

The Autonomic Nervous System and its Relationship to Headache.

by Dr. Dietrich Klinghardt, M.D., PhD

Thomas Willis, the “father” of modern neurology, proposed the vascular theory of headache in 1672. He suggested that the source of pain was not the brain itself but nerve fibers being pulled by the distended vessels(1)

Harold Wolff reported in 1930 on the autonomic nervous system (ANS) involvement in migraine headaches: he postulated, that the primary cause of migraine is vasoconstriction of the extracranial arteries in the early phases of the headache followed by vasoconstriction -with associated peripheral vasoconstriction in the limbs(2). Other signs suggesting ANS involvement in headache include nausea, diarrhea(3), constipation (4), coldness in hands and feet, paroxysmal tachycardia (5), chest pain (6), variant angina (7), paraesthesia and numbness of the skin and others. The vascular theory of migraine was the generally accepted working model until the cell receptor theory came along around 1970. In 1908 Nobel prize laureate Paul Ehrlich postulated the existence of cell receptors, whose interaction with specific agents was a mechanism responsible for many illnesses. Receptor biochemistry has become the basis for most pharmacological approaches. A recent example is the development of the drug sumatriptan which attaches to the 5-HT₁ receptor. Other receptors involved in headache include the alpha-2 receptors, u-opioid receptors and somatostatin receptors. Until today there are numerous theories on the neurophysiology of headache, none of which are completely proven(8).

Anatomy

To understand the role of the ANS in headache, the anatomy has to be understood. The ANS serves 3 basic functions in the brain:

1. Innervation of the **smooth muscle** of the vascular tree within the brain. A stress signal within the sympathetic nervous system will generally lead to vasoconstriction in the affected area of the brain
2. Transport of **neuropeptides** and informational substances within the axons of the ANS into the terminals within the vascular endothelium. Several dozen substances travel via the ANS axons to the endothelium and are released into the bloodstream, causing both local and systemic effects. Serotonin, enkephalin, nitric oxide and the inflammatory peptides such as substance P, neurokinin A and calcitonin gene related peptide are thought to be involved in the genesis of migraine pain.
3. 80% of ANS fibers are thought to be sensory in nature and may be directly involved in **pain perception**. Sensory autonomic nerves are present in the cranial membranes (dura, arachnoid, tentorium), in the connective tissue and in the walls of the larger blood and lymphatic vessels. The ANS is known to have a wind-up effect (sensitizing effect) on the wide dynamic range(WDR) cells in the spinal chord, which modulate the pain pathway. If pain originates for example in the trigeminal system, this message has to pass through the WDR cells. Is the threshold lowered by arousal of the sympathetic nervous system in the same segment, the pain message passes through the WDR cell up into the brain. Arousal in the ANS can be caused by any excitatory stimulus acting on the axons, nerve endings or ganglia of the ANS. Common in the dental arena are abnormal electrical signals (“abnormal signaling”) arising from dysfunctional scars (from tooth extractions or surgical procedures) or from dysfunctional teeth (decay, incompatible restoration materials, mechanical stress, toxicity from filling materials and infections etc.). The dental pulp has its own autonomic nervous system mostly comprised of sympathetic fibers traveling piggyback on the arteries, veins and lymphatic vessels of the toothpulp. The fibers are post-ganglionic and arise in the anterior cervical ganglia (stellate, middle-and upper cervical sympathetic ganglia) and travel to the teeth piggyback on the vessels and trigeminal nerve fibers). Any dysfunction in a tooth or related structure (muscles of mastication, periosteum, dental ligaments, jaw joint capsule) may cause arousal in the adjacent sympathetic fibers, causing local or systemic electrical chaos in the ANS, which in turn can often result in the clinical picture of headache. This includes organic headaches, tension headache, cluster headache, TMJ/dental related headache, migraine headache, cervicogenic headaches, sinus headaches and others.

Treatment Options

Only 3 treatment systems have evolved, that utilize the current understanding of the ANS involvement in headache patients in a sophisticated manner:

1. Acupuncture
2. Biofeedback
3. Neural Therapy

Neural Therapy is a treatment modality developed in Germany over the last 75 years, that addresses dysfunction of the ANS in a targeted and specific way. Other treatment modalities certainly work by modifying the ANS, such as chiropractic, cranio-sacral therapy etc., but the practitioner is rarely aware of this fact and is not utilizing the current physiological and anatomical knowledge base to further improve skills and results.

Health issues, that affect the ANS

Research has shown, that the ANS is commonly disturbed by a selected number of factors:

1. membrane instability caused by nutritional and hormonal deficits (i.e.: a number of nutrients, such as aminoacids, minerals and vitamins are required for the daily nutrition of a nerve; DHEA and pregnenolone have a membrane stabilizing effect)

2. food allergies

3. **toxicity** from metals and solvents : mercury toxicity destroys the enzyme that makes tubulin, a major structural component of every nerve axon

4. **emotional factors** : unresolved psycho-emotional issues create chronic arousal of the sympathetic nervous system via the limbic-hypothalamic-ANS axis.

5. **occlusal problems**: healthy proprioception has a suppressive effect on pain messages traveling through the WDR cells, poor proprioception facilitates pain signals. Poor occlusion also stimulates abnormal ANS signals in the ANS nerve endings in the involved structures

6. chronic **infections** (especially in face and jaw): toxins from teeth are often neurotoxic-interfering with the healthy function of a nerve

7. electromagnetic and other manmade **biophysical stress** : nerve conduction is the spreading of an electric field along the axon of a nerve. Man-made electric and magnetic fields can interfere with that function, often leading to lasting dysfunction, even if the noxious input is removed

8. the “interference field (IF)” or “focus”

A focus is a group of cells, that is disturbing to the system. A focus most often causes problems away from the site of the focus. Therein lies the main problem: how to find it. A focus can be a chronic osteomyelitis in the jaw, from where bacteria exit and settle in other specific target sites in the body (infectious focus). It can also be a group of cells, that has been injured (through scalpel, trauma or illness). These cells can become impulse generators, creating small bursts of electric impulses, which travel within the ANS, causing problems often far away from the disturbed site (electric focus).

Diagnosis

The following diagnostic approaches have emerged in the last 30 years, that are able to assess dysfunction of the ANS and/or locate a focal area:

1. Heart rate variability testing
2. Thermography

3. Electrodermal screening (EAV)
4. Autonomic response testing -ART (“kinesiology”, “muscle testing”)
5. Palpation/clinical exam
6. Chinese pulse diagnosis (also VAS)

Treatment

The treatment consists in an appropriate intervention, that eliminates or treats the disturbing factor.

Here is a list of common solutions, that have emerged in the European Neural Therapy context :

1. **Cluster headache:** the focus is usually a small area inside the nose, where the middle turbinate touches the nasal septum. Treatment is either injection of the area with normal saline or procaine or a series of sphenopalatine ganglion injections
2. **Migraine:** the focus is usually a scar, which can be anywhere on the body. Gallbladder, hernia, hip surgery and appendix scars are most common. Treatment is injection of the scar with saline or procaine. Also food allergies are common. To test most common foods, the Coca pulse test is the most reliable and cost-effective method: establish your resting heart rate, eat the suspected food. If your rate increases by 4 beats/min or more, avoid the food
3. **Cervicogenic headache** (common after whiplash injuries): the focal area is the superior cervical ganglion and the injured autonomic fibers in the upper cervical facet joint capsules. Treatment is a series of injections to the ganglion with procaine and facet joint injections of a mix of procaine and proliferant (such as P2G, which is a phenol, dextrose and glycerine mix)
4. **Trigeminal neuralgia** and atypical facial pain: the focus is usually a jaw bone infection or NICO lesion, which has to be found and surgically eliminated
5. **Tension headache:** the cause is usually an unresolved emotional childhood trauma, which has to be uncovered, reexamined and reprocessed. Techniques such as hypnotherapy, EMDR, NET or psycho-kinesiology(PK) are ideal.
6. **Sinus headache:** this type of headache is the great mimic: it can look and present like any of the other major types of headache, but also present as severe neck pain only. Treatment consists of treating a set of perivascular ANS points in the face or performing a series of sphenopalatine ganglion blocks
7. **TMD/dental headache:** again, the pain syndromes caused by pathology of the oral cavity can present in many different ways, mimicking other types of headache. Treatment for a dental headache is a) diagnostic anesthesia to the affected tooth, preferably using the stabident system b) appropriate intervention. For TMD related pain usually a mix of several procedures is required: a) correcting the plane of occlusion and the shape of upper and lower arch b) elimination of trigger points c) stellate, SPG, otic ganglion and vagus ganglion injections. Always consider unresolved emotional issues.

Results

The overall cure rate for headaches with this approach is high. Neural Therapy and autonomic response testing are techniques with extremely high benefit/risk ratio and can be mastered by any licensed health care practitioner.

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