Presumptions about the Mechanics and Causes of Headaches and Migraines over the last Century: A Historical Perspective

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For over a century now, neuroscientists have dedicated research to investigating headaches and migraines, in order to better understand this enemy common to many. Anyone who knows the misery of a migraine or severe headache understands the desperation for any new information and, most of all, a cure. Research in this area has come a long way over the years, aided in a large part by developments in research techniques and tools. Although there is still much to learn about headaches and cures are still sought with vigor, neuroscientists currently have a clearer understanding of the cause, the mechanisms, and the different forms of headaches and migraines than they did a hundred years ago.

Before taking a look back at the historical perspectives of head pain that have led to today's understanding, it is important to consider current theory of the causes and mechanisms behind headaches. A study published just last year by Watson and Drummond [1] focused on the role of cervical afferents, sensory neurons of the neck, in the pain associated with both migraines and tension-type headaches. The researchers confirmed previous claims that head pain results from deep stimulation of cervical afferents through joints and muscles. The cervical afferents converge on neurons of the trigeminal nuclei, the nuclei responsible for passing along pain, touch, and temperature signals to the midbrain when deeply stimulated. Watson and Drummond furthered the understanding of migraines and tension-type headaches by trying to reproduce head pain in patients of varying experience with migraines and tension-type headaches. The data showed that usual degrees of head pain were reproducible in patients who frequently suffered from migraines or tension-type headaches, while the same stimulation was unlikely to produce pain in a participant who had never experienced this type of head pain. This indicates that frequent headache sufferers may have a type of cervical dysfunction that causes deep stimulations of cervical afferents to send pain to the patient's head. Research continues in this domain because there are still many unanswered questions. The knowledge neuroscientists have now is largely due to relatively recent breakthroughs in the field, for there have not always been sufficient research techniques or tools.

Before identification of neurons was even thought possible, scientists were curious about the cause of head pain and sought relief. Almost a century ago, in 1925, an article was posted in the Los Angeles Times [2] which confidently explained, based on the supposed knowledge of migraines at the time, the source of the pain. The event of the migraine was described as an inflammation of the nervous system [2]. Though this is a broad, unreliable statement, this marked only the beginning of a theory of inflammation associated with migraines. In fact, the Neurogenic Inflammation Theory of Migraines was a major focus of research in the mid-1980s, some 35 years after this article was posted in the newspaper [3]. This inflammation theory claimed that vasoactive neurotransmitters released from afferent neurons inflame cerebral blood vessels by increasing blood pressure in target tissues. Though the presumption made
in 1925 was based on no more than observation and crude science, the inflammation theory was later founded by more reliable research.

Unfortunately, this is the only claim in the article from the Los Angeles Times that is still supported in Neuroscience today. The article continues by saying that the inflammation of the nervous system is caused by “digestive evils” [2]. The conclusion that migraines are a condition of the digestive system was likely due to the nausea that accompanies many migraines. However, this idea has since been abandoned. As mentioned above, the cause accepted by many neuroscientists today is that the pain stems from cervical dysfunction [1]. Lastly, the recommendation for migraine relief was to arrange furniture and plan color schemes in a way that calmed rather than aggravated the nervous system. Warm colors were said to be calming, while colors of lesser intensity were soothing. Cold colors were to be avoided and color combinations, taken into account [2]. Science has since shifted from a speculative form of providing relief to one based on controlled scientific experiments involving various treatments. Though the 1925 article is laughable by today’s standards, it is interesting to know the origins of migraine theory, and even more fascinating that some claims from 100 years ago have been followed up in more recent studies.

Research involving headaches and migraines drastically shifted from this science of observation and speculation to one involving hands-on science in the 1930s. Neurosurgical procedures were carried out with local anesthesia in order to stimulate certain areas of the brain and receive responses from patients throughout the procedure. This new technique allowed Ray and Wolff, two prominent neuroscientists, to create maps of the brain which indicated the associated response site when a particular area was stimulated [3]. These maps were a big step in headache research because they revealed which sites of stimulation were involved in particular pain sites within the head.

Neurosurgical breakthrough allowed for the focus of headache research to shift from a general concept of head pain to more specialized focus on types of headache and sites of pain. Subsequent research was able to target specific areas in which headache sufferers had a particular weakness. In 1968, Bradley et al. [4] discovered a treatment that reduced frequency and severity of migraines in women who suffered from especially bad migraines during menstruation. Unfortunately, the treatment, flumedroxone, was not able to revolutionize the field due to its undesirable side effects. However, neuroscientists continued on this specialized path in desperate search of a cure to severe head pain. Due to the stimulus maps and other developments that made it possible to breakdown the headache into different sites and degrees of pain, headache classification became necessary. In 1988, the Headache Classification Committee was formed in order to categorize different types of headaches [3]. Four major headache classifications were created—migraine, tension-type headache, cluster headache, and other primary headache—under which 14 sub-categories were named. This greatly propelled the understanding of headaches by providing categories for neuroscientists to analyze separately, as different types of pain are likely associated with different causes, different mechanisms, and thus, different treatments.

As classifications of different types of head pain became widely known, research regarding specialized types of headaches and specific pain sites became more common. One year after the Headache Classification Committee confirmed the four
main types of headaches, in 1989, Bonuso et al. [5] conducted a study similar to the first one discussed, in which head pain in migraine patients was reproduced. Bonuso et al. demonstrated that in unilateral migraine sufferers, pain was only reproduced if it was stimulated on the same side in which the patient’s pain usually occurred. When the stimulus was placed on the opposite side, the migraine pain was not reproduced in the patient. In bilateral sufferers, stimuli placed on either side of the head reproduced pain on that side of the head, but also spread to the opposite side of the head as well, though it usually stayed strongest on the stimulated side. This supports the notion that pain is adept at following a familiar pathway, and there may be dysfunction involved in migraine patients’ neurons that make them more susceptible to pain in certain sites in their heads.

Neuroscience research on migraines and headaches has developed dramatically in the past century. Just under one hundred years ago, observations led neuroscientists to believe that headaches were the result of a digestive condition and that certain color schemes would ease nervous system inflammation [2]. Today, the tools and techniques available to neuroscientists are greatly improved and have allowed scientists to discover the types of neurons involved in headaches as well as potential causes of this pain. Though neuroscience has come a long way so far, relief from the intense pain of migraines is still in high demand, and research in this area will not die down until more curiosities are dismissed and a clear cure is mastered.

References