CASE STUDY

Seizure, Ataxia, Fatigue, Strabismus and Migraine Resolved by Precise Realignment of the First Cervical Vertebra: A Case Report

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ABSTRACT

Objective: To analyze a case which appears to support chiropractic success in treating neurovascular symptoms through adjustment of the first cervical vertebrae.

Clinical Features: The patient was a 75 year old female presenting with gait ataxia, strabismus, fatigue, blood pressure fluctuations, seizures of two weeks duration, and history of concussion with similar symptoms. Previous medical diagnosis and care had been unrewarding.

Intervention and Outcomes: The patient presented to an Atlas Orthogonal chiropractic clinic where she was examined and her atlas vertebra adjusted per the SCALE method. The patient's symptoms were quickly and painlessly reduced and/or resolved.

Conclusion: Results suggest that Atlas Orthogonal care may be responsible for the reduction and elimination of neurological symptoms in this patient. Removal of intracranial insufficiency due to chronic compression of the vertebral artery by misalignment of the first cervical vertebra is a possible explanation for the mechanism of management success. These results suggest that chiropractic care, specifically adjustment of the atlas vertebrae, may be a useful treatment for conditions with neurovascular symptomatology.

Key Words: *seizure, ataxia, fatigue, migraine, vertebral artery, chiropractic, atlas orthogonal, subluxation, manipulation, adjustment*

Introduction

The field of chiropractic is currently recognized as having a very limited scope of practice universally. Chiropractors are seen mostly to treat neck and back pain, but numerous cases of positive results outside of these symptoms are known to occur. The lack of certain explanation for these results is likely the reason chiropractic care is not a more accepted treatment for such conditions. Often, the chiropractor who delivered the care is unsure of exactly how his treatment has prevailed. This uncertainty is brought about by the existence of multiple unproven theories coupled with disagreement within the profession.

The basic definition of a subluxation is a misalignment within the spine causing nerve interference. This disagreement

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exists even concerning the most universal task of a chiropractor: the correction of subluxation.

Originally, chiropractors believed that through manipulation/adjustment they removed nerve interference caused by direct bone-on-nerve compression in the intervertebral foramen (IVF). This theory has been challenged and is no longer considered the most likely explanation.[1] Even with near physiologically impossible stress on a cadaveric spine, the nerve root can still move freely within the IVF.

However, normal motions of lateral flexion, extension, and rotation can decrease the size of the IVF by up to 33% in the cervical and lumbar regions.[2] The Axis (C2) dorsal root ganglion (DRG) is perhaps the most vulnerable to compression due to its size with respect to the Atlas (C1) / Axis IVF. It has been shown to occupy up to an average 76% of foraminal height.[3] Still, even with forced rotation and hyperextension, there was decrease in height, but no direct bone contact to the ganglion.[4] It should be noted that the height ratio of the DRG to IVF will also vary due to the exact position of the DRG. It has been shown that a minority of DRG are located more proximally within the IVF, which is where the narrowest portion of the IVF lies.[5]

Current research suggests the key is in the surrounding tissue within the IVF. In the living spine, the nerve root is surrounded by lymphatic channels, the spinal segmental artery and vein, loose areolar and adipose tissue, and the transforaminal ligaments (TFLs). The TFLs are present in the majority of IVF and hold the nerve roots in a more fixed position then osseous structure would suggest.[6] Due to this confinement, the nerve root may be distorted and compressed without the superficially necessary osseous stenosis.

If there is a spinal misalignment or disc lesion encroaching on the IVF, the nerve root cannot move away from the lesion. Sharpless found that as little as 10 mmHg of pressure applied to 2.5 mm of the nerve root will result in a number of the fibers being blocked from conducting. After 30 minutes, the decrease in conductivity rises to 50%. The pressure required to induce a similar deficit in a peripheral nerve is in excess of 100 mmHg.[7]

The difference in susceptibility to compression has been related to the differences in the coverings of the two types of nerves. Nerve roots are covered by dura mater and are very susceptible to the effects of compression, while peripheral nerves are covered by epineurium and perineurium, making them far less susceptible. It may not, however, be the nerve fiber itself being compressed which causes diminished function. The change may actually be due to hypoxia or microcirculation ischemia of the nerve roots caused by compression in the IVF.[8] Nerve capillaries differ from capillaries in other areas of the body in three significant ways: they are wider, longer, and have much less musculature on the arteriolar side.[7]

The pressure gradient is very slight between the arteriolar and venous sides so it does not take much to decrease blood flow. The increase in metabolic waste caused by stasis in the vessels will draw fluid to the area to balance the concentration gradient. Nerve roots have less lymphatic drainage than peripheral nerves, thus accumulation of fluid is not easily removed.[9] This will lead to the nerve root presenting with a swollen appearance, which is important for any chiropractor claiming to be able to palpate the nerve root, as will be discussed later.

Infarction (loss of blood flow) to any living tissue will eventually cause temporary dysfunction or death to that tissue because all living tissues require nutrient and waste exchange. Infarction to cranial nerves can happen as in nerve roots, but from different means of compression or from insufficiency of larger vessels further from the nerve in question.

Neurovascular compression syndromes are commonly caused by pathological vascular contacts to the cranial nerves[10,11] causing neurological symptomatology. Infarction involving the distribution of the anterior inferior cerebellar artery has been known to cause audiovestibular functional loss including symptoms of vertigo, gait ataxia, sudden deafness,[12,13] spontaneous nystagmus, and eye motion limitation.[14]

Numbness and tingling in the arm, facial droop, and occasional syncope (partial loss of consciousness or awareness of surroundings) have also been related to vascular insufficiency originating in vessels external to the cranium.[15] The carotid arteries, the largest suppliers of blood to the head, have been shown to provoke neurological symptoms when compressed manually, with the potential to trigger nystagmus due to hind brain ischemia.[16]

Truly significant to this study is the potential to cause vascular insufficiency in the cranium leading to neurological symptoms due to spinal misalignment. The vertebral artery, which supplies much of the brain stem and posterior cerebrum, takes an unusual serpentine course in relationship to the skull, first, and second cervical vertebrae.[17] The vertebral arteries at the level of the first and second cervical vertebrae (Atlas and Axis) are particularly prone to mechanical compression due to their intimate relationship and the significant normal range of motion of the vertebra at this area.[18,19]

The best example of the result from vertebrobasilar artery insufficiency (VBAI; lack of blood supply to the basilar artery from the vertebral arteries) is a rare condition known as Bow Hunters stroke in which the vertebral artery is mechanically occluded during head rotation, resulting in stroke.[20] An individual's susceptibility to this condition is usually due to some abnormality of the bony structures in the area which makes arterial compression more likely. During this event, the entire distribution area of the vertebral artery under compression is prone to vascular insufficiency. Figure 1 shows a vertebral artery arteriogram, which displays its distribution pattern.[21] The symptoms of VBAI, however, are reversed by simply turning the head back to neutral and removing the mechanical stress (and, by extension, the stenosis) from the artery.[22]

By examining the severe example seen in Bow Hunter's stroke, we can come to the likely conclusion that lesser compression on the vertebral artery by an atlas misalignment could produce vascular insufficiency to the hind brain as well, with much less sudden and drastic symptoms. In fact, research has shown that there is a significant decrease in

intracranial blood flow from the vertebral artery following cervical spine rotation.[23] Research has also demonstrated the improvement of cognitive function through stint-assisted angioplasty to correct vertebral artery stenosis.[24] Therefore, adjustment of the atlas and relief of mechanical stress on the vertebral artery could potentially cure significant neurovascular symptoms caused by compression over time.

Compression over time, especially after trauma, however, can cause additional problems. The incidence of vertebral artery occlusion has been shown to be significant in patients with cervical spine trauma.[25,26] Further, most patients with vertebral artery occlusion following trauma do not reconstitute flow in the injured vertebral arteries.[27] Finally, and possibly of the greatest importance, thrombosis (blood clotting within a vessel) has been shown to occur in some cases after trauma and resulting rotational fixation.[28] This creates two possible dangers. The first involves the thrombus breaking free (becoming a thromboembolus) and causing a complete occlusion of a distal vessel which could lead to stroke.

The second involves fibrotic changes in response to the injury and presence of clotting which could render the vessel less elastic and more likely to rupture/dissect. Patients with a medical emergency known as vertebral artery dissection (VAD) often have initial symptoms which cause them to seek care from a chiropractic physician, then have a stoke some time after, independent of the chiropractic visit.[29,30] The result is the appearance of a stroke following a chiropractic adjustment.

The chiropractic technique of Atlas Orthogonal focuses directly and specifically on the atlas vertebra and its relationship with the cranium and axis vertebra. The technique can be summarized by three rules: in an optimally aligned spine, the cranium should be vertical, the atlas should be level, and the cervical spine should be vertical. In other words, the atlas should be perfectly perpendicular to the axis of the cranium and cervical spine.[31]

Atlas Orthogonal technique, also known as Stereotactic Cervical Alignment or SCALE, uses specific x-ray analysis, precise measurement, and mathematical calculation to determine the best angle (in three dimensions) to adjust an atlas misalignment.[32] During every office visit, each patient is assessed through supine leg check as well as scanning palpation of the C1 & C2 cervical ganglia as protocol for adjustment that day. A small study, conducted by Sweat, supported the interexaminer reliability of scanning palpation by experienced palpators.[33]

The adjustment is then delivered by a specially designed machine which applies a percussion force of approximately 5 lbs into the flesh over the atlas transverse process.[31] Although the patient can barely detect anything during the adjustment, the force is enough to move the atlas bone back into alignment due to the specificity of the placement and directionality which are calculated for each patient individually. The purpose of this case study is to analyze a case which appears to support Atlas Orthogonal chiropractic success in neurovascular symptoms through adjustment of the first cervical vertebrae.

Case Report

History

The patient was a 75 year old female who presented with gait ataxia (unsteady and uncoordinated movement), strabismus (laziness) in the left eye, and activity or posture induced seizures of two weeks duration. When walking, she had to take a wide stance and would drift left. She suffered from abnormally low energy levels and claimed to become exhausted after no more than walking across a room. Exhaustion or bending in forward flexion induced her seizures. When the seizures occurred, she felt a hot sensation in her upper chest, lost the ability to speak, and developed a painful migraine of the common type (no aura).

She previously saw her family doctor for this condition, but related that she was rushed to the hospital when he discovered her blood pressure to have risen "into the 200s." According to the patient, the hospital took an MRI, CAT scan, and sonogram over a three day period, but the results were unremarkable. She was told by a doctor that she needed physical therapy and anxiety medication. The patient decided that physical therapy was unnecessary because, prior to the onset of her symptoms, she had no difficulty with normal or even prolonged activity. The same was true for the anxiety medication because the patient claimed to have "never been anxious."

The symptoms did not subside so she returned to her family doctor. He then referred her to a neurologist, who told her she needed "eye and ear coordination" and again prescribed anxiety medication. At this point, the patient sought help from a cardiologist because her blood pressure had been going up and down. She could not walk to raise her heart rate so the cardiologist gave her an IV and chemically induced an elevated heart rate while taking blood pressure readings.

Unfortunately, this also induced a seizure. The patient reported that her blood pressure dropped to 40/30 and she was rushed to the hospital again. "Extensive MRIs, CAT scans, and [other tests]" were performed, but again, they "found nothing." The patient noted that the hospital considered giving her a pacemaker, but her blood pressure had normalized enough not to warrant the device.

The cardiologist then referred her to a different neurologist. He visited her in the hospital and discovered she had a history of concussion 10 years prior. Although her current episode was worse than ever before, the patient reported similar episodes in the past dating back to the concussion. The nature of the injury was a fall resulting in the impact of her occiput with the floor. She was unable to talk immediately following the fall and was taken to the hospital. She reported receiving a CAT scan and MRI along with many neurological examinations over the next 3 months. She was "getting a little better" after 3 months had passed so she was dismissed. Since then, however, she has felt like "her concussion" had returned ever so often, leading up to her current episode. According to the patient, the neurologist told her that the seizures were causing gastric reflux, which she felt as the hot sensation in her chest.

Also, he proposed that the concussion had caused her anterior cerebrum, where speech is controlled, to impact the front of her skull, leaving her temporarily unable to speak. Finally, he determined that she had an upper cervical misalignment which he thought was causing the exacerbation of her concussion symptoms. Traditional chiropractic care was not possible because her shoulders were "so touchy" that manual adjustment would send her into a seizure. Therefore, the neurologist referred her for Atlas Orthogonal chiropractic care.

Examination

It was observed that the patient had a high shoulder during postural evaluation and that her left leg was 3/4" shorter than her right upon supine leg check. Upon examination, it was revealed that she demonstrated strabismus (lazy eye) on the left when tracking to her right. Tenderness was also discovered at the first and second cervical nerve roots on the right. During x-ray analysis, swaying was observed in the standing position, though the patient was attempting to stand still. She also could not walk heel-to-toe, instead using a wide stance. After evaluation of her x-rays, it was determined that her atlas was out of alignment (elevated and posterior on the right).

Intervention and Outcomes

Following her first adjustment, the patient's posture was re-evaluated. Her shoulders were now level and her legs were balanced on supine analysis. Her walking had improved as well as her cervical range of motion - specifically rotation, which had been severely decreased "for years." The patient reported an increase in energy. For example, she had not done any ironing since prior to the onset of her recent episode, but did so for 2 hours straight that evening, stopping only "because it was dinner time."

The patient's care was continued. During each visit, she was checked to make sure the adjustment was holding through subjective evaluation, scanning palpation, and supine leg check. Although no adjustment was warranted until 149 days later, further visits saw improvement in her walking including the ability to walk heel-to-toe. Her balance improved to where she could stand on one foot. She noticed a general improvement in her vision - specifically clarity, brightness, and color perception. At first, her left eye began to track properly, but fall back. After time, the eye would track to the right properly and remain there for as long as the patient intended.

The left eye had also been getting tired much more quickly than the right when reading. She improved to being able to read "as long as she wants to" over time. Finally, it should be noted that she had not had a seizure since beginning Atlas Orthogonal care. Table 1 contains a summary of each visit the patient had made up to the present date. Figure 2 graphs the patient's subjective and objective progress over time. It should be noted that the data was graphed by visit rather than time elapsed. As the patient's care continued, the regularity with which she was brought in to be checked became increasingly less, as listed in Table 1.

Discussion

The subjective and objective data obtained shows a clear trend of improvement from the patient's initial condition, to near asymptomatic status. The patient did not seek any additional care other than Atlas Orthogonal and objective measurements yielded consistent results throughout her treatment. The results are especially reliable because the patient was only given a single adjustment to a single bone on any given visit – further implicating Atlas Orthogonal care in the instigation of her recovery. The word "instigation" is used because chiropractic philosophy dictates that the restoration of health is due to the proper function of the body and, indirectly, the chiropractic adjustment.

Mechanism

Symptoms similar to those of the patient's, especially issues with vision and coordination, have been shown to result from vascular insufficiency.[12-15] Insufficiency has been shown to result from pressure on the vertebral artery during rotation at the level of the atlas vertebrae in cases with both abnormal and normal osseous structure.[20,23] Atlas Orthogonal technique claims to correct misalignments in the atlas vertebrae.[31,32] The patient's symptoms were immediately and significantly reduced following her first adjustment according to subjective and objective data.

The adjustment appears to be the most likely cause of her positive response. Further, correction of vertebrobasilar insufficiency caused by misalignment of the atlas vertebra is a possible mechanism for this occurrence. Along with further substantiation of results like these, additional studies should be undertaken to assess the affect of adjustment to vertebral misalignment on microcirculation in nerve roots.

Conclusion

The results suggest that Atlas Orthogonal chiropractic care was likely to have reduced and eliminated the patient's neurological symptoms. The likelihood of these findings is aided by control for external treatments and the immediate significant improvement following the first adjustment. By comparison of symptoms to acknowledged cause and effect relationships, we can further propose that chiropractic adjustment to the atlas vertebra was likely to have relieved compression to the vertebral artery whose insufficiency was causing neurological symptoms in this patient. Large scale study of this mechanism is required to attribute any degree of certainty to these results. More substantiation for the mechanisms of positive results through chiropractic care in general is needed as well.

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Days Elapsed (since 1st Adj.)	Subjective	Leg Check	Scan	Additional Findings	Assessment	Care	Post Scan	Post Leg Check
0	N & S sev P bilat	L short 3/4"	C1,2 sev on R	Trapezius sev spasm bilat	Exacerbated	Initial Exam	N/A	N/A
0	N & S sev P bilat	L short 3/4"	C1,2 sev on R	Trapezius sev spasm bilat	Exacerbated	**Adjustment**	↓ Tender	Balanced
2	N & S mod P bilat	Balanced	C1,2 mod bilat	T5-8 mod tender bilat	Improved	None	N/A	N/A
4	N mild, S mod bilat	Balanced	C1,2 mild bilat	Trapezius mild spasm bilat	Improved	Muscle Therapy	N/A	N/A
6	N mod, S mild bilat	Balanced	C1,2 non-tender	T5-8 non-tender, no spam	Improved	None	N/A	N/A
8	N mild, S mild bilat	Balanced	C1,2 non-tender	T5-8 mild tender bilat	Improved	None	N/A	N/A
12	N mild bilat	Balanced	C1,2 mild bilat	None	Improved	None	N/A	N/A
16	N mild bilat	Balanced	C1,2 mild bilat	None	Improved	None	N/A	N/A
20	N mild bilat	Balanced	C2 mild bilat	None	Improved	None	N/A	N/A
24	N mild bilat	Balanced	C2 mild bilat	None	Improved	None	N/A	N/A
29	N mild bilat	Balanced	C2 mild bilat	None	Improved	None	N/A	N/A
36	N mild, S mild bilat	Balanced	C2 mild bilat	Trapezius mild spasm bilat	Improved	Muscle Therapy	N/A	N/A
43	N mild on R	Balanced	C2 mild on R	None	Improved	None	N/A	N/A
57	N mild on R	Balanced	C2 mild on R	None	Improved	None	N/A	N/A
73	N mild on R	Balanced	C2 mild on R	None	Improved	None	N/A	N/A
107	N mild on R	Balanced	C2 mild on R	None	Improved	None	N/A	N/A
149	N mild on R	L short 1/4"	C2 mod on R	None	Exacerbated	**Adjustment**	↓ Tender	Balanced
150	N mild on R	Balanced	C2 mild on R	None	Improved	None	N/A	N/A
337	N mild on R	Balanced	C2 mild on R	None	Improved	None	N/A	N/A
342	N mild on R	Balanced	C2 mild on R	None	Improved	None	N/A	N/A
344	N mild on R	Balanced	C2 mild on R	None	Improved	None	N/A	N/A
346	N mild on R	Balanced	C2 mild on R	None	Improved	None	N/A	N/A
353	N mild on R	Balanced	C2 mild on R	None	Improved	None	N/A	N/A

Table 1. Summary of Chiropractic Care. Table 1 contains a summary each office visit up to the date the case was acquired for report. Displayed are the days elapsed since the patient's first adjustment, subjective findings (the patient's condition as she reported it), objective findings (leg check, scanning palpation, and additional findings), overall assessment of her progress (shown as "exacerbated" or "improved"), care provided on that visit, post care scan findings, and post care leg check findings. The data depicts a trend of immediate and lasting improvement in both subjective and objective measure. Also important is the time elapsed between patient visits, which increased as her condition improved. The **a**bbreviations used were as follows: Adj. = Adjustment, N = Neck, S = Shoulder, P = Pain, sev = severe, mod = Moderate, bilat = Bilateral, L = Left, R = Right.

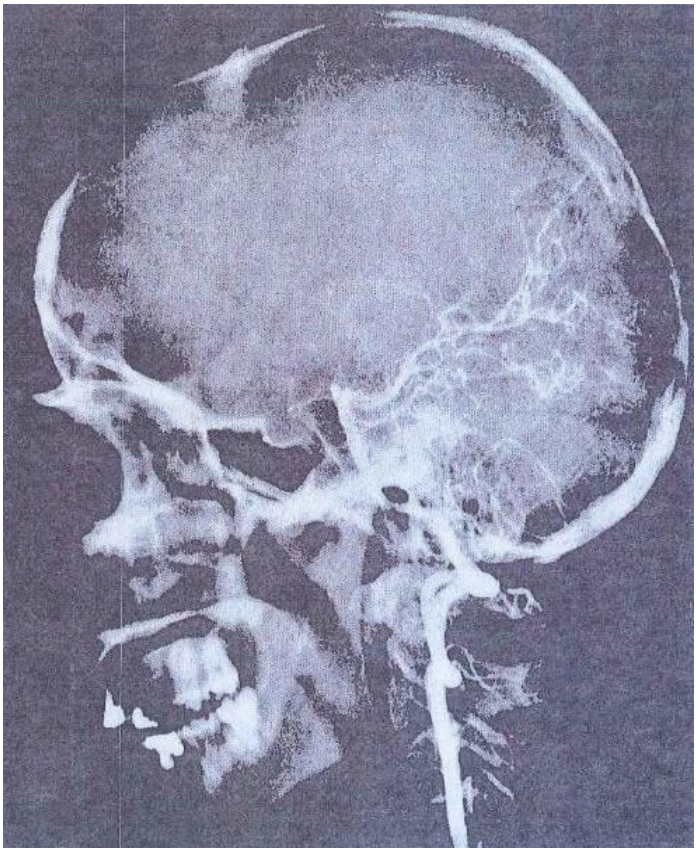

Figure 1. Lateral View of a Vertebral Artery Angiogram. Figure 1 demonstrates the distribution of the vertebral arteries.[21] It is evident that the vertebral arteries supply the brainstem and much of the posterior cerebral cortex. Also visible is the lateral view of the serpentine pathway taken by the vertebral arteries as they navigate the C2, C1, and occipital spinal levels.

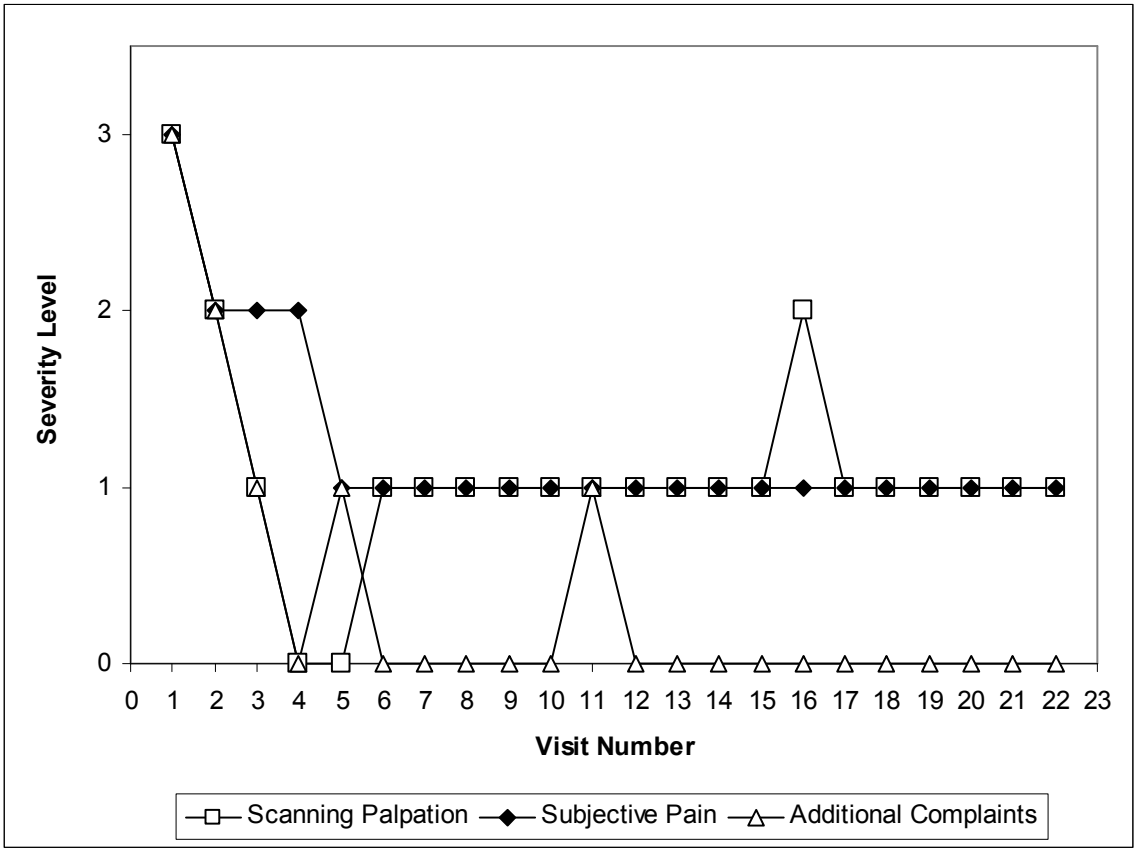

Figure 2. Subjective and Objective Data per Visit. Figure 2 demonstrates the patient's subjective (pain reported & additional complaints) and objective (scanning palpation) progress over time. Scanning palpation is, in actuality, both subjective and objective as both the doctor's observation and the patient's input are combined to produce the severity level. Severity levels of 0, 1, 2, & 3 correspond to "Absent, Mild, Moderate, & Severe" for the categories of scanning palpation, subjective pain, and additional complaints. The data shows an immediate and lasting improvement. It should be noted that the data was graphed by visit rather than time elapsed. Table 1 should be consulted for more detail.