REVIEW ARTICLE

Osteopathic Considerations in the Infections of the Respiratory Tract

Sheldon Yao, DO, Nardine Mikhail, OMS III, George Koutsouras, OMS III, Allison Coombs, OMS III, & Michael J. Terzella, DO

New York Institute of Technology College of Osteopathic Medicine, Old Westbury, New York

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Respiratory tract infections are a common reason for office visits in primary care settings. Respiratory tract infections can often be managed in an outpatient setting, however hospitalization may be necessary in some more emergent and life threatening cases. A thorough history and physical will often help guide physicians on the proper course and setting for management. Furthermore, a thorough osteopathic assessment will guide the physician in diagnosing and treating somatic dysfunctions caused by respiratory infection. Osteopathic manipulative treatment can aid in recovery by providing relief of symptoms, and restoring proper structure and function of the respiratory system.

INTRODUCTION

Acute respiratory infections (ARI) are currently the most common reason for seeking ambulatory care.[1] Additionally ARI's are the leading cause of seeking medical treatment in returning travelers.[2] Because the realm of ARI's is so broad, it is important to be able to correctly differentiate between cases that can be adequately treated in an outpatient setting, and those that will require hospitalization. Accounting for such a high number of office visits, it is important for osteopathic family physicians to be knowledgeable and confident in their approach to a patient with an (ARI). Understanding the interplay between the various components of the respiratory system, and the effect somatic dysfunctions have on function is central to the proper management of a patient with an ARI.

STRUCTURAL & FUNCTIONAL CONSIDERATIONS OF THE RESPIRATORY TRACT

The respiratory system is composed of the oropharynx, conducting airways, lungs, muscles of respiration, and the chest wall.[3] The distinction between upper and lower respiratory infections is an anatomical one. The nose, mouth, pharynx and larynx comprise the upper airway, which is also connected to the middle ear via the Eustachian tube.[3] Infections in these areas are considered upper respiratory infections. Lower respiratory infections can potentially include infections that extend from the bronchus to the alveoli.

CORRESPONDENCE:
Sheldon Yao, DO | syao@nyit.edu

The upper respiratory tract humidifies inspired air, and offers protective measures against entering microorganisms.[3,4] Inspiration brings exogenous microorganisms, dust, gases, and smoke into the lungs.[3] Because of this, the respiratory tract has to have a system of filtration for removal of harmful inspired material. Cilia and mucus entrap entering microorganisms, while tonsils and adenoids provide immunologic defense against biologically active material.[3] Smaller particles that escape to the trachea and bronchial airways get trapped in the mucus which is ultimately removed by mucociliary transport to the pharynx and mechanical expulsion via coughing and sneezing.[5] In the lower respiratory tract, alveolar macrophages engulf and destroy inhaled microorganisms and particles.[5] Somatic dysfunctions disrupting structural and functional relationships of the face and thoracic cage can therefore impede host defenses against infection.

EPIDEMIOLOGY

Infections of the upper and lower respiratory tract affect all individuals, but the probability of severe disease is observed in a bimodal distribution, as the young and the elderly are at greatest risk. In the United States, respiratory infections are currently the leading infectious cause of hospitalization and death among adults, and are the overall leading cause of hospitalization in children.[6,7] Acute respiratory infections are also one of the leading causes of death in children under 5 years of age.[8,9] Risk factors that result in more severe illness include being male, inhalation of pollutants, malnutrition, and extremes of age.[8] Upper respiratory tract infections, which are summarized in Table 1 *(page 18)*, contribute to disability and days lost from school or work.[9] In 2016, just twelve

TABLE 1:

Upper Respiratory Infections

Disease	Etiology	Common Symptoms	Common Physical Examination Findings	Considerations	Common Management
Pharyngitis[33, 34,35]	Viral & Bacterial (GAS)	Fever (>38°C) Sore Throat Myalgia Headahe	Cervical LAD Pharyngeal Erythema Exudates	Respiratory Distress Poor Feeding Resistant to antibiotic therapy	Antimicrobial therapy if high bacterial suspicion
Allergic Rhinitis[36,37]	Viral	>2 sx: Sneezing Nasal pruritus Rhinorrhe Congestion > 1 hour for most days	Inflamed Nasal turbinates Associated with sinusitis, asthma, OM & conjunctivitis	Rule out non-allergic causes including drug induced, & inflammatory disorders, etc.	Nasal decongestants Intranasal steroids
Acute Sinusitis[38,39,40]	Viral with possible secondary bacterial	Nasal obstruction & nasal secretions < 10 days	Sinus swelling Rhinorrhea	**IN THE NEWBORN:** poor feeding & focal signs of sinus involvement	**IN NEWBORNS:** Antibacterial therapy covers S. aureus, GAS & GBS
Rhinosinusitis[41,42]	Viral with possible secondary bacterial	**ACUTE:** > 3 times/ year, with > 2 sx: mucopurulent (not clear) drainage. Nasal obstruction, Facial Pain, & Anosmia **CHRONIC:** sx> 12 weeks	**ACUTE & CHRONIC:** Purulent nasal discharge **CHRONIC:** With or without nasal polyps seen on rhinoscopic exam or sinus CT scan.	Associated with asthma, GERD, OM, immunodeficiencies, defects in mucociliary clearance (CF or PCD)	**CRS:** Antibiotics are controversial, with potential use of a 10-14 day course with or without oral steroids.
Epiglottitis[43, 44,45]	*H.influenza, Streptococcus spp., Virall*	Fever (>38□C), sore throat, hoarseness, dyspnea, inspiratory stridor, with a "hot potato" or muffled voice	Unique posture of the head & neck. Gross appearance of the pharynx may appear normal	Posture & Stridor, Unstable vital signs & distress **ADULTS:** stridor not as frequently seen	BSA & steroids; Emergency intervention when necessary
Laryngitis[46,47]	Irritants Viral	Hoarseness & Aphonia ~3 - 4 days duration	Benign examination	If URT, consider alternative diagnosis	Voice Rest
Croup[48,49,50]	Viral (MC Parainfuenza) with possible secondary bacterial	**PRODROME:** URT sx 12 - 48 hours before "barking" cough with inspiratory stridor & hoarseness	**RADIOGRAPH:** AP neck film with "steeple" or "hourglass" sign Westley Score	Rapid course, Drooling & High fever may be present	Conservative Management; Emergent intervention when necessary
Otitis Media	*S.pneumonia, H.influenzae, M.catarrhalis*	< 3 years old are most susceptible: Fever, otalgia & impaired hearing	Fluid accumulation in the middle ear & erythema of the TM	Unvaccinated children Signs of pharyngeal irritation Recurrent & persistent episodes	Antimicrobial Therapy

ABBREVIATIONS: *MC: most common, GAS: Group A Streptococcus, Sx: symptoms, LAD: Lymphadenopathy, GERD: Gastroesophageal reflux disease, OM: Otitis Media, BSA: Broad Spectrum Antibacterials; CRS: Chronic Rhinosinusitis, GBS: Group B Streptococcus, URT: Upper Respiratory Tract, AP: Anterior-Posterior, CF: Cystic Fibrosis, PCD: Primary Ciliary Dyskinesia, SX: symptoms, TM: tympanic membrane*

TABLE 2:

Lower Respiratory Infections

Disease	Etiology	Common Symptoms	Common Physical Examination Findings	Considerations	Common Management
Acute Bronchitis[51,52]	Viral (Influenza & RSV) Bacteria (*Streptococcus spp*, Atypical Bacteria)	Cough +/- sputum 1-3 weeks	Upper & Lower Respiratory signs without crackles	*Hospitalizations* *Comorbidities* Vomiting & > 4 weeks duration: Consider B.*pertussis*	Cough suppressants, nasal decongestants, expectorants, beta agonists, antihistamines, & Abx therapy.
Bronchiolitis[53,54,55,56,57,58,59,60,61]	Viral MC is RSV	< 2 yrs old, MC within 1st year Wheezing, Fever, Cough, Rhinorrhea	Decreased lung sounds with crackles Dyspnea Chest retractions	Prematurity, Lower cord blood antibody titers to RSV, lower SES, smoke exposure.	Conservative management Consider Abx if bacterial superinfection suspected
Pneumonia[6,7,62,,63,64,65,66,67,68,69,70,71,72,73]	BACTERIA: *S. pneumonia, S. aureus, H.influenzae* VIRAL (CHILDREN): *RSV, Parainfluenza, Influenza* VIRAL (ADULTS): *Influenza & RSV*	Fever & Chills, Pleuritic chest pain, Productive cough with purulent sputum	Leukopenia Tachypnea Tachycardia Crackles Signs of consolidation Sputum: thick & purulent, possibly rust colored	Older age; Unvaccinated; Comorbidities	Beta-lactam plus a macrolide or fluroquinolone therapy

ABBREVIATIONS: *RSV: Respiratory Syncytial Virus, SES: Socioeconomic Status, Abx: antibiotics, MC: most common*

weeks into the year, influenza-like illness had already accounted for 2.9% of visits reported through the U.S Outpatient Influenza-like Illness Surveillance Network.[10]

In adults, community-acquired lower respiratory tract infections are an important cause of acute illness.[11] Lower respiratory tract infections, which include bronchitis, bronchiolitis, and pneumonia, are summarized in Table 2.[4] Pneumonia is an important contributor to mortality worldwide, and together with influenza, constitutes one of the leading causes of death in the United States.[12] In children, the most common lower respiratory infections are pneumonia and bronchitis; however, in children less than two years of age, bronchiolitis predominates.[5]

ASSESSMENT & MANAGEMENT OF ACUTE RESPIRATORY DISEASE

The key to proper diagnosis and treatment of respiratory disease depends on a thorough history and physical examination. Key diagnostic history and physical exam findings are presented in Tables 1 and 2. Several important considerations can be used to differentiate between patients who can be managed conservatively, and those who need emergent care. For example, in cases of upper respiratory infections that present with respiratory compromise, rapid disease progression, and symptoms of dyspnea, tachypnea, tachycardia, stridor, and drooling, hospitalization must be considered. Epiglottitis has the greatest potential of the upper respiratory infections to yield the need for airway intervention.

Proper assessment of whether a patient with community acquired pneumonia (CAP) requires hospitalization or can be managed in an outpatient setting, can be done using the Pneumonia Severity Index, which assesses severity of illness and associated mortality risk within 30 days, and the CURB-65 scores.[13] Some red flags that may warrant further investigation into whether a patient should be hospitalized or treated in an outpatient setting for CAP include altered mental status, temperature ≤35°C or ≥40°C, coexisting illnesses, respiratory rate of 30 breaths per minute or greater, systolic blood pressure < 90 mmHg or diastolic blood pressure <60 mmHg, and patient age.[13] Determining whether a patient will be managed in the hospital or outpatient setting for CAP will also determine the proper antibiotic regimen to be used.[13]

RESPIRATORY INFECTIONS & PROPER ANTIBIOTIC USE

Judicious antibiotic use should be a consideration when assessing treatment options for respiratory illness. Physicians often prescribe antibiotics during most visits for ARI's, even when most upper respiratory tract infections are viral in nature.[14,15] Fifty percent of all antibiotics prescribed for adults and 75% of all antibiotics prescribed for children are for the treatment of respiratory infections.[1] Antibiotic overuse may lead to resistance, increased costs, and increased adverse effects: thus, it is important to differentiate between bacterial and viral etiologies.[15] For example rhinosinusitis, which is commonly seen in outpatient settings, can lead to over-prescription of antibiotics if care is not taken to differentiate between bacterial and viral causes.[15] Bacterial rhinosinusitis should not be suspected until symptoms have lasted for 10 days or greater with worsening symptoms after initial improvement. Furthermore, purulent nasal discharge, maxillary tooth or facial pain, unilateral maxillary sinus tenderness, and initial improvement followed by worsening symptoms often indicate a bacterial etiology. Even cases of rhinosinusitis caused by bacterial etiology can be managed with watchful waiting if they are mild, and if proper follow up can be ensured.[15] In lower respiratory infections like CAP, the decision to treat with empiric antibiotic therapy should be based on the most likely pathogen involved, risk factors for antimicrobial resistance, clinical trials proving efficacy, and medical comorbidities that can influence the likelihood of a specific pathogen. Because antibiotics are not always indicated, OMT may fill a possible gap in treatment options in patients seeking treatment, and possibly in children.

INTEGRATION OF OSTEOPATHIC ASSESSMENT

Respiratory infections often manifest with cranial, cervical, and upper thoracic dysfunctions.[4] These somatic dysfunctions contribute to many of the symptoms that accompany upper respiratory infections and necessitate a thorough osteopathic structural exam in order to complete a comprehensive patient assessment.[4,6] Furthermore, by assessing and treating associated somatic dysfunctions, recovery can be achieved more efficiently.

INTRODUCTION TO THE MODELS OF OSTEOPATHY

When addressing a patient with a respiratory illness, one should consider the models of osteopathy and what treatment approach specifically addresses each model. The five models are the Biomechanical model, the Respiratory-Circulatory model, the Metabolic-Energy model, the Neurological model, and the Behavioral model.[16] As described below, these models represent a conceptual thought process in which a physician may utilize OMT.

Furthermore, as these modalities are applied on an individual patient basis, the osteopathic treatment plan should vary accordingly. For example, the quantity of OMT sessions needed to treat various illnesses is dependent on both the patient and the course of the disease. Acute conditions often require fewer treatment sessions, while chronic conditions require more OMT sessions.[17] Table 3 *(pages 21 and 23)* summarizes osteopathic manipulative treatments by region that can be useful in the treatment of apatient with an ARI.

BIOMECHANICAL CONSIDERATIONS

When performing an osteopathic structural exam, it is important to give special attention to the cervical, thoracic, and lumbar spines, clavicles, ribcage, thoracic inlet, and diaphragm. Respiratory infections are often coupled with coughing or labored breathing, resulting in the recruitment of accessory muscles of inspiration including the sternocleidomastoid, scalenes, levator scapulae, pectoralis minor, and upper trapezius.[18] Such increased respiratory effort overwhelms the capacity of the thoracic diaphragm causing somatic dysfunctions. Treating the first rib helps to relax the anterior scalene, enhancing the respiratory motion of the upper thoracic rib cage. Improving clavicle motion through techniques such as balanced ligamentous tension and muscle energy may help restore optimal respiratory motion, since it serves as an insertion point for many muscles involved in respiratory activity. In addition, optimizing movement of the diaphragm to return it to a non-hypertonic, freely mobile state is appropriate for a patient in respiratory discomfort. Treatment of the origins and insertions of the diaphragm may be considered. The diaphragm crura insert on the lumbar spine at the level of L1 to L3 and, if they are hypertonic, can be treated atthe associated vertebral levels to help relax and encourage normal thoracic diaphragm motion.[19] The upper segment of the thoracic rib cage, specifically ribs 1-4, should be treated to encourage proper range of motion to enable proper respiratory mechanics. The intercostal muscles can spasm and fatigue with labored breathing. Treatment with OMT may help to decrease spasms and improve rib cage mobility.

For patients presenting with complaints localized to the head and neck, such as sinusitis and otitis media, special attention should be paid to the cranium and cervical spine. Somatic dysfunctions of the head should be assessed and treated with cranial osteopathic manipulative medicine(COMM). Anatomically, the upper respiratory tract includes structures in areas enclosed by the sphenoid, basi-occiput, temporal, and frontal bones.[4] Therefore, dysfunctions of the cranial base and facial bones can affect the upper respiratory tract.[4] More specifically, dysfunctions affecting the vagus nerve can affect parasympathetic tone and influence pharyngeal motor activity.4Retro-orbital and retro-auricular pain may be produced by anterior atlas dysfunctions in patients with sinusitis or congestive symptoms.[4] In these patients, consider frontal and maxillary lifts, and a nasion spread in order to facilitate the movement of facial bones. This will facilitate removal of secretions from the maxillary, frontal, and ethmoid sinuses. The Galbreath technique can be used to help with auricular pain secondary to middle ear congestion by mechanically decompressing the auditory canal.[4]

RESPIRATORY-CIRCULATORY MODEL & METABOLIC-ENERGY MODEL CONSIDERATIONS

The right side of the head and neck and portions of the lung drain into the right lymphatic duct, while the left side of the head and neck, and portions of the lung drain into the left lymphatic duct or thoracic duct.[19] The nose, sinuses, and pharynx, typically drain into the submandibular and retropharyngeal nodes, ultimately draining into cervical lymph nodes.[4,19] Somatic dysfunctions in the head, precervical muscles, neck, and lung can impede proper tissue activity and metabolism.[19] Respiratory infections result in the recruitment of secondary muscles of respiration, leading to increased work of

TABLE 3:

Osteopathic Manipulative Techniques (OMT) to address respiratory disease organized by body region

<table>
<tr><th></th><th>Techniques</th><th>Potential Treatment Effects</th></tr>
<tr><td rowspan="6">Head</td><td>Balanced membranous tension</td><td>• Treats cranial strain patterns
• Decreases dural strainrestrictions</td></tr>
<tr><td>Sinus drainage technique Cranial bone lifts & effleurage</td><td>• Facilitates movement of facial bones
• Improves sinus drainage
• Decreases facial pain</td></tr>
<tr><td>Galbreath technique (Mandibular lift)</td><td>• Improves Eustachian tube drainage
• Decompresses the auditory canal
• Decreases auricular pain</td></tr>
<tr><td>Sphenopalatine ganglia inhibition</td><td>• Normalizes parasympathetic tone to nasal mucosa and sinuses
• Regulates blood flow to nasal conchae and encourages thinner mucosal secretions
• Decreases headache and facial discomfort</td></tr>
<tr><td>Venous sinus drainage</td><td>• Improves venous and gylmphatic flow of the brain
• Decreases dural strain
• Decreases headache</td></tr>
<tr><td>Occipito-atlantal decompression Suboccipital release</td><td>• Decreases muscle spasms and restores upper cervical mobility
• Frees the passage of the vagus nerve, normalizing parasympathetic tone</td></tr>
<tr><td rowspan="3">Neck & Cervical Spine</td><td>Soft tissue & myofascial techniques addressing secondary muscles of inspiration</td><td>• Relaxes the Sternocleidomastoid and scalene muscles to aid in the drainage of the superficial and deep cervical lymph nodes
• Allows improved respiration by relaxing the attachments to the manubrium and clavicle</td></tr>
<tr><td>Direct techniques (MET, articulatory, HVLA) to cervical spine dysfunctions</td><td>• Improves somatic dysfunctions in the cervical spine allowing increased range of motion of the neck
• Regulates neural influence over the trigeminal nucleus[4]
• Treatment of C3-C5 can affect diaphragmatic innervation
• Removes mediastinal fascial restrictions freeing the pathway of the vagus nerves</td></tr>
<tr><td>Indirect techniques (CS,FPR,BLT) to cervical spine dysfunctions</td><td>• CS alleviates acute tenderpoints
• Treatment of upper cervical region balances autonomics
• Indirect techniques can have the same treatment effects as direct techniques and may be an alternative to direct techniques or used when direct techniques are not tolerated by the patient.</td></tr>
<tr><td rowspan="2">Lumbar</td><td>Direct/indirect treatment of the lumbar spine (FPR or BLT of L2-L3)</td><td>• Addresses restrictions at diaphragmatic attachments on the lumbar spine at L1-L3[19]
• Encourages respiratory diaphragm motion
• Improves lymphatic drainage (cisterna chyli lies anterior to the lumbar spine)</td></tr>
<tr><td>Direct/indirect treatment of the psoas and QL</td><td>• Addresses myofascial restrictions at the attachments of the diaphragm
• Psoas restrictions affect the upper lumbar spine and cross into the pelvis and lower extremities</td></tr>
<tr><td>Pelvis & Sacrum</td><td>Direct/indirect treatments of the sacrum and pelvis (sacral rock, pelvic SD treatment with MET)</td><td>• Improves biomechanical restrictions of the sacrum to allow for proper motion of the spine with respiration
• Improves motion of the pelvic diaphragm, allowing for the descent of the abdominal diaphragm with inhalation
• Balances autonomic innervation affecting overall autonomic tone</td></tr>
<tr><td rowspan="2">Extremities</td><td>Direct/indirect treatment of the scapula and upper extremity SD</td><td>• Improves head, neck, and thoracic cage mobility due to the musculoskeletal attachments of 17 muscles from the scapula to the regions mentioned
• Improves upper extremity restrictions that can decrease thoracic lymph drainage</td></tr>
<tr><td>Direct/indirect treatment of the hip and lower extremity SD</td><td>• Improves diaphragmtic motion through the psoas and additional musculoskeletal attachments from the LE into the pelvis and sacrum</td></tr>
</table>

ABBREVIATIONS: CS: Counterstrain, FPR: Facilitated Positional Release, MET: Muscle Energy Technique, SD: Somatic Dysfunction, QL: Quadratus lumborum, BLT: Balanced Ligamentous Tension, HVLA: High Velocity Low Amplitude breathing. Specifically, somatic dysfunctions in the ribs, clavicles, and upper thoracic spine contribute to decreased lymphatic drainage through the thoracic inlet.[4] Proper thoracic cage compliance is vital to proper lymphatic drainage.[19] Rib, thoracic inlet, thoracic spine, and thoraco-abdominal somatic dysfunctions prevent full excursion during respiration and therefore negatively impact the change in intrathoracic pressure which in turn, can decrease lymph drainage.[4] Additionally, the thoracic diaphragm serves as a lymphatic pump, as well as an aid for circulation of blood return to the heart. These dysfunctions may be the cause or the effect of poor diaphragmatic movement, which proves vital in the normal changes in intrathoracic pressure.[4] Venous and lymphatic drainage from the head and neck are also disrupted by these dysfunctions, leading to decreased clearance of microorganisms.[4]

Optimizing thoracic movement and respiratory effort has many implications for improving the diseased state. Treatment of the ill patient suffering from respiratory infection favors addressing thoracic or upper lumbar dysfunctions to assist diaphragm attachments, to optimize the diaphragm's ability to act as a pump for lymphatic fluid and circulation. Restricted fascia in the neck and upper thorax should be treated to help aid in improved circulation to and from areas of infection. Opening of the thoracic inlet with myofascial techniques facilitates lymph drainage via the thoracic and the right lymphatic ducts. Once the thoracic inlet is opened and relaxed, lymphatic fluid can freely return to the venous circulation subsequently decongesting the body. Draining the cervical and neck lymph chains toward the inlet and lymphatic pumps are particularly useful during acute illness to mobilize lymphocytes and to facilitate lymphatic return and decongestion.[19] Efficacy of medical therapy may be decreased in the presence of tissue congestion, as this impedes the ability of leukocytes and medications to reach their target tissue.[19] Improving circulation therefore enhances drug delivery, should antibiotics be required, and also facilitates the immune system functionality by increasing the ability of white blood cells to reach infected areas.[20]

NEUROLOGICAL CONSIDERATIONS

Viscerosomatic reflexes manifested as tissue texture changes and tenderness on palpation in the upper cervical paravertebral soft tissues can support the physician's diagnosis of an upper respiratory tract infection,[4] as well as indicate areas that need treatment. Viscerosomatic reflexes often seen in respiratory illness can be found generally in the upper thoracic region for sympathetic reflexes and in the upper cervical region for parasympathetic reflexes.[19] Furthermore, somatovisceral reflexes like Chapman's points can affect the autonomic nervous system, upsetting the balance that exists between the sympathetic and parasympathetic nervous system.[4] OMT can normalize this balance, reducing the duration and intensity of symptoms and enhancing the efficacy of other therapies.[4] Chapman's reflex points which are listed in Table 4 were first defined by Frank Chapman, D.O as gangliform contractions which are tissue texture abnormalities that correspond to visceral dysfunction, and can be treated by rotatory motion.[19]

Somatic dysfunctions in the upper thoracic spine causing facilitation of those spinal segments can increase the activity of the sympathetic nervous system.[4] An increase in sympathetic tone leads to an increase in airway epithelial hyperplasia which leads to increased goblet cells and increased luminal secretions.[19] In order to normalize sympathetic tone in patients with respiratory infections, consider treating the sympathetic chain between T1-T7.[19] Rib raising is a technique that targets the rib angles in order to inhibit and normalize the sympathetic ganglia that lie paravertebrally. Rib raising can be used with great success, even in patients who are severely ill.

An increase in parasympathetic tone leads to relative bronchiole constriction.[21] Head complaints involving nasal sinuses and lacrimation can be treated with COMM as is seen in Table 3 *(page22)*. In order to normalize parasympathetic tone, target C2, C3, and the mediastinal fascia to free the pathway of the vagus nerves as they pass to the thorax. Finally, the upper respiratory tract delivers somatosensory input to the central nervous system through the trigeminal nerve.[4] Thus, muscles innervated by the trigeminal nerve may be subject to viscerosomatic reflexes.[4] Furthermore, because parasympathetic innervation to the upper respiratory tract from the facial nerve reaches its final destination through nerves in the distribution of the trigeminal nerve, treating these areas can correct the effects of parasympathetic hyperactivity.[4] Trigeminal nerve stimulation using OMT directed to the cervical and thoracic regions can reduce nasal congestion and increase secretions since it carries sympathetic and parasympathetic postganglionic fibers to the upper respiratory tract.[4]

BEHAVIORAL MODEL CONSIDERATIONS

Quality of life and psychological health are often altered in patients with respiratory infections, thus, the osteopathic family physician is highly encouraged to consider the patient's psychological and behavioral well-being.[22, 23,24,25,26,27] Infants and children experience prolonged symptoms of the common cold compared to adults. The degree of socioeconomic impact is therefore quite large. It is reported that a significant amount of time is missed from school by children, and from work by parents caring for sick children.[28]

The severity and chronicity of respiratory infections correlates with impairments in well-being, quality of life, and sleep.[23] As upper respiratory infections and chronic diseasessuch as asthma and Chronic Obstructive Pulmonary Disease (COPD) are correlated, these comorbid conditions correspond with an increase in anxiety and depression.[25,29] Although direct evidence is lacking on the effect OMT has on the quality of life of patients with respiratory infections, OMT has been shown to improve several parameters of pulmonary function and exercise capacity.[30]

EVIDENCE FOR USING OSTEOPATHIC MANIPULATIVE TREATMENT IN RESPIRATORY INFECTIONS

There have been several studies showing the efficacy of OMT in treating respiratory illness. OMT has been shown to accelerate the recovery of preoperative values of forced vital capacity (FVC) and forced expiratory volume in one second (FEV1) of postoperative patients with atelectasis.[31] OMT has also been shown to aid in the recovery from pneumonia by enhancing the functioning of the immune system, and maximizing the effects of antibiotics.[31, 32,20] In addition, OMT has been associated with decreased hospital-stay duration, decreased use of intravenous antibiotics, and decreased incidence of respiratory failure or death in elderly patients hospitalized with pneumonia.[20]

TABLE 3 (CON'T):

Osteopathic Manipulative Techniques (OMT) to address respiratory disease organized by body region

	Techniques	Potential Treatment Effects
Thorax	Techniques to address first rib SD (Still's, FPR, MET, articulatory)	• Enhances respiratory motion of upper thoracic rib cage • Relaxes anterior and middle scalene accessory muscles of respiration • Removes restrictions at thoracic inlet
	Thoracic inlet release	• Removes myofascial restrictions in the region of terminal lymphatic drainage[19] • Improves upper rib motion
	Lymphatic pumps	• Augments lymphatic drainage of lungs[19] • Increases rib mobility (side thoracic pump)
	Respiratory diaphragm doming / release	• Optimizes thoracic movement and respiratory effort • Restores proper diaphragmatic tone and structure • Facilitates lymphatic pump action of the diaphragm • Aids in return of circulation to the heart
	Direct/indirect treatments of the thoracic spine and rib cage	• Improves somatic dysfunctions allowing increased thoracic cage excursion and improves range of motion of spine and ribs • Balances sympathetic innervation to the head, neck, and lungs • Improves lymphatic drainage by allowing for improved pressure gradient changes with respiration
	Rib raising	• Targets the rib heads between T1-T4, where the sympathetic chain lies in order to inhibit and normalize the paravertebral sympathetic ganglia
	Direct/indirect treatments of the intercostal muscles and ribs (CS and MET)	• Optimizes thoracic cage movement by relaxing intercostal muscles • Encourages lymph flow • Improves diaphragmatic motion by addressing diaphragm attachments (anterior costal margin to ribs 11 & 12 posteriorly)

ABBREVIATIONS: CS: Counterstrain, FPR: Facilitated Positional Release, MET: Muscle Energy Technique, SD: Somatic Dysfunction, QL: Quadratus lumborum, BLT: Balanced Ligamentous Tension, HVLA: High Velocity Low Amplitude

TABLE 4:

Pertinent Chapman's Reflex Points for Respiratory Infections[4,74]

Structured Affected	Anterior Points	Posterior Points
Neck	Neck of the humerus	C3-C7 transverse processes
Tongue	Anterior surface of the 2nd costal cartilage at the junction of the sternum	C1 transverse processes
Tonsils	1st Intercostal space, close to the sternum	C1 transverse processes
Nasal Sinuses	1st rib medial to the junction with clavicle	C2 transverse process
Pharynx	Surface of the 1st rib near the sternal notch	
Sinuses	7-9 cm lateral to the sternum on the upper edge of the second rib	C2, midway between the spinous process and transverse process
Larynx	Anterior surface of 2nd rib, at the costochondral junction	
Bronchi	2nd intercostal space	T2 midway between the spinous process and transverse process
Upper Lung	3rd intercostal space	T3 midway between the spinous process and transverse process
Lower Lung	4th intercostal space	T4 midway between the spinous process and transverse process

CONCLUSION

Acute respiratory illnesses commonly present to the osteopathic family physician. A thorough evaluation and treatment integrating osteopathic manipulative medicine can be effective in the care of patients with respiratory infections. Considering the models of osteopathic care and utilizing an osteopathic approach targeting each of the 5 models can provide comprehensive treatment to a patient with a respiratory infection. Doing so can aid in the return of proper respiratory functioning, helping to restore patients back to optimal health.

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