

Rhinitis: The Osteopathic Modular Approach

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Historically, osteopathic principles have focused on the appropriate drainage of cranial structures to relieve symptoms of rhinitis, which include nasal congestion, anterior/posterior rhinorrhea, sneezing, and itching. Allergic rhinitis is primarily an aberrant immunologic reaction caused by cytokines secreted from lymphocytes that traverse the lymphatic pathway throughout the body. Several studies have documented that, when manipulated, the lymphatic system enhanced the motion of these lymphocytes to important immune structures in both human and animal models. Additionally, modulation of both sympathetic and parasympathetic outflow has been found either to inhibit or enhance secretion and/or drainage of important allergic sites. Osteopathic approaches to rhinitis play an effective role in the comprehensive management of rhinitis, and techniques based on these approaches are therapeutic options for rhinitis. This article provides an up-to-date literature review about the management of rhinitis using the 5 models of osteopathic medicine: biomechanical, respiratory-circulatory, metabolic, neurologic, and behavioral.

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Rhinitis is the inflammation of the nasal mucosa and can be categorized as allergic, nonallergic, or mixed (Table).¹ Allergic rhinitis is immunoglobulin E (IgE)-mediated, caused by sensitization and exposure to allergens, whereas nonallergic rhinitis is non-IgE-mediated. Allergic rhinitis affects 1.4 billion people worldwide and continues to increase in prevalence.^{2,3} Among nonallergic rhinitis, vasomotor rhinitis is the most prevalent.⁴ Common symptoms of allergic rhinitis include nasal congestion, anterior or posterior rhinorrhea, sneezing, and itching. Rhinosinusitis is a complication of allergic rhinitis, and both conditions can coexist.^{5,6}

A whole-person approach to rhinitis management includes patient education, environmental controls, pharmacotherapy, surgery, osteopathic manipulative medicine, and allergen-specific immunotherapy, if applicable.⁵ Osteopathic principles and practices have focused for generations on the appropriate drainage of cranial structures to relieve symptoms of rhinitis.^{6,7}

These techniques involve manipulation of cranial structures, vasculature, and neurologic innervations.^{6,7} To a large extent, these modalities have been adjunctive to the traditional medical, biological, and surgical modalities available to the practicing physician. In this article, we aimed to distill an up-to-date targeted review of the literature and osteopathic management options for rhinitis for the practicing osteopathic physician.

Table.
Types of Rhinitis and Their Defining Characteristics

Types of rhinitis	Defining characteristics
Allergic	
Allergic with seasonal variations	IgE-mediated reaction to either seasonal or environmental aeroallergens; perennial environmental aeroallergens include animal dander, cockroaches, dust mites, molds, and pollen where pollen is geographically perennial.
Perennial with seasonal variations	
Perennial without seasonal variations	
Episodic after specific aeroallergen exposure	IgE-mediated reaction to sporadic/episodic exposure to aeroallergens.
Nonallergic	
Vasomotor	Chronic symptoms without immunologic or infectious origins.
Infectious	Acute or chronic symptoms because of viruses or bacterial infection, with approximately 98% of acute infectious rhinitis due to viruses.
Occupational	Caused by airborne substances in workplace (eg, chemicals, grains, irritants, and wood dust).
Hormonal	Pregnancy or menstrual cycle–related rhinitis. In pregnancy-related rhinitis, symptoms of nasal congestion typically start in the second month of pregnancy and resolve within 2 weeks of delivery.
Drug-induced	Symptoms can be induced from a wide variety of medications (eg, ACEIs, phosphodiesterase-5-selective inhibitors, aspirin, and other NSAIDs); rhinitis medicamentosa is due to rebound nasal congestion with intranasal α -adrenergic decongestant overuse or cocaine abuse.
Atrophic	Chronic inflammation with atrophy of nasal mucosa.
Nonallergic with eosinophilia syndrome	Nasal eosinophils with perennial symptoms and degree of anosmia, typically without evidence of allergic disease.
Mixed rhinitis	Combination of both allergic and nonallergic rhinitis, more common than either pure allergic or pure nonallergic rhinitis.

Abbreviations: ACEI, angiotensin-converting enzyme inhibitor; Ig, immunoglobulin; NSAIDs, nonsteroidal anti-inflammatory drugs.

Methods

We conducted a targeted search of relevant databases (ie, Cochrane, PubMed, OSTMED.DR, LWW Health Library/Osteopathic Health Library, and OVID) to find literature about the musculoskeletal system's relationship to rhinitis and the use of osteopathic manipulative treatment (OMT) in the management of rhinitis. The searches were conducted without limitation of publication dates, and combinations of key search terms

included *osteopathic manipulative treatment, allergic rhinitis, immune, rhinosinusitis, rhinitis, and sinusitis*. The inclusion criteria for this review were osteopathic studies published within the past 15 years that used the 5 osteopathic models as they relate to rhinitis: biomechanical, respiratory-circulatory, metabolic, neurologic, and behavioral.

Studies were excluded if OMT was not used to manage symptoms of rhinitis.

OMT Techniques

The video series shows an osteopathic approach to rhinitis by using a lymphatic treatment protocol. The general principle for lymphatic treatment is to manage the most central or proximal obstruction first, often starting at the head and neck, and any associated thoracic/coastal somatic dysfunction.⁶⁻⁸ The initial management is followed by opening the thoracic inlet (step 1) before undergoing specific lymphatic techniques (**Video 1**). Doming the diaphragm (step 2) may be necessary for individuals who simultaneously present with lymphatic congestion distal to the diaphragm, respiration abnormalities, and/or lower extremity somatic dysfunction (**Video 2**). Steps 3 to 8 show lymphatic OMT performed in a stepwise manner that can be used in patients in an inpatient or outpatient clinical setting: step 3, facial effleurage across the frontal and maxillary sinuses (**Video 3**); step 4, ear tug (**Video 4**); step 5, auricular drainage (**Video 5**); step 6, mandibular drainage of Galbreath (**Video 6**); step 7, cervical chain drainage (**Video 7**); and step 8, suboccipital release (**Video 8**).

Results

Our search found a total of 40 articles, which mainly consisted of reviews examining the functional changes of rhinitis and suggested using OMT to manage rhinitis. Few osteopathic studies directly investigated the effects of OMT on patients with rhinitis. For each included study, we analyzed the number of participants, the study model, and the specific osteopathic treatments used. Two articles were chosen for critical review based on the date of publication, relevancy, and use of human patients with rhinitis.

Biomechanical

Somatic dysfunction in the upper thoracic and cervical spine, as well as structural defects of the cranial base and facial bones, may affect the health of the nasal mucosa through viscerosomatic reflexes, or segmental facilitation.⁶ Sympathetic preganglionic fibers arising

from the upper thoracic (T1-4) region synapse in the superior cervical ganglion (C2-3) to innervate the sinuses. Somatic dysfunction to any of the surrounding structures along this pathway may alter the sympathetic tone.⁶ Thus, structural evaluation and dysfunctions found should be treated for relief of nasal symptoms. Likewise, somatic dysfunctions due to rhinitis include tissue texture changes to the nasopharyngeal mucosa, craniofacial asymmetry, restricted cranial or cervical range of motion, and tenderness on palpation of the sinuses and lymph nodes.^{6,7}

Nishida et al⁸ conducted a prospective, randomized, controlled pilot study at 2 training clinics that evaluated the efficacy of OMT for enhancing recovery from acute rhinosinusitis. Adult patients were screened for the primary diagnosis of acute rhinosinusitis, which was defined as having symptoms of rhinosinusitis for up to 4 weeks.

These patients were randomized to an intervention group (conventional medical evaluation and treatment + OMT, n=6) and a control group (conventional medical evaluation and treatment only, n=11). Participants in the control group rated their symptoms (runny nose, cough, postnasal discharge, thick nasal discharge, ear pain, dental pain, facial pain, facial pressure, ear pressure, and headache) using the 5-point-scale Sino-Nasal Outcome Test (SNOT) at the end of their office visit on day 1, and patients in the OMT group rated their symptoms using SNOT before and after OMT on day 1. Subsequent SNOT scores were obtained by telephone calls on days 3 and 6 in both groups.⁸

Within the OMT group, somatic dysfunctions of the cranial, cervical, thoracic, and 6 upper-rib regions were diagnosed and treated with the Still technique or myofascial release before 3 standardized treatments were given: thoracic inlet myofascial release, supraorbital and infraorbital nerve release, and suboccipital decompression. A trend toward reduced clinical symptoms of rhinosinusitis and improvement of the ear, facial pressure, and thick nasal drip was observed, but results were not statistically significant ($P=.31$). Nishida et al⁸ acknowledged that the result could be attributed to

either the nature of the small cohort study or the acceptance of the null hypothesis. Additionally, the symptoms may have resolved naturally by days 3 and 6.

Although this pilot study did not demonstrate a statistically significant reduction in symptoms of rhinosinusitis in patients treated with OMT, it analyzed the efficacy of a standardized OMT protocol for acute rhinosinusitis. Strengths of the study⁸ included a criterion for the definition and diagnosis of acute rhinosinusitis, an exclusion criterion, patient randomization, a control group, background on the OMT performers, and a standardized OMT protocol with detailed descriptions for each technique. Limitations included a small sample size, the variability of somatic dysfunctions and associated OMT techniques, a lack of repeated structural evaluation before subsequent SNOT scores assessment in the OMT group, and variability in the conventional medical treatments used in the control group.

The observations and trends of this pilot study⁸ may reflect expected sympathetic responses seen with disruption of the viscerosomatic reflexes. Other OMT techniques for rhinitis,^{8,10} such as those demonstrated in the **Videos** and shown in **Figure 1**, should be used to assess for clinical response and recovery. The procedures used in these videos have been used in our large outpatient allergy clinic. Therefore, we recommend these procedures, although other physicians may use other techniques.

Respiratory-Circulatory

Osteopathic manipulative treatment within the respiratory-circulatory model addresses dysfunction in respiratory mechanics, circulation, and venous and lymphatic drainage.¹¹ Lymphatic circulation of the head passes through the neck, cervical fascia, and thoracic inlet. Lymphatic congestion results when there is a

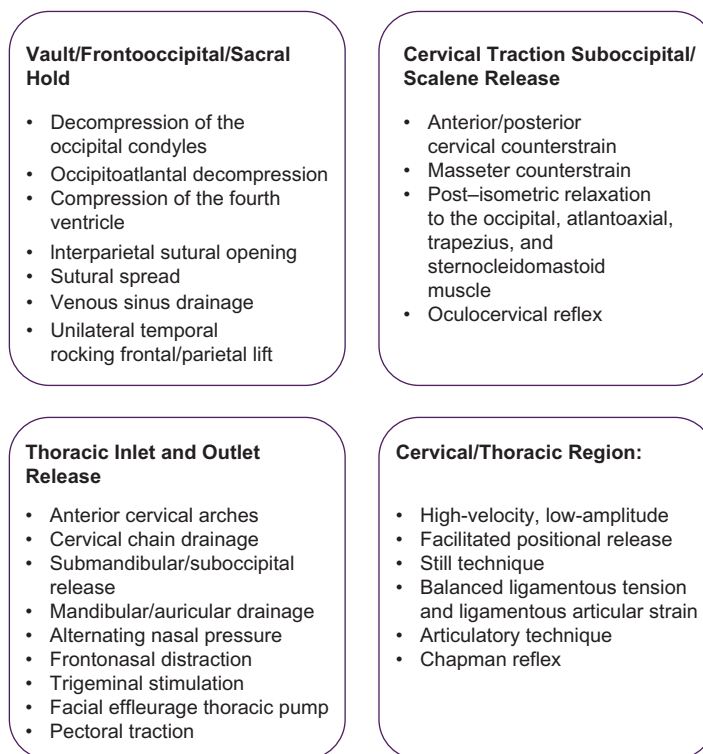


Figure 1.

Osteopathic manipulative treatment techniques for rhinitis exemplifying the 4 tenets of osteopathic medicine.

dysfunction at any point of this circulation. By maintaining appropriate lymphatic drainage, symptoms of rhinitis may be improved. Symptoms such as facial tenderness and pain follow the drainage pattern, or mucociliary transport, of the anterior ethmoid, frontal, maxillary, posterior ethmoid, and sphenoid sinuses (Figure 2). Osteopathic manipulative treatment targeting these somatic dysfunctions may provide additional symptomatic relief and improvement in the quality of life of patients with rhinitis.^{1,7}

Lee-Wong et al¹² explored whether adjunctive treatment with OMT could provide symptomatic relief for patients with chronic sinus pain not adequately controlled with conventional therapy. In this nonrandomized pilot study, 15 patients at an outpatient allergy clinic completed a symptom scorecard before and after OMT. Four direct pressure and “milking” techniques and 1 sinus drainage technique were completed for a total of 18 minutes. The results showed significant improvement ($P < .001$) in overall sinus pain and congestion after OMT.¹²

Although the main author of this case series was an allopathic physician and the operator’s background

unclear, the OMT techniques performed were derived from an osteopathic textbook, which increases the validity of their protocol.

This study demonstrated the efficacy of OMT as adjunctive treatment and showed that OMT may decrease the use of additional pain medications for chronic sinusitis. A multicenter, randomized, double-blind control study would likely provide better analysis along with incorporating a criterion for diagnosis and cause of rhinitis. Other OMT techniques may also be used in future trials. The videos depict an example of a lymphatic treatment protocol for rhinitis with several lymphatic techniques that may be used in an outpatient allergy/immunology setting.^{9,10}

Metabolic

The neuroendocrine-immune axis plays a pivotal role in regulating the inflammatory and infectious pathway of rhinitis. Allergic rhinitis is predominantly directed by helper T-cell type 2 and mediated by interleukin (IL) 4, IL-5, and IL-13.¹³ Viral rhinitis, in contrast, was found to have higher levels of interferon γ , IL-6, IL-8,

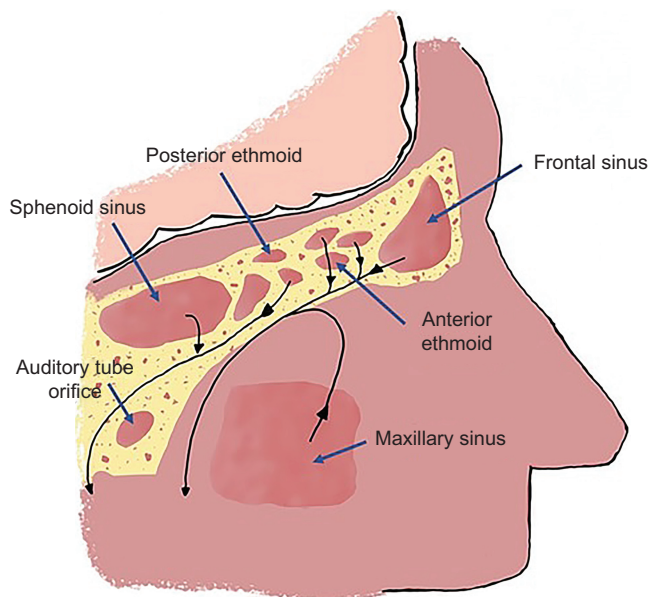


Figure 2. Anterior and posterior sinus drainage patterns.

monocyte chemoattractant protein 1, and granulocyte-macrophage colony-stimulating factor, and to express IL-10.¹⁴ These cells and cytokines are components of lymphatic tissues and vasculature. Changes to these structures may influence T-cell lymphocyte populations and their functions in peripheral tissues, thereby influencing clinical symptoms.¹⁵

Osteopathic physicians have hypothesized that OMT can improve the immune system by decreasing lymph stasis and preventing the formation of edema and the accumulation of toxins, bacteria, and other particulates.¹⁶ The Miller Thoracic Pump, which was developed in the 1920s by C. Earl Miller, DO, and other lymphatic techniques have been shown to augment the immune system by increasing white blood cell count, with increases in B cells, T cells, and basophils, improving pneumococcal and hepatitis B vaccine response, and increasing opsonic index and bacteriolytic power.¹⁶

Lymphatic pump techniques (LPTs) have been shown to enhance the lymphatic and immune systems in animal and human models.¹⁷⁻²⁰

Schander et al¹⁷ and Castillo et al¹⁸ used canine models to demonstrate an increase in lymph flow and mobilization of inflammatory mediators with the use of LPT. It is unclear whether these findings will translate into human studies. Another study¹⁹ in a healthy and homogenous human population showed an increase in the overall blood dendritic cells and upregulation of granulocyte-macrophage colony-stimulating factor after LPT, which demonstrated the ability of OMT to alter the immune profile in a human population. A 2014 study²⁰ with 406 patients found that using LPTs and other OMT techniques with conventional therapy was beneficial in elderly patients with pneumonia who were hospitalized.

The distribution fluidity of inflammatory mediators with LPT has been shown to augment immune surveillance and response to infectious or inflammatory conditions, though we did not find any published trials examining the effects of LPT on rhinitis, including allergic rhinitis. Moreover, the clinical responses in a human population cannot be predicted from experimental animal studies. Studies that use a nonhealthy human

population to investigate the effects of LPT on the allergic cell and cytokine responses may clarify its benefits. Using the procedures shown in the **videos** may also enhance lymphatic flow and benefit the immune system in patients with rhinitis.^{8,10}

Neurologic

Aberrations in the autonomic, peripheral, and central nervous system can contribute to craniofacial pain, impaired cervical and thoracic mobility, nasal congestion, and sleep disturbances. These aberrations can manifest themselves as allergic and nonallergic rhinitis.

Although techniques targeting the neurologic model are taught in osteopathic education (eg, sphenopalatine ganglion [SPG] stimulation and compression of the fourth ventricle), we found no published clinical studies that analyzed the direct effect of OMT on neuromodulation in rhinitis, including allergic rhinitis. Sphenopalatine ganglion stimulation appears to produce a parasympathetic reflex to manage nasal obstruction, chronic rhinitis, and snoring.²¹ Nonosteopathic studies^{21,23} showed the benefit of postganglionic parasympathetic blockade of the SPG in reducing pain and nasal congestion in patients with cluster headaches. Allergic rhinitis increases the risk of obstructive sleep apnea (OSA) developing and a significant positive correlation ($P < .001$) between the clinical control of rhinitis symptoms and OSA.

Jacq et al²¹ conducted a single-center, randomized, crossover, double-blind study that compared the effects of OMT applied to the SPG with sham manipulation on upper airway stability in adult patients with OSA. Five of 9 patients were randomized to the OMT group and were found to have increased pharyngeal stability. Several patients treated with OMT also experienced a reduction in nasal congestion and an increase in sensory and somatosensory sensations.²¹ These findings suggested the possibility of autonomic neuromodulation in patients with OSA by postganglionic parasympathetic blockade induced by OMT to the SPG.²¹

The improvement in nasal symptoms found in these studies^{21,23} suggested that OMT applied to the SPG

may benefit patients with rhinitis. Larger randomized, controlled, double-blinded studies evaluating the direct effect of SPG on all types of rhinitis are warranted. Future studies should also include the definition of the diagnosis, diagnoses separated by types of rhinitis, having specific inclusion and exclusion criteria, and using other neuromodulatory osteopathic treatments. For example, the Chapman reflex or suboccipital release for rhinitis and a soft tissue inhibition technique that targets the parasympathetic system can be used as a potential treatment for patients with rhinitis.⁸ This technique is shown in **Video 8**.

Behavioral

The interrelationship of the mind and body is a key osteopathic principle.²⁴ Rhinitis can affect the mental, emotional, social, and spiritual components of behavioral health. Prospective studies^{25,26} showed that depression, facial pain, and sleep dysfunction are associated with a decrease in quality of life in patients with chronic rhinosinusitis and allergic rhinitis. Audino et al²⁷ showed a causal role of rhinitis in depression in 1283 Italian middle school students aged 10 to 13 years. An increase from 11.2% to 17.7% of students with depression demonstrated the likelihood of depression in patients with rhinitis. To our knowledge, studies evaluating the direct effects of OMT on the behavioral-psychosocial aspect of rhinitis are lacking. The power of touch from OMT may affect the patient's wellness and their mind, body, and spirit. However, future studies analyzing the way OMT affects each of these components are necessary.

Literature⁸⁻²⁶ suggests some benefits of using OMT in patients with rhinitis. Most are pilot studies with small sample sizes and subjective findings after OMT that were obtained from surveys. Future research should include translating research from an animal to human model, evaluating the effects of OMT by types of rhinitis, examining long-term effects of OMT on rhinitis, and exploring the use of OMT in other disease processes, such as OSA, depression, and sleep disorders that are associated with the different types of rhin-

itis. A strong focus on the neurologic, metabolic, and behavioral models of osteopathic manipulative medicine for rhinitis is warranted to optimize a whole-body approach to the management of rhinitis. These recommendations for future research in the field of OMT are based on expert opinions within the field of allergy and those faculties within the present osteopathic allergy training fellowship at the University Hospitals Osteopathic Consortium in Cleveland, Ohio.

Conclusion

An osteopathic approach to rhinitis is central to the diagnosis and management of rhinitis. The musculoskeletal system plays a substantial role in the management of rhinitis with OMT techniques. Further research using the 5 models of osteopathic medicine to evaluate the use of OMT for rhinitis can provide validity and offer a new consensus for the management of all types of rhinitis. Future studies addressing specific OMT techniques are needed to provide an osteopathic-targeted approach to treat patients with allergic rhinitis.

Author Contributions

All authors provided substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data; all authors drafted the article or revised it critically for important intellectual content; all authors gave final approval of the version of the article to be published; and all authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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