CASE REPORT

Physical Causes of Anxiety and Sleep Disorders

Scott Cuthbert, DC; Anthony Rosner, PhD, LLD (Hon), LLC

Scott Cuthbert, DC, is chief clinician at Chiropractic Health Center, PC, Pueblo, Colorado. Anthony Rosner, PhD, LLD (Hon), LLC, is research director of the International College of Applied Kinesiology - USA in Brookline, Massachusetts.
(*Altern Ther Health Med*. 2011;17(4):54-57.)

Corresponding author: Scott Cuthbert, DC
E-mail address: cranialdc@hotmail.com

A 64-year-old female presented with long-term anxiety disorders as well as insomnia, constant anxiety and worry, physical and emotional exhaustion, easy irritability, and frequent breathlessness and gasping with significant flushing of the skin. Hypoglycemic episodes, daily fatigue, and cognitive swings were also impairing her work and home happiness. The patient completed a pain drawing and visual analogue scale (VAS) of spinal pain at her initial consultation. On the VAS, she rated her neck pain as 4 out of 10 and headache as 4 out of 10 at the time of her first appointment. When asked how many days a week she had the headaches, the patient replied, "Three or 4 days out of the week."

The Nijmegen Questionnaire, a noninvasive test for hyperventilation syndromes with a high sensitivity and specificity,[1-3] was given to the patient for completion before the examination began. The patient had grades of 3 or 4 in all 16 items of the questionnaire for a total grade of 56; a score of 23 or above (out of 64) is diagnostic of hyperventilation syndrome.[3] The Nijmegen Questionnaire, easily administered and internationally validated, is a simple and accurate indicator of acute or chronic hyperventilation.[1,3] The questionnaire has shown itself to correlate well with other objective signs of hyperventilation: 80% of high scorers reported that their symptoms matched the sensations felt after a provocation test.[3]

Up to 10% of patients in general practices are reported to have hyperventilation syndromes as their primary diagnosis, with a female preponderance of this disorder that ranges from 2:1 to 7:1 (Figure 1).[2,3]

Written informed consent was obtained from the patient for treatment and for publication of this case report.

A battery of orthopedic and neurologic tests for the neck, spine, and pelvis were positive in the identical locations where the muscle impairments and pain were found.

Manual muscle testing (MMT)[4] was used to guide the appropriate interventions that would take the patient from muscle weakness toward strength. To accomplish this, various sensory receptor stimuli were applied; if the muscle dysfunction was improved, this indicated that the weakness was functional in nature and had potential for improvement. This procedure is known in applied kinesiology (AK) as challenge and therapy localization (TL) and has been presented in the literature.[5,6]

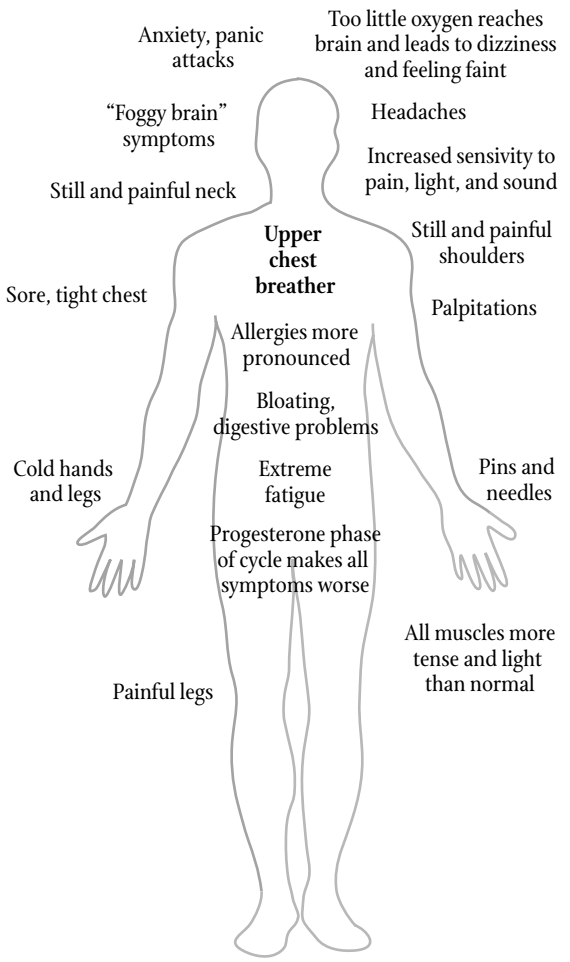

FIGURE 1 Symptoms of Hyperventilation Syndrome
Reproduced with permission from Chaitow, 2002.[2]

The muscle tests listed in this examination as strong were equivalent to 5 on the 5-point strength scale provided in the *Guides to the Evaluation of Permanent Impairment*, 5th edition, by the American Medical Association.[7] Muscles graded 4 or lower were considered weakened, warranting interventions as described below. The results of the first series of MMT are shown in the Table.

The AK ocular lock test showed disorganization in the use of the extraocular eye muscles, indicating neurologic disorganization of cranial nerves III, IV, and VI. When the eyes were turned into a

superior inferior direction, previously strong indicator muscles throughout the patient's body weakened.[4,5] This test has been described previously and indicates that the eyes do not work together efficiently and that when the eyes are used in binocular vision, they create weaknesses in postural muscles.

The suspicion of hyperventilation syndrome from the consultation and the Nijmegen Questionnaire was pursued by testing the diaphragm muscle.[1,7-10] To find the source of the dysfunction, the patient maintained contact on the TL area for the diaphragm while simultaneously stimulating areas related to the diaphragm. In this patient's case, TL to the C3-C5 area (the nerve supply to the diaphragm) corrected the weakness created by TL to the diaphragm area.[8-11]

The AK method of testing the diaphragm muscle consists of the patient touching the area just below the xiphoid process where the leaves of the diaphragm attach just posterior to the lower sternum and ribs. If stimulation of the diaphragm muscle's TL area[8-10] creates weakness in a previously strong indicator muscle (usually after a full inspiration or full expiration is added to the test), then the source of this suspected respiratory dysfunction is investigated.

TABLE Manual Muscle Test Results

	Strong	Weak
Pectoralis (clavicular and sternal divisions)	XX	
Deep neck flexors		XX
Sternocleidomastoid (SCM) (bilaterally)		XX
Anterior scalenes (bilaterally)		XX
Upper trapezius		XX
Lower trapezius (bilaterally)		XX
Cervical extensors (bilaterally)	XX	
Biceps and triceps (bilaterally)	XX	
Deltoid, serratus anticus, subscapularis, teres minor	XX	
Infraspinatus, supraspinatus, levator scapula, rhomboid, opponens pollicis, flexor digiti minimi brevis (bilaterally)	XX	
Diaphragm muscle		XX (weakens indicator muscles on full expiration)
Psoas (bilaterally)		XX
Rectus femoris (seated)		XX (weakens with lumbar flexion
Tensor fascia lata		XX (on right)
Left gluteus medius		XX (on right)
Extensor hallucis (bilaterally)	XX	
Flexor hallucis (bilaterally)	XX	
Adductors (bilaterally)	XX	
Piriformis		XX (on left only)
Gluteus maximus (bilaterally)		XX
Hamstrings (bilaterally)		XX
Rectus abdominus		XX
Posterior tibialis		XX
Anterior tibial and peroneus longus and brevis	XX	

TL is a diagnostic procedure unique to AK and consists of placing the patient's hand over areas of suspected involvement and observing for a change in the MMT. This method is hypothesized to assist the doctor in finding areas that are involved with the muscle dysfunction found on MMT and has been used clinically for more than 30 years.[8] Pollard et al in a recent literature review presented some of the research about the AK concept of TL.[12] Collectively, these data suggest that stimulating the skin and the cutaneomotor reflexes can produce changes in muscle function.

The correlation found between the C3-C5 spinal dysfunction and the phrenic nerve has been suggested in the literature and may produce dysfunction of the diaphragm muscle. The diaphragm muscle's importance to the orthopedics of respiration is well established.[11,13]

The two-hand breathing test also suggested that the patient had a dysfunctional pattern of breathing. The patient was asked to place a hand on the upper abdomen and another on the upper chest (Figure 2). The hands were observed as the patient breathed several times; in this examination, the test was performed before a full-length mirror so that the patient could observe this pattern as well. If the upper chest area moved before the abdominal/diaphragm area and if the movement was significantly toward the ceiling, the secondary muscles of respiration were considered to be overworking and the diaphragm muscle was judged to be impaired.[1-3,7]

Muscle weakness occurred in previously strong indicator muscles upon turning out the lights in the examination room and asking the patient to leave her eyes closed for 10 seconds in the dark. Before the MMT was performed, she was told to be prepared for the MMT pressure so as not to be caught by surprise during the test with the lights off. When the lights were turned on again and she opened her eyes, she regained full strength of all the previously strong indicator muscles.

Because a suspected problem existed relating to insomnia, the pineal gland cranial fault challenge was conducted.[14] This involved asking the patient to press upon the greater wings of the sphenoid bilaterally and then the ramus of the mandible bilaterally, hypothetically narrowing the sphenoid bone and exacerbating this cranial fault. This cranial challenge weakened all previously strong indicator muscles in the body.

Another essential diagnostic procedure used in AK is termed a challenge.[9,10] Challenge is a diagnostic procedure unique to AK that is used to determine the body's ability to cope with external stimuli, which can be physical, chemical, or mental. Cranial challenge has been described in the literature previously.[5,6] After an external stimulus is applied, muscle-testing procedures are done to determine a change in the muscle strength as a result of the stimulus. For joints and muscles, challenge involves pushing the joint or muscle in different directions until the one creating the optimal muscle response is found. Through this approach, ineffective therapies that produced no improvements in muscle strength are rejected and only those that elicit a positive muscle response are used. This guides the treatments given to the patient.

FIGURE 2 Two-hand Breathing Assessment of Breathing Pattern
The examiner notes whether the upper hand moves first and upward toward the ceiling. If this occurs, a dysfunctional breathing pattern is suggested.

TREATMENT

Treatment began with an attempt to correct the causes of the muscular deficits found throughout the body. Once the dysfunctional muscle was identified, several treatment options were open to the doctor. The one most effective in restoring strength to the inhibited muscle (using the challenge and TL test procedures) indicated the best treatment for the patient.[5,6,9-11] Gentle cranial corrections (guided by the AK cranial challenge procedure[10]) were performed to return strength to the muscles of the neck that tested weak and to eliminate the positive lights-out testing. Patients with sleep disturbances may show muscle inhibition on the manual muscle test after the lights are turned off in the room. Correction of this finding involves treatment to the cranial mechanism, by widening the pterygoid plate of the sphenoid bone and the mandible. In AK, this is called the "pineal gland cranial fault." In this case, the patient's sleep pattern was improved after this treatment was administered (Figure 3).

When TL was applied to the diaphragm muscle on full expiration, previously strong indicator muscles weakened, indicating a problem in diaphragm muscle function. After specific challenges to the C3-C5 areas revealed the optimal angle of correction, chiropractic manipulative therapy was performed to these areas of the phrenic nerve and immediately corrected all findings related to faulty mechanics in the diaphragm muscle.[10,12,13] Simultaneous therapy localization to the diaphragm muscle and the C3-C5 area (the location of the phrenic nerve, innervating the diaphragm) corrected the weakness that occurred during manual muscle test with therapy localization to the diaphragm area alone (Figure 4).

Fixations of thoracic spinal joints also were found in both the upper thoracic and lower thoracic spines in this case, and this produced bilateral weakness of the lower trapezius muscles (Figure 5).[2,9,10] Thoracic involvement may have inhibited the expansion of the rib cage, further impairing the biomechanics of respiration.[15]

OUTCOME

The patient reported that at the end of her first 65-minute treatment session, her fatigue, brain fog, and anxiety were much improved. On reexamination, the two-hand breathing test was improved, but the patient still initiated respiration with her upper chest. Breathing pattern instructions were given to her for review and for retraining her upper chest breathing pattern.

Over the next 10 days (4 visits, 15 minutes each), her anxiety decreased and her energy levels increased significantly. The Nijmegen questionnaire was given a second time after her fourth visit. The sum scores of the questionnaire were markedly reduced. Her initial scores of 3 or 4 in all 16 items of the questionnaire were lowered to 0 and 1, indicating that the symptoms of hyperventilation syndrome "never" or "seldom" disturbed her now.

After six visits (covering a 3-week period), her sleep difficulties and anxiety symptoms were resolved, and her follow-up VAS yielded the score of "0" for the spine. The patient discontinued her use of zolpidem tartrate (Ambien), and her self-reported cognitive performance, energy, equanimity, and physical endurance were much improved. The patient has remained free of the anxiety and insomnia symptoms since her first series of six initial AK treatments 3 years ago.

DISCUSSION

The most obvious muscles of respiration are the diaphragm and intercostals. The extent to which patients use their accessory respiratory muscles can be used as a rough guide of the degree of their respiratory distress and impairment.

In this case, a specific interaction between C3-C5 spinal dysfunction and diaphragm muscle dysfunction was apparent. The correlation found between the C3-C5 spinal dysfunction and the phrenic nerve has been suggested in the literature and may produce dysfunction of the diaphragm muscle. The diaphragm muscle's importance to the orthopedics of respiration is well established.[13]

In AK (and in the other professions that employ the MMT), muscular dysfunction is thought to reflect neural function. First the Kendalls in the 1950s[4] then Goodheart in the 1960s[9] followed by many others today have all expanded the construct validity and the clinical usefulness of the MMT[16-18] because of the recognition that muscular imbalance is a key characteristic of spinal and articular dysfunction. The websites of the International College of Applied Kinesiology (ICAK)-USA (www.icakusa.com) and ICAK-International (www.icak.com) present the Applied Kinesiology Research and Literature Compendium, where a collection of research papers on the tenets and practices of AK and chiropractic MMT can be reviewed.

AK is a diagnostic and therapeutic chiropractic technique that

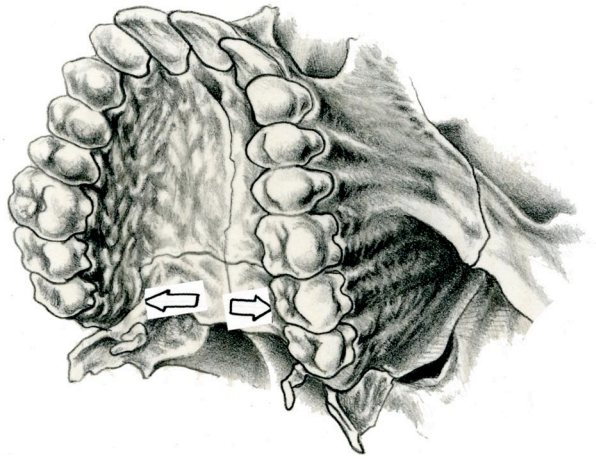

FIGURE 3 Pineal Gland Cranial Fault Correction in Applied Kinesiology

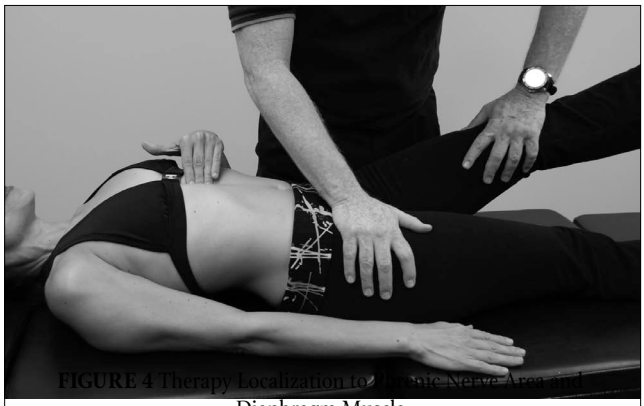

FIGURE 4 Therapy Localization to Phrenic Nerve Area and Diaphragm Muscle

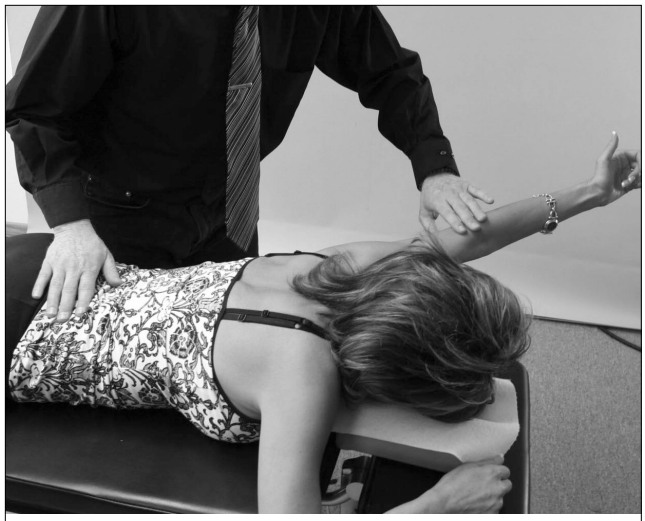

FIGURE 5 Lower Trapezius Manual Muscle Test

has gained peer-reviewed support within the chiropractic, dental, biofeedback, acupuncture, veterinary, and other health care literature.[19-29] The detailed methods used in AK for evaluation and treatment of the respiratory system have been described previously.[11,28,29]

In AK, the assessment became treatment in that muscular inhibitions found with the MMT (especially related to respiratory mechanisms) were given specific physical challenges that improved the patient's muscular strength; these challenges guided the manipulative treatment applied and normalized tissue tensions found with follow-up MMT.

Chiropractic manipulative treatment (CMT) is an underutilized noninvasive treatment for patients with breathing pattern disorders and specifically hyperventilation syndrome. The use of CMT may help decrease morbidity rates in this patient group.

REFERENCES

1. Vansteenkiste J, Rochette F, Demedts M. Diagnostic tests of hyperventilation syndrome. *Eur Respir J*. 1991;4(4):393-399.
2. Chaitow L, Bradley D, Gilbert C. *Multidisciplinary Approaches to Breathing Pattern Disorders*. Edinburgh, Scotland: Churchill Livingstone; 2002:133.
3. van Dixhoorn J, Duivenvoorden HJ. Efficacy of Nijmegen Questionnaire in recognition of the hyperventilation syndrome. *J Psychosom Res*. 1985;29(2):199-206.
4. Kendall HO, Kendall FP, Boynton DA. *Posture and Pain*. Baltimore, MD: Williams & Wilkins Company: 1952.
5. Cuthbert SC, Barras M. Developmental delay syndromes: psychometric testing before and after chiropractic treatment of 157 children. *J Manipulative Physiol Ther*. 2009;32(8):660-669.
6. Cuthbert S, Blum C. Symptomatic Arnold-Chiari malformation and cranial nerve dysfunction: a case study of applied kinesiology cranial evaluation and treatment. *J Manipulative Physiol Ther*. 2005;28(4):e1-e6.
7. Andersson GB, Cocchiarella L, eds; American Medical Association. *Guides to the Evaluation of Permanent Impairment.* 5th ed. Chicago, IL: American Medical Association; 2001:510.
8. Han JN, Stegen K, Simkens K, et al. Unsteadiness of breathing in patients with hyperventilation syndrome and anxiety disorders. *Eur Respir J.* 1997;10(1):167-176.
9. Goodheart GJ. *Applied Kinesiology Research Manual*. Detroit, MI: Privately published; 1964.
10. Walther DS. *Applied Kinesiology: Synopsis*. 2nd ed. Pueblo, CO: Systems DC; 2000.
11. Cuthbert SC. A multi-modal chiropractic treatment approach for asthma: a 10-patient retrospective case series. *Chiropract J Aust.* 2008;38(1):17-27.
12. Pollard HP, Bablis P, Bonello R. Commentary: the ileocecal valve point and muscle testing: a possible mechanism of action. *Chiropr J Aust.* 2006;36(4):122-126.
13. De Troyer A, Estenne M. Functional anatomy of respiratory muscles. *Clin Chest Med.* 1988;9(2):175-193.
14. Goodheart GJ. *Applied Kinesiology Research Manual.* 15th ed. Detroit, MI: Privately published; 1979.
15. Lewit K. Relation of faulty respiration to posture, with clinical implications. *J Am Osteopath Assoc*. 1980;79(8):525-529.
16. Janda V. *Muscle Function Testing*. Butterworths, London; 1983.
17. Janda V, Frank C, Liebenson C. Evaluation of muscular imbalance. In: *Rehabilitation of the Spine: A Practitioner's Manual.* 2nd ed. Philadelphia, PA: Lippincott, Williams & Wilkins; 2007:203-225.
18. Cuthbert SC, Goodheart GJ Jr. On the reliability and validity of manual muscle testing: a literature review. *Chiropr Osteopat*. 2007 Mar 6;15:4.
19. Christensen MG, Delle Morgan DR. *Job Analysis of Chiropractic: A Project Report, Survey Analysis, and Summary of the Practice of Chiropractic Within the United States*. Greeley, CO: National Board of Chiropractic Examiners. 1993;78.
20. Walther DS. Applied kinesiology and the stomatognathic system. In: Gelb H, ed. *New Concepts in Craniomandibular and Chronic Pain Management.* London: Mosby-Wolfe. 1994:349-368.
21. Schmitt W. Individualized assessment using applied kinesiology procedures. In: Bassman L, ed. *The Whole Mind: The Definitive Guide to Complementary Treatments for Mind, Mood, and Emotion*. Novato, CA: New World Library, 1998:187-207.
22. Gelb G. Applied kinesiology. In: *Killing Pain Without Prescription*. New York, NY: Harper & Row Publishers, Inc. 1993:165-172.
23. Tiekert CG. Applied kinesiology: its use in veterinary diagnosis. *Vet Med Small Anim Clin*. 1981;76(11):1621-1623.
24. Larson D. Physical balancing: acupuncture and applied kinesiology. *Am J Acupunct*. 1985;13(2):159-162.
25. Gregory WM, Mills SP, Hamed HH, Fentiman IS. Applied kinesiology for treatment of women with mastalgia. *Breast*. 2001;10(1):15-19.
26. Schmitt WH Jr, Cuthbert SC. Common errors and clinical guidelines for manual muscle testing: "the arm test" and other inaccurate procedures. *Chiropr Osteopat*. 2008 Dec 19;16:16.
27. Gin RH, Green BN. George Goodheart, Jr., D.C., and a history of applied kinesiology. *J Manipulative Physiol Ther*. 1997;20(5):331-337.
28. Masarsky CS, Weber M. Somatic dyspnea and the orthopedics of respiration. *Chiro Tech*. 1991;3(1):26-29.
29. Masarsky CS, Weber M. Chiropractic management of chronic obstructive pulmonary disease. *J Manipulative Physiol Ther*. 1988;11(6):505-510.