SKULL BASE [Craniocervical] ANATOMY

INTRODUCTION

In order to understand the types of problems and symptoms one might experience as a result of an atlas to skull subluxation it's necessary to have a close up look at the junction between the skull and the first cervical vertebra or atlas [craniocervical junction]. At first glance it's clear that there is not a lot of room at the skull base junction, in fact it's much like a road map with nerves, blood vessels and ligaments crisscrossing the area. Thus it is not hard to imagine that misalignments between skull and atlas may have a significant negative affect on the critical neurological and vascular structures whose pathways to and from the brain pass through and around this area.

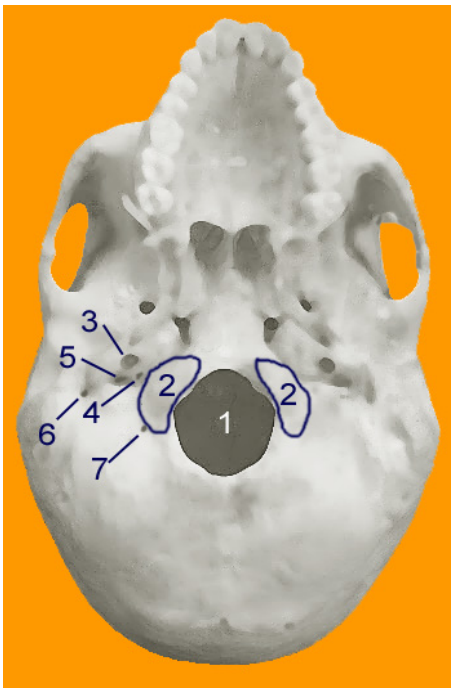

Figure 1: The HUMAN SKULL BASE

Opposite is a depiction of the skull base and anatomy of interest. This is the inferior view or view from the bottom. The following structures or cavities (foramen – holes) can be identified. These foramen and therefore the neurological and vascular structures, which pass through them, are in close proximity with the atlas vertebra and muscles and ligaments attached to and surrounding the atlas.

1. Foramen magnum – this is the exit hole from the brain for the spinal cord and entry to the brain for the vertebral arteries from the cervical spine.
2. Occipital condyles – these kidney shaped structures articulate or connect to the articular facets of the atlas, as shown in my section entitled "Anatomy of the Atlas Subluxation" – reference 'superior articular – occipital condylar surface'. To use an analogy, these occipital condyles 'balance' on the atlas much like one might place one's feet in horse stirrups. The stirrups being the atlas facets and one's feet being the occipital condyles.
3. Carotid canal – this cavity is where the internal carotid artery passes through into the skull in the petrous temporal bone. The temporal bone is that which 'houses' your hearing mechanism – internal ear structures. The carotid artery runs through this bone very close to the pharyngotympanic (auditory or Eustachian) tube. It may be possible for altered flow of blood in the carotid artery to be detected by your inner ear mechanism, and what affect does this have on your brain. Fernandez Noda et al, in their paper 'Neck and brain transitory vascular compression causing neurological complications', J CARDIOVASC SURG 1996; 37 (SUPPL. 1 TO No. 6): 155-66, suggest "compression of arteries including the carotid at the level of the cervical atlas results in "faulty irrigation of blood supply and oxygen of the cerebellum and basal ganglia of the brain. Among the effects are: a decrease in the secretion of dopamine at the level of the putamen, which produces the symptoms of Parkinson's disease" etc.

4. Hypoglossal canal – this is where the Hypoglossal or cranial nerve XII exits the skull after making its way from the medulla (lower portion of the brain stem). The hypoglossal is a motor nerve and provides motor control to the tongue muscles.
5. Jugular canal – this canal contains three major cranial nerves and a vein, these being;
    a. The glossopharyngeal or cranial nerve IX, which is both a motor and sensory nerve. It is responsible for visceral motor & sensation and taste. It innervates the posterior tongue, walls of the pharynx and the middle ear. The stylopharyngeus muscle is also innervated by the glossopharyngeal. This is an interesting connection as the stylopharyngeus muscles open and close the pharyngotympanic tube by affecting the recoil of the cartilage around the tube. Maybe here lies a connection to hearing disorders?
    b. The vagus or cranial nerve X, which is the largest cranial nerve. Vagus is Latin for 'wanderer' and this is because the vagus, being a motor and sensory visceral nerve has major responsibilities throughout the body and hence 'wanders' a long way. This nerve sends motor control and receives sensory feedback from the bile and gall ducts attached to the liver, the pancreas, spleen, stomach, intestines, lungs, heart, and bronchial structures. The vagus also provides sensation to the external acoustic meatus, which is the ear canal.
    c. The spinal accessory or cranial nerve XI is a motor nerve, which controls the neck & shoulder muscles, such as the trapezius and sternocleidomastoid but also joins with the vagus to innervate the muscles of the larynx and pharynx.
    d. The jugular vein.
6. Stylomastoid canal – the facial nerve or cranial nerve VII passes through this foramen on its way to innervate the muscles of facial expression. It also innervates the stapedius muscle of the middle ear, which acts to dampen the response of the ossicles of the ear to loud noises. There are other functions of the facial nerve, which are listed in most medical textbooks associated with this subject.
7. Condylar canal.

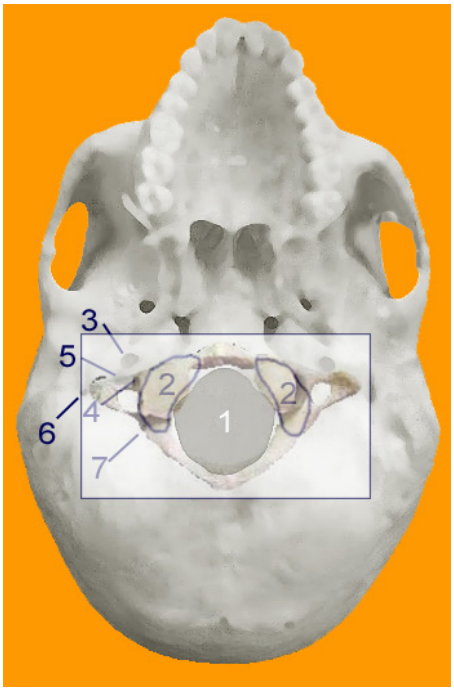

Figure 2: SKULL BASE with ATLAS OVERLAY

In this figure I have overlaid the atlas to show its position relative to the foramen and hence critical structures leaving or entering the skull. In a non-subluxated position the foramen are quite close and remember that there are many muscles and ligaments between the atlas and the skull, which the neurological and vascular structures must pass through. Thus when a subluxation, even a minor one, exists at this level there may be quite dire consequences for the individual. It is quite possible for the ligaments 'straining' to maintain stability of the upper cervical spine and hold the head perpendicular, to place compressive or traction forces on the cranial nerves and blood vessels in and around these ligaments or muscles. The result

can be attenuated nervous system signals and/or attenuated blood flow. What would be the result of the vagus not firing at full potential? It is not hard to envisage organs, which do not function correctly. And what would be the result of a reduction in blood flow to the brain? We know that in catastrophic occlusions of arterial flow stroke can be a result. What would the result be even in minor reductions in flow? I suggest the result could be myriad neurological and/or other symptoms, which, apart from the complaints being made by the patient, go undetected by the diagnostic processes available to your average MD or specialist.

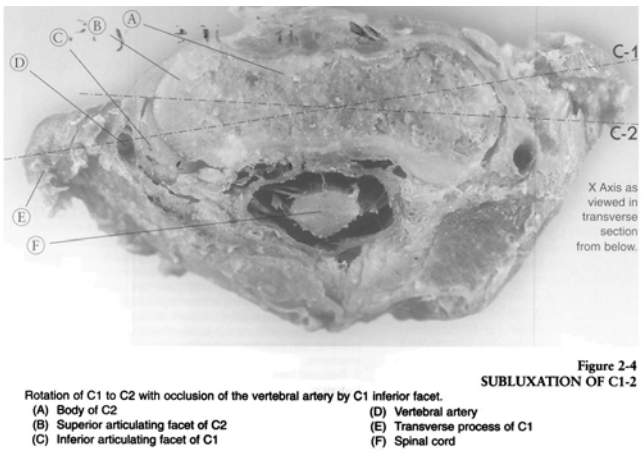

Figure 3: C1-C2 SUBLUXATION and OCCLUSION of VERTEBRAL ARTERY

Source: 'Atlas of Common Subluxations of the Human Spine and Pelvis'; RUCH, William J. - D.C. ; CRC Press LLC © 1997; Page 13. Order this book through CRC Press at www.crcpress.com, Search for RUCH.

Opposite is an axial section (or cut) as seen from below of a subluxation of C1 (atlas) to C2 (axis). It is noted by Ruch, "it is apparent that C1 is rotated relative to C2 and the inferior articulating facet of C1 on the left is contacting and compromising the vertebral artery." Given that the vertebral artery provides blood supply to the cervical spinal cord and posterior portions of the brain, e.g. cerebellum, surely this kind of subluxation, which I suggest is quite common, would have the potential to result in adverse and even dire consequences for an individual?

SUMMARY

The base of the skull, that is, the junction between the skull and the upper cervical spine, is packed with very critical neurological and vascular structures. These structures wind their way to and from the brain via foramen or holes in the base of the skull and pass through ligaments and muscles responsible for maintaining the head atop of the cervical spine (neck). When a person receives a blow or bump to the head, the result can be a shift of the skull on the first cervical vertebra (atlas or C1). This shift causes the ligaments and muscles holding the head perpendicular to the spine to go into spasm, which can and does result in compression and/or traction of the vital nerves and blood vessels passing through them on their way to organs and other parts of the body. Long-term affects of this on the body, amongst other things are biomechanical changes to the spine, viewable postural changes, atrophy of key muscles e.g. trapezius & sternocleidomastoid and dysfunction in organs. Tension can be placed on the lower part of the brainstem or upper part of the spinal cord, which of itself alone is a cause for concern. Anyone who has sustained a subluxation of this kind, and I'm such a person, will attest to the multiple and distressing symptoms which seem to abound. Those like me that have run the gauntlet of modern conventional medicine in search of answers will also attest to a lack of understanding of this injury. I was lucky enough to stumble upon 'specific' upper cervical chiropractic as a solution to this problem, but not before I was subjected to unnecessary surgery, in the "off chance" that it may relieve me of my symptoms, which it was being suggested were all in my mind. Have a look at my symptoms at the time. One would have to conclude some kind of cranial nerve or

vertebral artery involvement. I don’t blame Doctors for not understanding this, but I do blame them for not trying to understand what is happening here, studying it and ruling out chiropractic as not being relevant.

Finally, tens of millions of dollars have been given to modern medicine in order to research human diseases. What cures have been found? Not much I put to you. Surely a few well-directed millions to research the atlas subluxation phenomenon and the affect that upper cervical chiropractic may have on a person’s well being would be funds invested wisely? Read the research, case studies and information available throughout the World and you will find that there are overwhelming pointers to a condition of this type to be involved in many human illnesses. Time to forget prejudices and put the patient first.