CASE STUDY

Complications Following Brain Surgery Improved After Upper Cervical Chiropractic Care: A Case Study

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ABSTRACT

Objective: To evaluate and discuss the effects of upper cervical chiropractic care on a 17-year-old female patient with a loss of balance, speech difficulties and postural distortion following the removal of an astrocytoma from her cerebellum

Clinical Features: The patient is a 17-year-old female that was diagnosed with a cerebellar astrocytoma that was previously removed. The patient presented to the office with significant postural abnormalities, difficulty with balance and difficulty with speech. that began post surgery. The patient presented to the office 4 years after the surgery.

Intervention & Outcomes: A case history and chiropractic examination was performed and it was determined that the patient had a subluxation of the C1 (atlas) vertebra. The patient received chiropractic care following the National Upper Cervical Chiropractic Association (NUCCA) protocol. The duration of care was five months and the patient was seen 28 times. At each visit she was checked for vertebral subluxation and was adjusted a total of 26 times. The patient reported an improvement in her balance from a 6/10 to a 9/10 and experienced a 90% improvement in her speech.

Conclusion: The findings presented in this case suggest that upper cervical adjustments may benefit patients who suffer from post surgical complications.

Key Words: *chiropractic, NUCCA, balance, proprioception, ataxia, cerebellum, subluxation, astrocytoma, cancer*

Introduction

The cerebellum is part of the central nervous system (CNS) that is a relatively large mass posterior to the pons and medulla. It consists of two lateral hemispheres that are connected by a narrow middle part called the vermis.[1] The cerebellum has no direct ability to cause muscle contraction but if harmed or removed, body movements become uncoordinated and abnormal.

This happens because the cerebellum helps to sequence motor activity and makes adjustments in the body's motor patterns. The cerebellum makes changes to movement patterns as they are happening so the body will conform to the signals directed by the cerebral cortex and other parts of the brain.[2] The connection between the motor units of the body to the CNS is also seen in muscle spindles as they enable the CNS to modify or control the activity of the receptors.[3]

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The cerebellum coordinates muscle function at three different levels consisting of the vestibulocerebellum, the spinocerebellum, and the cerebrocerebellum. The vestibulocerebellum is responsible for the body's equilibrium. The spinocerebellum is responsible for coordinating distal portions of the limbs such as the hands and fingers. The cerebrocerebellum functions as a feedback system with the cerebral cortical sensorimotor system to help plan for voluntary body and limb movements before the movements happen.[1]

It has been observed that excessive sway and difficulty with maintaining equilibrium in an upright posture can become a problem for people with lesions in the cerebellum. If there is damage to the anterior lobe of the cerebellum it has been seen to cause anteroposterior body movements.[2] If spinocerebellar input is affected then it can cause a strong lateral sway component to an upright stance. Lesions that would involve the vestibulocerebellar connections cause a multi-directional oscillating movement.[4] These findings support the idea that cerebellar damage causes increased postural sway during stance.[5]

These lesions in the cerebellum have been seen to affect several motor functions and lead to disorders. Cerebellar disorders typically present with ataxia, incoordination of movement, instability of gait, impairment of articulation, and difficulty with eye movement and swallowing.[6] Ataxia is uncoordinated movement that result when the motor control system cannot predict how far the movements need to be and overshoots the mark and rapidly succeeds which is called dysmetria.[2]

Damage to the cerebellar component of the distributed neural circuit leads to impairment of the area containing the lesion, which manifests as ataxia.[6] A study done on 22 children and adolescents looked at single and multi-joint finger and arm movements after cerebellar tumor removal. All the participants were evaluated at a minimum of 3 years after surgery and showed that 54% of the participants had upper limb ataxia.[7] Since intact joint position sense is necessary for normal muscle coordination and timing, there is a loss of balance.[8] Cerebellar lesions in the superior hemispheres may lead to speech deficits known as speech dysarthria. The speech alterations that have been seen are imprecise consonant and vowel sounds, irregular articulatory breakdown, reduced speaking rate and harsh voice quality.[9]

In the early stages of cerebellar degenerative disorder, balance is poor and there is an inability to stand on one leg. As the degeneration progresses a wider base is seen and when ataxia is severe, the ability to walk and stand without assistance decreases.[6]

Case Report

History

A 17-year-old female presented to the office with health concerns that consisted of an astrocytoma that was surgically removed from her cerebellum four years prior. The patient also reported scoliosis, headaches, tremors, fatigue, loss of balance, and dizziness. The patient had originally received a diagnosis of an astrocytoma from a CHECK practitioner when they were looking for reasons for her hand tremors and dizziness. Surgery was performed to remove the tumor from the cerebellum. After the surgery the patient experienced a significant decline in her postural control, her speech began to slow and was slurred and her balance deteriorated. Her balance declined to the point that she was no longer trusted to drive. She also had fatigue and headaches that were debilitating and caused her to vomit. Prior to the current symptoms she was an avid dancer and soccer player. She was also taking no medication. The CHECK practitioner had referred her to the chiropractic office.

Chiropractic Examination

The purpose of the chiropractic examination was to determine if a vertebral subluxation was present at the location of the C1 and C2 vertebrae. This is determined by gathering information about the body through posture analysis using hip calipers, observing leg length in the supine position, manual palpation, thermography, and x-rays. The patient presented with a short left leg of ½ inch when checked in the supine position. There was left cervical rotation restriction with severe right head tilt. She had a low left shoulder of 4.25 degrees and a right low hip of 2.25 degrees. Manual palpation revealed C1 fixation, suboccipital tension, right C4-5 severe tension, thoracic spine curvature and right sacroiliac joint fixation. Weight distribution was determined to be 82 pounds on the right and 63 pounds on the left; an uneven weight distribution of 19pounds.

Thermography measures the infrared heat that is emitted along the spinal column. This gives clinical information about the nervous system in relation to neuromusculoskeletal conditions and is accurate within 1.0-degree centigrade.[10] The use of thermography has been shown to have a very high intra-examiner and inter-examiner reliability.[11]

Leg length is a tool used by chiropractors for the detection of vertebral subluxation. In a study, examiners agreed on the presence of a functional leg length inequality of at least 1/8 inch in 40 of 50 rating pairs indicating good agreement.[12] It has been found to have excellent intra- and inter-examiner reliability and validity relative to anatomic leg length inequality determined by x-ray measurements in asymptomatic patients. The research also suggests that an unloaded leg-length asymmetry is a different situation than an anatomic leglength inequality which indicates neurological interference to the suprapubic muscles.[13]

Hip calipers were used to measure pelvic distortion in the frontal, transverse, and fixed point planes. This is done while also measuring the weight distribution upon each leg. The hip caliper is a tool that is utilized in the National Upper Cervical Chiropractic Association protocol.[14]

Radiographic Results

The x-rays that were taken during the initial visit consisted of a lateral cervical, nasium and a vertex. These x-rays are the

standard for the National Upper Cervical Chiropractic Association protocol. The lateral cervical is used to determine the angle of atlas. The vertex view is mainly used to determine rotation and the nasium view is used to determine atlas laterality and head tilt. The lateral cervical (Figure 1) showed an atlas angle of 40.82 degrees, the vertex (Figure 2) showed right rotation of the atlas of 0.98 degrees and the nasium (Figure 3) showed a head tilt to the right of 2.77 degrees and right atlas laterality of 3.62 degrees. A study was performed to determine the reliability of upper cervical X-ray marking systems and they were deemed to have a very good degree of reliability. The study concluded that there is strong support for the upper cervical X-ray marking system when the measurements being used are done by properly trained professionals.[15]

Chiropractic Intervention

The patient had a total of 28 office visits over a four month period. Of the 28 office visits the patient was adjusted on 26 of those visits. There was only one day in which the patient was adjusted twice. On each visit the patient was checked for vertebral subluxation using leg length inequality, paraspinal thermography, and palpation of the upper cervical spine. When it was determined that a subluxation existed, a specific adjustment to the atlas was accomplished through a low force move. This low force move is used to create a force or resistance at a calculated angle using a contact at the transverse process of C1. The adjustment consists of a triceps pull that transforms potential energy into kinetic energy, which allows the structure of the head and neck to release a misaligned pattern and move into a more proper mechanical position.[16]

The adjustment vector taken was listed as a right atlas, high ¾", Posterior 1", braced on a C headpiece, with a contact point measured at the tip of the mastoid to correct the subluxation. This contact is determined through the x-rays taken upon the initial visit. Once the patient received the adjustment the patient's leg length inequality was evaluated, the hip calipers were used to analyze posture and paraspinal thermography was performed to determine autonomic function. These tools were utilized as post adjustment assessments as well. A re-exam was completed on the 24th office visit.

Outcome

Upon the 24th visit the patient stated that her balance had improved from a 6/10 to a 9/10 since starting care. The rating of a 10/10 would indicate an improvement of perfect balance and a 0/10 would indicate no balance at all. The patient also stated that her speech had improved over 90% since beginning care and that she feels it is smoother and less choppy. The patient said she noticed improvements as early as the second adjustment and she continues to improve with each adjustment. Nasium and Vertex post X-rays showed improvement in rotation, and head listing (Figures 4-5). Atlas laterality showed an increase, but the lower neck and head tilt were reduced indicating a more optimal position of the spine to gravity. It was deemed that the patient should continue with current chiropractic care.

Discussion

The purpose of this case study was to document the relationship between upper cervical specific care and the changes that occurred in a patient that had a loss of balance. The case study showed an improvement in balance through the correction of an atlas misalignment and the neurological compromise related to it. The reestablishment of balance and the 90% improvement in speech was seen over a 5-month period.

In NUCCA, the main clinical focus is the detection and reduction of vertebral subluxations. The reduction of these subluxations will remove interference in the transmission of mental impulses between the brain and body allowing the restoration of proper physiology. Unfortunately, the mechanism that would explain how the reduction of subluxation would restore proper physiology is poorly understood.

Kent has proposed the dysafferentation model of subluxation that may shed light on this question. The dysafferentation model consists of the idea that a vertebra that subluxates will alter normal nociception and mechanoreception. These altered stimuli will lead to abnormal signaling being relayed to the cerebral cortex. As a consequence of altered signaling, biomechanical dysfunction may occur.[17] This can be corrected through spinal adjustments by introducing a mechanical force that may alter segmental biomechanics by releasing trapped meniscoids, releasing adhesions, or by reducing distortion of the annular fibers. It may also achieve a new position of stable equilibrium. These mechanoreceptors are part of a complex system that helps with the body's proprioception.[18]

Proprioception is defined as the afferent input of internal stimuli from proprioceptive fibers within the body screened from the external environment responsible for body segment stability, posture control, and certain conscious sensations. Neuromuscular control is dependent on the proprioceptive component of the sensorimotor system.[19] This can lead to the proposed idea that altered nociception and mechanoreception from subluxation will cause abnormal signaling to the central nervous system, including the cerebellum therefore compromising the central nervous system.

Grostic[20] has proposed the dentate ligament-cord distortion hypothesis that gives insight intothe upper cervical subluxation. He said that the subluxation of the C1 or C2 vertebra could directly produce neurological insult through mechanical irritation of the spinal cord via vascular compromise of the cervical cord. This occurs because of the attachment to the spinal cord by the dentate ligaments.

The dentate ligaments can directly stress and deform the spinal cord. Vascular compromise occurs from minor misalignments of the atlas, which can compromise the vertebral artery. A study done using MRI examined hypersensitive patients and evaluated the relationships between the upper ventrolateral medulla and vertebral arteries. They found compression of the artery in 90.6% of cases.[21] The vertebral arteries branch off to supply blood to the brain including the cerebellum.[1]

A case study reported by a NUCCA practitioner involved the care of a 14-year-old girl who used single words, mumbled incoherently, did not use her left arm or hand in situations considered to be normal and had poor eye contact. After care the patient immediately maintained eye contact, gave full sentences, had appropriate speech, and regained use of her left arm. The study concluded that there is a relationship between upper cervical adjustments and improvement in mental function. [22]

Several chiropractic studies show improvement in cases regarding a loss of balance as one of the complaints. In a study by Brown et al,[23] a patient presented with multiple sclerosis. She complained of numbness from her multiple sclerosis and she would fall frequently due to her balance issues. The NUCCA protocol was followed throughout care. The study followed her through her first eight months of care and she was seen a total of 44 times. She reported a 50% improvement of her overall balance.

A paper by Sweat and Pottenger[24] reports on a 75-year-old female who presented with gait ataxia, strabismus in the left eye, and activity or posture induced seizures. She was placed under Atlas Orthogonal chiropractic care and post adjustment results saw an improvement in her walking. Her walking continued to improve along with her balance to the point that she was able to stand on one foot and an overall improvement in her vision occurred. She also did not have another seizure while under care.

A retrospective analysis by Elster[25] looked at 60 patients with chronic vertigo that were under upper cervical care. The International Upper Cervical Chiropractic Association developed the protocol followed. The patients began treatment at various times over an eight-year period. From the total of 60 cases, 100% of the patients were improved or symptom free.

Conclusion

This case report outlines subluxation-based chiropractic care of a 17-year-old female who was experiencing a loss of balance, difficulty with speech and postural problems following the removal of an astrocytoma from her cerebellum. After a total of five months of care and 26 adjustments the patient's balance improved form a 6/10 to a 9/10 and a 90% improvement in her speech was seen.

This is one case demonstrating an improvement in balance, speech and posture while under chiropractic care. There needs to be further research to determine the relationship and effect the vertebral subluxation has on the cerebellum. The relationship between the vertebral subluxation and the complex process the body uses for proprioception and balance should also be investigated.

References

1. Moore KL & Dalley A *Clinically oriented anatomy*. 5th ed. Baltimore: Lippincott Williams & Wilkins; 2006.
2. Guyton A & Hall J *Textbook of medical physiology*. 11th ed. Philadelphia: Elsevier Saunders; 2006.
3. Fitz-ritson D, The anatomy and physiology of the muscle spindle, and its role in posture and movement: a review. J CCA 1982; 26(4):144-150.
4. Day BL, Steiger MJ, Thompson PD, Marsden Cd. Effect of vision and stance width on human body motion when standing: Implications for afferent control of lateral sway. J Physiol1993; :479-499.
5. Bakker M, Allum J, Visser J, et al. Postural responses to multidirectional stance perturbations in cerebellar ataxia. Exp Neurol 2006; 202:21-35.
6. Schumahmann JD, Disorders of the cerebellum: ataxia, dysmetria of thought, and the cerebellar cognitive affective syndrome. J Neuropsychiatry Clin Neurosci 2004; 16(3):367-378.
7. Konczak J, Schoch B, Dimitrova A, et al. Functional recovery of children and aolescents after cerebellar tumour resection. Brain 2005; 128:1428-1441.
8. Lee H, Liau J, Cheng C, Tan C, Shih J. Evaluation of shoulder proprioception following muscle fatigue. Clin Biomech 2003; 18:843-847.
9. Konczak J, Timmann D. The effect of damage to the cerebellum on senorimotor cognitive function in children and adolescents. Neurosci. Biobehav. Rev. 2007; 31:1101-1113.
10. Brown M, Coe A, DeBoard TD. Mastoid fossa temperature imbalances in the presence of interference patterns: a retrospective analysis of 253 cases. J Vert Sublux Res. 2010;July(15):1-13.
11. Owens, Jr EF, Hart JF, Donofrio JJ, Haralambous J, Mierzejewski E. Paraspinal skin temperature patterns: An interexaminer and intraexaminer reliability study. J Manipulative Physiol Ther 2004; 27(3):155-160.
12. Woodfield HC, Gerstman BB, Olaisen RH, Johnson DF. Interexaminer reliability of supine leg checks for discriminating leg-length inequality. J Manipulative Physiol Ther 2011; 34(4):239-246.
13. Knutson G. Anatomic and functional leg-length inequality: A review and recommendation for clinical decision-making. Part II, the functional or unloaded leg-length asymmetry. Chiropr & Osteopat. 2005;13:12. doi:10.1186/1746-1340-13-12.
14. Noriega A, Chung J, Brown J. Improvement in a 6 year-old with autistic spectrum disorder and nocturnal enuresis under upper cervical chiropractic care. J Upper Cervical Chiropr Res. 2012; :1-7.
15. Jackson BL, Barker W, Bentz J, Gambale AG. Inter- and intra-examiner reliability of the upper cervical x-ray marking system: A second look. J Manipulative Physiol Ther 1987; 10(4):157-163.
16. Goodman R. National upper cervical chiropractic association. [homepage on the Internet]. 2012 [cited 2012 Nov 30]. Available from: http://www.nucca.org
17. Kent C, Models of vertebral subluxation: A review. J of Vertebral Subluxation Res 1996; 1(1):1-7.
18. Pickar JG, Neurophysiological effects of spinal manipulation. Spine J 2002; 2:357-371.

19. Learman KE, Myers JB, Lephart SM, Sell TC, Kerns J, Cook CE. Effects of spinal manipulation on trunk proprioception in subjects with chronic low back pain during symptom remission. J Manipulative Physiol Ther 2009; 32(2):118-126.
20. Grostic JD. Dentate ligament-cord distortion hypothesis. Chiropr Res J 1988; 1(1):47-55.
21. Bakris G, Dickholtz Sr M, Meyer PM, Kravitz G, Avery E, Miller M, et al. Atlas vertebra realignment and achievement of arterial pressure goal in hypertensive patients: A pilot study. J Hum Hypertens 2007; 1-6.
22. Thomas MD, Wood J. Upper Cervical Research Foundation. J Manual Medicine [serial on the Internet]. 2010 [cited 2012 Nov 30].;6 Available from: http://www.ucrf.org/publications
23. Brown J, Chung J, Mccullen B. Upper cervical chiropractic care of a female patient with multiple sclerosis: A case study. J Upper Cervical Chiropr Res 2012; :16-19.
24. Sweat R, Pottenger T. Seizure, ataxia, fatigue, strabismus and migraine resolved by precise realignment of the first cervical vertebra: A case report. J Upper Cervical Chiropr Res 2012; :20-26.
25. Elster E, Sixty patients with chronic vertigo undergoing upper cervical chiropractic care to correct vertebral subluxation: A retrospective analysis. J Vertebral Subluxation Res 2006; :1-9.

Figures

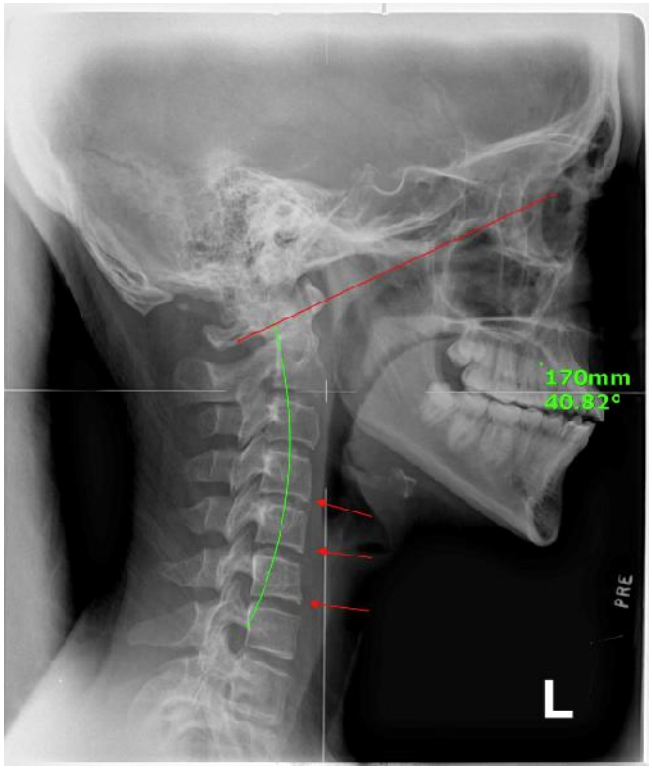

Figure 1. Pre Lateral Cervical View

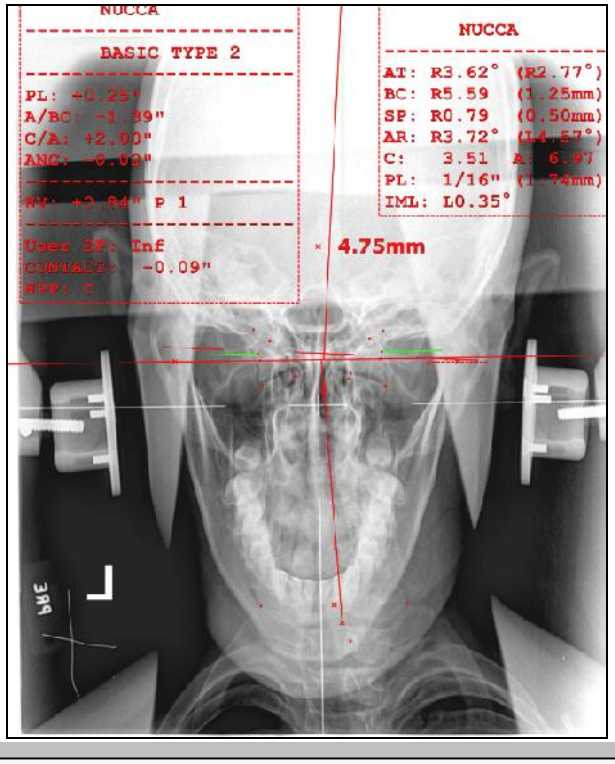

Figure 2. Pre Nasium View

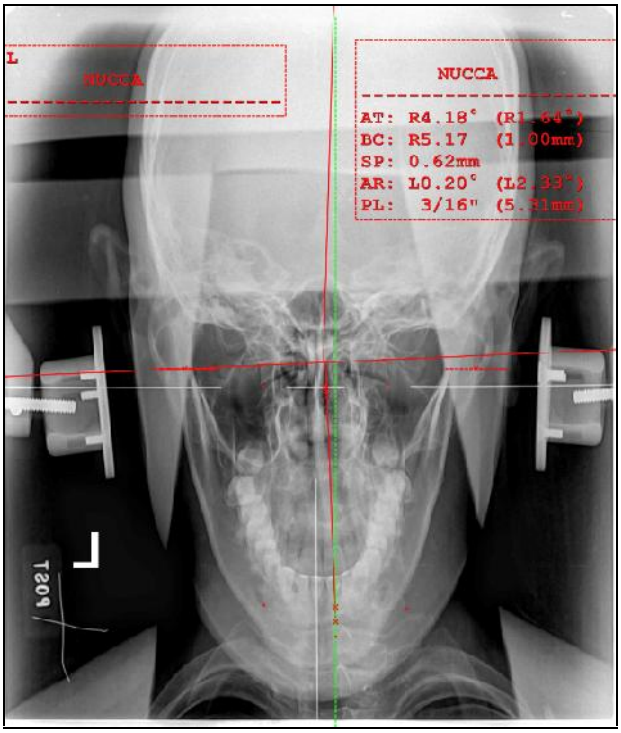

Figure 5. Post Nasium View

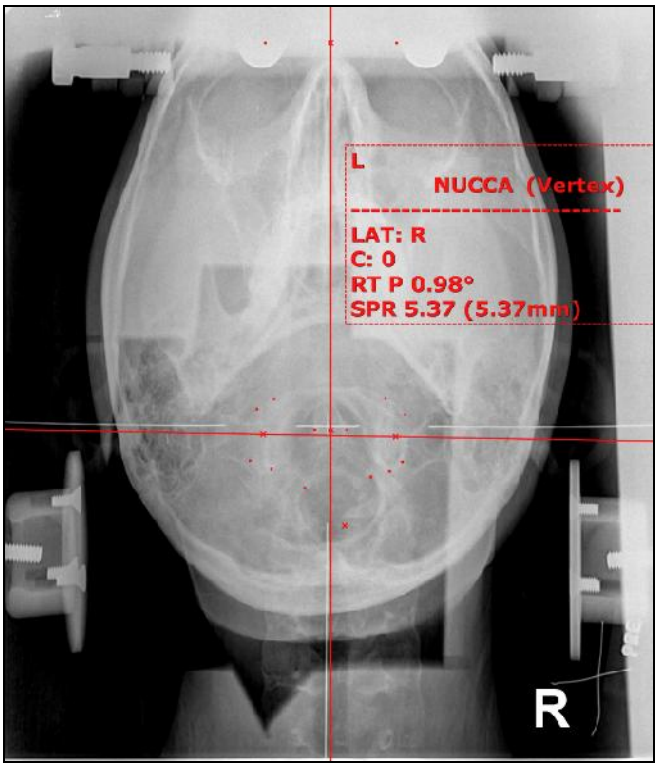

Figure 3. Pre Vertex View

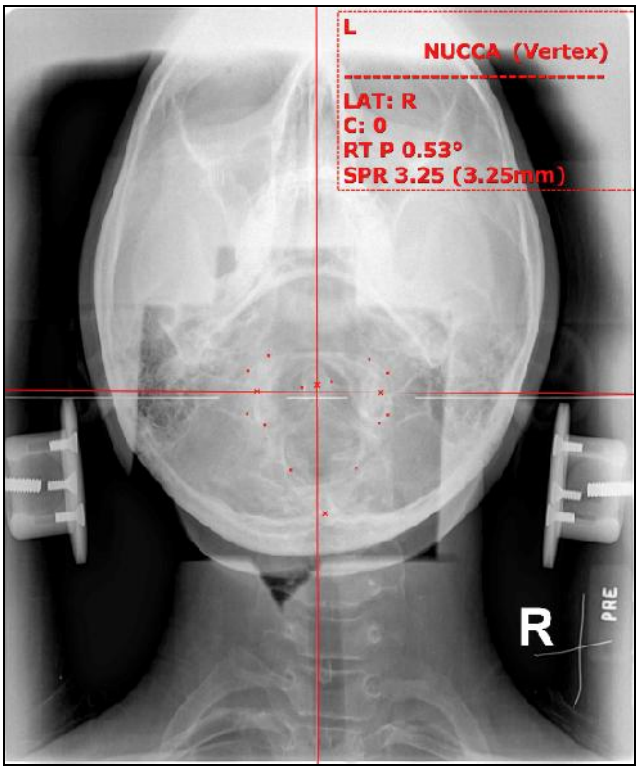

Figure 4. Post Vertex View