Utilization of Videofluoroscopy to Demonstrate Kinematic Changes to the Spine Following Chiropractic Care

Abstract

Objective: To evaluate changes in intersegmental motion of the spine following chiropractic care with the utilization of video fluoroscopic studies.

Clinical Features: Four subjects were included in this study. All patients presented to the chiropractic clinic seeking care for relief of symptoms. The protocol used consisted of a combination of video fluoroscopy, plain film x-ray photographs, and infrared thermography scans. Each of the four patients’ videofluoroscopy tapes were evaluated in order to identify the existence and location of vertebral locking within the spine. Based upon the patient’s clinical presentation they were adjusted as indicated and underwent follow up videofluoroscopy analysis following chiropractic care.

Outcomes: All four subjects in the study had a significant degree of positive and measurable change with intersegmental motion following chiropractic intervention. Three females and one male participated and each had immediate and positive reports on relief of symptoms. Images were taken from the videos in maximal extension before and after chiropractic adjustment(s) were delivered to the segment(s) determined to have vertebral subluxation present. On average, there were two adjustments to the segment(s) showing vertebral locking on the video fluoroscopy motion study and all demonstrated decreased vertebral locking on the post motion study.

Conclusion: With the utilization of video fluoroscopy the chiropractic profession is able to reliably demonstrate kinematic changes of the spine following chiropractic care.

Keywords: Subluxation, Pierce Results System, Chiropractic, Videofluoroscopy

Introduction

The goal of many chiropractic techniques or systems is to restore the proper structure of the spine in order to restore proper function to the nervous system. One way in which health care professionals have been evaluating the structure of the spine is with the use of plain film radiography. Static photographs however, provide a limited amount of information and can at times be misleading. Video fluoroscopy allows professionals the opportunity to observe kinematic information using pulsed radiation with an image intensifier to view real time details of internal structures in motion. This technology has been the gold standard across the entire medical field for years and has proven to be reliable in measuring intersegmental motion in detail. Studies have demonstrated that spinal structure can be changed after chiropractic adjustments, but far less has been reported about changes in vertebral intersegmental motion having occurred following chiropractic care. The use of videofluoroscopy has allowed the chiropractic profession to evaluate the changes in intersegmental motion before and after chiropractic care in order to demonstrate the vital component of the vertebral subluxation model. Historically, the primary use of video fluoroscopy is to assess, diagnosis, and treat patients suffering
from dysphagia. First proposed in 1965, Donner & Siegel utilized motion x-ray to determine the exact cause of dysphagia. This changed the outlook for patients suffering from either neurological or mechanical disorders. The United States had an estimated 16,500,000 patients in 2010 that required treatment for dysphagia. A large percentage were evaluated using video fluoroscopy due to the fact that swallowing takes place in approximately 2 seconds. This allows for increased accuracy of diagnosis and intra-examiner reliability between 76 and 92 percent.

The medical field is not the only profession utilizing videofluoroscopy. The chiropractic profession has improved upon its own procedures and techniques with the use of videofluoroscopy. Specifically, the Pierce Results System which uses a combination of video fluoroscopy motion studies, plain film radiographs, and infrared thermography in an attempt to create an objective assessment in determining where and when a chiropractic adjustment should be given. Pierce and Continental X-Ray developed the first specific video fluoroscopy machine used in the chiropractic profession to visualize the spine in motion. This machine has a very low MA setting, thereby significantly reducing the amount of radiation exposure to the patient. The ability to be able to analyze the kinesiological aspects of the spine allows for greater specificity and accuracy when determining where a subluxation is located. It can also determine the line of drive for correction of the subluxation. This study and several others demonstrate that videofluoroscopy can allow a chiropractor to deliver more specific care which results in faster progress for the patient. However, little information exists to support improved vertebral intersegmental motion following a specific chiropractic adjustment to a given segment that had been determined locked on videofluoroscopy.

Case Series

Each of the four patients included in this study were evaluated and adjusted using only the Pierce Results System protocol. The main goals of the Pierce System are to restore proper structure to the spine with the removal of subluxation. This allows for proper motion of the spine to take place therefore restoring function. The Pierce technique consists of, but is not limited to a culmination of techniques including: 5th Cervical Key, Logan Basic, HIO, Thompson, Nimmo, and Pierce’s individual adjusting style.

Pierce Results system utilizes: videofluoroscopy, plane film x-rays, and thermographic instrumentation. The thermography readings are recorded on every patient pre and post adjustments. The purpose of this reading is to tell the doctor when and when not to adjust based off of the patient’s “pattern”.

History

Patient 1: A 36 year old female who presented experiencing neck pain. Following videofluoroscopic analysis, it was determined that the patient’s C5 vertebrae was locked in extension. The patient was assessed each visit and when indicated a chiropractic adjustment was delivered to the locked segment. Over the course of eight days the patient received a total of one A-P drop table adjustment.

Patient 2: A 17 year old female who presented with complaints of neck stiffness and pain. The patient was evaluated and it was determined after viewing the videofluoroscopy that the patient had a C6 vertebrae in extension. One hand delivered adjustment was given to the patient at C6. A post fluoroscopy motion study was performed 24 hours later.

Patient 3: A 38 year old male who presented with benign tremors as well as low back pain. The patient had been medically diagnosed with benign tremors after all other diagnostic testing was negative. After the videofluoroscopy films were analyzed it was determined the C6 vertebrae was locked in extension. The patient was assessed each visit using infrared thermography and when indicated received a chiropractic adjustment. Over the course of 9 days the patient received a total of 1 adjustment by hand to the locked segment and 2 adjustments with the variable frequency adjuster to the 6th cervical vertebra.

Patient 4: A 32 year old female who presented seeking relief of neck pain. Videofluoroscopy revealed T1 and T2 vertebrae were locked in extension. The patient received a total of 0 hand adjustments and 4 instrument adjustments to T1 and T2 over the course of 30 days.

Methods/Examination:

Four subjects were included in this study. Each subject presented to and was evaluated in the Berner Family Chiropractic office using video fluoroscopy, plain film radiographs, and infrared thermography. The criteria of all subjects were: initiation of care in 2012, had a measurable and obvious loss of motion during extension, and all subjects agreed to continue care until post videos could be recorded.

Under the given protocol each patient was thoroughly evaluated to determine areas of cervical or thoracic vertebral locking, as it relates to the vertebral subluxation complex. It was determined that significant locking was found at the 5th, or 6th cervical vertebra, or 1st or 2nd thoracic vertebra, all of which were in extension. Plain film radiography and infrared thermal scanning were also utilized in the evaluation of each patient. These tools revealed additional indicators that vertebral subluxation(s) were present.

Each of the three subjects displaying cervical vertebral locking received 1 adjustment, which was performed by hand on the locked segment. A follow up video fluoroscopy motion study was performed which showed a significant increase in spinal motion. The follow up fluoroscopy study was performed ranging from 1-8 days following the adjustment. The patient whose 1st and 2nd thoracic vertebrae were locked received a total of four adjustments delivered by hand to the locked segment. The follow up fluoroscopy study was performed 30 days after the 1st adjustment.

Each of the above mentioned patients experienced a notable decrease in symptoms as well as a significant improvement in intersegmental motion. Figures 1-4 below demonstrate the
increase in cervical extension. The other indicators for subluxation used also decreased dramatically showing positive signs towards the removal of the subluxation(s).

Discussion

In 1895 Palmer created the hypothesis of vertebral subluxation. In a report written by Sandoz he explained that before Palmer came up with the hypothesis it was recognized that a vertebral subluxation (also defined as a misalignment in this report) involves altered motion between the subluxated vertebra and its adjacent vertebra. Before videofluoroscopy however, the biomechanical characteristics and evidence of a subluxation had yet to be recognized.12 As discussed in this article, it is evident that videofluoroscopy provides a way to distinguish between various misalignments and subluxations.

In a study conducted by Bolton, he discussed the controversy surrounding the chiropractic profession in regards to their “hypothesis” that a vertebral subluxation causes illness, disease, or both.3 Bolton wrote about three principle reasons the chiropractic profession must determine the validity of this hypothesis. He stated, “First, if false it should be abandoned, and alternative hypotheses should be proposed and tested. Second, if partly correct, it should be modified according to the available valid (scientific) evidence, and the clinical activities of all healthcare providers should be modified accordingly. Third, scientific investigations of the chiropractic vertebral subluxation hypothesis may provide important clues about health and disease that can enhance the clinical activities of all healthcare providers.”13 The article continued to describe various reasons as to why this chiropractic hypothesis is problematic for the clinician and scientist. He asked “when is a vertebra misaligned, and what constitutes nerve interference”?13 Video fluoroscopy and the Pierce Results System technique answer both of these questions reliably.

Throughout his career, Pierce worked diligently to clarify the definition of a subluxation. He believed there was a misconception across the chiropractic profession that was to blame for the lack of results. Pierce came up with four definitions to describe what could be occurring in any given spine. First, he defined a misalignment which he said is a vertebra rotated out of position but is moving under fluoroscopy. Next, he described a fixation which is when a vertebra locks next to or near a subluxation, but is not the true “lock”. Finally, he explained a compensation which is a vertebra out of normal position but is moving under fluoroscopy. These vertebrae are later explained as the “mate vertebrae” to the subluxated one. The subluxation, as Pierce defined as the true lock, could be easily located on fluoroscopy as the bone not moving. When a Pierce Results doctor analyzes a patient’s cervical spine in motion, they use four routine procedures; a flexion, extension, right and left rotation video.9

Studies on videofluoroscopy and the interexaminer reliability of fluoroscopic detection of subluxations in the midcervical spine have been conducted. Two chiropractors reviewed 50 videos which examined the cervical spine, an 84 percent agreement on the presence of fixation was achieved, and a 96 percent agreement on the absence of fixation was achieved. This yielded a total of 93 percent agreement on evaluating subluxations using fluoroscopy.14,15

It is evident that the goal of many chiropractic techniques or systems is to restore the proper function of the spine by restoring proper segmental motion.11,13,15,16 By using video fluoroscopy, the gold standard in spinal kinematics, chiropractors can not only reliably identify segments displaying vertebral locking, but can reliably correct them as well. Chiropractors are also able to determine the appropriate time to perform a chiropractic adjustment when incorporating video fluoroscopy, in combination with plain film radiography, infrared thermography, and other chiropractic tools. The results listed above clearly demonstrate proper segmental motion can be restored with fewer adjustments and in less time than is typically expected by most chiropractic treatment plans.17-20

It has also been understood that the lack of proper structure in the spine has been linked to negative health outcomes.8 Previous Pierce Results System research shows that the use of video fluoroscopy has been beneficial in structural correction of the spine. This research has demonstrated chiropractic adjustments delivered to specific areas identified on videofluoroscopy will allow the spine to return towards a normal structure with no other intervention such as traction or surgery.8,10,21

Conclusion

As the chiropractic profession looks to provide more evidence for the detection and correction of a vertebral subluxation complex as it relates to overall improved health outcomes; chiropractors must strive to use more objective measures in their spinal assessments. As stated above, the same goal throughout most of the profession is to restore proper motion to the locked segment(s).11,13,16,17 In order to do this the segments with decreased motion must be accurately identified. Many techniques utilize the motion palpation method which consists of manually motioning a patient in order to feel for a subluxation. This method however has proven to yield a very poor intra-examiner reliability rate.22

An article reporting on the reliability, accuracy, and exposure of objective spinal motion imaging assessments (OSMIA), discussed the importance of being able to measure the lumbar spine motion in patients requiring surgery for stabilization.5 The same should hold true for Chiropractors evaluating the stability of the spine. Haslock reports that back pain is the most common rheumatological symptom leading to consultation with a general practitioner, and that the outcome of treatments prescribed is many times unsatisfactory.23 One study even suggested that patients actually “appear to be more disabled after treatments” due to many of the methods routinely used to treat back pain.3 Detecting abnormal ranges of motion or postural deformities is an essential part of a physical examination.6 Videofluoroscopy offers both the medical and chiropractic professions the opportunity to see real time dynamic images while reducing radiation exposure to the patient.3

Another area of scrutiny facing the chiropractic profession is with the inability for chiropractors to establish the consistent
findings of segmental motion restrictions or subluxation patterns. By integrating the utilization of videofluoroscopy into their spinal analysis, chiropractors practicing any given technique will be able to identify the same areas of vertebral locking and subluxation patterns with more accuracy and reliability.14,15 Chiropractors will also be able to reliably demonstrate intersegmental motion was significantly altered following a chiropractic adjustment. In using advanced technology, the guess work will be removed and both the doctor and patient will experience results in a shorter period of time. Videofluoroscopy may also potentially lower the cost associated with chiropractic care due to the fact that less visits could be required.24

References:

Figure 1. Patient One Thermography

Figure 2. Patient Two Videofluoroscopy

Figure 3. Patient Three Videofluoroscopy

Figure 4. Patient Four Videofluoroscopy