osteopathic manipulation had a 0.25% overall mortality and a 10% mortality rate if they developed pneumonia. The mortality rates for patients who only received medical care and no osteopathic manipulation were 5% overall and 30–60% if they developed pneumonia.³⁰

A number of studies have shown the effectiveness of manual therapy in modifying respiratory physiology. Stiles, for example, looked at chronic obstructive pulmonary disease.⁵⁹ Jackson and Steele reviewed the literature on the osteopathic manipulative treatment of asthma.^{23a} They found studies dating back to the 1920s in which OMT was effective in producing physiologic changes in asthma patients. Manipulations included cranial flexion, the thoracic lymphatic pump, and spinal manipulation. Some recent articles on the physiology of asthma lead us to suggest that historical osteopathic techniques for influencing both the sympathetic and parasympathetic nervous systems may be useful in treating asthma.^{10a,24a,25a,25b,30b,55a}

In another study involving the respiratory system, Belcastro et al. explored the use of OMT in treating wheezing due to bronchiolitis in infants.⁷ The OMT included scapular release, rib raising, intercostal fascial release, diaphragm release, and cranial fascial release. Because of the small number of subjects (12) and the absence of a control group, it was not possible to determine the efficacy of the treatment. Nevertheless, the authors are optimistic that, with transcutaneous oxygen measurements, the value of this form of OMT on respiratory physiology could be determined.

Radjeski et al. conducted a study of the effects of osteopathic manipulative treatment on patients with pancreatitis.⁴⁸ The study was randomized with a control group and with the attending physicians blind to group assignment. The treatment involved 10–20 minutes daily of a standardized protocol using myofascial release, soft tissue, and strain-counterstrain techniques. Patients who received OMT averaged significantly fewer days in the hospital before discharge (mean reduction, 3.5 days) than control subjects, although there were no significant differences in time to food intake or in use of pain medications.

The early osteopaths made much of the ability of manual therapy to affect the cardiovascular system. In modern research, Rogers and Rogers have reported that osteopathic manipulative therapy is of significant value in some patients with coronary insufficiency.⁵² Burchett et al. found that manual therapy in the form of generalized paraspinal inhibition is useful in decreasing total peripheral resistance and cardiac workload.⁹ Fitzgerald reports that osteopathic manipulative treatment has been demonstrated to significantly lower the incidence of arrhythmias and mortality in post-myocardial infarction patients.¹⁴

Hypertension is also amenable to manual therapy and is a condition for which there are reports going back to the early days of osteopathy.¹² Mannino³¹ and Northrup⁴² have shown substantial drops in blood pressure with osteopathic manipulative therapy. In the Mannino study of hypertensive patients, treatment of Chapman's posterior points to the adrenals resulted in a blood pressure drop of 15 mmHg systolic and 8 mmHg diastolic. In the Northrup study, there was an average drop of 33 mmHg systolic (from 199 to 166 mmHg) and 9 mm diastolic (from 123 to 114 mmHg).

Mannino looked at both systemic blood pressure and serum aldosterone levels in hypertensive patients.³¹ It is possible that abnormal function of the angiotensin-aldosterone system may be involved in some forms of hypertension. No significant alterations of systemic blood pressure were demonstrated, but there was a significant, reproducible decrease in serum aldosterone levels after osteopathic manipulative

therapy. Mannino speculated that insufficient time was allowed for the hormonal change to affect blood pressure.

Morgan et al. also attempted to use spinal manipulation to influence hypertension.⁴⁰ They employed a different manipulative technique than Mannino did (a spinal manipulation/soft tissue massage) to lower blood pressure on the principle that major autonomic outflows are present at the chosen locations. They did not find evidence of effectiveness of their technique but noted that future studies should identify techniques that are effective in lowering blood pressure and specific types of patients for whom the techniques are effective.

Regulatory techniques in the head and neck area have also been studied. Purdy et al. demonstrated that gentle, soft tissue manipulation in the suboccipital region can result in significant changes in blood flow in the fingers, mediated by the sympathetic nervous system.⁴⁷ Their result is particularly interesting because it demonstrates measurable changes in the autonomic periphery during manipulation of a dermatome unrelated to the area being measured. This shows the complexity of reflexes that may be used in physiologic regulation.

Craniosacral technique focuses primarily on the head. The goals of craniosacral technique include improving circulation and venous drainage. Central to craniosacral therapy is the concept of the articular mobility of the bones of the cranium. The relationship between craniosacral dysfunction and symptoms has not been established firmly in controlled studies.¹⁸ Nevertheless, Greenman et al. cite several clinical studies suggesting a relationship. Of particular interest is an efficacy study of craniosacral therapy by Frymann in which there was a statistically significant improvement in the sensory performance of children with neurologic deficits.¹⁵

Kaluza and Sherbin performed a controlled study of the physiologic response of the nose, utilizing osteopathic manipulative treatment.²⁶ They took a systemic and historical approach to the importance of the nose in general body physiology, stating: "If a therapeutic modality is capable of improving nasal function, it is then implied that the body as a functioning unit is also improved."²⁶ They noted that there are a number of reflexes involving the nose, including both sympathetic and parasympathetic influences. The reflexes range from a nasal-pulmonary reflex to sexual responses from olfactory stimulation. They used the treatment protocol of Bailey, which included (1) manipulative stimulation of the supraorbital nerve, the superior aspect of the orbit, and the infraorbital nerve; (2) alternating pressure over the medial canthus of the eyes and over the lower third of the nose; (3) deep pressure over the maxillary and frontal sinuses; and (4) massage of the temporal regions.³ Using rhinomanometry, they found a significant improvement in nasal function following treatment, including removal of physiologic congestion of the nose (one form of drainage).

Misischia³⁹ and Feely et al.¹³ have shown that osteopathic manipulation can be effective in reducing intraocular pressure in glaucoma. The Feely study was a double-blind, randomized study that reported significant pressure changes after osteopathic manipulative therapy.

In a placebo-controlled study, Guthrie and Martin demonstrated that inhibitory pressure in the lumbar area was effective in relieving pain during labor, whereas thoracic pressure was not.²¹

The Continuum of Manual Therapy for Regulation

Specific adjustments have been, and will likely continue to be, the province of specialists, e.g., osteopaths and chiropractors. For regulation, on the other hand, there is a continuum of manual therapy. The early osteopaths did both, and some felt that this distinguished them from chiropractors, who focused on specific adjustments.

Few modern osteopaths concern themselves with regulation, although it is of great importance to some.³⁰ But regulation is not limited to osteopaths. There is a continuum related to the degree of training in regulation. Manual therapists who employ techniques of regulation include physical therapists, massage therapists, nurses, and some chiropractors. Acupressure, acupuncture, and manual lymph drainage would also fall in the area of regulation.

For example, the protocol followed by Kaluza and Sherbin for improving nasal drainage did not involve any form of spinal manipulation or adjustment.²⁶ It consisted of soft tissue work around the face, including massage. Similarly, the soft tissue work used as simulated chiropractic manipulation in the Balon et al. study enhanced peak expiratory flow in asthmatic children.⁴

Guthrie notes that his technique of lumbar pressure to relieve pain during childbirth does not require an osteopath; it may be administered easily by a husband or other nonprofessional.²⁰ Similarly, Sleszynski and Kelso state that the thoracic lymphatic pump technique (used in this case for postsurgical respiratory problems) can be taught to and administered by a respiratory therapist, at a cost savings over an osteopath.⁵⁶

Of particular interest is the physiotherapist Harold Reilly, who originally was trained as a chiropractor but later developed many regulatory techniques.⁴⁹ Reilly integrated massage with chiropractic and osteopathic concepts to yield a broad-based system of manual therapy. For more than 30 years, the Reilly Health Institute in Rockefeller Center in New York City was a health mecca for prominent people. Reilly combined traditional massage with "rotations," the manipulation of the long bones of the body, with a variety of drainage techniques, and with hydrotherapies such as fume baths, sitz baths, and colonic irrigations, all to affect the physiology of the patient. Reilly's approach continues to be taught at the Reilly School of Massotherapy in Virginia Beach. There are also other specialties of manual therapies that are no longer practiced, such as neuropathy and spondylotherapy, which employed regulatory techniques.

DIRECTIONS FOR THE FUTURE

Research on Regulatory Techniques

There is a wealth of regulatory techniques in the works of such authors as Barber and Hazzard that are not in common use today and have never been scientifically studied. Basic research into the anatomy and physiology of manual therapy effects is needed to explain the relationship among structure and function, specific techniques, and biologic effects. For example, there is a need for a systematic investigation of both centers and reflexes (e.g., Chapman's reflexes). There is also a need for clinical demonstration of the effectiveness or ineffectiveness and under which conditions techniques such as Barber's can be effective.

To accomplish these goals, several considerations might be helpful. First, it is necessary to acknowledge the full spectrum of manual therapies. This will help with developing research methodology that addresses the problem of active control treatments that distort findings and can compromise conclusions. Second, whenever possible, the political turf battles within manual therapies should be avoided. Cooperation and the respect of the diversity of practices with manual medicine will help accomplish these goals more quickly and completely.

Many feel that we are in the midst of a medical revolution. There is currently a window of opportunity to legitimize these techniques and educate the medical establishment of their efficacy.

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