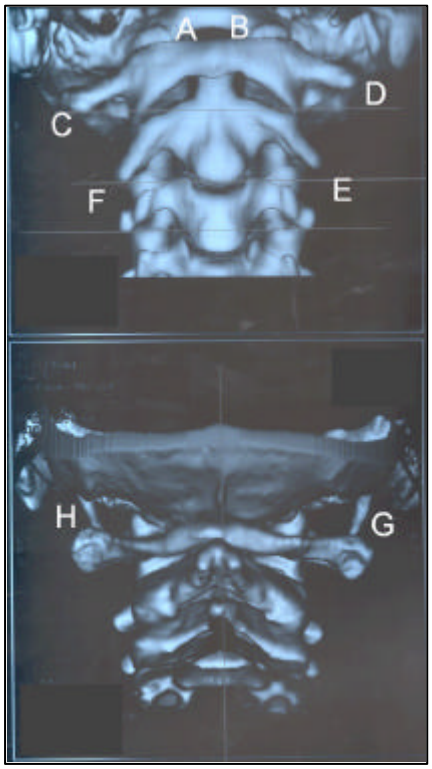
IMAGES and RADIOGRAPHS

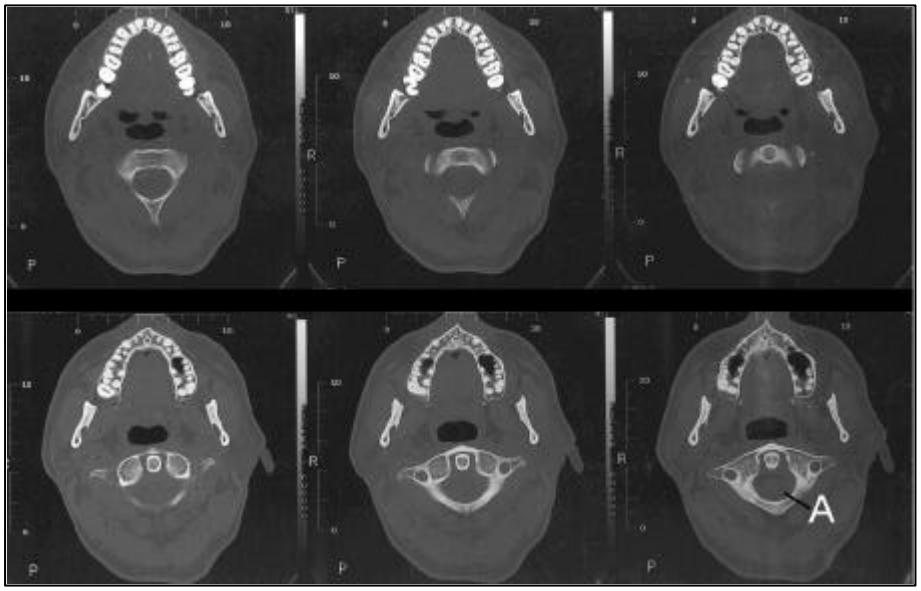
This section is to help you understand the different imaging and diagnostic options available to many practitioners today, and help you with some idea about what you need to look for when understanding your own images, scans and radiographs. There are many technologies available today which can assist chiropractors in locating and correcting the source of your discomfort. The scientific validity of these technologies is not in question.

X-ray: Scoliosis – This X-ray on the left was taken with the patient in standing position. The X-ray equipment is calibrated to ensure accuracy. Line A; on the X-ray shows the height of the two femurs to be the same. Therefore the scoliosis is not related to an anatomical short leg. Atlas subluxation pulls pelvis high on left. B and C are lines which indicate that the pelvis has lifted. According to upper cervical chiropractic research and case studies, this pelvis tilting occurs in compensation for the atlas subluxation at the top of the cervical spine.

X-ray: Scoliosis – This X-ray on the right was taken with the patient in standing position. The X-ray equipment is calibrated to ensure accuracy. Line A; on the X-ray shows the height of the two femurs to be different. This person has an anatomical short leg (measured by CT scan to be 10mm or 0.4 inches). Therefore the scoliosis shown here is related to this anatomical short leg. B and C are lines which indicate that the pelvis has dropped on the right, the side of the short leg. People who sustain an atlas subluxation with an already short anatomical leg will incur further scoliosis and pelvic distortion.



3 Dimensional Helical CT Scanner: This is a 3D image (left) of the upper cervical spine taken by a helical CT scanner. The top scan shows the cervical spine looking from the front of the patient and the bottom is that from the rear. The CT scanner takes an appropriate number of slices and the software reconstructs those images into the 3 dimensional scan shown opposite. Upper cervical chiropractic (atlas orthogonal) vertex X-rays of this patient indicated an anterior left subluxation of atlas to occiput. Interestingly, even though these CT scans are taken with the patient lying down, this subluxation would seem to be evident. You will note it appears that the right occipital condyle (A) is more exposed than the left (B) and that the atlas transverse process is more anterior on the left (D) than the right (C). This is because the atlas has rotated forward on the left. Further this person's head is tilted to the right due to the atlas subluxation. The weight of the head to the right causes a widening of the gaps in the intravertebral foramen between C2 and C3 on the left (E) and a reduction of the foramen on the right (F). What happens to spinal nerves leaving the spinal canal through this foramen? Could one conclude that the spinal nerves leaving the canal at (E) would be stretched by ligaments they travel through, and at the same time compressed at (F)? Another indication of the altered weight bearing is the amount of the stylomandibular process which is shown. At (G) there is more exposed than at (H). This is because the weight of the head is pushing the right transverse process of the atlas down and the left up. That is, the atlas is not level with ground. A combination of orthogonal and Blair upper cervical X-ray analysis with some conventional imaging would, I think, reveal everything about the articulations in the upper cervical spine on most patients.

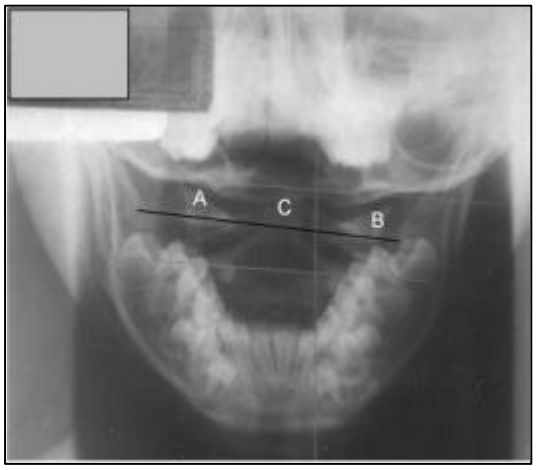


2 Dimensional CT Scan: This scan is another view of the same patient in the 3D scan above. The scanning is from the bottom up, thus the right side of these scans is actually the left side of the patient's head. You will note in the bottom 3 scans that the atlas vertebra is clearly rotated to the left anteriorly. If you look closely you can see that the inner margins of the atlas vertebral ring appear to overlap the foramen magnum (A).

Foramen magnum malformation
[not central to skull]

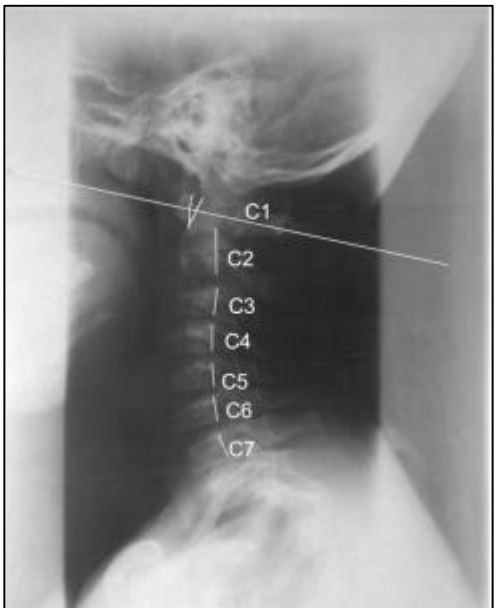
Radiologists considered the above CT scans to be "Within Normal Limits". Could this actually be normal or is it the definitive signs of an upper cervical subluxation? Blair upper cervical analysis would confirm whether or not this person had offset occipital condyles (picture left), and thus whether or not this anatomy was 'normal' for this patient. We wouldn't want to have our atlas adjusted if this rotation was normal!

"We must never forget that before any of us can know the correct vertebral positions, we must first know of all existing asymmetries and malformations." **Dr. William G. Blair**



Nasium (open mouth) X-ray: This is an X-ray of a 10 y.o. child. The atlas lateral masses are labeled (A) and (B) and the odontoid process or peg is labeled (C). This X-ray was taken with calibrated equipment and with the child standing, and assuming her normal (for her) posture. Clearly the atlas is significantly tilted and the centre line of the skull is not perpendicular to the ground. Weight bearing on the cervical spine is now altered as the head is off centre – "not on straight".

Now look at the effect of this altered weight bearing on the normal (lordotic) curve of the cervical spine (right). I have labeled the cervical vertebrae and placed a line on the posterior portion of the vertebral body. The head posture is forward, and you can see that the gap between the anterior arch of the atlas and the dens (odontoid process), indicated by the 'V' has widened. This is known as the atlanto-dental interval (ADI) and when it widens and looks like a 'V-sign' some authors suggest it indicates some instability, whereas others suggest it could be due to congenital laxity of ligaments. The loss of normal curve of the cervical spine which is occurring at C2-C3 is due to the weight of the head and thus



centre of gravity now being forward of C7. A flattening out of the midline through C1 as indicated by the white line is a further indication on altered weight bearing of the skull on the cervical spine, manifesting itself as observable forward head posture seen in many people today. The radiologist report on the above X-rays included "Alignment of the cervical spine is normal." You tell me if you think a child who carries her head forward and with these X-rays has a 'normal' cervical spine.

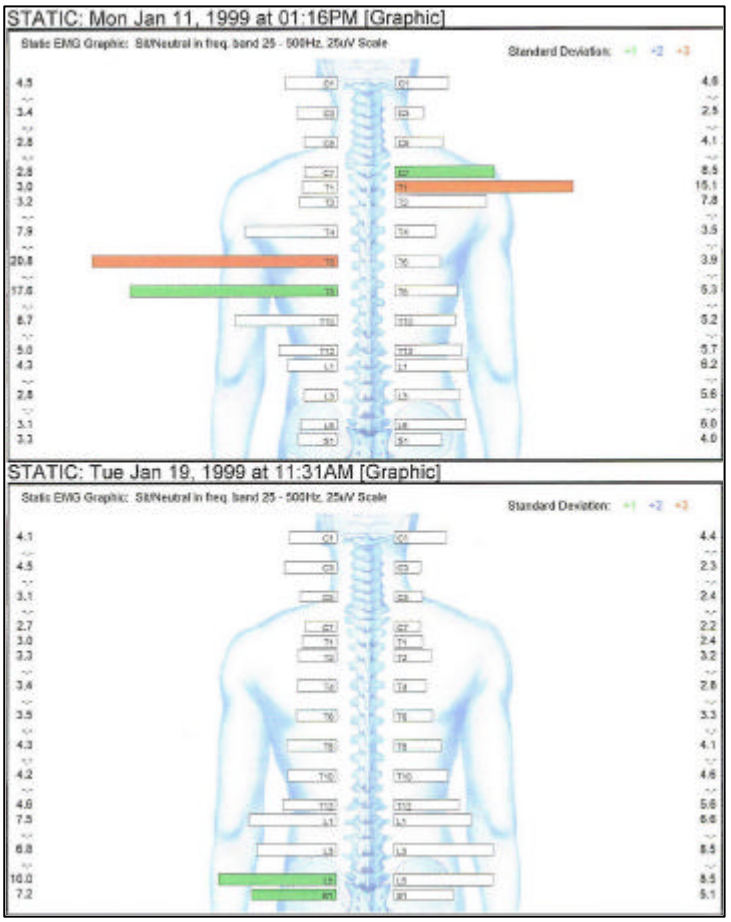
"Atlas rotation following blow on the neck"; Australian Physician Magazine; Vol. 27, No. 6, June 1998, 'Letters to the Editor'; Pg. 461-62; Drs F. Orenshaw and P. Crooke of Healesville, Victoria, Australia.

I think it is appropriate here to digress slightly and make reference to the 'Letters to the Editor' referred to above. The letter discusses a woman who received a blow to the neck from another player's elbow during a game of basketball. Her symptoms shortly afterwards were "severe headache, nausea, giddiness, a fainting sensation, pain in her neck and pins needles in her right hand." A referral to cervical spine x-ray was reported as, "no abnormality is shown in the cervical spine. The vertebrae are in normal alignment." The patient referred herself to a chiropractor, who discussed the case with the doctors. The chiropractor carried out manipulation to the upper cervical spine with reported "dramatic results". Apparently, "Within 2 minutes facial colour was restored, headache, nausea and dizziness were completely relieved". Two days later further gentle chiropractic manipulation was done, which "relieved residual neck pain and peripheral nerve symptoms". Drs Orenshaw and Crooke raise the question of so called 'normal' X-ray findings with patients continuing to suffer ongoing symptoms and finish with the comment "this case appears to demonstrate the need for close scrutiny of upper cervical films to detect quite small displacements of the atlas that can cause significant clinical symptoms."

Those who are familiar with upper cervical subluxations will know that what the two doctors refer to above is common place in the community and is already known throughout the chiropractic profession. These types of subluxations are detectable on precision upper cervical chiropractic X-rays and in most cases can be corrected by utilizing upper cervical chiropractic techniques. It's time the medical profession realized that many of their patients today actually have these subluxations, and further they would most likely be helped by referral to 'specific' upper cervical chiropractors. The evidence linking upper cervical subluxations to myriad conditions and symptoms is abundant. Likewise, the evidence linking upper cervical chiropractic to correction of these upper cervical subluxations and reversal of the associated conditions and symptoms is also abundant. The above results come as no surprise to those familiar with chiropractic. The average medical doctor ***does not*** understand chiropractic. The medical profession should engage upper cervical chiropractors and work in unison with them to manage cases. Patients will be the main beneficiaries. Isn't that what it's all about?

Magnetic Resonance Imaging (MRI): Another type of imaging (left) which can be used is MRI. The image to the left is that of the cervical spine of the same person in the 3D and 2D CT scan above. You will note the loss of cervical curve resulting from forward head posture. The white lines again indicate the anterior ring of the spinal canal. Normal lordosis has been lost. You will also note disc bulges into the spinal canal impinging on the thecal sac. There is a small disc bulge at C3/C4, a bigger one at C4/C5 (A) and a smaller one again at C5/C6. Thus the altered weight bearing on the cervical spine, due to the "head not being on straight" and not sitting perpendicular atop the cervical spine, changes the biomechanics of the cervical spine. This in turn, over time, causes the vertebral bodies to compress down on the discs between them pushing the discs into the spinal canal. Degenerative processes are at work and unless addressed this type of situation becomes chronic. The head goes further forward, muscles holding the head up become atrophic, vertebral fusion processes progress and the symptoms (neurological, vascular and musculoskeletal) associated with such spinal injuries increase in intensity.

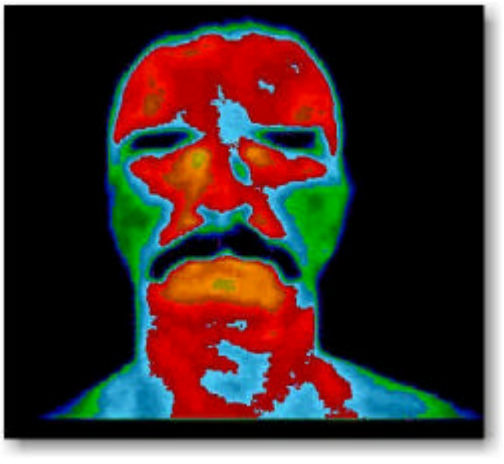
Electromyography (EMG):



Electromyography is the measurement of electrical activity that occurs within muscle fibres in response to nervous system stimulation. As muscles contract electrical signals with amplitudes in the microvolts (millionths of a volt) range, are created within the muscles. Sensors placed on the skin's surface detect these electrical signals and the active muscles and provide this information to the EMG unit. In chiropractic EMG can be used to help locate muscles which are 'tight' or in 'spasm'. Typically, this would be at the site of a subluxation. Upper cervical subluxations can create scoliosis, thus the areas which might show up in EMG analysis would be at the site of the scoliotic curves. EMG can be used to measure before and after upper cervical adjustment muscular problems, as shown in the print outs on the right. The top shows the positions of muscular activity, which also coincided with the patient's areas of pain. These areas also correlate with the patient's scoliotic spine. The bottom EMG output, which was taken after upper cervical chiropractic adjustment to the atlas, shows much improved EMG levels. According to Chiroweb.com: 'Paraspinal EMG Scanning: A Viable Technology for Chiropractic', http://www.chiroweb.com/archives/09/09/02.html; "Chiropractic adjustments alter paraspinal EMG readings. Chiropractors have often observed dramatic palpatory changes in paraspinal muscles pre- and post-adjustment. Shambaugh conducted a study where surface electrodes were used to measure paraspinal EMG activity before and after chiropractic adjustment. This study was reported in JMPT, a refereed, peer-reviewed journal. Shambaugh concluded: "Results of this study show that significant changes in muscle electrical activity occur as a consequence of adjusting." Similar findings were reported in a study conducted by the osteopathic profession. Ellestad et al. found that paraspinal EMG activity decreased in patients following osteopathic manipulation. Similar changes did not take place in controls."

Digital Infrared Imaging (DII):

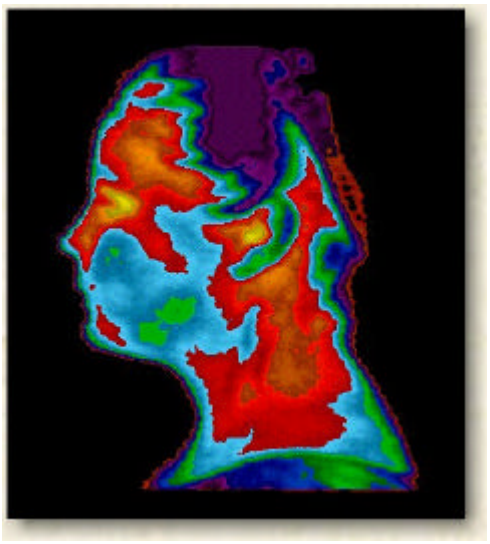
Reprinted with permission from Dr. William C. Amalu, DC, DABCT, DIACT, FIACT - Vice President and Research Director – International Upper Cervical Chiropractic Association [IUCCA]. For further detail and list of the references see website http://www.pacificchiro.com



Over thirty years of clinical use and more than 8,000 peer-reviewed studies in the medical literature have established digital infrared imaging (DII) as a safe and effective means to examine the human body. This highly specialized technology fills the gap left by less sensitive procedures in determining a diagnosis. By assisting the doctor in determining a diagnosis, DII ultimately helps to ensure that a patient is receiving the most appropriate care for their condition.

DII is based on a careful measurement and analysis of skin surface temperature. It is completely non-invasive and does not require the use of radiation or other potentially harmful elements. Special training is required to capture as well as to interpret the images. Extensive research and investigation performed at prestigious medical teaching

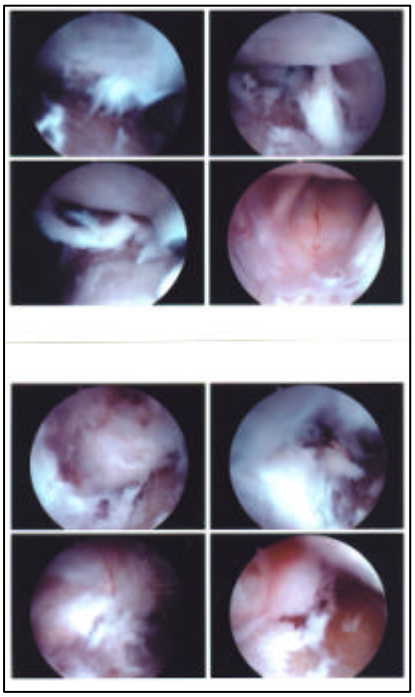
institutions such as Johns Hopkins University Medical School, have established normal values for the distribution of heat in each region of the body. During the DII examination, variation from these normal values are measured and correlated with suspected injuries or diseases in the same way a blood or urine laboratory study is interpreted.



DII excels at measuring nervous system function. It possesses 96% sensitivity and 94% specificity rating respectively. Sensitivity is the ability to detect an abnormal finding in a group of people known to have a particular condition. Specificity is the ability to detect a normal finding in a group of people known to be free of that condition. Other common imaging procedures such as MRI, CT scan and EMG have ratings which are all under 90% and some possessing up to 40% error ratings. In trying to measure the subtle nervous system changes which accompany many injuries and disease states, use of these other procedures would be like trying to find a virus with a hand held magnifying glass.

Many imaging procedures demonstrate changes in the structure of the body (anatomy) but do not measure how well it functions (physiology). X-ray, CT scan, and MRI all look at anatomy whereas DII measures physiology. The use of anatomical imaging exclusively to detect a nerve problem would be incomplete. This would be similar to a mechanic trying to diagnose a car problem by looking at all the parts of the vehicle and never hooking it up to an analyzer and turning the car on.

Digital Infrared Imaging is not limited to the detection of nervous system conditions. Medical research has shown it to be helpful in the diagnosis of, Breast Cancer, Repetitive Strain Injuries, Headaches, Neck and Back Problems, TMJ Conditions, Numerous Pain Syndromes, Arthritis, Vascular Disorders, and Soft Tissue Injuries among others. Treatment failure is often the result of incomplete or misdiagnosis. By assisting the doctor in determining the diagnosis, DII ultimately helps to ensure that a patient is receiving the most appropriate care for their condition.



Arthroscope: Although not a diagnostic procedure used by chiropractors, the images (left) being arthroscopic pictures showing right and left temporomandibular joints (TMJ), are interesting because they are of a patient who sustained an upper cervical subluxation and was reporting noises in the right jaw joints soon after. The patient's head tilt was to the right and it is the right TMJ (bottom) which shows most damage to the meniscus (cartilage) which lies between the jaw (mandible) condyle and the skull socket (fossa). Upper cervical subluxations which cause the patient's head to move off centre, thus resulting in head tilt, can result in the misalignment of the TMJ condyle into the socket in the skull. This misalignment or incorrect articulation of the joints causes the jaw condyles to 'catch' the meniscus during normal jaw movement as with eating, talking and yawning. This 'catching' can result in tearing of the meniscus and ongoing damage to the TMJ mechanism. TMJ symptoms as reported by patients of TMJ physicians or dentists correlate highly with those symptoms reported by upper cervical chiropractic patients. TMJ symptoms have been shown to resolve following upper cervical chiropractic adjustment and also following TMJ dentistry. Some dental physicians also report resolution of patients' poor posture following TMJ dentistry, and certainly poor posture is rectified following upper cervical chiropractic adjustment.

SUMMARY:

It can be shown that there are many imaging options available to today's practitioners. In my experience it is also patently obvious that much pathology is 'missed' and people complaining of what eventually become chronic symptoms are never really helped in a timely manner. Upper cervical chiropractors are trained in detecting sometimes subtle signs in their patients' cervical spines; usually after the patient's

standard radiographs have been classed as ‘normal’ or ‘within normal limits’. I find time and time again that main stream medical practitioners dismiss out of hand findings on radiographs made by experienced chiropractors. I think it’s time to concede that chiropractic examination, which has been around for decades, does provide appropriate methodologies to reveal ‘hidden’ or ‘missed’ pathologies. It can then be hypothesized that these pathologies do lead to chronic symptoms and as evidenced by chiropractic cases and studies, such symptoms may be reversed with chiropractic intervention. It also highlights how important it is for chiropractors to utilize ‘specific’, that is ‘precision’, upper cervical analysis and adjustment techniques.

I think that the following study shows just how important it is to have an open mind and to be alert when examining cervical spine imaging of patients who have been involved in some kind of accident involving a direct head injury (of any force) or whiplash event.

Comparison of Radiographic, MR Imaging, Anatomic, and Pathologic Findings Radiology, November, 2001;221:340-346.
Authors: Axel Stäbler, MD, Jurik Eck, MD, Randolph Penning, MD, Stefan P. Milz, MD, Reiner Bartl, MD, Donald Resnick, MD and Maximilian Reiser, MD

In this study the cervical spines of 10 accident victims were examined using radiography and MR imaging. The results indicated that radiographic X-rays found only 4% of lesions and that only 11 of 28 lesions were found using MRI. Soft tissue injuries accounted for 89% of c-spine lesions detected in postmortem images and some factures were missed by X-rays. The authors note that “the c-spine is a particularly susceptible site for injury” and these “injuries are often occult.” A further study involving 22 traffic accident victims found 245 various lesions which “were not detected on radiographs.”

Other notes by the authors are; “Hyperextension injuries of the cervical spine are common and are associated with a risk of spinal cord compromise of variable degree even in the presence of normal radiographs.” And “hyperextension injuries … often show only subtle radiographic abnormalities, even in severe and unstable lesions.” The study confirms “the high frequency of associated cervical spine injuries after severe head injuries.”