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# CASE STUDY

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## Improvement in a 6 year-old Child with Autistic Spectrum Disorder and Nocturnal Enuresis under Upper Cervical Chiropractic Care

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### ABSTRACT

**Objectives:** To report on the improvement of a pediatric patient with nocturnal enuresis and Autistic Syndrome Disorder (ASD), after undergoing upper cervical specific chiropractic care.

**Clinical Features:** A 6 year-old boy who presented for chiropractic care with a history of nocturnal enuresis and ASD. The child experienced a traumatic birth and at the time of chiropractic care was following the Defeat Autism Now! (DAN!) Protocol.

**Intervention and Outcomes:** An atlas subluxation complex was determined based on clinical data collected at the first visit. Objective clinical evaluation included: static palpation, motion palpation, radiographs, paraspinous thermography, supine leg length inequality, as well as measurements of hip leveling, and bilateral weight distribution. National Upper Cervical Chiropractic Association (NUCCA) upper cervical specific adjustments were administered over a 15-week period. There was an overall reduction in the patient's pattern of atlas subluxation, in addition to successful resolution of nocturnal enuresis and marked improvement in both his social interactions and learning difficulties at school.

**Conclusions:** The case presentation of a 6 year-old boy with nocturnal enuresis and Autistic Spectrum Disorder who underwent upper cervical chiropractic care is described. The reduction of vertebral subluxation was related in time with the resolution of nocturnal enuresis and significant improvements in behavioral patterns. Further research in both subject areas is advocated.

**Key Words:** *nocturnal enuresis, chiropractic, subluxation, upper cervical, children, autism*

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### Introduction

Primary nocturnal enuresis, or bed-wetting, affects five to seven million children over the age of six in the United States.<sup>1,2</sup> Embarrassment, lack of control, and low self-esteem are only a few emotional repercussions that the child endures. However, it is not only the child who is affected, the family

also faces its own psychological challenges and economic impacts that are involved in caring for the child.<sup>3,4</sup> Ward-Smith and Barry<sup>1</sup> describe bedwetting as the cause of this psychological distress, rather than the result of psychological distress.<sup>1,4</sup>

The Diagnostic and Statistical Manual of Mental Disorders, 4<sup>th</sup> edition (DSM-IV), defines the criteria for enuresis to be: voiding of urine at least two occurrences per week for at least 3 months; the child must be at least 5 years of age

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(chronologically or developmentally); and the child's urinary incontinence must not be due exclusively to the direct physiological effects of a substance or a medical condition.<sup>4-9</sup> The three main causes of primary nocturnal enuresis include nocturnal polyuria, bladder over-activity at night, and disorder of arousal.<sup>3, 9, 10</sup>

A small body of evidence has linked bed-wetting to behavioral issues in children, such as Autistic Syndrome Disorder (ASD).<sup>11</sup> Such evidence provides a small view into the interference occurring between the child's urogenital and neurological systems. A 1996 cross-sectional data analysis conducted by Byrd et al.<sup>11</sup> revealed that extreme scores on the Behavior Problem Index (BPI) were more common among younger boys that wet the bed.<sup>11</sup>

Characterizations of behavioral problems included: antisocial behavior patterns, anxious or depressed mood, headstrong, hyperactive, peer conflict or social withdrawal, and immaturity.<sup>11</sup> Williams et al.<sup>12</sup> found that the parents of 210 children with autism reported a 44-83% incidence of poor sleep, which may attribute to an increase in the child's aggression and irritability, often characteristic of autism; it was also noted that 27.7% of poor sleep was attributed to bed wetting.<sup>12</sup>

It is estimated that an average of 1 in 110 children in the United States have ASD and it is found to be more common among males: 1:70 versus females: 1:315.<sup>13</sup> Autistic Spectrum Disorder includes autism, childhood disintegrative disorder, Rett syndrome, Asperger syndrome, and pervasive development disorder-not otherwise specified (PDD-NOS).<sup>14</sup> A great deal of media coverage has been directed towards autism and spectrum disorders in the past decade. There has also been a good deal of research by several factions of health care investigating the etiology, treatment, and prevalence of these disorders.<sup>15</sup>

This recognition has played a significant role in allowing parents and clinicians to identify the signs and symptoms at an earlier age. A diagnostic criterion for autism issued by the World Health Organization in 1993 indicates that at least six symptoms within the following categories must be included: impaired social interaction; abnormalities in communication; or restricted, repetitive, and stereotyped patterns of behavior, interests, and activities.<sup>14</sup>

## **Case Report**

### *Patient History*

A six year-old male with chronic episodes of nocturnal enuresis as well as signs and symptoms of autism presented for upper cervical chiropractic care. The child was first diagnosed with Autistic Spectrum Disorder (ASD) at two years of age.

The patient's mother reported that the pregnancy was complicated as the expansion of her abdominal region caused her thigh to numb. The mother noted that she had taken Levoxyl for hypothyroidism throughout the pregnancy. She stated that the child's hospital delivery and birth were traumatic. She noted having problems with vaginal dilation

which resulted in the inability for the child to progress through the birth canal. As a result, the child was delivered via cesarean section. The mother noted that the patient's forehead was blue immediately after being birthed. The patient was breast fed for the first three months following his birth and formula fed for the remainder of his first year.

It was noted by the patient's mother that her son had endured several falls as an infant, as well as had been afflicted with multiple ear infections. Over the course of the patient's lifetime, he had received three to five series of injected antibiotics and had taken three to five oral prescriptive antibiotics for ear infections. In addition, the patient reportedly suffered from respiratory allergies and allergies associated with mosquito and insect bites.

Prior to and over the course of care, the patient followed the Defeat Autism Now! (DAN!) Protocol, which includes taking vitamins C, K, E, D, B12 (injected), B6, Co-Enzyme Q10, multi-vitamins, probiotics, multi-minerals, taurine, carnitine, and detoxification supplements. The patient had also received Ca-EDTA suppositories from the age of two years old to six years old and stopped six months prior to beginning chiropractic care.

### *Chiropractic Examination*

The initial chiropractic exam entailed observation, static palpation, motion palpation, postural evaluation of the hips, weight distribution, supine leg length comparison, paraspinous thermography instrumentation, and cervical radiographs. The radiographs included were nasium, vertex and lateral cervical views. (Figure 1-3)

Motion palpation has been shown to be an effective assessment for normal and aberrant spinal range of motion.<sup>16,17</sup> This assessment tool has helped to identify areas of motion restriction or joint dysfunction and was found to be a responsive tool following an adjustment of the cervical spine.<sup>16,17</sup>

Static palpation has been shown to enhance the clinician's ability to recognize the sites of pain or tenderness in order to determine the correct regions of the spine in which a spinal misalignment may be present.<sup>17,18</sup> The inter- and intra-examiner reliability of clinicians to locate painful and tender points along the spine and sacroiliac joints has been determined to be high.<sup>17,18</sup>

An assessment tool frequently used in the National Upper Cervical Chiropractic Association (NUCCA) procedure involves measuring pelvic distortion in the frontal (horizontal), transverse (rotatory), and fixed-point (vertical) planes using hip calipers.<sup>19,20</sup> This is done in conjunction with measuring the bilateral weight differential of the patient.

The patient steps onto two individual weight scales, the right foot on one scale and the left on the other and the weight differential is calculated.<sup>19,20</sup> According to Seemann,<sup>19</sup> when the pelvis measurement returns to zero degrees in all three planes and the bilateral weight differential decreases towards zero, there has been a successful reduction of the atlas subluxation.<sup>19,20</sup>

In accordance with NUCCA protocol supine leg length comparison is performed on the patient while lying in a supine position with their feet hanging slightly off the end of the table and neck in a slightly flexed position.<sup>21</sup> This comparison is done in order to determine the presence of any neurological interference from an upper cervical misalignment.<sup>22</sup>

Based on Grostic's Dentate Ligament – Cord Distortion theory, a misalignment of the upper cervical vertebrae via the dentate ligament results in spinal cord tension and irritation, thus affecting the muscles of the pelvic girdle and lower extremities, prompting contracture of the muscles and causing the appearance of a short leg.<sup>20-23</sup> The measurement of supine leg length differentials is considered to be of high inter- and intraexaminer reliability.<sup>20,24</sup>

Paraspinal thermography has been used in chiropractic analysis as an assessment tool for the neurological component of the vertebral subluxation.<sup>25, 26</sup> Asymmetrical deviations in skin temperature indicate dysfunction of the sympathetic nerves innervating the vascular beds of the skin.<sup>26,27</sup> According to McCoy et al.,<sup>26</sup> excellent evidence of inter- and intraexaminer reproducibility have been determined using commercially available paraspinal thermography.<sup>26</sup>

#### *Chiropractic Impressions/Diagnosis*

Motion palpation findings indicated a right fixation of atlas. Static palpation revealed tension around the left atlas structure as well as hypertonic muscles spasm ranging from the lower cervical spine to the thoracic spine.

Postural analysis of the patient revealed a right head tilt, right low shoulder by 2°, and un-leveling of the left pelvis lower by 2°. The weight distribution of the patient was determined to be 31 lbs on the right and 28 lbs on the left. Supine leg length revealed a contracted right leg of 3/8 inch shorter than the left.

Pre-adjustment radiographic x-rays revealed right atlas laterality 5.14 degrees from the center, right head tilt by 8.46°, and segmental rotation 3° posterior. (Figures 1-3) Collectively these findings indicated evidence of a vertebral subluxation of atlas.

#### *Intervention*

Following the initial chiropractic examination, the findings were assessed using NUCCA protocol and the patient's management plan was established so care could begin immediately. The NUCCA procedure is based on a tonal model, which views the spine and nervous system as a functional unit and emphasizes the importance of functional outcomes.<sup>28</sup>

It was advised that the patient be assessed for upper cervical subluxation two times per week for the first 12 weeks. The patient was compliant with the established care plan.

An atlas adjustment was given on the second visit. The vector for the adjustment, determined by x-ray analysis, was right atlas laterality, inferior 1 ½ inches and posterior 3 inches. The headpiece was placed at the D position, with a contact of -0.24 inches below the mastoid process with a clockwise torque.

The atlas vertebral complex was categorized as a Basic Type II Misalignment. Specific upper cervical side-lying adjustments, based on NUCCA protocol and procedures were administered.

The adjustment set-up entailed the clinician to position the pisiform of his superior hand over the patient's right atlas transverse process, while stabilizing his contact hand at the wrist with the opposite hand. The contact arm and the top of the clinician's sternum was aligned in a vector directed 1 ½ inches inferior and 3 inches posterior to his contact. The clinician then applied a light contact and shallow thrust, which was elicited by contracting the head of the triceps muscle along the vector, in order to reduce the atlas subluxation.<sup>29</sup>

Motion palpation, static palpation, supine leg length comparison, and hip leveling were assessed at each visit to determine the presence of an atlas subluxation complex. Paraspinal thermography of the cervical spine was performed a total of eight times.

The initial two thermographic scans, performed at the third and fifth visits, revealed a greater right heat differential in the mid-cervical region. Visits seven and thirteen revealed equal heat differentials side to side; and visits fourteen through seventeen demonstrated heat deviation to the right upper cervical region. A progressive re-evaluation was performed during week 11 visit 20. The follow up nasium view revealed marked improvements well. (Figure 4) Based on the results of the re-evaluation, it was advised that the patient continue care at a frequency of one time per week.

#### *Outcome*

Upon re-evaluation the patient's mother reported complete resolution of bed-wetting since the initial exam. She also reported that she had observed a 70% improvement in his ASD, most notably that he had performed better at school and displayed greater social skills. Over the course of 15 weeks the patient was seen 25 times. The patient's records indicated a decreased incidence of an atlas subluxation complex.

Objective findings on the 25<sup>th</sup> visit documented no abnormal neurological or musculoskeletal findings. Also noted, there was no discrepancy in leg length in the supine position, and there was symmetry of the cervical spine as measured via thermographic scans. These findings indicate reduction of an atlas subluxation complex. The child continues to be checked for upper cervical subluxation.

#### **Discussion**

##### *Nocturnal Enuresis*

The pathophysiology of primary nocturnal enuresis is due to a disparity between the bladder capacity of the child (too small), nocturnal urine production (too large), and the child's inability to wake up to empty his/her bladder.<sup>3</sup> Hjalmas et al.<sup>3</sup> noted that the child's ability to wake up has to do with sleep and arousal.

Preliminary interventions for nocturnal enuresis include counseling, provision of information regarding nocturnal

enuresis, positive reinforcement from family members and physicians, and increasing motivation of the child.<sup>3</sup> Initial steps include awakening the child to void at times usually associated with bed-wetting; implementing positive reinforcement for desired behavior; bladder training; and minimizing fluid and caffeine intake before bedtime.<sup>7</sup>

Lee et al.<sup>30</sup> noted that the common self-help strategies that were most effective involved waking the child at night to void (38.1%), restricting water intake (25.7%) and consulting a health worker (13.7%).<sup>30</sup> Multiple studies emphasize that positive reinforcement in conjunction with a motivated child and parent are necessary for the success of combating nocturnal enuresis.<sup>2,3,7,10</sup>

First-line treatment recommendation is supported by evidence-based research on the subject.<sup>3</sup> It is recommended that children should not begin treatment prior to 6-years of age.<sup>3</sup> Thiedke<sup>2</sup> discussed the possible treatments for nocturnal enuresis, these include bedwetting alarms and other non-pharmacologic treatments such as elimination diet, hypnosis, retention control, biofeedback, and acupuncture.<sup>2</sup> Common pharmacologic treatments utilized include Desmopressin (DDAVP) and imipramine (tofranil), a synthetic analog of arginine vasopressin.<sup>2,6</sup> At this time the effect of imipramine on nocturnal enuresis has not been documented by clinical research.<sup>2,6</sup>

Older children with greater social pressures and low self-esteem are treated with arousal alarm treatment and pharmacotherapy; medications are typically not considered or used after the age of seven.<sup>7</sup> Alarm treatment is based on a device used at night or during the day; it provides a strong sensory signal, usually but not necessarily acoustic, immediately upon the occurrence of incontinence.<sup>3,10</sup> This type of treatment is based on the highest levels of evidence and has demonstrated the best results when associated with optimal motivation of the child and family.<sup>3</sup>

Factors that predict a good response of enuresis alarms include a cooperative family, no coexisting emotional and behavioral problems, small bladder capacity, and frequent bed-wetting (four or more wet nights per week).<sup>3,9</sup> According to Nevés et al.<sup>10</sup> initial success with 'full response' is defined as 100% decrease, and 'response' is defined as 90% or greater decrease or less than one symptom recurrence monthly.<sup>10</sup> 'Complete success' is defined as no relapse after 2 years of treatment intervention.<sup>10</sup>

### *Chiropractic Literature*

The connection between the reduction of the vertebral subluxation and the resolution of nocturnal enuresis may best be explained by the mechanism suggested by Rodnick and Rodnick.<sup>4</sup> They propose that, "the reduction of the vertebral subluxation may reverse the neurological deficits to restore normal function to the urinary system and relieve associated behavior problems."<sup>4</sup>

To date, studies available in the chiropractic literature have shown mixed results. Leboeuf et al.<sup>31</sup> found that 25% of the 171 children in the study were successful and 15.5% were considered 'dry' by the end of the treatment period.<sup>6,8,9,31</sup>

Success was defined as a 50% or more reduction in wet nights per week. "Dry" was defined as bedwetting no more than two times per 14 days with an unrestricted fluid intake.<sup>6,8,9,31</sup> However, Leboeuf et al.<sup>31</sup> did not consider chiropractic care to be any more effective than any other treatment.

In contrast, a clinical trial performed by Reed et al.<sup>8</sup> revealed that out of 46 enuretic children between ages five and thirteen, 25% of the children in the treatment-group had a 50% or more reduction in wet night frequency from baseline to post-treatment assessment. None among the control group had such reduction.<sup>6,8,9</sup> It was also found that spinal dysfunction in primary nocturnal enuretic children was predominantly located in the pelvic (43%) and upper cervical (atlas- 24%) regions of the spine, which correlates with the innervation of the micturition centers.<sup>8</sup>

Ressel and Rudy<sup>32</sup> evaluated the neuromuscular, biomechanical, neuro-homeostatic development and patterning of 650 children, focusing on the Pelvic Distortion Subluxation Complex (PDSC). The PDSC was used by the authors in order to describe a number of adaptive neurological patterns and kinesio-pathological reflexes that may promote a myriad of conditions.<sup>32</sup>

The results indicated that out of the 650 children in the study 13.2% of the children were affected by frank wetting of the bed at night, dribbling, and loss of bladder control, even during the day.<sup>32</sup> Results also indicated that 17.1% of all boys across all age groups were affected, as compared to 9.3% of girls; and in the 5-12 age group, more than twice as many boys as girls have bladder difficulties.<sup>32</sup>

In a case series following 33 participants, van Poecke and Cunliffe<sup>9</sup> found that 22 children ages 3 to 18 showed a "significant drop in bed wetting frequency" while under chiropractic care receiving NeuroImpulse Protocol (NIP) for a 12 month period.<sup>6,9</sup> The results indicated that 66.6% of the children had full resolution, "defined as not wetting at all or having a maximum of 1 accident per week;" with no relapse noted over the course of the treatment period. The average length of achieving resolution was 4.86±2.77 months.<sup>9</sup>

Alcantara and Weisberg<sup>6</sup> reported on a nine year-old boy who sought chiropractic care after unsuccessful medical treatment. The boy was adjusted using high velocity, low amplitude (HVLA) Diversified Technique at the levels of C<sub>0</sub>-C<sub>1</sub>, C<sub>7</sub>-T<sub>1</sub> and L<sub>5</sub>-S<sub>1</sub>. The boy was seen for 16 weeks and was deemed to have resolution of his bed-wetting issues, as well as reduction in his vertebral subluxation.<sup>6</sup>

Rodnick and Rodnick<sup>4</sup> performed a retrospective case report, outlining the resolution of an 11 year-old boy with a history of nocturnal enuresis and attention problems. A decrease in episodes of bedwetting from seven days per week to one time every two to three weeks as well as a marked increase in attention over the course of 33 visits was reported.

### *Autism*

Although the exact cause(s) of ASD's are unknown, the etiologies most commonly accepted are those associated with genes, neurological pathways, neurotransmitters, and

environmental influences.<sup>33</sup> Most researchers believe that autism and spectrum disorders are multifactorial;<sup>37</sup> there is ample research and evidence that concludes that these factors affect the same brain systems, or impede the development through disruption of different abilities necessary for social and communicative development.<sup>34</sup>

A unique component of this study reveals the possible link between hypoxia at birth and ASD. Burystyn et al.<sup>35</sup> found that there was a 1.03% (85 cases) observed rate of ASD among 8,286 males that were tested to be hypoxic at birth.<sup>35</sup> In addition a variety of observations and theories on the suggested role of vaccines, drugs, toxins, infections and diet as possible risk factors for autism.<sup>34</sup>

#### *Traditional and Alternative Treatments*

Gleberzon<sup>23</sup> discusses the best practices for children with autism including Applied Behavior Analysis (ABA), social-pragmatic therapy, “floor-time” therapy, and speech-augmentative device.<sup>17, 23</sup> ABA focuses on the break down of complex tasks into smaller components intended for the child to master.<sup>23, 17</sup> Additional therapies include: speech therapy, sensory integration, physical therapy, occupational therapy, good educational programs, and building social relationships and skills.<sup>36</sup>

Most Complementary and Alternative Medicine (CAM) treatment therapies for ASDs are founded on the following considerations: altering the child’s gastrointestinal function through diet (gluten-free and casein-free diet); enhancing neurotransmitter function; immune mechanism modulations; and toxin removal.<sup>14</sup>

Biomedical therapies, such as the DAN! Protocol are suggested to “help improve the efficacy of these other interventions, by improving brain and body health and making it easier for the child to learn.” The general steps to the DAN! Protocol, which are altered according to each individual child’s needs, involve healing the digestive system; incorporating supplementation to boost the immune system, amino acids; and detoxifying the body from metals.<sup>36</sup>

Treatments such as combination of B6 and magnesium supplementation; vitamin C supplementation; pantothenic acid (dimethylglycine-DMG); and Omega-3, fish oils, or essential fatty acids are used to enhance neurotransmitter function.<sup>14</sup> According to Levy and Hyman,<sup>14</sup> the combination of B6 and magnesium supplementation that is thought to help improve language in autistic individuals as well as help with inattention.

Vitamin C works as a weak dopamine blocker, which is posited to help with the treatment of symptoms of autism.<sup>14</sup> Examples of immune modulation mechanisms include antibiotic or antifungal treatment, intravenous immunoglobulin (IV-IG), vitamin A supplementation, as well as withholding immunizations. Vitamin A helps to facilitate the immune response by modulation of G-protein function in cell membrane.<sup>14</sup>

#### *Chiropractic Literature*

According to Gleberzon,<sup>23</sup> “the role of the chiropractor is as the diagnostic gate-keeper.”<sup>23</sup> To date there is limited evidence of efficacy of care and autism. A randomized clinical trial performed by Khorshid et al.<sup>38</sup> concluded that upper cervical (Atlas Orthogonal) adjustments of seven autistic children showed higher efficacy compared to the seven children who received full spine adjustments.<sup>17, 38</sup>

Hoffmann and Russell<sup>37</sup> discussed the case of a 3 ½ year old autistic female by outlining the subjective and objective improvements of behavioral patterns and nerve system symmetry following one month of chiropractic care.<sup>37</sup> Marini and Marini<sup>17</sup> studied the case of a 6 year-old autistic boy under diversified, Thompson drop assisted techniques over a 16-week period.<sup>17</sup> They also reported a reduction of autistic signs and symptomatology of the child.<sup>17</sup> Finally, Thomas and Wood described the case of a 14 year-old girl with mental and motor impairments. They reported that after upper cervical care she was able to utilize full sentences and regained use of her left arm.<sup>39</sup>

These case studies provide evidence indicating the reduction of a vertebral subluxation coupled with improvement in the signs and symptomatology of autism and spectrum disorders. Marini and Marini<sup>17</sup> who delineate two possible theories of application outline the proposed mechanism by which the reduction of a vertebral subluxation is linked to autism. These mechanisms address “sensory dysafferentation” and “functional disconnection,” which through their specified physiological mechanisms, help describe how the reduction of a subluxation can reinstate a dynamic nervous system in which a patient is able to optimally adapt to his/her environment.<sup>17</sup>

In their review, Schroeder et al.<sup>33</sup> examined three possible models based on the core characteristics of ASD, which revealed a link to joint complex dysfunctions altering circuitry, thus aberrantly affecting the structure and function of the cerebellum and the frontal lobe.<sup>17, 37, 40</sup> Hoffmann and Russell<sup>37</sup> describe the impact that a subluxation has on the cerebrum and cerebellum by suggesting that as a result of “altered biomechanics of the spine, a subluxation can lead to an imbalance in sensory input into both the cerebrum and the cerebellum.”<sup>37</sup> They further stated that “this sensory dysafferentation then leads to alteration in the central state of the neuronal cells involved with initiating the response to the environmental stimuli.”<sup>37</sup>

#### **Conclusion**

This case study explores the possible link between the objective reduction of a vertebral subluxation and the resolution of nocturnal enuresis as well as the subjective improvement in the behavioral patterns of a child diagnosed with Autistic Spectrum Disorder.

There have been similar cases reported on both topics, however there continues to be a limited amount of evidence supporting the efficacy of chiropractic care for either subject. Further research is warranted in both areas.

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# Figures

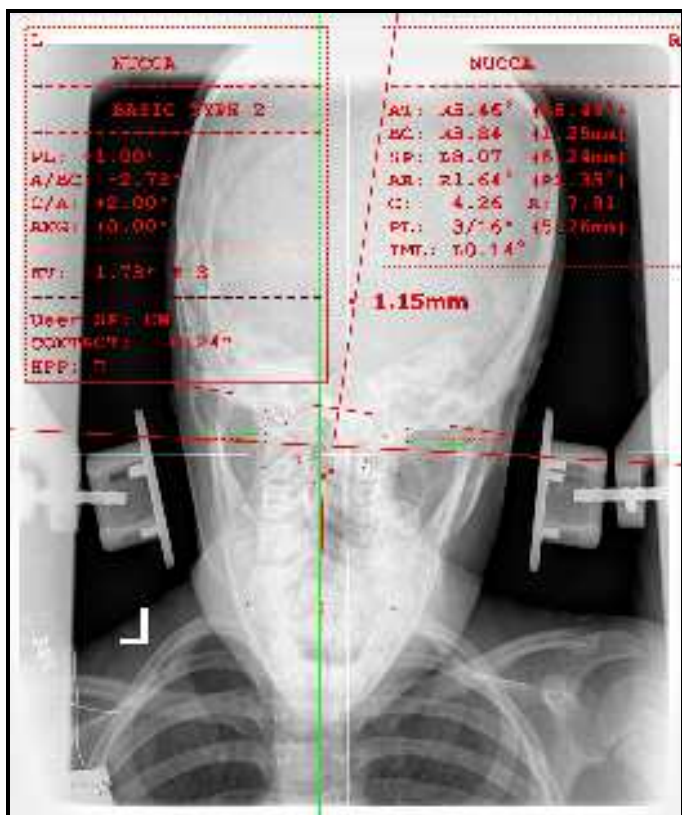


Figure 1. Pre Nasium View

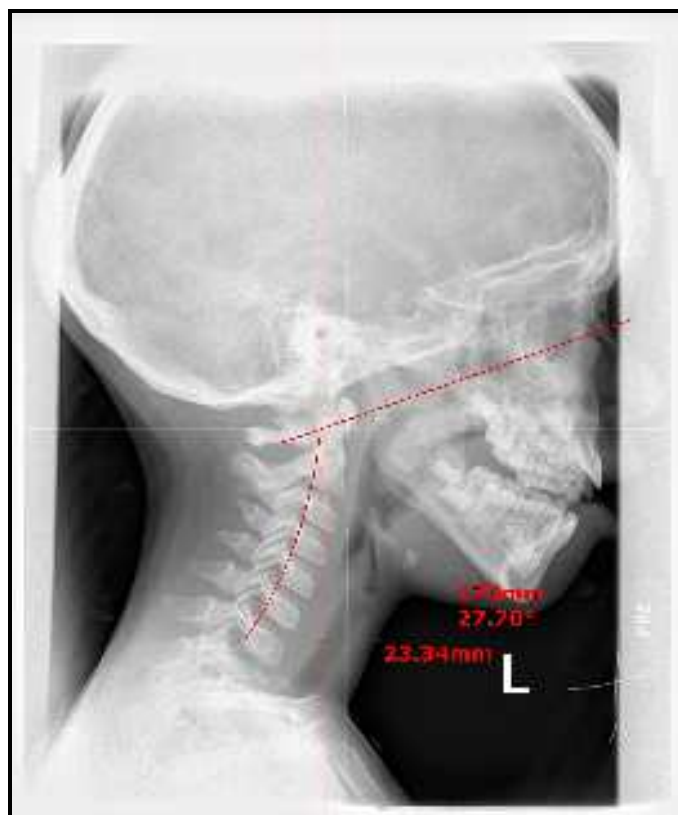


Figure 2. Lateral Cervical View

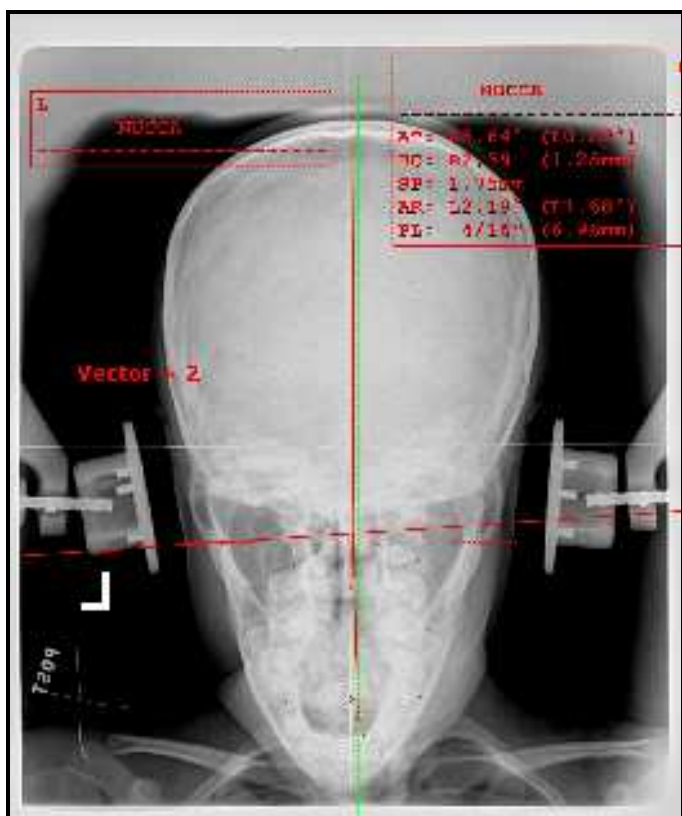


Figure 4. Post Nasium View



Figure 3. Vertex View