



An evidence-based osteopathic approach to Parkinson disease

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Osteopathic family medicine offers a unique perspective to Parkinson disease (PD). Patients with PD present with a common set of concerns and symptoms. Application of evidence-based osteopathic manipulative treatment approaches can be utilized to address these clinical issues. This article focuses on the treatment of musculoskeletal somatic dysfunction to optimize health measured by the biomechanical, respiratory-circulatory, neurologic, metabolic or energetic, and behavioral models for patients with PD. © 2013 Elsevier Inc. All rights reserved.

Parkinson disease (PD) affects approximately 1 million people in the United States and more than 7 million worldwide.¹ Very little research has been conducted in investigating the effect of osteopathic manipulative treatment (OMT) in patients with PD. This article presents an osteopathic approach to assist the family physician in managing patients with PD. Our approach encompasses the 5 osteopathic models and correlates OMT with recent research findings. Although some of the studies were not conducted on patients with PD, their outcomes are nonetheless relevant because they address similar issues.

Biomechanical perspective

Approaching the patient with PD from a structural and mechanical perspective provides a model by which the

cardinal features of PD can be addressed directly. PD is a progressive neurologic depletion of dopaminergic neurons from the basal ganglia which manifests as common motor or extrapyramidal signs: tremor, bradykinesia, rigidity, and, as the disease progresses, postural instability.² In a review of the clinical features of PD, the characteristic distal resting 3-6 Hz tremor or an active tremor or both were found in 79%-90% of the patients with PD. Bradykinesia, a slowness of movement, was present in 77%-98% of the patients. Rigidity, resistance to passive movement around a joint, occurred in 89%-99% of the patients. Postural instability, due to the dysfunction of centrally mediated postural reflexes, is a feature of stage III severity according to the Hoehn and Yahr scale³ measurement of PD disability and does not commonly occur early in the disease process.²

The previously mentioned cardinal features of PD lead to patients having the characteristic shuffling gait which is quantified as having a reduction in both speed and stride length due to rigidity and an increase in gait cycle and stance duration with noted double limb support due to bradykinesia and postural instability.⁴ Patients with PD have an increased

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incidence of falls and are 5 times more likely to have fall-related injuries compared with the general population.⁵ For this reason, studies have focused on gait and postural instability due to their contribution to major disability in the PD population.^{2,6}

Motor symptoms are not the only musculoskeletal manifestation of PD. A systematic review found that pain is present in over 67% of the patients with PD and is most frequently located in the lower limbs as compared with the general population in which it is most frequently located in the lower back. The pain was musculoskeletal in origin in almost half (46.7%) of the patients.⁷

Osteopathic treatments

The goal is overall health of the musculoskeletal system through pain relief, increased quality of joint function and motion, and achieving appropriate muscle tone.⁸

A study looking at the effect of OMT on gait in patients with PD included the use of passive range of motion (ROM) techniques to prevent muscle contracture, joint restriction, and the development of fibrous adhesions, muscle energy techniques (MET) to lengthen muscle fibers around joints by activating the golgi tendon organ, and passive linear pull or stretch to lengthen muscles. Subjects with PD who were administered the OMT protocol had improvement in stride length, cadence, and upper and lower limb velocity after a single session of OMT.⁹

Another study on healthy elderly patients showed that OMT improved their balance. The techniques included myofascial release (MFR) of the spine from the cervical spine to the sacrum, MFR of the shoulders and scapula, occipitoatlantal and condylar decompression, compression of the fourth ventricle (CV4) technique, and venous sinus techniques. OMT helped to improve the treatment arm's postural stability as measured by changes in sway values compared with control (no treatment).¹⁰

Recommendations

An osteopathic family physician can address the musculoskeletal system in patients with PD by treating somatic dysfunctions in key areas of motion restriction. Specific complaints of pain can be addressed by applying OMT to the particular region. Studies have shown the efficacy of OMT in the treatment of chronic back pain.¹¹ As muscle spasm and rigidity are increased with PD, osteopathic treatment aimed at reducing muscle spasm can potentially help break pain-spasm-pain cycles.¹² MET have been shown to improve the ROM within a joint after 1 application.^{13,14} In addition to helping decrease muscle spasms and improve ROM, utilization of MET requires patients with PD to activate specific muscle groups to command. This form of active treatment may also help to improve their hypokinesia by utilization of verbal commands. When utilizing OMT to decrease myofascial restriction, clinicians can potentially help decrease pain, improve gait and balance, and decrease risk of falls.¹⁵

Respiratory-circulatory perspective

Morbidity and mortality in the patients with PD is greatly linked to both the respiratory and cardiovascular systems. In a study investigating mortality in 340 patients with parkinsonism, the primary causes of death were arteriosclerotic heart disease and bronchopneumonia.¹⁶ A cohort study with 1948 patients with PD documented that the most commonly reported comorbidity after arthritis is heart or circulation problems (36.3%). There is evidence that cardiovascular comorbidity correlates more with decreased cognitive measures in the PD population than in comparison to age, severity of PD, and medication use.¹⁷

Respiratory dysfunction has been well documented in patients with PD. In an evaluation of pulmonary function tests of patients with PD during both their stable "on state" of disease as well as their "off state" created through 12 hours without medication, a restrictive flow-volume loop pattern was seen in both states of PD. The severity of the restrictive pattern of pulmonary disease was worse in the off state and had increased levels of arterial CO₂ partial pressure because of decreased ventilatory drive. This suggests that there is rigidity in the muscles of respiration which does not allow them to move through their full ROM and prevents them from respirating properly.¹⁸ This increases the work of breathing.

This decreased ventilatory drive not only restricts the airflow and gas exchange in the pulmonary alveoli but also decreases the difference in the thoracoabdominal pressures between inspiration and expiration. The pressure difference in the thoracic cage is important in venous as well as lymphatic circulation.⁸ A decreased pressure difference could lead to lymphatic and venous stasis which does not allow for optimal removal of metabolic waste.

Camptocormia, a condition that is found in patients with PD, links the respiratory-circulatory model to the biomechanical model. Camptocormia is a distinctive and pronounced flexed posture of the thoracic or lumbar spine.¹⁹ This "hunched over" posture has been associated with severe PD dysautonomic and motor symptoms as well as pain.²⁰ The abnormal posture also decreases the ability of the patient with PD to maximally expand the rib cage during inspiration.

Osteopathic treatment

The goal of this treatment model is to optimize the movement of the lymphatic and cardiovascular circulation as well as respiratory function, thus minimizing the work of breathing.⁸ In patients with PD, there is a decreased mobility of the thoracic cage due to muscle rigidity. OMT on the thoracic cage and diaphragm is commonly used in clinical practice to address myofascial imbalances, including muscle spasms, to improve thoracic cage excursion. Prior research has demonstrated that manual approaches applied to the thoracic cage improve lung function and reduce inflammation.²¹⁻²³

Recommendations

Several studies have been conducted in demonstrating positive effects of OMT on the respiratory-circulatory system. Treatment of the thoracic spine and rib cage with indirect myofascial techniques and localized lymphatic pump techniques demonstrate improved hemodynamic effects.²⁴ Another study demonstrated that OMT decreased length of stay, intravenous antibiotic use, and morbidity and mortality of hospitalized patients more than 60 years old who were diagnosed with pneumonia. Many of the techniques treated the thoracic cage and included soft tissue techniques, rib raising, diaphragm doming, thoracic inlet release, and lymphatic pumps.²⁵ These techniques can be done in a family practice office setting and are hypothesized to help improve rib cage mobility and promote diaphragm excursion by decreasing muscle spasms, thus improving venous and lymphatic drainage and balancing autonomic tone. When applied to patients with PD, the goal is to improve respiratory excursion and decrease the work of breathing, which in turn also improves lymphatic and circulatory flow. The pectoralis muscle group is another key area to address so as to improve upper rib motion and prevent blockage of lymphatic flow.

Neurologic perspective

Autonomic dysfunction has been well documented as a nonmotor feature of PD.²⁶ It affects almost every system in the body and has added to the disease burden and disability of patients with PD.²⁷ The pathology behind the autonomic dysfunction is not completely understood but is believed to be due to cell loss and Lewy bodies in the sympathetic and parasympathetic nervous systems as well as within the neural plexi of the gastrointestinal tract system, heart, and pelvic structures.²⁸ Symptomatology is different in every case and, according to a longitudinal cohort study of patients with PD, the self-reported presence of autonomic dysfunction increased with age, disease severity, and medication use. Compared with the controls having no central nervous system diseases, the patients with PD had a statistically significant increase in autonomic symptoms in the following domains: gastrointestinal, urinary, cardiovascular, thermoregulatory, pupillomotor, and sexual. The greatest of these increases were in the gastrointestinal and urinary domains (Table 1).²⁹ The significance of these autonomic system-related complications is that the severity of the symptoms was found to moderately correlate with depressive symptoms, psychiatric complications, night time sleep problems, and motor dysfunction.²⁹

Osteopathic treatment

The goal of a neurologic treatment approach is to optimize neural function and balance and restore the regulatory functions of the body.⁸ Studies looking at the effect of OMT

Table 1 Autonomic symptoms in Parkinson's disease patients²⁹

Gastrointestinal	<ul style="list-style-type: none"> Swallowing or choking Constipation Straining for defecation Fecal incontinence 	<ul style="list-style-type: none"> Sialorrhea Dysphagia Early abdominal fullness
Urinary	<ul style="list-style-type: none"> Urinary urgency Incomplete emptying Weak stream of urine 	<ul style="list-style-type: none"> Frequency Nocturia
Thermoregulatory	<ul style="list-style-type: none"> Hyperhidrosis during the day Hyperhidrosis during the night 	<ul style="list-style-type: none"> Cold intolerance Heat intolerance
Sexual	<ul style="list-style-type: none"> Men: erection problems Men: ejaculation problems 	<ul style="list-style-type: none"> Women: problems with orgasm Women: vaginal lubrication problems
Cardiovascular	<ul style="list-style-type: none"> Lightheaded when standing up Lightheaded when standing for some time Syncope 	
Pupillomotor	<ul style="list-style-type: none"> Oversensitive to bright light 	

on autonomic dysfunction specifically in the PD patient population have not been published. There have been studies published that included healthy subjects or other patient populations. In one study, healthy subjects in a hypersympathetic environment were found to have an increased vagal response when receiving OMT compared with control groups. The study specifically used cervical MFR to shift the balance from the sympathetic nervous system to the parasympathetic nervous system.³⁰

Recommendations

OMT targeting the autonomic nervous system has been studied extensively. Rib raising has been postulated to affect the sympathetic nervous system based on the anatomic proximity of the sympathetic chain ganglion to the costovertebral articulation. Some studies have shown changes in salivary amylase and IgA levels with rib raising.³¹

Treatment of the upper cervical and occipital regions has been theorized to affect the parasympathetic nervous system through the vagus nerve. Studies have shown changes to heart rate variability after suboccipital decompression and cervical MFR.^{30,32} One study found an increased frequency of occipitoatlantal and occipitomastoid suture restrictions in patients with PD compared with controls.³³ Some pilot studies have shown that CV4 and other cranial manipulation resulted in measurable autonomic changes.³⁴ Treatment of abdominal

ganglia by gentle inhibition has been theorized to help balance sympathetic tone to the abdominal viscera.³⁵ Addressing sacroiliac and sacral dysfunction can influence parasympathetic innervation to the lower gastrointestinal and genitourinary systems.³⁶ Treatment of thoracic cage, occipital, cervical, and sacral somatic dysfunctions may help to balance and address autonomic dysfunction in patients with PD.

Metabolic-energy perspective

The family physician can expect fatigue to be a common complaint reported by patients with PD. Its etiology has been hypothesized to be connected to both depression and sleep problems, but the pathophysiology is still not well understood. Fatigue is a symptom that is difficult to measure objectively and has a wide range of severity, but it has been found to directly impact the quality of life of patients with PD.³⁷ Several studies have documented fatigue to be a symptom in 40%-78% of patients with PD.^{27,37} A higher prevalence of fatigue and sleep difficulties are present with the akinetic rigidity type subgroup of patients with PD compared with the tremor type subgroup of PD.²⁷ Akinetic rigidity is characterized by a slowness of movement, akinesia, and rigidity caused by increased tone in both agonist and antagonist muscles. Fatigue has also been associated with self-perceived weakness in patients with PD. The self-perceived weakness is experienced by the patient and not measured through motor strength tests. It was not found to be associated with motor function severity, tremors, or bradykinesia.³⁸

Osteopathic treatment

The goal of approaching a patient with PD through the metabolic-energy treatment model is to restore a balance between energy production and expenditure. The body seeks homeostasis and an osteopathic family physician can assist by influencing the stressors that the patient is trying to adapt to and compensate for.⁸ This can be achieved by working with different models presented to decrease the burden of the disease.

Recommendations

An osteopathic approach to patient care strives to be all-encompassing and integrative, incorporating the best treatments available from various modalities. This is no different when treating patients with PD. Patients should be counseled on nutrition, exercise, and pharmaceuticals. The addition of OMT offers a valuable way to enhance a patient's overall function and sense of well-being by reducing the energy expenditure involved in ambulation and movement.

OMT focuses on reducing muscle spasm and optimizing mobility, which may help decrease the amount of energy a patient would need to use for ambulation or movement. Treatment of the thoracic spine and rib cage can help to decrease the work of breathing. Rib raising and CV4 have

been shown to help with sleep latency.³⁹ The previously discussed techniques for promoting circulation and lymphatic flow can help improve homeostasis and immune function.

Behavioral perspective

The psychobehavioral effects of PD on the patient have been assessed through measurements of disability, quality of life, activities of daily living, anxiety, and depression. Disability is common in many disease processes, but, in a study comparing disabled populations with and without PD, there were significant absolute risk differences between the 2 groups with regard to limitations in the following categories: communication, mobility, pain, memory, and vision. This is evident by an increased need for assistance in patients with PD with their activities of daily living.⁴⁰

It is estimated that approximately 50% of patients with PD suffer from depression but only 20% are being treated for it.⁴¹ Psychomotor retardation, early morning waking, and fatigue may all be symptoms of both depression and PD. When a patient exhibits these symptoms, they can be misinterpreted as symptoms of the PD and lead to undiagnosed depression.⁴² There is also a relationship between chronic pain and depression. Patients with PD with pain are more likely to have major depression than without pain.⁴³ Depression is a risk factor for falling in older adults.¹⁵

Patients with PD have a greater risk of falling and this contributes to the burden of the disease. Postural instability and gait difficulty are major contributors to disability in patients with PD.⁶ Self-reported mood symptoms and axial impairment were the 2 factors most closely associated with worsened quality of life.⁶ In a study comparing PD patients who fell, "fallers," with those who did not fall, "nonfallers," it was noted that the fallers were more depressed than the nonfallers, but also that the fallers tended to have a higher severity of PD measured through the United PD Rating Scale (UPDRS). The nonfallers with higher UPDRS had greater anxiety about falling and were more cautious about falling compared with nonfallers with a lower UPDRS.⁴⁴ Fear of falling and depression can lead to activity restriction, social isolation, and a decreased quality of life.⁴⁵

Osteopathic treatment

The goals of the treatment in the behavioral model are to affect the perception of pain, how the patient deals with the disease, and decrease disability.⁸ An osteopathic approach by a family physician would include both physical and psychosocial treatments along with standard of care pharmacotherapy. Before treatment is initiated for psychiatric conditions, it is vital to make sure that the conditions are not due to any medication use, other medical conditions, or deep brain stimulation treatments. Deep brain stimulation has been implicated in suicidal ideation, apathy, and depression.⁴²

In a review investigating the role of the musculoskeletal system in the prevention of falls, evidence supports that strength and balance exercise regimens can decrease fall rates in older adults.¹⁵ Exercise and physical techniques are also used to prevent and correct musculoskeletal dysfunctions while optimizing physical performance. This approach helps increase the patient's functions as the disease progresses.⁴⁶

Recommendations

The osteopathic family physician's approach to a patient with PD involves taking into account the complete patient including his or her mental health. Patients should be screened for depressed mood, fear, and anxiety. The family and caretakers should also be engaged in the discussion, as the disease strains not only the patient but also the patient's support system.

OMT aimed at improving balance, gait, and stability may help to decrease the stressors and potentially reduce the fear of falling. Another goal of OMT includes decreasing pain and improving ROM. This may allow patients to perform more activities and participate in tasks and events. Techniques covered earlier in this paper can be applied to accomplish these goals.

Conclusion

PD is a chronic and progressively debilitating disease that affects patients in many different ways. A rational approach that utilizes OMT as an adjunctive management may play a major role in caring for patients with PD. OMT can be particularly helpful in treating patients with PD when supporting functional gains or minimizing decline over time. Considering the promising results in initial studies, the authors recommend more research investigating the application of OMT on PD.

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