Plain film radiography in the Atlas Orthogonal (AO) Chiropractic Practice

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AO is a specialty technique within chiropractic that focuses on the most complex joint in the human body: the upper cervical spine. It is part of a group of techniques that are united by their use of radiographic spinal analysis since the 1920s.

Being that the purpose of chiropractic is the *alleviation of suffering through the functional enhancement of life through neuro-musculoskeletal integrity* - Practitioners would be disadvantaged in their patient care if radiology was absent, by virtue of the fact that certain patients who *prefer*, *and seek out* these methods, would continue to suffer. Patient safety may also be compromised.

We will presently argue this point scientifically, but point out that this is also evident in a large global movement in social awareness through electronic communications.[1] [2] [3] [4]

The AO program was clinically formulated by Dr Roy Sweat[5], after Grostic[*] and Palmer[6], since 1980. Hundreds of doctors of chiropractic practice it world wide with thousands of cases documented clinically and in the medical literature[7] using this scientific protocol.

For the following reasons, there is no change or adjustment intervention made without first attempting visualization of the relationship and integrity of integral and contiguous hard tissue. An aberrant functional and structural upper cervical relationship in disease has been acknowledged by various groups- mainly chiropractors (from 1895), predated by osteopaths (c1875) and medical physicians such as Riadore[8] and in antiquity by Galen, Hippocrates and others. Currently Physiotherapist and Manual Medical Associations are also influential.

BJ Palmer revolutionized upper cervical treatments by formulating and coining the term *Spinography*. To this day it is debatable whether techniques benefit from spinography in comparison to other non-radiographic-based techniques but the best collection of references may exist in chapter five of Eriksen's book[9], which argues strongly for its efficacy as a tool in making accurate diagnosis and administering treatment of vertebral dyskinesia, postural distortion and cervicogenic neurological aberration as possibly causing patient illness.

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[*] In 1952 Dr. Sweat began a course of study specializing in the upper cervical occipital-atlanto-axial complex under Dr. John F. Grostic in Ann Arbor, Michigan. In 1960 Dr. Grostic chose Dr. Sweat to become an instructor at his seminars and help present the Grostic programs.

Following reasons are evidence for use of radiographs to correctly diagnose and treat suspected upper cervical vertebral lesions:

1. Relatively unchecked motion.
The upper cervical area consists of diarthrodial, freely moveable joints without limiting facet joints or discs. As stated by Basmajian in *Muscles and Movements*:

> *The vertebral column, the great stabilizer of the trunk, also embodies mobility. However, this mobility is limited by the various ligaments, articular facets, spinous processes, intervertebral discs and other indirect factors. Although the total range of movement of the spine is wide, movement between adjacent vertebrae is quite limited, except for the first two cervical vertebrae (the atlas and axis)."*[10]

Therefore, vectored adjustment is calculated via the roentgenometric analysis of upper cervical radiographs.

2. Complexity requires visual confirmation of palpatory findings
If this area does prove to demonstrate palpatory abnormality and postural deviation, after thorough history demonstrates injury, it may be due to abnormality. It may be unwise to proceed without imaging and plain film is cheap and easy to perform on site by the chiropractor.

This is reflected in White and Panjabi's major text:

> *The occipital-atlanto-axial joints are the most complex joints of the axial skeleton, both anatomically and kinematically.*[11]

3. Safety issues dictate that the human spine be visualised where appropriate
Patients may be at risk where the following is found:

a) postural distortion
b) allodynia or abnormal pain responses to palpation, anywhere in the spine, especially suboccipital regions
c) locomotor abnormalities indicating a postural component

It appears that safety may be enhanced when plain film radiography, accompanied by specific analysis, is applied. Biederman[12] wrote, in his treatment of children for upper cervical disturbances:

> *Where I work (Germany, Belgium, Switzerland) I do not deem it necessary to let the parents sign a written [consent] form. All parents receive a folder explaining the procedure and the eventual reactions of the children. To our knowledge there are no serious side effects to manual therapy in children (MTC) if the guidelines laid down here are followed. Our archives comprise more that 25 000 children treated in our practice (as of July 2003) and another group at least as big as this one treated by colleagues who follow the same procedure." Page 238.*

4. X ray line analysis (roentgenometrics) of the upper cervical spine is reliable
As observed in table one:

Table One: research into x ray line analysis reliability

Scientific study	Conclusions or comments
Grostic & DeBoer. Roentgenographic measurement of Atlas laterality and rotation: A retrospective pre- and post-manipulation study. JMPT 5(2) June 1982	"Under the circumstances presented in this retrospective study, these data tend to show that spinal manipulative therapy altered the position of the atlas in the postulated direction"
Aldis & Hill. Analysis of a chiropractor's data. J and Proc, Royal Soc., NSW. 112:93-99, 1979	Mathematicians statistically analyzed data obtained from an upper cervical chiropractor. Pre- and post-adjustment studies showed significant changes in both laterality and rotation.
Rochester RP. Inter- and Intra-Examiner reliability of the Upper cervical x ray marking system: A third and expanded look. Chir Res J 1994: Vol 3(1)23-31	This study concluded that all aspects of the upper cervical marking procedures are reliable.
Owens EF. Line drawing analyses of static cervical x ray used in chiropractic. JMPT 1992; 15(7);442-9.	"reliability studies exist showing that inter- and intra-examiner reliability are sufficient to measure lateral and rotational displacements of C1 to within + or - 1 degree"
Jackson BL, et al. Inter- and Intra-Examiner reliability of the Upper cervical x ray marking system: A second look. JMPT 1987	"Examination of the data suggest that the reliability (stability over time) for the practitioners is very good. The data on reliability (equivalence over experts) across the practitioners also suggests reliability is very good"
Harrison DE. Repeatability Over Time of Posture, Radiograph Positioning, and Radiograph Line Drawing; An analysis of six Control Groups. JMPT, 2003; 26(2):87-98.	Conclusions were that Posture is stable over time; radiographic positioning is repeatable; and the CBP radiographic line drawing is reliable. CBP, like upper cervical , do line vector/alignment analyses on x rays.

5. Neurological influence in the upper cervical area is subject to mechanical distortion syndromes

The neurology of the upper neck is unique. Postural deviation and poor alignment on any of the three cardinal planes can affect neurological function and can be visualised on x ray.

a) **Vestibular:** The cervical spine is a rich reservoir of proprioceptive vestibular input. Dysfunction of spinal segments in this area are likely to affect vestibular function, which in turn, may affect visceral function. Research[13] on rabbits suggests vestibular projections to the areas of the autonomic nervous system known as the nucleus tractus solitarius and the dorsal motor nucleus of the vagus nerve. Studies on rats show that upper cervical proprioceptors make direct connection to portions of the vestibular complex, and stimulation or inhibition may result in vertigo or nystagmus[14]. Through this, relationship may be postulated between postural controls, somatic mechanoreceptors, visual reflexes, and visceral autonomics.

b) **Periaqueductal Grey:** Cervical spine connections to the periaqueductal grey (PAG) have been observed in animal research. The PAG plays an important role in analgesia as well as in motor activities, such as vocalization, cardiovascular changes, and movements of the neck, back, and hind limbs. The strongest PAG-spinal connections have been observed to exist to the upper cervical cord[15]. The upper cervical connections terminate in laminae V, VII, and VIII, containing pre-motor interneurons of the neck muscles.

c) **Mechanoreceptor function:** Mendel[16] and McLain[17] stated the purpose of the mechanoreceptors in the intervertebral disc and facet joint capsular ligaments is to tell the central nervous system about changes in spinal alignment and position. Thus it can be understood that this afferent receptor input plays a vital role in posture.

d) **Posture**: If cervical spine dysfunction can affect vestibular function, then postural influences may relay to the autonomic nervous system. For example, a paper observing the phenomenon of sweating suggests "...that the autonomic nervous system is controlled at least in part, by body posture."[18]

e) **Dural connections:** Hack *et al*,[19] concluded after 11 dissections of human cadavers that there is a physical attachment between the rectus capitis posterior minor muscle and the dura mater of the spinal cord.

f) **Brain Stem connections and Cervicogenic Headache:** The trigeminal cervical nucleus can extend down to C4. Studies injecting noxious chemicals into the upper neck musculature showed that there was subsequent contracture of muscles of the TMJ. There may also be headache. Nilsson[20] also stated that the prevalence of cervicogenic headache in random population sample "...appears to be a relatively common form of headache, similar to migraine in prevalence." What is hypothesized is a confusion of the sensory information to the thalamus,

causing cortical firing to the head area of the homunculus, by a disturbance of upper cervical afferentation, involving the trigeminal pathways. Bogduk[21] wrote that cervicogenic headache can arise from abnormalities in normal joint end-play, and abnormalities of position found on radiographs. He clearly states:

> The neuroanatomical basis for cervicogenic headache is convergence in the trigeminocervical nucleus between nociceptive afferents from the field of the trigeminal nerve and the receptive fields of the first three cervical nerves. Structures innervated by C1-3 have been shown to be capable of causing headache...

<u>6. Patient outcomes may be improved with alignment analysis from radiographs</u>
Author Rochester[22] has demonstrated the benefits of using radiographic analysis in the upper cervical area

In conclusion:

a) It is the most complex area of articulation in the body.
b) There is communication between this area and the vestibular system <u>directly</u>
c) There may be direct muscular connection between this area and the spinal cord (dura)
d) There is direct input to the Thalamus from levels above C3.
e) There is mechanoreceptor input to the thalamus from the entire body. However, the number of these receptors being far greater in the upper cervical area, coupled with an absence of synapses that potentially modify representation in the neuraxis, makes the upper cervical area unique and highly influential.
f) Input into the periaqueductal grey area from the cervical spine has a role in various activities including pain regulation.

For all the above reasons, to negate a visual diagnostic radiographic system that is proven clinically and supported scientifically, may compromise safety and efficacy of techniques designed to alleviate the suffering of people with musculoskeletal disorders.

References:

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