# CASE STUDY

# Resolution of Hearing Loss, Improved Speech & School Performance Following Chiropractic Management of Vertebral Subluxations in a Male Child: A Case Study

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## Abstract

**Objective:** To report on improvement in hearing in a male child following chiropractic management of vertebral subluxation.

**Clinical Features:** Patient presented with mild to moderate hearing loss documented on Pure Tone Audiometry on two occasions. The child was falling behind in class and the patient's speech was difficult to understand. Tympanostomy tubes were recommended. The child was examined and found to have vertebral subluxations.

**Intervention & Outcomes:** The child was adjusted using Koren Specific Technique with the use of an Arthostim hand held adjusting instrument. On two separate occasions his hearing, speech and school performance were improved following chiropractic care.

**Conclusions:** The clinical progress documented in this report suggests that chiropractic adjustments using Koren Specific Technique (KST) delivered to the central nervous system (CNS) may create positive changes in the auditory system following the removal of the vertebral subluxation.

**Key Words:** *Hearing loss, deaf, deafness, Koren Specific Technique, chiropractic, vertebral subluxation, adjustment, Arthrostim, typanostomy tubes, pediatric, audiometry*

**Introduction**

Hearing impairment refers to the loss of a person's ability to hear tones at a normal level and this can be a partial or total loss of the ability to perceive acoustic stimulus. Such impairments can affect full range or limited parts of the hearing spectrum, and it is usually expressed as decibels of hearing loss (dB) relative to the hearing of a normal population. The hearing ability is tested at specific frequencies, most commonly 250, 500, 1000, 2000, 4000 and 8000 Hz as these are frequencies that our ears are especially sensitive to.

This current study examined hearing impairment of a male child on two occasions, namely in the year 2014 (6-years-old) and 2016 (8-years-old), and the effects of weekly chiropractic adjustments on his hearing ability.

The first chiropractic adjustment rendered in 1895 reportedly cured deafness. This study examined the effects of specific chiropractic adjustments using the Koren Specific Technique (KST) on the central nervous system (CNS). This study documents clinical audiometry changes in a patient after removing vertebral subluxation.

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**Case presentation**

*Methods*

A male child patient presented on two occasions in 2014 (6-years-old) and 2016 (8-years-old) with mild to moderate hearing loss. On both occasions, patient's hearing was reclassified to normal hearing threshold following a series of chiropractic adjustments.

Pure Tone Audiometry (PTA) was performed to ascertain the patient's hearing ability. The measurement involves the peripheral and central auditory systems. Pure-tone thresholds (PTTs) indicate the softest sound audible to an individual at least 50% of the time. The patient's hearing sensitivity is plotted on an audiogram, which is a graphical representation showing intensity (loudness) of the sound or hearing level measured in decibels (dB) as a function of frequency (pitch) measured in hertz. Hearing loss is classified in different degrees based on the hearing ability: Normal hearing (0-25dB), mild hearing loss (26-40dB), moderate hearing loss (41-55dB), moderate-severe hearing loss (56-70dB), severe hearing loss (71-90 dB), and profound hearing loss (>90dB).[1] These tests were formed at 250, 500, 1000, 2000, 400 and 8000 Hz.

In June 2014, the first PTA was performed on the patient. The patient's hearing was diagnosed with mild hearing loss in his right ear (30dB at 250 and 500 Hz, and 40dB at 1000Hz) and mild to moderate hearing loss in his left ear (35dB at 350 and 1000Hz, 50dB at 8000Hz). Please see Fig 1.

The patient was advised by an Ear Nose Throat (ENT) Specialist to undergo a surgical procedure to insert a Grommet tube into his ear. His parents declined this recommendation, as they wanted to utilize chiropractic care exclusively for a period of ten weeks. The patient's parents reported that prior to the discovery of patient's hearing loss, the patient's teacher told them that he was falling behind in class and the patient's speech was difficult to understand, despite undergoing speech therapy from September 2011-2012 and Feb 2013. His parents noted minimal improvement.

Patient's vertebral subluxation was analyzed and corrected using KST with the use of the Arthrostim instrument. During the 12 visits, patient's atlas (C1) appeared to be most consistently subluxated. (Table 1)

After twelve visits of chiropractic adjustments, the patient returned to the ENT for a follow up assessment. His hearing was in the normal hearing range of 5 to 20 dB at 250, 500, 1000, 2000, 4000 and 8000 Hz. (See Figure 2). It was concluded by the ENT that patient's hearing returned to normal. His teacher informed the parents that the improvement was immediate and the patient had caught up with the class by the end of the third term of his school. His speech also improved.

Following the recovery of his hearing in August 2014, the patient remained under care on a very irregular basis. The patient received similar chiropractic care, however, for only 10 times in about twenty-four months before returning in September 2016 due to his second hearing loss. The ENT performed the hearing test on September 28, 2016 and concluded that the patient had mild low to middle frequency hearing loss (35dB at 500 – 1kHz) on the right ear and normal hearing threshold with a slight drop from 500Hz – 1kHz (25dB at 500 – 1kHz, 25dB at 8kHz) on the left ear. (Refer to Fig 3).

Similar to 2014, the patient's vertebral subluxation was analyzed and corrected using KST with the use of the Arthrostim instrument. (see Table 2)

The audiometry test was performed in November 2016 after seven sessions of chiropractic adjustments. The audiologist concluded that the patient's hearing was back to the normal hearing threshold: The right ear registered 5-15dB at 250 – 8kHz and left ear registered 10-15dB at 250-8kHz (Fig 4).

**Discussion**

The association of chiropractic with hearing started back in 1895 when the first chiropractic adjustment was reported to have cured deafness.

D.D. Palmer, in his 1910 text, The Chiropractor's Adjuster described:

> "Harvey Lillard, a janitor, in the Ryan Block, where I had my office, had been so deaf for 17 years that he could not hear the racket of a wagon on the street or the ticking of a watch. I made inquiry as to the cause of his deafness and was informed that when he was exerting himself in a cramped, stooping position, he felt something give way in his back and immediately became deaf. An examination showed a vertebra racked from its normal position. I reasoned that if that vertebra was replaced, the man's hearing should be restored. With this object in view, a half-hour's talk persuaded Mr. Lillard to allow me to replace it. I racked it into position by using the spinous process as a lever and soon the man could hear as before. There was nothing "accidental" about this, as it was accomplished with an object in view, and the result expected was obtained. There was nothing "crude" about this adjustment; it was specific, so much so that no Chiropractor has equaled it"[2]

While this was suggested to be a myth, many similar cases reported in the literature demonstrated that it is quite plausible. It has been suggested that the altered sensory input from Harvey Lillard's back injury may have altered the central processing of information from his ears.[3]

In 2002, Terrett[4] noted that "a review of the medical and chiropractic literature suggests that hearing deficits may be associated with spinal joint motion restriction, spondyloarthosis, irritation of the sympathetic nervous system, decreased cervico-cerebral circulation and/or decrease in tinnitus. Search of the literature indicates that vertebrogenic hearing disorders are beginning to be investigated by medical researchers".

Segal et al[5], in 2003, found that 83 patients lost their hearing

as a result of blunt neck trauma such as whiplash. In 1987, Svatko et al[6] reported that 17 out of 19 patients with hearing loss in both ears showed improvement in their hearing, following chiropractic manipulation of the functional blocks in the upper (OCC-C1) cervical spine. These 19 patients were part of the 105 patients examined for cervical spine pathologies.

In 1994, Hulse[7] found that 62 patients had subjective hearing disorders. He palpated them and found cervical dysfunction. Hulse concluded in his study that hearing deficit is reversible through upper cervical chiropractic manipulation to the neck. In 1998, Wagner and Fend[8] reported improvement of hearing in a 36-year-old who was diagnosed with almost completely deaf in the right ear, with a loss of hearing at 500Hz. Post audiogram showed his hearing returned after thoracic spine, sacroiliac and cervical spines were adjusted.

Many other similar cases such as those by Di Duro,[9] Emery,[10] and Ferranti et al[11] documenting hearing improvements following chiropractic care were reported and published. Generally, auditory messages[12] in humans are conveyed to the brain through two different pathways, namely the primary auditory pathway (this exclusively carries messages from the cochlea), and the non-primary pathway (also called the reticular sensory pathway and carries all types of sensory messages).

There are numerous mechanisms that can explain how spinal manipulation may affect hearing positively. Ferranti et al[11] reviewed and discussed a few possible ones:

> According to Di Duro[9], manipulation delivered to the neuromusculoskeletal system may create central plastic changes (i.e. the CNS's ability to adapt to environmental influences, or the changes in a person's ability to hear tones at speech threshold) in the auditory system. Chiropractic adjustments can affect afferent information of somatic structures to bring about changes in the vestibulo-cochlear system of the brainstem and therefore influence the integrity of acoustic processing and hearing.

Pickar[13] suggested that spinal manipulation has a physiological effect on the influx of sensory information into the CNS which affects primary afferent neurons from par spinal tissues. Changes introduced to the spinal structures such as the intervertebral foramen can also affect the dorsal root ganglia and cause changes in the CNS. It was suggested that spinal manipulation could alter the central sensory processing by eliminating sub threshold mechanical or chemical stimuli, which can then result in somatosomatic reflexes.

Carrick[14] examined brain function changes after manipulating the cervical spines of five hundred test subjects. He suggested that cervical manipulation is able to cause an increase in thalamic and cortical activity. Specific neurological pathways can become activated and this can cause a change in brain function. However, this is dependent on the side of manipulation and the cortical hemisphericity of a patient.

Ferranti et al[11] postulated, as an extension from Carrick's finding, that cervical manipulation stimulates primary afferents of the auditory nerve at the cochlear level in the brainstem to affect the cerebellar projection in the reticular sensory pathway and the cerebellar projection to the thalamocortical tracts of the primary auditory pathway.[12,14]

It is to be noted that in this study, the patient only received chiropractic care. On two occasions the patient was found to have mild to moderate hearing loss. His hearing returned to normal following a series of chiropractic care. The chiropractic adjustments were done via the Arthrostim instrument exclusively, with patient in the seated position in all his visits. There was also no manual or rotary manipulation administered throughout the two periods. Hence, the term "adjustments" were used instead of "manipulations". The patient's skeletal system was analyzed using the KST protocol. While we are unable to establish any correlation of any spinal segments to the hearing loss, we observed that the patient's atlas was most consistently subluxated. Sacrum was observed to be the second most subluxated segment. Cranial bones were also subluxated and were adjusted in the study.

The ArthroStim is an FDA approved instrument developed by IMPAC technology in Oregon, and has a 22-year history. It introduces energy/force/information to the body to realign segments and remove nerve pressure at a speed of 12 "taps" per second (12 hertz); ArthroStim is a fast, accurate, low force and controlled adjustment.[15]

KST was developed in 2003 by Tedd Koren, D.C. The procedure[15] is made up of three steps:

The first step, challenging, is part of the analysis procedure, which involves the analysis of the entire structural system: skull, spine, discs, hips, ribs, sternum, shoulders, arms, legs, hands and feet.

The second step, checking, involves analyzing if the body part is in its proper position. KST uses the occipital drop, which is a binary neurological biofeedback device to locate vertebral subluxations. The base of the skull is used as a yes/no device and using a binary or yes/no system to assess if an area needs or does not need to be corrected or adjusted. This system is akin to muscle testing (applied kinesiology or AK) wherein a muscle will become weak when confronted with a negative impulse.

The third step is correcting. When an adjustment is needed the area is corrected using the ArthroStim adjusting instrument.

It is also to be noted that the patient's hearing was tested by the same ENT using the PTA.

**Conclusion**

The patient's hearing loss reversal in this study is consistent with the findings of the numerous papers published and the mechanisms discussed. This study demonstrates that chiropractic care may benefit/reverse hearing loss. Specific chiropractic adjustments to the spinal column to correct the

vertebral subluxation can have positive effects on auditory processing. It also shows that chiropractic analysis using the KST and chiropractic adjustments rendered exclusively using the low force and 12 hertz ArthroStim in the seated position can be effective in correcting the vertebral subluxation. It is observed that cranial bones may also have an effect on one's hearing. The observations documented in this study provide limited support to previous works indicating that hearing loss can be reversed by chiropractic care. Further research in this area is required, in the form of a well-designed randomized controlled trial.

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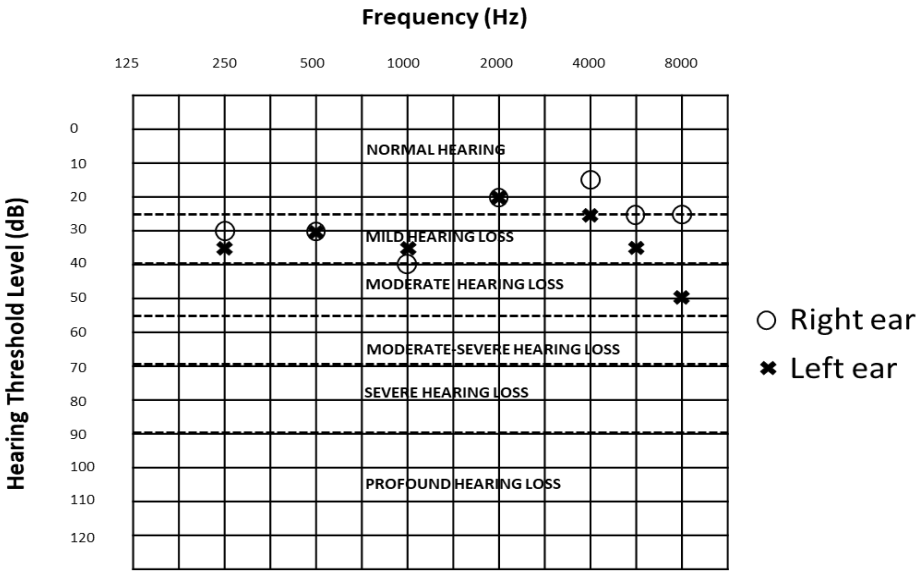


**Figure 1: Pre-chiropractic care audiogram (2014).** June 4, 2014 audiogram shows audible thresholds for standardized frequencies to determine the extent of hearing loss. Both the right (O) and left (x) were tested. Mild to moderated hearing losses were noted in both ears: Right ear shows mild hearing loss at 30dB at 250 and 500 Hz, and 40dB at 1000Hz, left ear shows mild to moderate hearing loss at 35dB at 350 and 1000Hz, 50dB at 8000.

| Visit number | Date | Subluxation corrected |
|---|---|---|
| 1 | June 5, 2014 | C1L, R sacrum, cranials |
| 2 | June 11, 2014 | C1R, R occiput, R sacrum, cranials, TMJ |
| 3 | July 16, 2014 | C1L, R sacrum, cranials |
| 4 | July 21, 2014 | C1L, R sacrum, cranials |
| 5 | July 23, 2014 | C1L, cranials |
| 6 | July 30, 2014 | C1L |
| 7 | August 4, 2014 | C1L, T5, R sacrum, cranials |
| 8 | August 6, 2014 | C1L, TMJ |
| 9 | August 11, 2014 | C1L |
| 10 | August 13, 2014 | C5L, R sacrum |
| 11 | August 20, 2014 | C1L, C5, R sacrum |
| 12 | August 27, 2014 | C1R, C5, R sacrum |

**Table 1:** During the 12 visits, patient's atlas (C1) appeared to be most consistently subluxated.

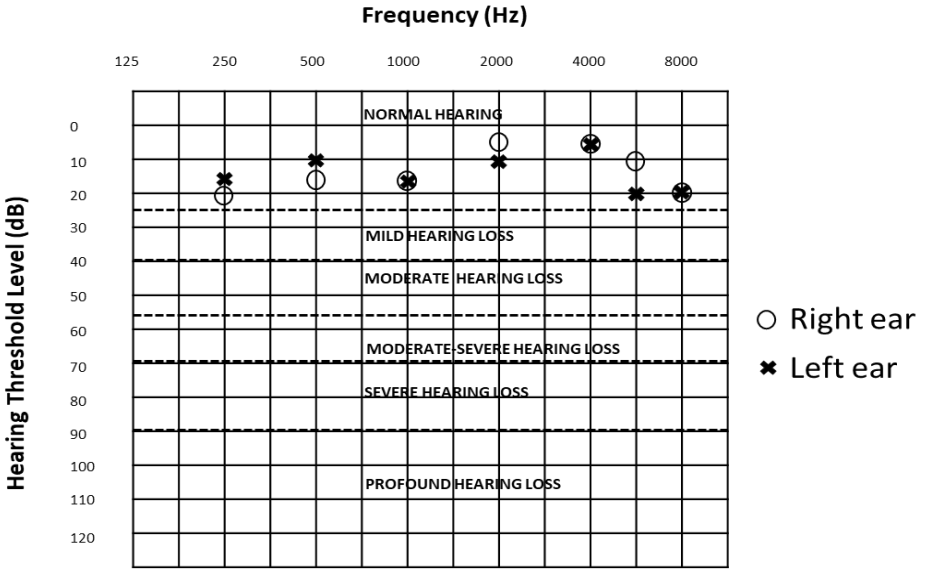


**Figure 2. Post-chiropractic care audiogram (2014).** September 10, 2014 audiogram shows audible thresholds for standardized frequencies to determine the extent of change in hearing loss. Both the right (O) and left (x) were tested. All measured points bilaterally fell within normal hearing limits.

| Visit number | Date | Subluxation corrected |
|---|---|---|
| 1 | September 28, 2016 | C1R, C5, R occiput, R sacrum, cranials, TMJ |
| 2 | October 12, 2016 | C1R, sacrum, cranials |
| 3 | October 19, 2016 | C1R, sacrum, cranials |
| 4 | October 26, 2016 | C1R, sacrum, cranials |
| 5 | November 9, 2016 | C1R, cranials, TMJ |
| 6 | November 16, 2016 | C1R, T5, R sacrum |
| 7 | November 23, 2016 | C1R, R sacrum, cranials |

**Table 2:** Similar to 2014, the patient's vertebral subluxation was analyzed and corrected using KST with the use of the Arthrostim instrument.

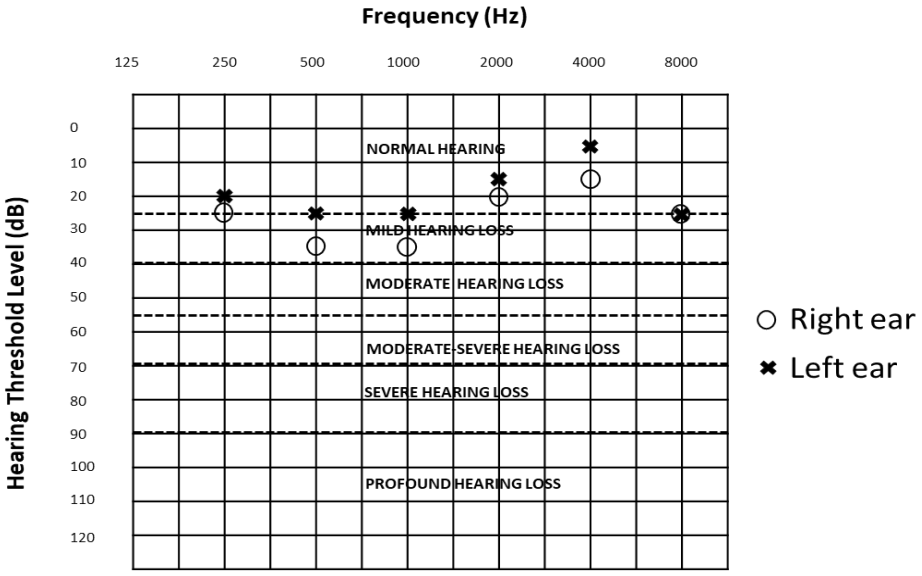


**Figure 3. Pre-chiropractic care audiogram (2016).** September 28, 2016 audiogram shows audible thresholds for standardized frequencies to determine the extent of hearing loss. Both the right (O) and left (x) were tested. Mild to moderated hearing losses were noted in both ears: Right ear shows mild low to middle hearing loss (250-1Hz). Normal hearing in other frequencies. Left ear shows normal hearing threshold with a slight drop from 500Hz – 1kHz.

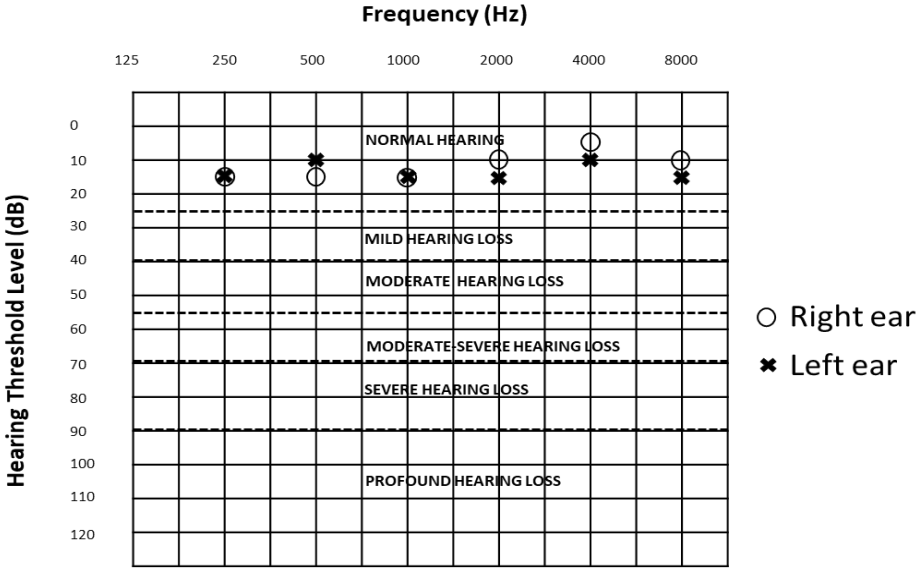


**Figure 4. Post-Chiropractic care audiogram (2016).** November 25, 2016 audiogram shows audible thresholds for standardized frequencies to determine the extent of change in hearing loss. Both the right (O) and left (x) were tested. All measured points bilaterally fell within normal hearing.