

Pediatric Respiratory OMT Module



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Background: Influenza

A world wide influenza epidemic occurred during the years of 1918-1919. The estimated death toll for the world was anywhere from 21-30 million people.

This occurred prior to the advent of antibiotics.

Background:

- *Over 28% of the population in the US died during the epidemic. The mortality rate in US military hospitals was 36% as opposed to the rate in civilian hospital, 30-40%. In New York the rate of death was 68%.*
- *Overall mortality was 30-60% if influenza was complicated by pneumonia.*

Background:

- *An accumulated effort of 2,445 Osteopathic physicians treating 110,112 patients with influenza reduced the mortality rate from 5% to 0.25%. A 400 bed Massachusetts Osteopathic hospital in Boston also reduced the mortality to 0.25% and reduced hospital stays by 10%.*
- *Overall mortality for those who developed pneumonia was reduced to 10%.*

Goals of OMM in Respiratory Disease

- Increase mobility of the thoracic spine and rib cage to allow full excursion of chest with breathing
- Decrease negative impact of viscerosomatic and somatovisceral reflexes
- Improve musculoskeletal components of airway disease to allow maximum effectiveness of medications

Benefits of Osteopathic Manipulation in Respiratory Disease

- Increased vital capacity
- Increased rib cage mobility
- Increased clearance of airway secretions
- Possibly improve autoimmune function

Childhood Asthma

- Chronic inflammatory condition of the lung airways resulting in episodic airflow obstruction
- Cause is multifactorial
- Boys and children from poor families are more likely to have asthma
- 80% of asthmatics report disease onset prior to 6 years old
- Allergies in young children is a major risk factor for persistence of childhood asthma

Pathogenesis of Asthma

- Chronic, reversible airway obstruction
- Airflow in small airways regulated by smooth muscles encircling airway lumens
- Inflammatory infiltrate and exudate can obstruct airway lumen
- Triggers can cause hypersensitivity of airway smooth muscles
- Mucous gland hypertrophy and mucous hypersecretion contribute to obstruction

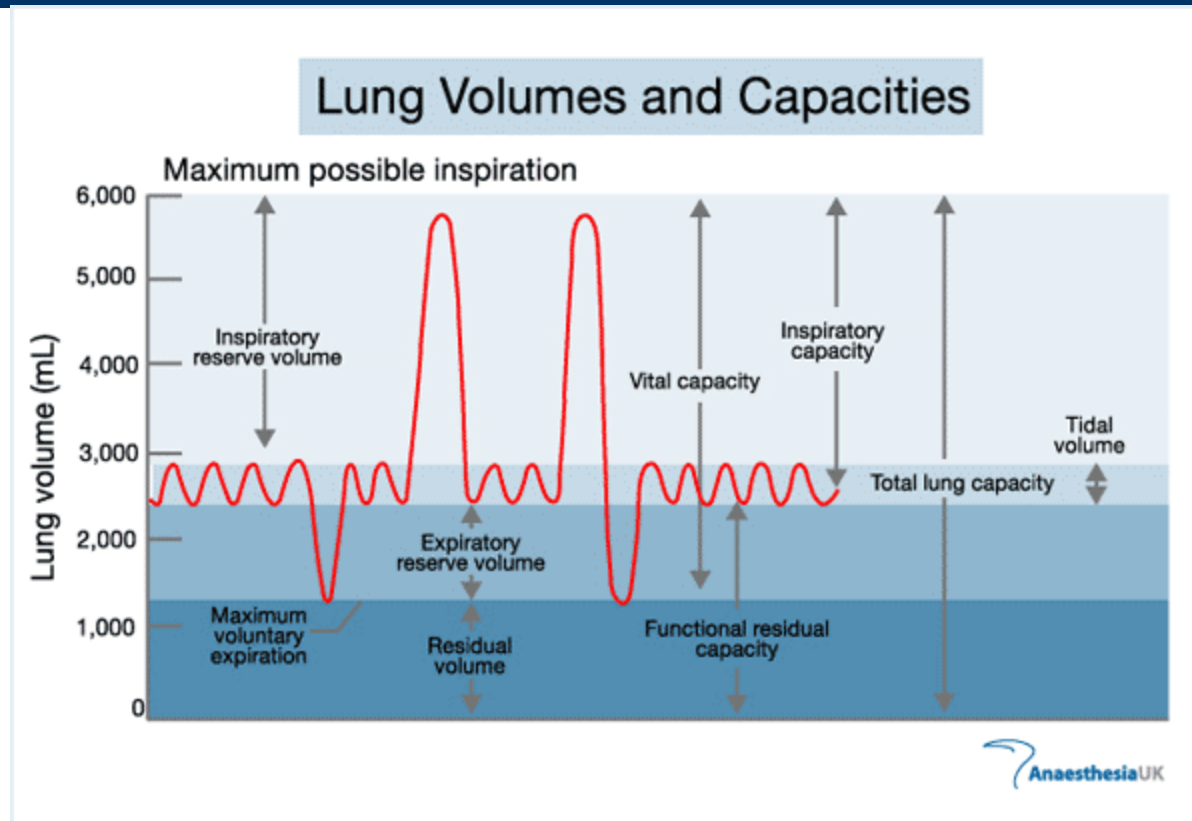
Clinical Manifestations of Asthma

- Intermittent dry cough and/or expiratory wheezing
- Intermittent non-focal chest pain
- Night time cough/wheeze
- Daytime symptoms related to physical activity or play
- Non-specific limitations of physical activity and/or fatigue
- Improvement in symptoms with bronchodilator and corticosteroid therapy

Laboratory Findings in Asthma

- Spirometry is a helpful measure of airflow
 - FEV1 <80% or FEV1/FVC ratio < 0.8 indicates significant airway obstruction
 - Bronchodilator response with improvement of FEV1 >12% is consistent with asthma
- Measuring exhaled nitric oxide can help titrate medications and confirm diagnosis
- Peak expiratory flow (PEF) measures airflow and will decrease with airflow obstruction
- CXR (PA and Lateral)=hyperinflation and peribronchial thickening
- Allergy testing: 88% of 5-12 y/o have (+) allergy skin prick tests

Pulmonary Function



Osteopathic Findings in Asthma

- Increased vagal tone (occipitoatlantal, atlantoaxial, cranial dysfunction)
- High narrow palate
- Somatic dysfunction of the thoracic with particular attention to 3rd and 4th rib articulations
- Somatic dysfunction of C3-5 (phrenic nerve distribution)

Medical Treatment of Asthma

- Eliminate or reduce environmental exposures
- Annual influenza vaccination
- Treat co-morbid conditions
 - Rhinitis, sinusitis, GER are 3 most common
- Pharmacologic interventions
 - Inhaled corticosteroids (ICS)
 - Leukotriene modifiers
 - Combination therapy: ICS and long-acting beta-agonist
 - Rescue medications (short acting beta-agonist)
 - Anticholinergic agents

Osteopathic Treatment in Asthma

- OMT during asthma exacerbation
 - Stimulate sympathetics for bronchodilator response (T2-7)
 - Reduce spasm of thoracic musculature
 - Seated thoracic pump technique
 - Vagal inhibition (CN X)
 - CV4 technique, correct sphenobasilar dysfunction
 - Avoid HVLA of thoracic
 - Preference of muscle energy and indirect OMT

Osteopathic Treatment in Asthma

- OMT between asthma exacerbations
 - Maximize thoracic, sternal, costal motion
 - Goal is to decrease the frequency and severity of attacks and the need for medications

Thoracic myofascial



Seated Thoracic Technique



Evidence-Based Medicine: Asthma

- JAOA 2005 randomized controlled trial of the effects of OMT on pediatric patients with asthma measuring peak expiratory flow (PEF) rates
- Included 140 patients aged 4 years - 18 years
- PEF was measured before and after OMT or sham procedure
- OMT group showed statistically significant improvement in PEF after treatment from 7 L/min to 9 L/min

Evidence-Based Medicine: Asthma

- Mean improvement in PEF in OMT was 4.8% versus 1.4% in the sham (control) group
- Mean increase of PEF in the OMT group in this study was 13 L/min while control group showed no statistically significant improvement
- OMT used included rib raising, muscle energy for ribs and myofascial release
- Authors concluded study was able to demonstrate OMT can significantly improve pulmonary function in asthmatic pediatric patients

OMT in Asthma/RAD/Bronchiolitis

- Goals & Considerations
 - Balance autonomic tone
 - Maximize airflow (sympathetics)
 - Maintaining thin, watery secretions (parasympathetics)
 - Increase lymphatic flow to decrease tissue congestion
 - Free fascial & intersegmental restrictions
 - Maximize thoracic respiratory excursion
 - Restore respiratory diaphragm integrity
 - Promote appropriate depth of inhalation and exhalation
 - Release tense accessory muscles of breathing

Hands-On Approach Treating Asthma/RAD/Bronchiolitis

- Cervical *and* Thoracic Muscular Assessment and Treatment
- Sternal Release
- Respiratory Diaphragm Release
- Doming of the Diaphragm
- Thoracic Inlet/Outlet Release
- Rib Raising (T2-7)
- Muscle energy for rib dysfunction
- Occipitoatlantal (OA) Release
- Cervical (C3-5 Phrenic Nerve)
- Chapman's Reflexes

Pediatric Pneumonia

- Inflammation of the lung parenchyma caused by either microorganisms or noninfectious (i.e. aspiration, foreign body)
- Overall incidence ranges from 10-30% in infants and children
- Major bacterial causes for pneumonia in the developing world include: *S. pneumoniae*, *H. influenzae*, and *S. aureus*
- Viral causes of pneumonia are prominent in children < 5 years old

Pediatric Pneumonia

- More common in fall and winter
- Children fully immunized against H. influenza b and S. pneumoniae are less likely to get pneumonia from these causes
- Physiologic defense mechanisms to infection
 - Mucociliary clearance, secretory IgA, coughing
- Immunologic defense mechanisms
 - Macrophages, secretory IgA, immunoglobulins

Clinical Manifestations of Pneumonia

- Tachypnea is the most consistent clinical manifestation of pneumonia
- Preceded by a few days of rhinitis, coughing
- Infants can present with cyanosis
- Older children can present with chills, high fever and chest pain
- Many children present with splinting the affected side due to pleuritic pain

Clinical Manifestations of Pneumonia

- Early=rales and rhonchi
- Complicated=diminished breath sounds, dullness to percussion
- Abdominal pain common with lower lobe pneumonia
- Liver may seem enlarged due to downward displacement of diaphragm

Osteopathic Findings in Pneumonia

- Palpatory and auscultatory findings can precede CXR changes by 24-48 hours
- Exhalation rib dysfunctions can be caused by coughing
- Dysfunction can be found at C1-2 with vagus nerve irritation

Chapman's Reflexes

- Viscerosomatic reflex points described by Frank Chapman, DO
- Believed to be result of sympathetic nervous system's effects on lymphatic tissue
- Described as small pearls of tapioca that are firm, partially fixed and located in deep fascia
- Anterior points used in diagnosis, posterior points used in treatment

Chapman's Reflexes

- Anterior lung points
 - Upper lung: 3rd intercostal spaces adjacent to sternum
 - Lower lung: 4th intercostal spaces adjacent to sternum
- Posterior lung points
 - Upper lung: between the 3rd and 4th transverse processes bilaterally
 - Lower lung: between the 4th and 5th transverse processes bilaterally
 - Both upper and lower described as being midway between tip of transverse process and spinous process

Evidence-Based Medicine: Chapman's Reflex Points

- JAOA 2003 case control study to determine whether hospitalized patients with pneumonia had anterior Chapman's reflex points
- 69 adult patients in study comparing those admitted with pneumonia to those admitted for other reasons and without underlying lung pathology

Evidence-Based Medicine: Chapman's Reflex points

- Only one examiner, but blinded to diagnosis of the patient being examined
- Only anterior points were used since there was no OMT being done
- Statistically significant relationship between the presence of Chapman's reflex points and the diagnosis of pneumonia
- Authors concluded Chapman's points are a useful examination tool in evaluating patients for the potential diagnosis of pneumonia

Diagnosis of Pneumonia

- CXR (PA and Lateral) confirms diagnosis
 - Repeat CXR not required for proof of cure
- Peripheral WBC count can differentiate viral vs. bacterial
 - Viral: normal or <20,000, lymphocyte predominant
 - Bacterial: 15-40,000, granulocyte predominant
- Pneumococcal=elevated ESR and CRP
- Viral studies of respiratory tract secretions
- Blood cultures can be (+) in 10% of pneumococcal pneumonias

Osteopathic Treatment of Pneumonia

- Initial OMT for pneumonia has 3 main goals
 - Reduce congestion
 - Reduce sympathetic hyperactivity to lung (T2-7)
 - Reduce mechanical chest wall motion restrictions
- Improve lymphatic flow by treating thoracic inlet restrictions
- Inhibition of the thoracolumbar muscles
- Redoming abdominal diaphragm
- Rib raising

Osteopathic Treatment for Pneumonia

- Treatment of thoracic cage restrictions including sternum and shoulder girdle to improve chest wall excursion
- Lymphatic pumps
- Treatment of cranial dysfunction, OA and AA to normalize parasympathetic effects on the lung via vagus nerve
- Treatment of cervical dysfunction C3-5 and its effect on the phrenic nerve

Rib Raising

- Thought to increase blood supply to lung tissue by inhibitory sympathetic interference
- Effective rib raising aims to treat sympathetic imbalance by
 - Decreasing sympathetic influence on respiratory mucosa
 - Decreasing goblet cell secretion
 - Encouraging thinner bronchial secretions
 - Enhancing venous and lymphatic drainage from bronchial and peribronchial tissues
 - Relaxing paraspinal musculature

Rib-raising

- Patient is supine
- Physician can either perform one side at a time or both sides at once
- Physician's hands are under the spine grasping the erector spinae mass
- Finger pads are close to the spinous processes
- The pads of the fingers elevate as the forearms are used as the fulcrum
- Applied forces raise the sternum and ribs
- Rib raising performed for about 30-90 seconds until tissues relax

Rib-Raising



Lymphatic Drainage

- The patient is supine with knees flexed
- The physician is at the head
- The physician hands are spread over the chest wall
- The pressure is equally distributed over the entire surface with both hands
- Apply in a downward and caudad rhythmic manner
- Alternatively, physician can grasp at tendinous insertion of pectoralis major muscles and pull cephalad and medially for a period of seconds to a minute or with each inhalation

Lymphatic Drainage



Treatment of Thoracic Inlet



Lateral Recumbent Treatment of Shoulder Girdle



Evidence-Based Medicine: Pneumonia

- JAOA 2000 randomized controlled study of efficacy of OMT in treating hospitalized patients with pneumonia
- Adult study with patients >60 years old
- OMT began within 24 hours of admission
- Control group received therapeutic touch
- Attending physician blinded to OMT vs. control group
- 58 patients completed the study

Evidence-Based Medicine: Pneumonia

- OMT group received a standardized OMT protocol including:
 - Bilateral paraspinal inhibition
 - Bilateral rib raising
 - Diaphragmatic myofascial release
 - Condylar decompression
 - Soft tissue technique of cervical muscles
 - Myofascial release to anterior thoracic inlet
 - Thoracic lymphatic pump

Evidence-Based Medicine: Pneumonia

- OMT was provided in order listed, over 15 minutes, twice a day, 7 days a week until study endpoint
- Endpoints: hospital discharge, ventilator dependant respiratory failure, death
- Transient muscle tenderness=only adverse event (2 patients)

Evidence-Based Medicine: Pneumonia

- Mean duration of IV antibiotic use was significantly shorter in OMT group: 5 days versus 7 days for control group
- Mean length of hospital stay was significantly shorter in OMT group: 6.6 days versus 8.6 days for control group
- Authors concluded adjunctive OMT reduces IV antibiotics and hospital stay for pneumonia

Question 1

1. A 10 year old male presents with chest tightness and cough. You diagnose and asthma exacerbation. You plan to start oral corticosteroids. What OMT procedure would be helpful at this time?
 - A. Auricular pull
 - B. Cranial occipital release
 - C. Drainage of Galbreath
 - D. HVLA of thoracic spine
 - E. Pedal pump

Question 2

2. A 7 year old female presents with fever and cough. A CXR shows a left lower lobe pneumonia. Which OMT procedure would be of benefit?
- A. Mandibular thrust
 - B. Myofacial release lumbar region
 - C. HVLA cervical manipulation
 - D. Rib raising
 - E. Sacral release

Question 3

3. An 8 year old male present to your office with cough and resolving asthma exacerbation. Which of the following would be a common area of somatic dysfunction in an asthmatic?
- A. C6-T1
 - B. T3-4
 - C. T8-10
 - D. L4-5
 - E. Solar plexis

Question 4

4. Based on studies of OMT of asthmatic patients, which of the following lab findings would you expect after OMT?
 - A. Decrease in FEV1
 - B. Decrease in PEF
 - C. Increase in PEF
 - D. Increase in WBC count
 - E. Resolution of CXR hyperinflation

Question 5

5. A patient is admitted to the hospital with hypoxia and pneumonia. You treat him with oxygen supplement, IV fluids, OMT and IV antibiotics. Which of the following could be expected in this patient compared to a patient without the benefit of OMT?
- A. Complete 10 day course of IV antibiotics prior to discharge
 - B. Increased need for chest PT
 - C. Respiratory failure
 - D. Resolution of fever after OMT
 - E. Transition to oral antibiotics sooner

References

- Guiney P, Chou R, Vianna A, Lovenheim J. Effects of osteopathic manipulative treatment on pediatric patients with asthma: a randomized controlled trial. JAOA. 2005; 105 (1): 7-12.
- Washington K, et al. Presence of Chapman reflex points in hospitalized patients with pneumonia. JAOA. 2003; 103 (10): 479-483.

References

- Kliegman, Behrman, Jenson, Stanton. Nelson textbook of pediatric medicine, 18th ed. Saunders; 2007.
- Kuchera M, Kuchera W. Osteopathic considerations in systemic dysfunction, 2nd ed. Greyden Press; 1994.
- Noll D, Shores J, Gamber R, Herron K, Swift J. Benefits of osteopathic manipulative treatment for hospitalized elderly patients with pneumonia. JAOA. 2000; 100 (12): 776-782.