Cervicogenic Headache

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A cervical origin for common headache is generally only considered when the distribution of the pain is posterior and when the upper cervical spine demonstrates osteoarthritis. For most authors, the cervical spine does not play a major role in common headache. Muscular, cervical, static or postural origins are sometimes alluded to. But generally, common headaches are considered as psychogenic pain that manifests with protective guarding of the neck and shoulder girdle muscles, commonly referred to as the "tension headache".

On the contrary, we believe that the upper cervical spine play a frequent role in common headaches. We have described a semiology. If psychogenic factors are frequent in common headaches, they are perhaps sequelae, while the real cause of the headache is often cervical.

But headache is a very nonspecific symptom with multiple causes. Statistics show that 2-3 of 1000 headaches are caused by a serious disorder. Therefore, before a headache is classified as "common," a detailed and thorough history and physical examination of the patient are necessary. If there is still any doubt, ancillary studies should be performed and advice from specialists sought.

COMMON CHARACTERISTICS OF CERVICAL HEADACHES

Cervical headaches have their own semiology (Maigne 1968, 1976, 1981). They are most often unilateral. In all cases, there is tenderness to palpation of the C2-3 facet joint ipsilateral to the headache (Fig. 1 *left* and *right).* During the different acute episodes, their topography is fixed, always right or always left for a given patient. With time, it can become bilateral. For a given patient, the cause triggering the attack can always be the same or vary from one attack to the other: postural, psychologic, digestive, menstrual periods, etc. It is sometimes impossible to determine the exact nature of the trigger. The attacks may vary in frequency and intensity and may last a few hours to a few days. It is important to note that the cervical and craniofacial signs of examination described below are constant and permanent and can be found even between acute attacks. Suitable cervical treatment is regularly useful. Attacks and clinical signs of the examination disappear, even if the usual triggering factors persist.

Figure 1. Left, Cervical segmental examination. Examination for facet joint tenderness. **Right**, In all cervical headaches, the segmental examination demonstrates facet joint C2-3 tenderness on the side where the headache usually presents. The C2-3

facet joint is the hightest that one can palpate. Stress on this facet joint translates to a dysfunction of C2-3 and eventually to segments that are supra-adjacent, including C0-1 and C1-2.

Cervical Semiology

For us, the only spinal sign indicating the cervical origin of a headache is tenderness to palpation of the C2-3 facet joint on the affected side. In 20% of cases, that pain is bilateral. A possible decrease in active or passive mobility has no particular value; it certainly demonstrates the existence of a cervical problem, but it does not establish the cervical origin of the headache. It is unusual to provoke the headache by various cervical maneuvers. However, pressure maintained on the facet joint point can reproduce the usual referral pattern (Fig. 1, *left* and *right).*

In most cases, radiographic studies of the superior cervical spine are normal. The existence of arthritic lesions does not automatically imply that they are responsible for the headache. In a patient with repeated attacks, facet joint (C2-3) palpation is tender ipsilateral to the headache and is found even between acute attacks. In general, it is the result of a Painful Minor Intervertebral Dysfunction (PMID). Occasionally, it can be due to acute synovitis.

DIFFERENT ASPECTS OF CERVICOGENIC HEADACHE

Three forms of cervicogenic headaches can be distinguished, each with its own semiology.

- Occipital (Fig. 2a)
- Occipitotemporomaxillary (Fig. 2b)
- Supraorbital, the most frequent, which corresponds to a projection of the cervical pain in the territory of the ophthalmic division of the trigeminal nerve (Fig. 2c)

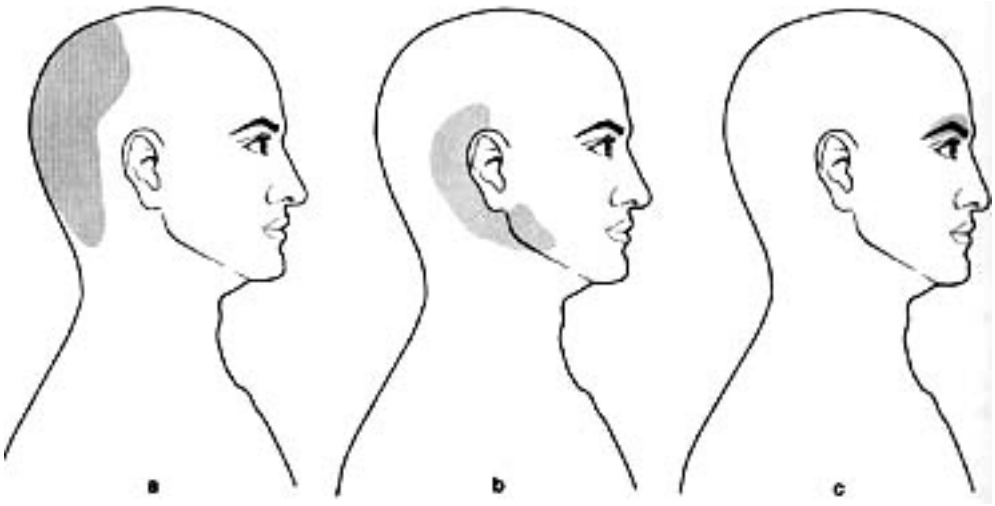

Figure 2. Three types of cervical origin headache (Maigne). a, Occipital form. b, Occipital temporal maxillary form. c, supraorbital form (the most frequent). Tese forms can exist as mixed types.

Occipital Headache

Occipital headache is felt at the occiput and can radiate to the vertex. It corresponds to the territories of the posterior rarni of C2 and C3 facet joint is the highest that one can palpate. Stress on this facet joint translates to a dysfunction of C2-3 and eventually to segments that are supra-adjacent, including C0-l and Cl-2 (Fig. 3). Isolated, it represents 20% of headaches of cervical origin, but it is often associated with other forms. The acute form is Arnold's neuralgia; it is rare, and its paroxysms are generally provoked by forceful

or strenuous movements of the neck. The chronic form is frequent. It is responsible for episodic occipital headaches of variable duration and intensity. In both cases, the friction sign of the scalp (Maigne) can be found.

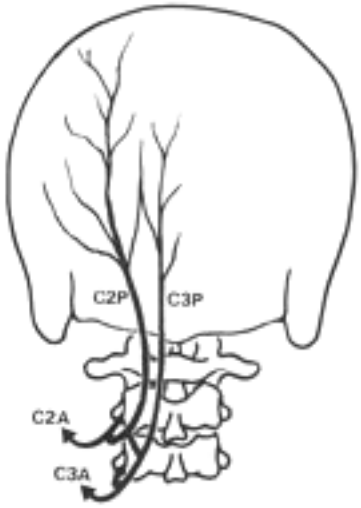

Figure 3. Posterior primary rami of C2 and C3 (C2 Post and C3 Post) and anterior primary rami of C2 and C3 (C2 Ant and C3 Ant) (according to G. Lazorthes).

Friction Sign of the Scalp (Maigne)

Friction applied to the scalp replaces the pinch-roll test. It consists of pressing firmly with the pad of the fingers against the scalp and mobilizing it with small to-and-from motions (Fig. 4). This maneuver is painless on a normal scalp, but it is very disagreeable and even painful in the case of an occipital headache of cervical origin. Ipsilateral to the C2-3 facet joint, tenderness is found.

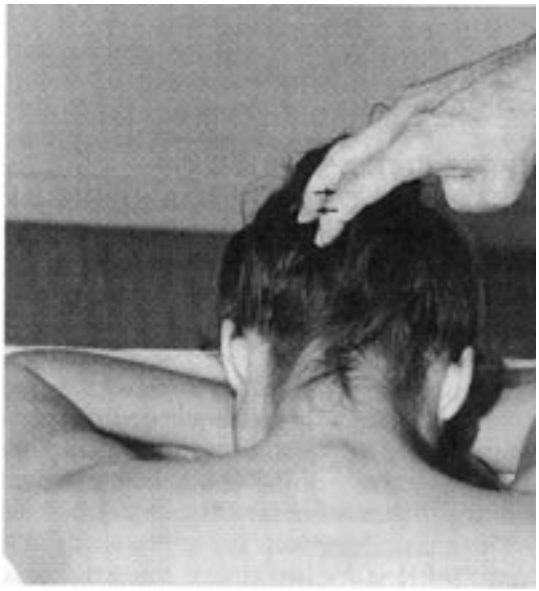

Fig. 4. "Friction sign" (Maigne). The fingers rub the scalp against the skull. This maneuver is painful in territories that are irritated. This test replaces pinch-roll test in this area.

The territory that is painful to friction can correspond to the posterior ramus of C3, which innervates the paramedian zone, or to the posterior ramus of C2, which innervates the lateral part of the occiput (Fig. 3). It

can be more diffuse, but it does not go beyond the biauricular line. The periauricular region also receives innervation from C2 or C3, but it comes from their anterior rami.

Occipitotemporomaxillary Headache

The occipitotemporomaxillary headache is located in the retroauricular, mastoid, and pa rietal region and radiates toward the inferior maxilla. Pain is found ipsilateral to the facet joint tenderness at C2-3, with a positive friction sign over the painful scalp in the retroauricular territory that is innervated by branc arising from the superficial cervical plexus (anterior ramus of C2, sometimes of C3) (Fig. 5).

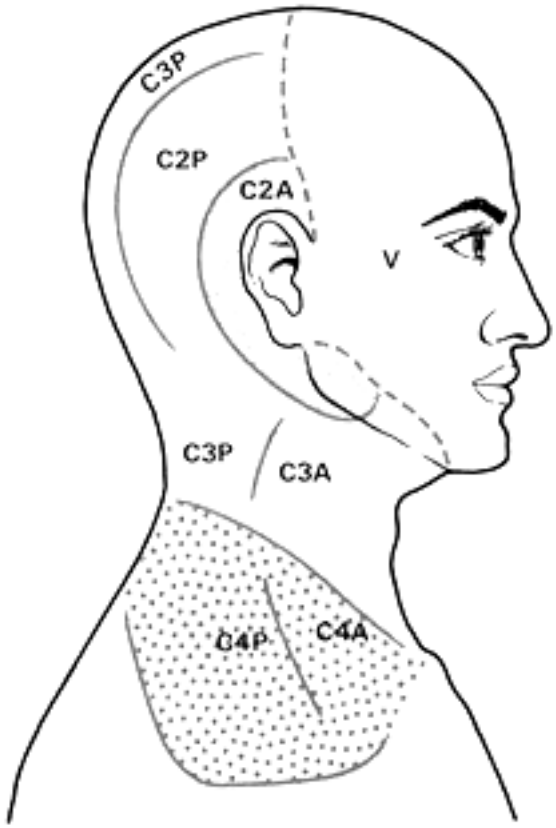

Fig. 5. Distribution of innervation. C2P, Posterior ramus of C2; C2A, anterior ramus of C2; C3A and C3P, anterior (A) and (P) posterior rami of C3.

Pain with pinch-rolling at the angle of the jaw is seen (Fig. 6). A fold of the skin is pinched firmly between the thumb and index finger and rolled between these two fingers. The maneuver should be controlled and be compared with the opposite side. It requires practice, as do all the maneuvers that we propose here. The sign is positive if the maneuver is painful (the fold can be thickened). It is painless on the contralateral side if the impairment is unilateral.

The discomfort elicited at the angle of the jaw is referred to as the angle of the jaw sign(Maigne). This skin region at the angle of the jaw is innervated by the anterior ramus of C2 and not by the trigeminal nerve. Isolated, this form makes up about 5% of headaches of cervical origin, but it is often associated with another form of headache, presenting with mild features.

Fig. 6. Pinch-roll sign of skin overlying the angle of the jaw (Maigne).

Supraorbital Headache

Supraorbital headache is the most frequent headache of cervical origin (67% of cases in our statistics). The topography of the pain is usually supraorbital, sometimes occipitosupraorbital, and in a few cases, retro-orbital. It always carries with it the "eyebrow sign."

"Eyebrow Sign" (Maigne)

The eyebrow is pinched between thumb and index finger and kneaded and rolled like a cigarette. It is explored from one end to the other, going over the skin of the forehead (Fig. 7). When the sign is positive, the fold is painful and often thickened throughout all or part of the length of the brow. This sign is found only on the side of the usual headache, which is generally the side of the C2-3 articular pain. The maneuver is painless on the other eyebrow, except in cases of bilateral headache.

Fig. 7. Eyebrow sign (Maigne). The pinch-roll eyebrow sign is painful, and the skin is thickened on the side of the cervical-origin headache. This is essentiallythe sign of supraorbital headacheof cervical origin. This sign disappears with anesthetic injection of the C2-3 facet.

The link between this sign and an origin in the cervical spine is shown by the response to any manual therapy maneuver (or facet injection) that renders the C2-3 articulation painless. The eyebrow becomes no

longer painful to pinch-rolling. The fold becomes supple and thin. Conversely, a poorly performed manipulation that increases C2-3 tenderness also increases the sensitivity of the eyebrow and usually results in headache.

We did not find this sign in the true migraines, even when they had a dominant radiation toward the eye, nor in the other forms of headaches (sinusitis, psychologic headaches, etc.) On the other hand, the supraorbital cervical headache can have a migrainous character.

Cheek Sign (Maigne)

Some patients with the eyebrow sign also have some tenderness to pinch-rolling the skin of the cheek, located below the maxilla (cheek sign). This maneuver is particularly painful in some facial pain syndromes that are relieved by cervical treatment.

Different Aspects of the Supraorbital Headache of Cervical Origin. This headache represents 67% of headaches of cervical origin. 11 can have three clinical presentations: simple form (85% of cases), vascular form (10% of cases), and the migrainous form (5% of cases). These are personal statistics from 162 cases of cervical headache. They probably vary depending on the recruitment. For all these forms, frequency, intensity, and duration of the episodes of headache are extremely variable from case to case, spanning a spectrum from mild low-frequency headache to the intense, daily, incapacitating headache.

Simple Form. The most common form, it has a supraorbital or occipitosupraorbital pain. It is always located on the same side for a given subject. It can migrate to the other side if the episode is severe, but its examination signs remain unilateral. It can be truly bilateral in some cases. Some patients describe it as the pain of a frontal sinusitis. It is sometimes felt as a retroorbital pain; the patient has the impression that his eye is "pulledbackwards."

Vascular Form. In this less frequent form with supraorbital pain, there is also nasal congestion (the nostril is clogged with or without rhinorrhea) and occasionally a unilateral tearing. These manifestations are always ipsilateral to the C2-3 facet joint tenderness, and the eyebrow sign is always positive on the same side during successive attacks. The efficacy of medications for the headache is generally poor, whether antiserotonin or an ergotamine derivative. The cervical treatment is the only one that is useful. The following case is typical.

Case report. A42-year-old woman suffered from headaches for the last 13 years. They had become progressively worse during this time, with increasing frequency and duration, without any precipitating cause. When she consulted a physician, the attacks occurred three to four times a month, lasting 2-3 days. Topography was supra- and retro-orbital, always on the left, with swelling of the left nostril, then rhinorrhea and watering of the left eye. She was followed in two departments of neurology, and their diagnosis was vascular headache. She was not relieved by ergotamine tartrate, dihydroergotamine, or antimigrainous medication but was well relieved with amidopyrine (6 tablets/day of Optalidon). On examination, the left eyebrow was thickened and very painful to pinch-rolling, and there was a sharp pain at the left C2-3 facet joint. Cervical radiographs were normal. Four manipulative treatments and two injections relieved her.

She did not have any more attacks for the next 12 months. This form of headache represents 8.5% of cases of cervical headaches in our statistics (14 cases of 162).

Migrainous Form. In some cases, the migrainous form has the characteristics of true migraine. It is a nonalternating migraine, localized always on the same side in a given patient during the successive attacks. It often responds poorly to antimigrainous medications, but cervical treatment is very useful.

TRIGGERING FACTORS

Whatever its variety, headache of cervical origin can be episodic, with variable intervals between attacks. It can be mild or severe, but as stated above, the examination signs that we describe persist beyond the attacks.

The triggering factor can be cervical. It is often postural, such as improper neck positioning on the pillow (sleeping prone) or improper work place ergonomics that place patients in *a* strained position. These headaches can also be provoked by cold drafts on the neck. They can also be triggered by gynecologic, dietary, or psychologic factors. Often the headache is fallaciously attributed to these factors without considering a cervical etiology, despite the fact that cervical treatment is the only one that is efficacious and long lasting.

These headaches can also be triggered by minor factors in persons whose tolerance threshold is very low. The slightest articular ysfunction is then felt even while the physical or psychologic state is good. This is considered to be the mechanism in slightly depressed or anxious individuals and "spasmophiles" (M. Duc, M. Janel), etc. In these people, the psychologic factor is often, wrongly, the only one tended to.

FREQUENCY OF CERVICAL HEADACHES

Cervical headaches are frequent. The frequency found in various studies depends on the recruiting; in our statistics, they represent 80% of unscreened headaches (162 cases on a known sampling of 200 cases). J. L. Garcia (1977) used our semiology and diversified its recruiting; he obtained identical figures on 110 cases. His studies demonstrated the efficiency of the cervical treatment that we propose. He studied three groups of patients with common headaches.

- The first group was recruited from patients referred for neurologic consultation.
- The second group was recruited from patients referred for rheumatologic consultation.
- The third group was recruited among patients in general medicine selected in a population group that was easy to follow (military and their families).
- A total of 110 patients was recruited, and of these, 87 met the criteria for cervical headache as we have defined them; 78 were followed up and seen regularly. Treatment by manipulation and sometimes by articular injection brought 90% good results with 1 year of follow-up.

Frequency of the Different Forms

All the forms described above can be seen in isolated or mixed forms. However, a painful topography is most often dominant. In the 162 cases of our study, the dominant pain was:

- Frontosupraorbital or supraorbital in 110 cases
- Occipital in 35 cases
- Occipitomaxillary in 7 cases
- Diffuse in 10 cases

There was always a correlation with the examination signs. But the signs can be present without the pain of the attack occupying all the painful territories at examination. For example, the eyebrow sign can be positive in a cervical headache that is painful only in the occipital region, but in this case, the friction sign is always positive.

Remark

Persons showing C2-3 facet joint tenderness on examination do not all have headache. But those who present some other signs of the craniofacial semiology that we propose are rarely without any episodes of headache, at least mild and of low frequency.

PATHOPHYSIOLOGIC MECHANISM

There are two questions about the mechanism of these headaches: the first is about the cause of the C2-3 facet joint tenderness, the second about the supraorbital projection of pain and the eyebrow sign.

C2-3 Facet Joint Tenderness

Facet joint tenderness is a constant sign of PMIDs at all levels of the spine. C2-3 facet joint tenderness is found on palpation in all cases of cervical headache. Does it express only the dysfunction of the segment C2-3? Probably not. C2-3 is the highest cervical facet joint that is palpable. It is at the junction of the two functional units of the cervical spine:

- Inferior part, with the last five vertebrae, whose biomechanical characteristics are the same and which function in a synchronous manner
- Superior part, with atlas and axis, whose great mobility allows precise adjustment of the finest and most varied movements of the head

The possible isolated dysfunctions of the occiput-atlas-axis cannot be clearly shown. Some signs of palpation or radiologic examination have been proposed; they seem to us to be only presumptive signs.

But, any isolated dysfunction eventually affecting C0-1 or Cl-2 also perturbs all of the superior cervical spine, which functions as a unit. This perturbation is reflected at the junction of the latter with the inferior cervical spine, which has different biomechanical chacteristics than C2-3. And so, tenderness palpation at C2-3 seems to us to reflect mechanical perturbations of the superior cervical spine.

Disappearance of this tenderness after treatment means the return to normal of the musculoskeletal functions of the whole. The small suboccipital muscles, which a stretched on palpation, are probably essential to maintain these dysfunctions. They also play a role in the production of pain, through the formation of taut bands that persist sometimes in spite of the spinal treatment; a local treatment then becomes necessary.

Craniofacial Signs

Some signs that we describe correspond anatomically to the territory of the anterior or posterior rami of C2 and C3 (Fig. 5). This the case with the friction sign, which reveals the hypersensitivity of the scalp in the supplied region. It is also the case with the angle of the jaw sign, which corresponds to the cutaneous region of the anterior ramus of C2 (masseter notch).

On the other hand, the supraorbital projection and especially the eyebrow sign are mot unexpected. The zone of the eyebrow is innervated by a branch of the trigeminal nerve (ophtalmic division) and seems to have no an,atomic connection with the cervical spine. However, their clinical link is easy to demonstrate.

In a previous study (1981), we had 50 patients with unilateral supraorbital headache for more than 2 years and C2-3 facet joint tenderness and the eyebrow sign on the same side. In 47, we were able to eliminate the tendernes to pinch-rolling of the eyebrow by injection of 0.5% lidocaine in the tender C2-3 facet joint. Not only did the fold become painless, but it was supple after a few minutes, although it was thickened prior to injection.

Hypotheses about the Mechanism

The observations outlined can be explained by some connections between the nucleus of the trigeminal nerve and the cervical spinal cord. The gelatinous nucleus of the trigeminal nerve descends very low and becomes continuous with the posterior column of the spinal cord. Anastomoses of branches from Cl, C2, and even C3 probably unite with the ophthalmic division of the trigeminal nerve, as Kerr has demonstrated. It is generally accepted that the fibers carrying nociceptive information have a more inferior location in the

inferior part of the gelatinous nucleus, descending as far distally as the second or third cervical segment of the spinal cord. The ophthalmic fibers project to the inferior and anterior part of the trigeminal nucleus (Lazorthes). These cornmon anastomoses explain the painful supraorbital projection that we have noted.

Another mechanism might also be at work here. Sympathetic fibers are carried by branches of the trigeminal nerve and go to the cutaneous regions along with the sensory nerves. These fibers come from the periarterial sympathetic nerves of the internal carotid. After a relay in the superior cervical ganglion, they arrive at the ganglion of Gasser through the internal pericarotid plexus. But this classic cervicogasserian anastomosis was never really shown by anatomists.

On the other hand, numerous peripheral anastomoses unite the trigeminal branches and the vascular plexus of the collateral of the external carotid (Lazorthes). In its intracranial segment, the internal carotid receives, from the superior pole of the superior cervical ganglion, two nerves that anastomose in the plexus and are distributed to the collaterals and the terminals of this artery and, therefore, to the supraorbital artery, which goes out by the supraorbital foramen. The superior (Cl, C2, C3) cervical ganglion is bound to the spinal nerves by communicating branches.

Whatever the actual cause of the eyebrow sign, it is a common sign of the dysfunction of the first three cervical segments, as appears to be the case with the C2-3 facet joint tenderness.

TREATMENT OF HEADACHE OF CERVICAL ORIGIN

Treatment confirms the cervical origin of the headache because the examination signs disappear and the patient is relieved.

Manipulation

The basic treatment is manipulation if it is not contraindicated because of the vascular or spinal condition (postural tests) and when it is technically possible, respecting the rules of application. It should be very precise and perfectly executed. If it is performed correctly, it relieves or cures; performed incorrectly, it aggravates and can create a local perturbation that could make any other treatment difficult. Application of the rule of *no pain and opposite movement* is sometimes difficult at the superior cervical spine. To determine the directions of the maneuver to be performed, it is often better to perform repeated stretching in the different orientations. Performed in favorable directions, they definitely decrease the facet joint tenderness on palpation and relax the suboccipital muscles (Fig. 8).

Depending on the patient, two to five sessions are necessary. Soon after the first maneuvers, the result on the friction sign or the eyebrow sign allows the diagnosis to be made. A reaction occurring during the night following the first session is not rare and the patient should expect it.

Fig. 8. Example of the manipulation of the superior cervical spine in the treatment of cervicai-origin headache.

Facet Joint Injection (C2-3)

If manipulation is contraindicated or insufficient, facet joint injection is useful. For the injection, the patient is seated on a stool, with the forehead resting on a table. The point of injection is at the painful facet joint point, C2C3, about 1 cm lateral to the spinous process of C2, which is easily found (Fig. 9).

A corticosteroid derivative, 0.25 mL is injected strictly on contact with the bone, after checking by aspiration that there is neither blood nor spinal fluid. To avoid any accident, it is better to use a corticosteroid derivative that is safe for intrathecal use without producing any disturbance, and no local anesthetics should be used.

Fig. 9. Injection of the C2-3 facet joint

Other Treatments

Massage can be a very useful adjunct (even if the patient has been relieved of the headache), when applied to the subcutaneous tissues of the neck if they are cellulalgic or to suboccipital trigger points.

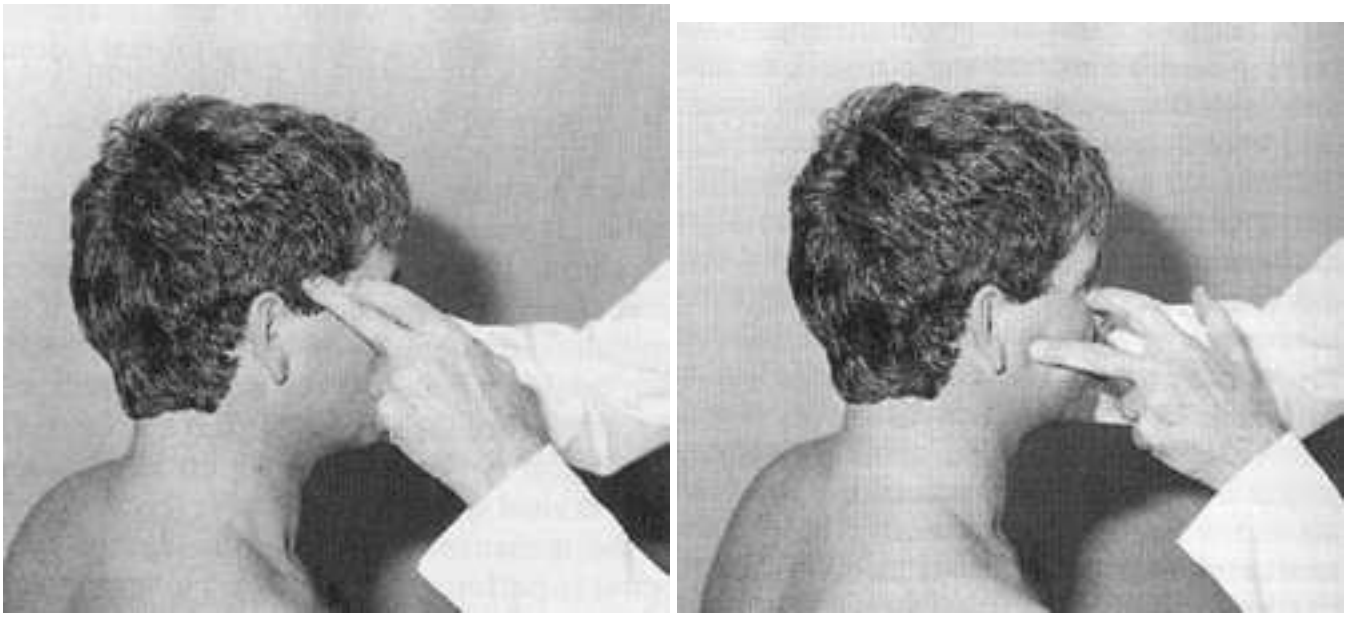

Fig.10. Trigger points either involving the temporalis (left) or the masseter (right) can be responsible for persistent cervical headaches. They are often due to problems with the temporomaxi l lary joint (due to poor dental articulation).

The patient should learn to avoid extreme rotation of the neck (prolonged backing up in a car, for example). Patients with morning headaches should remove or modify the pillow, depending on the case. Sleeping in prone places the neck in extreme rotation, which can be harmful and cause morning headaches. Patients should not sleep in that position.

CERVICAL MUSCLES AND HEADACHES

Some headaches seem to be provoked by trigger points, which can have several origins.

- They can be postural.
- They may result from articular dysfunctions. The masseter or temporal muscle (Fig. 48. 10, *left* and *right)* is disturbed in the syndrome of temporomandibular joint dysfunction. The trigger points provoke pains that radiate to the supraorbital and temporal regions, and to the teeth (dental pseudopain) (J. Travell, D. Simons).
- Some of these "trigger points" can be localized to a taut band that is part of a cellulotenoperiosteomyalgic syndrome of cervical origin (Maigne). They affect especially the suboccipital muscles, the trapezius and the sternocleidomastoid (Fig. 48.11). Some can cause headaches. When they are linked to a cervical PM11), they disappear or become inactive after treatment of the PM11); but they can persist if they also have a postural origin, and a local treatment is necessary.

Fig.11. Sometimes the sternocleidomastoid muscle has a taut band that plays a role in cervical origin headache. It is often attenuated by cervical treatment. However, local treatment may be necessary.

The trapezius and the sternocleidomastoid are innervated by the cranial accessory nerve, which receives a contribution from C2 and C3 as the spinal accessory nerve. The latter participates to a variable degree with the motor fibers of this nerve and assures the proprioceptive innervation of the muscle (Winckler). That explains the possibility of having taut bands with a segmental C2 or C3 syndrome. For the sternocleidomastoid, the trigger point usually is located at the junction of the superior onethird and the inferior two-thirds, but it can be higher or lower. The pain is projected toward the mastoid or the orbital region. It can be provoked by compression of the trigger point between thumb and index finger and maintained for about 15 seconds (Fig. 11).

With the trapezius, the upper fibers are generally affected along its superior border. Pain referral is in the temporal region. The trigger points of the suboccipital muscles (rectus and obliquus posterior) have occipitotemporal projections (J. Travell, D. Simons).

The treatment consists of two to three trigger point injections of 0.5% lidocaine.