CASE STUDY

Improvement in a Pediatric Patient with Neurofibromatosis Type 1 and Asthma: A Case Report

Brian Kachinsky, D.C.[1] & Jill Kachinsky, D.C.[2]

Abstract

Objective: To evaluate the chiropractic care on a 3 year-old boy with asthma as an alternative option to traditional medical care.

Clinical Features: A 3 year-old male with a history of Neurofibromatosis Type I, asthma and ear infections. He was having frequent asthmatic episodes requiring emergency department visits two times per month. His mother sought chiropractic care to attempt to control his exacerbations of asthma. He had a previous RSV (Respiratory Syncytial Virus) infection

Intervention and Outcomes: The patient was adjusted utilizing the Diversified chiropractic technique at a frequency of two to three times per week. Within one month after beginning care the patient no longer had violent exacerbations of his asthma and was able to sleep through the night and decrease his rescue inhaler usage.

Conclusions: This specific case shows a positive response to chiropractic care in the treatment of uncontrolled asthma in a three year old male with a history of Neurofibromatosis type 1, ear infections and a previous RSV infection. However, more research is needed to explore chiropractic as a viable alternative to medical care in these types of cases.

Key Words: *Neurofibromatosis Type 1, asthma, chiropractic, antibiotics, vertebral subluxation*

Introduction

Neurofibromatosis (NF) is described as a common autosomal dominant neurocutaneous syndrome, resulting from functional inactivation of the NF1 gene[1]. It affects between 1 in 3,000 to 1 in 4,000 individuals depending on the source.[1-5] It was first described in 1882 by Von Recklinghausen and has distinguishing clinical features which include café-au-lait spots (hyperpigmentary abnormalities) commonly called the "coast of California appearance", iris hamartomas which are called Lisch nodules and peripheral nerve sheath tumors.[1,2,5] The Neurofibromin gene (NF1) is known to be a tumor suppressor gene and when a mutation occurs it inactivates the neurofibromin and leads to uncontrolled cell growth and tumorigenesis.[1,2] Other sequelae of NF may include learning disorders such as attention deficit disorder, spinal manifestations such as scoliosis, osseous dysplasia and soft tissue dysplasia, headaches and hypertension.[1,2] Diagnosis is based on the findings of two or more of the following:

1. Private Practice of Chiropractic, Cartersville, GA
2. Private Practice of Chiropractic, Cartersville, GA

1. 6 or more café au lait macules, >5mm before puberty, >15mm after puberty
2. 2 or more neurofibromas
3. 1 or more plexiform neurofibromas
4. axillary or inguinal freckling
5. optic glioma
6. 2 or more iris hamartomas
7. 1 or more distinctive bone lesions (eg, sphenoid dysplasia, pseudoarthrosis)
8. a first-degree relative who also meets these diagnostic criteria for NF-1. [2]

While some authors also include NBO's as diagnostic criteria which are described as Neurofibromatosis Bright Objects and are bright white spots that show up on brain MRI in many patients with Type 1 NF.[4]

Asthma is a respiratory condition that is characterized by inflammation, increased responsiveness of the airways, and mucus production. It has many provoking factors such as pollens and molds, animal dander, dust, exercise, aspirin, and cold air.[6,7] Besides being a multifactorial condition, it is the most common chronic disease of childhood.[8] The prevalence of asthma is steadily increasing.[7-12] It was estimated that in 2005 there were 22.2 million people in the U.S that currently had asthma.[10] One paper reported a 50% increase in the prevalence of pediatric asthma and a 70% increase in the mortality rates since 1980.[8] Because asthma causes many symptoms including breathlessness, wheezing, chest tightness and coughing, some studies in the past have focused on immune, neurogenic, and vascular abnormalities.[13] Antibiotic use has also been implicated in the possible causes of asthma.[6,14] In a study by Thomas et al, they found that antibiotics can make the gut sterile resulting in immune system function alteration. A correlation was found between antibiotic usage and asthma especially if given within the first year of life.[14]

There are several treatment options for asthma such as CAM (Complementary and Alternative Medicine) which includes chiropractic care, acupuncture, and herbal remedies. The traditional medical treatment consists of inhaled corticosteroids and long acting beta-2 agonists.[12,15] The purpose of this paper is to describe the outcomes of chiropractic care received by a 3-year old boy with Neurofibromatosis Type 1 and asthma.

Case Report

History

A three year old male previously diagnosed with Neurofibromatosis presented for chiropractic care. He had three café au lait spots at birth and by 6 months he had over twenty. An MRI was performed at 6 months and showed NBO's (which some clinicians consider diagnostic for NF), as well as tumors on his optic nerve, optic glioma.[4] Genetic testing was done for the immediate family members and was negative. The geneticist stated the child was a random mutation. At 5 months old he had been given antibiotics for ear infections. He also had an RSV infection at 13 months and was hospitalized for 5 days. At the age of 18 months, he began chemotherapy to stall the growth of the tumors on the optic nerve. It was at this time that his mother stated he began to struggle with allergy-induced asthma. Once the chemotherapy regime was complete the asthma began to worsen which required visits to the emergency department at least two times per month. His mother described the asthma as atypical, meaning he was not wheezing but instead coughing through the night to the point of vomiting. According to the mother, he was being treated with Albuterol via a rescue inhaler every 20 minutes for an hour to make the coughing stop and it seemed to do nothing. When using the rescue inhaler was unsuccessful, they would go to the emergency department and he would be treated with more Albuterol and an oral steroid medication. The mother also stated there were times when she felt she did not know her son because he became "wild" from the asthma drugs.

Chiropractic Examination

Upon examination, posture analysis revealed right sided head tilt and left high shoulder. Thermography was utilized via the Nervoscope instrument. Motion palpation was performed and showed a restriction at the C1/C2 motion segment with right lateral flexion and right rotation. Static Palpation demonstrated taut/tender fibers at the C1 vertebrae on the right side as well as bilateral increased muscle tension at the 2nd thoracic vertebrae. Radiographs were not obtained and the decision was made that if there was not sufficient improvement within 2 months radiographs would be taken to further assess the situation.

Intervention

The patient was analyzed utilizing the Nervoscope instrument which has two thermal sensors that are composed of metal wires.[16] These thermal sensors pick up surface temperature and will yield a qualitative assessment of thermal asymmetry.[16] The amount of difference in temperature is thought to be directly proportional to the amount of neurophysiologic involvement caused by the vertebral subluxation.[16] However, temperature difference alone does not verify the existence of vertebral subluxation due to the fact that hypermobile segments may cause aberrant nervous system activity.[16]

The reliability of the Nervoscope has been tested statically and in the dynamic scanning mode. The consistency in the measurement of the differential was determined to be excellent when tested by placing and then replacing the thermocouples statically on the same location on the skin. In dynamic scanning mode there was good intra and interexaminer reliability when used in the thoracic region.[16]

Specific spinal adjustments were delivered to the upper cervical and upper thoracic regions where subluxations were identified utilizing the Diversified technique. The Diversified technique is one of the most common techniques in chiropractic being utilized by 95.9% of chiropractors. Diversified adjustments consist of a high velocity, low-amplitude thrust that usually results in a cavitation of a joint.[17] Many joints of the body can be treated with the Diversified technique.[17,18]

Outcomes

The patient received a total of 57 adjustments in 15 months, most of which were in the upper cervical and thoracic regions. He was seen two to three times a week when care began. Within one month after starting care, the asthmatic attacks resolved and there was no need for any more medications. In fact, the mother stated within a three month period, the child had only one attack in which he needed to use the rescue inhaler which he used three times over a period of twelve hours. His mother stated she believed chiropractic care improved her son's overall immune function as well as his asthma as he demonstrated overall improvement in his health.

Discussion

The pathophysiology of asthma is an underlying airway inflammation. There is increasing evidence that the underlying process driving and maintaining the asthmatic inflammatory process is as abnormal or inadequately regulated CD4+T-cell immune response to otherwise harmless environmental antigens.[7,19] A Brazilian study found that there was a significantly higher risk for wheezing at age six in children who had a RSV infection before the age of three.[19] Asthma is described as "a chronic inflammatory disorder of the respiratory airways, characterized by bronchial airway inflammation resulting in increased mucus production and airway hyper responsiveness resulting in decreased air flow, and marked by recurrent episodes of wheezing, coughing, and shortness of breath."[19]

Asthma is a major global health problem in children.[12] There are approximately 300 million people in the world who are afflicted with asthma and it is estimated that there may be an additional 100 million more asthmatics by 2025.[11] The morbidity and mortality have increased in the last 25 years as have the costs associated with its treatment.[7] Over a ten-year period from 1975 to 1985 in the United States, hospital inpatient care represented the largest component cost of direct medical expenditures.[11] However in 1994 medications were reported to be the largest component cost of direct medical expenditures.[11] The annual estimates rose from approximately $1.4 billion (1985 adjusted dollars) to $2.5 billion.[11] Combined with these costs people are leaning towards alternative options such as CAM therapies.

CAM therapies are used by patients who have chronic conditions such as asthma. One-third of the US population has tried some form of CAM.[15] In Australia that number reaches 50%. Some of the reasons for patients utilizing CAM therapies are the fear of side effects from medications, word of mouth, and a desire for their treatment to be more personalized.[15]An article by Angsten stated "asthma patients and their parents may be interested in complementary medicine because of the long-term nature of their illness and perceived toxicities of therapies such as inhaled corticosteroids."[9] A recent paper by Sinha et al found that RCT's in children with asthma mostly assess the effects of therapies on short term disease activity, but rarely consider the effects on long term progression of disease.[12]

Chiropractic has been identified as an alternative that can help people with asthma. It is a largely growing profession and has become the third largest group of health professionals in the United States despite opposition from the government and organized medicine.[20] The body's respiratory center is located in the brain stem, specifically the medulla oblongata and the pons and it is thought that an upper cervical subluxation may create localized spinal segmental reflexes affecting both the brainstem and the upper and lower motor neurons of the cervical spine and their synapses.[7] The pulmonary plexus is also known to innervate the lungs. It arises from the vagus nerve as well as from the T2-T5 nerve roots. It is thought to be sympathetic depression and increased parasympathetic response in asthmatic patients, thus, the premise is that an increase in the sympathetics by a spinal adjustment would be beneficial to the patient.[7]

In a study by Hawk et al, the adverse effects of chiropractic care, which also included Spinal Manipulative Therapy (SMT), were indeed rare and when present they were transient and not severe.[21] The researchers concluded this type of care provided benefit to asthma patients as well as cervicogenic vertigo, and infantile colic. The same study also described the paucity of RCT's and demonstrated the need for further RCT's to be performed.[21] Another study by Graham, et al looked at the neurogenic mechanisms of asthma related neuropeptides such as substance P, calcitonin-related-peptides and neurokinin A which is a bradykinin. The researchers found that these substances have vascular permeability and mucus secretagogue activity, bronchial vascular dilation effect, and bronchoconstrictor activity.[22] These neurotransmitters are thought to be released from tissues in the presence of a vertebral subluxation and may possibly initiate and/or complicate the asthmatic condition.[22]

Balon et al discusses the theory behind the expectation of benefit an asthmatic may gain from chiropractic care. The first part of their theory is that a subluxation causes a reflex irritation of somatic and autonomic nerves at the spinal cord and nerve-root levels. The second part is that this alteration ultimately affects chest wall function or may possibly affect airway tone or responsiveness. In the same study, researchers found that symptoms of asthma and use of (beta)-agonists decreased and the quality of life was increased. However, there were no statistically significant differences between the control and experimental groups.[18]

Conclusion

In the case study reported on here the patient experienced an improvement in his respiratory symptoms after one month of chiropractic care. He was able to sleep through the night and decrease use of the inhaler. In fact, he had only one asthmatic episode where he required the use of his inhaler. This case has some positive indications for an alternative treatment of asthma given the huge economic burden that the disease carries with it.[11] However, given the small number of randomized controlled trials (RCT's) published there needs to be more research performed and published to further explore chiropractic as a viable alternative to medical care in the treatment of asthma related conditions.

References

1. Bennett E, Thomas N, Upadhyaya M. Neurofibromatosis type 1: its association with the Ras/MAPK pathway syndromes. J Pediatr Neurol. 2009;7(2)105-15.
2. Gajeski BL, Kettner NW, Awwad EE, Boesch RJ. Neurofibromatosis type I: clinical and imaging features of Von Recklinghausen's disease. J Manipulative Physiol Ther. 2003;26(2):116-27.
3. Lama G, Graziano L, Calabrese E, Grassia C, Rambaldi PF, Cioce F, et al. Blood pressure and cardiovascular involvement in children with neurofibromatosis type 1. Pediatr Nephrol. 2004;19:413-18.
4. Griffiths PD, Blaster S, Mukonoweshuro W, Armstrong D, Milo-manson G, Cheung S. Neurofibromatosis type 1: a proliferative potential? Pediatrics. 1999;104:e49.
5. Charrow J. An 11 year-old girl with multiple hyperpigmented macules. Pediatr Ann. 2006;35(5):325-26.
6. Blum CL. Role of chiropractic and sacro-occipital technique in asthma treatment. J Chiropr Med. 2002;1:16-22.
7. Gibbs AL. Chiropractic co-management of medically treated asthma. Clin Chiropr. 2005;8:140-44.
8. Bronfort G, Evans RL, Kubic P, Filkin P. Chronic pediatric asthma and chiropractic spinal manipulation: a prospective clinical series and randomized clinical pilot study. J Manipulative Physiol Ther. 2001;24:369-77.
9. Angsten JM. Use of complementary and alternative medicine in the treatment of asthma. Adolesc Med. 2000;11(3):535-46.
10. Fedorchuk C. Correction of subluxation and reduction of dysponesis in a 7 year-old child suffering from chronic cough and asthma: a case report. J Vert Sublux Res. 2007:1-5.
11. Bahadori K, Doyle-Waters MM, Marra C, Lynd L, Alasaly K, Swiston J, et al. Economic burden of asthma: a systematic review. BMC Pulm Med. 2009 May19;9:24.
12. Sinha IP, Williamson PR, Smyth RL. Outcomes in clinical trials of inhaled corticosteroids for children with asthma are narrowly focussed on short term disease activity. PLoS One 4(7): e6276.
13. Elster EL. Upper cervical chiropractic care for a nine-year-old male with Tourette Syndrome, Attention Deficit Hyperactivity Disorder, depression, asthma, insomnia, and headaches: a case report. J Vert Sublux Res. 2003:1-11.
14. Thomas M, Custuvic A, Woodcock A, Morris J, Simpson A, Murray CS. Atopic wheezing and early life antibiotic exposure: a nested case-control study. Pediatr Allergy Immunol. 2006;17:184-8.
15. Graham DM, Blaiss MS. Complementary/alternative medicine in the treatment of asthma. Ann Allergy Asthma Immunol. 2000;85:438-48.
16. Plaugher G. Textbook of clinical chiropractic-a specific biomechanical approach. Baltimore: Williams & Wilkins; 1993.
17. American Chiropractic Association Claim Solutions Work Group. Claim adjuster index(CAI) no.7: chiropractic techniques[internet]. Arlington,VA:American Chiropractic Association;2003[cited 2009 Sep 1]. Available from: http://www.acatoday.org/pdf/PDR/H-Chiropractic%20Techniques.pdf
18. Balon J, Aker PD, Crowther ER, Danielson C,Cox PG, O'Shaughnessy D, et al. A comparison of active and simulated chiropractic manipulation as adjunctive treatment for childhood asthma. N Engl J Med. 1998;339(15):1013-20.
19. Miller AL. The etiologies, pathophysiology, and alternative/complementary treatment of asthma. Altern Med Rev. 2001;6(1):20-47.
20. Shekelle PG. Editorial: what role for chiropractic in health care? N Engl J Med. 1998;339(15):1074-75.
21. Hawk C, Khorsan R, Lisi AJ, Ferrance RJ, Evans MW. Chiropractic care for nonmusculoskeletal conditions: a systematic review with implications for whole systems research. J Altern Complement Med. 2007;13(5):491-512.
22. Graham RL, Pistolese RA. An impairment rating analysis of asthmatic children under chiropractic care. J Vert Sublux Res. 1997;1(4):1-8.