JAOA ORIGINAL CONTRIBUTION

Presence of Chapman Reflex Points in Hospitalized Patients With Pneumonia

Kevin Washington, DO; Ronald Mosiello, DO; Michael Venditto, DO; John Simelaro, DO; Patrick Coughlin, PhD; William Thomas Crow, DO; Alexander Nicholas, DO

The authors undertook a case control study to determine whether hospitalized patients with pneumonia had reflex points in the anterior chest wall as described by Frank Chapman, DO, specifically those classified as relating to the lung. Sixty-nine hospitalized patients were enrolled in the study. Patients with an admitting diagnosis of pneumonia were compared to those without pneumonia as their admitting diagnosis. All patients were examined to determine if Chapman reflex points for the lungs were present. The study controlled for potential confounding diagnoses by excluding patients with lung pathology other than pneumonia. Results demonstrated a statistically significant relationship between the presence of Chapman reflex points and pneumonia in hospitalized patients.

Frank Chapman, DO, discovered discrete tissue texture changes that were consistently palpable at specific anatomic landmarks for specific organ pathology. These reflexes have been described as "small pearls of tapioca" that are firm, partially fixed, and located under the skin in the deep fascia.[1,2] Chapman theorized that organ-specific pathology would cause these small palpable masses or "gangliform contractions."[3] When present, these contractions occur at specific loci and correspond to specific organs; they denoted the presence of organ-specific pathology and had both posterior and anterior manifestations.[3,4] In the upper lung, the anterior reflex is located in the third intercostal space bilaterally, adjacent to the sternum.[3-5] In the lower lung, the anterior reflex is located in the fourth intercostal space bilaterally adjacent to the sternum.[3-5] The corresponding posterior points are located between the third and fourth transverse processes for the upper lung and the fourth and fifth transverse processes for the lower lung, midway between the tip of the transverse process and the spinous process bilaterally. Any disease process in the lung (eg, pneumonia, chronic obstructive pulmonary disease, asthma) could cause these palpable reflexes to appear. Chapman believed that as these reflexes were predictable, they could be used as an aid in diagnosis as well as a modality of manipulative treatment.

Most of the information available on Chapman reflexes has been anecdotal, pertaining to clinical observation only.[2,6] Tissue biopsy studies have been unable to demonstrate the reflex change.[2,3,7] However, in a study by Mannino,[8] the Chapman reflex for the adrenal glands was treated with manipulation in an attempt to lower serum aldosterone concentrations in patients with hypertension. A significant decrease in aldosterone levels was demonstrated. However, the study failed to demonstrate any decrease in blood pressure.

Chapman reflexes are included in the general osteopathic education and appear repeatedly on osteopathic board examinations. Though familiar, many osteopathic physicians have generally given little credence to their existence. Even when recognized, the reflexes are often used solely for differential diagnostic purposes and are rarely incorporated into treatment.[2] One reason that Chapman reflexes may not be more commonly used is lack of evidence for their existence and potential diagnostic and therapeutic benefit.[6]

In today's world of evidence-based medicine, it is paramount that osteopathic physicians strive to demonstrate clinical evidence to arm our profession's future generations, giving scientific strength to what has clinically been held as true for decades. Therefore, we undertook an investigation to evaluate the existence of Chapman reflex points in patients with pneumonia.

Methods

Patients for the study were recruited from the Philadelphia College of Osteopathic Medicine inpatient internal medicine service at Allegheny University Hospital, Philadelphia, Pa. Patients were placed into either the control group or the experimental group. Patients in the control group had a diagnosis other than pneumonia. Patients in the experimental group had an admitting diagnosis of pneumonia. The specific etiologic factor of the pneumonia was not considered in the selection process. The inclusion criteria for the experimental group were as follows:

From the Philadelphia College of Osteopathic Medicine, where Drs Venditto and Simelaro are professors in the Department of Internal Medicine, Dr Coughlin is a professor in the Department of Anatomy, and Drs Crow and Nicholas are professors in the Department of Osteopathic Manipulative Medicine. Dr Washington is a family practice resident in Allentown, Pa. Dr Mosiello is in private practice in Saco, Maine.

Address correspondence to William Thomas Crow, DO, Department of Osteopathic Manipulative Medicine, Philadelphia College of Osteopathic Medicine, 4190 City Line Ave, Philadelphia, PA 19131.

E-mail: ThomasCr@pcom.edu

Table 1
Control Group Results

Patient No.	Diagnosis	Results	Location
1	Deep vein thrombosis	Neg	
2	Congestive heart failure	Pos	Left
3	Rule out deep vein thrombosis	Pos	Left, right
4	Seizure disorder	Neg	
5	Diabetes mellitus/ pulmonary edema	Neg	
6	Cellulitis	Neg	
7	Atrial fibrillation/ congestive heart failure	Pos	Right
8	Coronary artery disease	Pos	Right
9	Diabetes mellitus	Neg	
10	Hypertension/ congestive heart failure	Neg	
11	Diabetes mellitus/ gangrene	Neg	
12	Hyponatremia	Pos	Right
13	Transient ischemic attack	Neg	
14	Diabetic ketoacidosis/sepsis	Pos	Left
15	Cerebrovascular accident	Pos	Left
16	Diabetes mellitus	Pos	Left
17	Abdominal pain	Neg	
18	Jaundice/atrial fibrillation	Neg	
19	Hypoglycemia	Neg	
20	Diabetic ketoacidosis	Pos	Left
21	Ankle wound	Neg	
22	Diabetes mellitus/congestive heart failure	Neg	
23	End-stage renal disease/ diabetes mellitus/ hypertension	Neg	
24	Leg ulcer/constipation	Neg	
25	Osteomyelitis	Neg	
26	Diabetes mellitus	Neg	
27	Cellulitis	Neg	
28	Rule out myocardial infarction	Neg	
29	Rule out myocardial infarction	Neg	
30	Cerebrovascular accident/ hyperparathyroidism	Pos	Left, right
31	Atrial fibrillation	Pos	Left
32	Left ventricular hypertrophy	Pos	Left, right
33	Dizziness/ischemia	Pos	Left, right
34	Heroin overdose	Neg	
35	Tachycardia	Pos	Right
36	Hypertension	Pos	Left, right
37	Rule out myocardial infarction	Neg	
38	Biliary obstruction	Neg	
39	Heel ulcer	Neg	
40	Diabetes mellitus/ toe amputation	Neg	
41	Peptic ulcer disease	Neg	
42	Sacral ulcer	Neg	
43	Rule out myocardial infarction	Neg	
44	Deep vein thrombosis	Neg	
45	Rule out myocardial infarction	Neg	
46	Rule out myocardial infarction	Pos	Left, right
47	End-stage renal disease/ human immunodeficiency virus/seizures	Pos	Left, right
48	Gangrenous toe	Neg	
49	Diabetes mellitus/sepsis	Pos	Left, right
50	Systemic lupus erythematosus/ seizure disorder	Neg	
51	Myocardial infarction	Neg	
52	Pelvic inflammatory disease	Pos	Right
53	Diverticulitis	Neg	

- Patient must have a chest x-ray positive for pneumonia.
- Patient must have a temperature of 38° or higher.
- Patient must have a white blood cell count greater than 12,000 mg / dL or a bandemia of 10% or greater.
- Patient must be examined within 72 hours of admission or diagnosis.
- Patient must be between 18 and 85 years of age.

If patients met any of the following exclusion criteria at the time of initial examination or later, they were dropped or excluded from the study:

□ History of lung disease or pathology (eg, asthma, chronic obstructive pulmonary disease, tuberculosis, chronic bronchitis);
□ History of chest surgery;
□ A chest tube or a central line in place;
□ History of significant chest trauma (eg, broken ribs);
□ History of multiple sclerosis; or
□ Patient was younger than 18 years or older than 85 years.

The control group was composed of patients who did not meet any of the exclusion criteria, had a diagnosis other than pneumonia, were between the ages of 18 and 85 years, and were examined within 72 hours of admission or diagnosis. Patients were recruited over 1 year.

Procedure

Patients were not followed up or treated by the study investigators. The study used two principal investigators: a recruiter and an investigator. One recruited the patients and the other examined the patients to determine if Chapman reflex points were present. After checking the inpatient service for eligible participants, the recruiter logged the eligible patient's name, diagnosis, and room number into a database. Then the recruiter gave the name and room number to the examiner. The examiner was not given the patient's diagnosis in an attempt to blind the examiner to the group in which the participant was placed. After obtaining consent from the patient for participation in the study, the examiner evaluated the patient for the anterior Chapman reflex points specific for the lung. The examiner gently palpated the third and fourth intercostal spaces bilaterally, adjacent to the sternum, noting any masses. The presence of a palpable mass denoted a positive Chapman point. Because Chapman advocated that the posterior Chapman reflex points were used primarily in treatment, examination for their presence was not done.[5] The same examiner examined all of the patients in the study to limit interexaminer variability.

Results

As there were only two variables in the study, the data were subject to analysis with the Fisher's exact probability test. The binomial confidence interval was also calculated. These tests were used to determine the likelihood that there was an association between the Chapman reflex points and pneumonia. The raw numbers were then used to determine the odds ratio, sensitivity, specificity, and predictive values for Chapman reflex points as a diagnostic test in patients with pneumonia.

Table 2
Study Group Results

Patient No.	Results	Location
1	Pos	Left
2	Pos	Right
3	Neg	
4	Pos	Left
5	Neg	
6	Neg	
7	Pos	Left
8	Pos	Left
9	Pos	Right
10	Pos	Left, right
11	Pos	Right
12	Pos	Right
13	Neg	
14	Pos	Left
15	Neg	
16	Pos	Right

Seventy-three patients were enrolled in the study, of which four were dropped at the time of examination as the result of either central line placement (one patient) or having been discharged (three patients), leaving 69 participants. Sixteen of the participants had pneumonia and were assigned to the experimental group. The remaining 53 had diagnoses other than pneumonia and were placed in the control group. The results of the study are summarized in *Tables 1* and *2* (raw data).

Of the 53 patients who did not have pneumonia, 19 had palpable changes consistent with the Chapman reflex in the third or fourth intercostal space. These data, which include the patient's diagnosis and palpatory findings, are presented in *Table 1*. Of the 16 patients in the study group, 11 had positive Chapman points for the lungs. The remaining five patients had no palpable changes in the third or fourth intercostal space. These data are presented in *Table 2*.

Fisher's exact analysis revealed a significant association between diagnosis of pneumonia and presence of Chapman reflex points for the lungs. The one-tailed *P* value was .021, and the two-tailed *P* value was .025. According to the binomial confidence interval, the chance that the test was correct was 65.2% (range, 52.8% to 76.3%). The chance that the test was incorrect was 34.8% (range, 23% to 47%). The confidence

Table 3
Association Between Diagnosis of Pneumonia and Presence of Chapman Reflex Points for the Lungs

Scenario	Binomial Confidence Interval	Upper and Lower 95%
No. 1		
+Pneumonia/+Test	11/69 (15.9%)	8.2% to 26.7%
−Pneumonia/+Test	5/69 (7.3%)	2.4% to 16.1%
+Pneumonia/−Test	19/69 (27.5%)	17.5% to 39.6%
−Pneumonia/−Test	34/69 (49.3%)	37.0% to 61.6%
Test was correct:	11+ 34/69 (65.2%)	52.8% to 76.3%
Test was incorrect:	19+ 5/69 (34.8%)	23.7% to 47.2%
No. 2		
+Pneumonia/+Test	11/51 (21.6%)	11.3% to 35.3%
−Pneumonia/+Test	5/51 (9.8%)	3.3% to 21.4%
+Pneumonia/−Test	11/51 (21.6%)	11.3% to 35.3%
−Pneumonia/−Test	24/51 (47.1%)	32.9% to 61.5%
Test was correct:	11+ 24/51 (68.6%)	54.1% to 80.9%
Test was incorrect:	11+ 5/51 (31.4%)	19.1% to 45.9%

interval data are presented in *Table 3*. The probability that the results of a Chapman point examination would be positive in a patient with pneumonia (sensitivity) was 69%. The probability that a Chapman point examination would be negative for the lungs in a patient without pneumonia (specificity) was 64%. The Chapman point examination had a positive predictive value of 37% and a negative predictive value of 87%. The odds ratio was 3.94. These calculations are summarized in *Table 4*.

The calculations were repeated with a second scenario in which all patients in the control group with an admitting cardiac diagnosis were excluded. This included all control group patients with a diagnosis of hypertension, congestive heart failure, transient ischemic attacks, myocardial infarction (or rule out myocardial infarction), left ventricular hypertrophy, atrial fibrillation, or known coronary artery disease.

With significant cardiac dysfunction, pulmonary function can also be compromised, as with congestive heart failure and pulmonary edema. Thus, perhaps the Chapman reflex points to the lungs were induced secondarily by compromised lung function due to significant cardiac dysfunction. Also, there is overlap of sympathetic innervations for the heart and lung. Sympathetic innervation for the heart and lungs is considered to be from T1 to T9.[9] The restructured control group included 35 patients, 11 of whom had a positive Chapman reflex point for the lung. The remaining 24 patients had a negative Chapman reflex point for the lung. These data are presented in *Table 3*. The new one-tailed *P* value was .014, and the new two-tailed *P* value was .017. The recalculated binomial confidence interval for a correct test was 68.6% (range, 23.7% to 47.2%). The recalculated confidence interval for an incorrect test was 31.4% (range, 19.1% to 45.9%). The binomial confidence intervals are presented in *Table 3*. As the experimental group was not altered by the new groupings, the sensitivity of the examination remained 69%. The new specificity value was also 69%. The new positive predictive value increased to 50%, and the negative predictive value decreased to 82%. The recalculated odds ratio was 4.8. These calculations are summarized in *Table 4*.

Discussion

To incorporate Chapman reflexes into practice, Chapman advocated that one should perform a full physical examination, noting any pertinent traditional osteopathic structural lesions as well as Chapman viscerosomatic reflex points. He would then proceed to check for the anterior gangliform contractions. These have most commonly been described as small, partially fixed masses similar to "small pearls of tapioca" located deep to the skin on the deep fascia.[1,2]

Chapman believed, as it is currently held today, that these reflexes were the result of the sympathetic nervous system's effects on lymphatic tissue.[1-3] The sympathetic nerves of the thorax not only send branches to their respective organs, but also give branches that run with the intercostal nerves. These fibers innervate the intercostal arteries, veins, and lymph tissue between the anterior and posterior layers of the intercostal fascia. If there were an insult to organ functioning, this insult would alter sympathetic tone to that organ. This information is then passed on to the intercostal sympathetic nerves, which results in altered functioning of the tissues they innervate. This causes the gangliform contractions that block lymph flow and cause local inflammation distally.[2-4] Because Chapman believed that these changes were predictable and that they always occurred in the same place for the same organ, he believed that a physician could use these changes as an aid in forming a differential diagnosis and treatment. Owens writes, "A gangliform contraction between the fourth and fifth ribs, close to the sternum, indicates an involvement of the lymphatic drainage of the lower lung, or complete blocking of the lymphatic, with attendant dyspnea in pneumonia, acute miliary tuberculosis, and asthma."[3]

This study demonstrates a significant relationship between palpable tissue texture changes consistent with Chapman reflex points for the lungs in patients with pneumonia. The *P* values for the first scenario were well below the standard .05 (see *Table 4*). In the first scenario, the sensitivity and specificity percentages (69% and 64%, respectively) are encouraging. The first-scenario patients with a positive Chapman reflex for the lung were 3.9 times more likely to have pneumonia than the general population. This suggests that there is value in using a Chapman reflex–oriented examination as an aid in forming a differential diagnosis in patients at risk for pneumonia, especially because the negative predictive value in this scenario was high (87%).

A similar relationship was demonstrated by scenario 2. Again, *P* values were below .05 (see *Table 4*). Sensitivity was

Table 4
Fisher's Exact Probability and Other Calculations

Variable	Value
Scenario No. 1	
☐ One-tailed *P* value	.021
☐ Two-tailed *P* value	.025
☐ Sensitivity	.69
☐ Specificity	.64
☐ Positive predictive value	.37
☐ Negative predictive value	.87
Scenario No. 2	
☐ One-tailed *P* value	.014
☐ Two-tailed *P* value	.017
☐ Sensitivity	.69
☐ Specificity	.69
☐ Positive predictive value	.50
☐ Negative predictive value	.83

unchanged, but the specificity improved to 69%. The odds ratio increased to 4.8, further strengthening the credence that examination for Chapman points are of diagnostic value in patients with pneumonia. Furthermore, while the negative predictive value remained in the 80th percentile, the positive predictive value increased from 37% to 50%.

Although both groupings demonstrated a significant relationship between the presence of Chapman reflex points and patients with pneumonia, the readjusted *P* values were lower than that of the original groupings (*Table 4*). The restructured group had a higher odds ratio (4.80 versus 3.94), as well as an improved positive predictive value. Chapman reflex points are supposed to be locus-specific, yet Owens only lists myocarditis as a reference diagnosis for the heart.[3] Its reflex point is listed as the second intercostal space, bilaterally adjacent to the sternum.[3] It is unclear if this reflex point was supposed to be present in all or only some forms of cardiac disease. It is possible that this may be too simple an explanation. As Patriquin wrote, "Because the textbook that you refer to on Chapman reflex dates from the 1930s, it's clearly in need of updating, and it's certain to me that the reflex described for myocarditis is probably not describing a cardiac condition at all."[1]

There may be yet another explanation. With significant cardiac dysfunction, pulmonary function can also be compromised, as with congestive heart failure and pulmonary edema. Thus, perhaps the Chapman reflex points to the lungs were induced secondarily by compromised lung function due to significant cardiac dysfunction. If that were the case, it would not only explain the difference between the two scenarios, but would allow for the lungs and the heart to retain their individual locus-specific Chapman reflex points. More research is needed to evaluate and confirm the proper Chapman reflex points concerning the heart and any that other organ systems may have.

The examinations were often done early in the patient's stay. As follow-up was not done, any manifestations of the patient's course could not be evaluated. For example, no information was obtained as to the final status of the patients with "rule out myocardial infarction" as the sole admitting diagnosis. These patients were not included in the recalculated data regardless of what their eventual outcome might be. Five of six patients had negative Chapman reflex points on examination. If all of these patients were to rule out (albeit unlikely) and thus be included in the recalculated data, the study's recalculated *P* values would have been .0077 (one-tailed) and .0085 (two-tailed). Sensitivity would still have been 69% and specificity would have been 71%, with an odds ratio of 5.32. As such, future studies may wish to have close follow-up or exclude such patients from the study altogether.

Conclusion

The data presented in this study indicate that hospitalized patients with pneumonia have a high predictability of presenting with Chapman reflex points classified for lung. This relationship was statistically significant. The study also revealed that Chapman reflex point examination might be useful in evaluating patients with a potential diagnosis of pneumonia. Further, this relationship occurs within the first 72 hours after admission or diagnosis and was independent of the etiologic factor of the pneumonia.

Acknowledgments

The authors thank Bruce Stauch and Peggy Stewart, PhD, for their assistance with the statistical analysis.

References

1. Patriquin D. Viscerosomatic reflexes. In: *The Central Connection: Somatovisceral/Viscerosomatic Interaction, 1989 International Symposium*. Athens, Ohio: University Classics, Ltd; 1992.

2. Patriquin D. Chapman's reflexes. In: Ward R, ed. *Foundations for Osteopathic Medicine*. Baltimore, Md: Lippincott Williams & Wilkins; 1997: pp 935-940.

3. Owens C. *An Endocrine Interpretation of Chapman's Reflexes, by the Interpreter*. 2nd ed. Chattanooga, Tenn: Chattanooga Printing and Engraving Co; 1937.

4. Kuchera ML, Kuchera WA. *Osteopathic Considerations in Systemic Dysfunction*. 2nd ed. Columbus, Ohio: Greyden Press; 1994.

5. Soden CH. Lecture notes on Chapman's reflexes. In: *Academy of Applied Osteopathy Yearbooks, 1949*. Ann Arbor, Mich: Edwards Brothers Inc; 1949: pp 201-211.

6. Zucker A. Chapman's reflexes: Medicine or metaphysics. *American Academy of Osteopathy Yearbook, 1995-96*. Indianapolis, Ind: American Academy of Osteopathy; 1996: pp 148-151.

7. Brown A. Clinical aspects of the Chapman's reflexes. In: *Academy of Applied Osteopathy Yearbooks, 1949*. Ann Arbor, Mich: Edward Brothers Inc; 1949: pp 212-214.

8. Mannino JR. The application of neurologic reflexes to the treatment of hypertension. *J Am Osteopath Assoc*. 1979;79(10):607-608.

9. D'Alonzo GE, Krachman SL. Respiratory system. In: Ward R, ed. *Foundations for Osteopathic Medicine*. Baltimore, Md: Lippincott Williams & Wilkins; 1997; pp 441-458.