Tension-Type Headache
—Its mechanism and treatment—

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Abstract: Tension-type headache, often accompanied with dull pains originating from the occipital area, shoulder stiffness etc., is the headache caused by ischemic muscle contraction, which must be distinguished from those having psychological or depression-type pathogenesis. Headaches in patients with tension-type headache begin often in bending down posture or during a night sleep with a high or hard pillow. Those patients have the tendency of having a slender and long neck and problems with cervical angulation or cervical instability. It is important to strengthen the neck muscles by exercising the abdominal and back muscles and also to try to maintain the correct, straight posture in daily life. Medical treatment is necessary for those with hypotension or anemia, and neuroleptics are effective for headache caused by stress.

Key words: Tension-type headache; Muscle contraction headache; Psychological headache; Depression

Introduction

Tension-type headaches make up 2/3 of all chronic headaches. This fact is important when considering the treatment of headache. Actually, muscle contraction headache, psychological headache and masked depression are often confused with each other.

In psychological headache, headache is the chief complaint, and its intensity (complaint) is often strong. The condition of the headache, however, varies, and it always has concomitant symptoms such as sleeplessness, dizziness, numbness of the four extremities, and irritability. Although the patients with psychological headache strongly complain of their headache, they have a relatively normal daily life and do not seem to worry much about their headache. On the other hand, when the headache disappears, the patients suffer sleeplessness or other concomitant symptoms, which then become the center of their attention. In other words, the patients with a psychological headache are living comfortably as if they are protected by a surrounding wall called headache; thus, in reality, it will become a problem if the head-
TENSION-TYPE HEADACHE

The pain mechanism

If the muscles continue to contract for a long time despite a decreased blood supply (called ischemic muscle contraction), pain substances such as lactate, pyruvic acid etc. are released. Pain occurs when these substances stimulate the nerves. Then a sensation of pain occurs at the sites of muscle attachment and ligaments where peripheral nerves are densely distributed.

This pain is characterized by a dull ache. With tension-type headache, the pain occurs at the insertion of the posterior neck muscles in the occipital area. At the same time, the pain radiates across the sides of the head or the retroorbital areas; thus, the pain is also felt around these areas. This is the pain mechanism of tension-type headache. On the other hand, in the belly of muscles where the nerves are loosely distributed, a duller and localized, vague feeling of so-called “stiffness” is felt in the belly of muscles.

Why does tension-type headache occur?

By thorough observation of patients with tension-type headache, it is found that the headache begins when they are bending their heads down. They are in the so-called bending down posture. As a result, the posterior neck muscles become very tense. If the abdominal muscles are actually touched, they are hard. In those cases where the patients wake up early in the morning due to a headache, it happens because they use high or hard pillows, which consequently increase the tension in the posterior neck muscles.

The patients first feel “tension” or “stiffness” in the posterior neck area. Here “tension” refers to the muscles that are tensed while “stiffness” means the beginning of a dull ache that results from the tension. The pain then radiates across the sides of the head and further to the retroorbital area.

When giving infiltration anesthesia with
Xylocaïne at the tender point, which is located in the posterior neck, the entire expanded headache immediately disappears. Therefore, it shows that the headache is a referred pain that radiates from this tender point.

EMG activity of the posterior neck muscles in a sitting posture reveals that the changes in EMG, indicating the degree of the muscle contraction, is higher in patients with headache than in control subjects without headache. If a headache occurs, the posterior neck muscle contraction only disappears when the head is kept straight in an upright position. Therefore, this intense muscle contraction is not a result of the pain.

3. The body structure of patients with headache

An adult head weighs approximately 4 kg. This corresponds to 3 full bottles of wine or one watermelon. If one holds either of these in one’s hands and extends the arms, pain immediately spreads throughout the arms and “stiffness” remains. We are almost never aware of the heaviness of the head, but the neck is constantly supporting such a heavy object.

Upon examining the frame of patients with headache, it is revealed that the neck is usually slender and long compared to the weight of the head. Head weight moment index (headache index) shows such a frame. It is calculated as follows: head circumference $^3 \times$ (the torus occipitalis—the 7th cervical spine)/neck circumference $^2 \times 1000$. This indicates the head weight moment over the neck per unit dimension. Female control subjects and headache patients are $2.4 \pm 0.4$ and $2.9 \pm 0.4$, respectively, while male control subjects and headache patients are $2.0 \pm 0.4$ and $2.4 \pm 0.4$, respectively. It is significantly larger in the headache patients than in the control subjects, and also larger in the female than the male. In other words, this indicates that the neck is slender and long compared to the head weight. Most of the patients suffering from headache are females with long necks. One cannot change one’s frame, however, strengthening of the neck muscles by exercising the abdominal and back muscles is important.

4. Problems with the cervical spine

Cervical stability means that the cervical spine supports the head in a stable way. The cervical vertebrae usually form a slight curve to support the head securely. If there is no cervical spine, it would be impossible to support the head only with muscles. Nonetheless, patients with headache have problems with this cervical stability. When the cervical spine is bent forward, it is called angulation. In such a case, the weight of the head cannot be supported.

In addition, when the spine is shifted forward in a bending down posture, it is called instability. This also significantly prevents the cervical spine from supporting the weight of the head.

On X-ray, angulation and neck instability were found in 50% of patients with tension-type headache.

Cervical stability impairment of the ligaments that are attached to the cervical vertebrae results. In other words, bending the head down for a long time or using a high and/or hard pillow extends the ligaments.

5. Hypotension and anemia

Poor oxygen supply to the muscles also triggers ischemic contraction. So, when does the oxygen supply become insufficient?

Firstly, hypotension is one of its causes. When a person with hypotension bends down, the muscles become tightly contracted, and the blood flow stops due to the low pressure in the blood vessels.

In the case of anemia, the basic problem is that the blood cannot supply sufficient oxygen, therefore oxygen deficiency occurs easily even though the vascular flow is maintained.

6. Stress

Stress and depression do not trigger headache immediately.

When stress, such as a mental arithmetic load
is given under the electromyogram and vascular flow tests, changes in muscle contraction are not observed. However, blood circulation sometimes drops to 50%.

Therefore, if a strong stress load is given when the muscles of the head are continuously contracted for some reason, muscle contraction with oxygen deficiency occurs immediately, and pain substances are released. Then headache begins.

7. Differences between voluntary bending down posture and involuntary bending down posture

Athletes never feel “stiffness” during matches. On the other hand, if the same posture must be maintained, “stiffness” occurs easily.

Upon examining the EMG activity and the blood flow volume, it was revealed that when involuntarily passive muscle contraction occurs, the blood flow in the muscles decrease and the decreased state continues as long as it is contracted. On the other hand, even though muscle contraction has the same intensity, when muscle contraction is initiated voluntarily, the blood flow recovers in about 20 to 30 seconds as a reflex reaction.

In fact, headache is easily induced when the neck and shoulders are relaxed, and the head is loosely bent downward.

8. Problems with pillow

The higher the pillow, the stronger the tension in the posterior neck muscles. This fact can actually be confirmed by surface EMG.

Treatment for Tension-Type Headache

1. Do not bend down

In most cases, tension-type headache can disappear by only correcting the posture.

When correcting the posture, take the following steps: first, actually touch the posterior neck muscles with the hands to check their firmness. Bend over, looking above the knees. Gradually look up. The muscle tension diminishes as the visual line approaches the horizontal level. A straight posture with a book on the head is indeed the best posture. Try to maintain this posture in daily life. Also, it is effective to develop the habit of immediately looking up and relaxing for about 5 minutes when tension or a dull pain emerges in the posterior neck area.

Re-checking the environment to establish the origin of daily headaches is also necessary. For example, if headaches occur easily while working at a desk, ideas such as lowering the chair, tilting the writing board or tilting the keyboard need to be practiced.

2. Muscle training

Nonetheless, the posture can be taken involuntarily, and cannot be corrected easily if the muscle strength is not sufficient. For instance, it is reported that 40% of amyotrophic lateral sclerosis carriers and many Duchenne Muscle Dystrophy carriers complain of tension-type headaches. It is advisable to exercise the abdominal and back muscles in the morning and evening, even if it is only for 1 to 2 minutes.

Concerning the present-day body structure of women, the abdominal and back muscles are often poorly developed. The body structure appears to be fairly solid from the front view, but when looking at it from the side, the body does not have thickness and the “queen of playing cards” body frame is noticeable. With this body frame, one easily becomes hump-backed, consequently promoting a bending down posture.

3. Treatment of hypotension and anemia

When a person with hypotension bends down, the muscles become tightly contracted, and the blood flow stops due to the low pressure in the blood vessels. In the case of anemia, the basic problem is that the blood cannot supply sufficient oxygen, therefore oxygen deficiency occurs easily even though the vascular flow is maintained. Treatment therefore is necessary by way of diet or medication.
4. Treatment for stress
Neuroleptics show certain effects.

Conclusion
Tension-type headache is a distinctive bio-
physical phenomenon. Treatment demands that
a good posture is taught from childhood.

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