

TRIGEMINAL PAIN: TOPICAL DIAGNOSIS, CLINICAL MANIFESTATIONS

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Abstract

Pain in the face and oral cavity due to pathology of the structures of the trigeminal nerve requires a thorough topical diagnosis to determine the level of damage. The collection of anamnesis, especially the description of the pain phenomenon by the patient, as well as an objective study of clinical manifestations, make it possible to determine first the level of damage, and then the cause of the disease. Anatomy of the trigeminal nerve.

Introduction

As a mixed nerve, n. trigeminus has sensory and motor nuclei in the brainstem. The sensory fibers of the trigeminal nerve, consisting of three branches: r. ophthalmicus, r. maxillaris, r. mandibularis, are dendrites of the cells of the powerful Gasser's node (ganglion semilunare Gasseri), located on the anterior surface of the pyramid of the temporal bone. N. trigemini (portio major), which enters the pons in its middle third, near the middle pedicles of the cerebellum. Further, the fibers for pain and temperature sensitivity come to the nucleus – nucleus tractus spinalis, where they end. This long nucleus is a direct continuation of the posterior horns of the spinal cord, it can be traced along the entire length of the medulla oblongata to the pons. They end in another nucleus, the nucleus terminalis, located orally to the nucleus of the descending root. Further conduction of sensory stimuli from the face is carried out by the second neurons, whose cells are laid in the nuclei. Their fibers are directed through the midline of the trunk into the lemniscus trigemini, which enters the opposite medial loop (lemniscus medialis), and together with it end in the optic tuber. Since the fibers of tactile sensitivity pass into the loop of the opposite side, without entering the nucleus of the descending root, damage to this nucleus alone (similar to damage to the posterior horn) causes loss of pain and temperature sensitivity in preservation of tactile on the face and in the oral cavity. Further conduction of sensitivity from the face, as well as from the whole body, is carried out by means of third neurons going from the optic tuberosity through the internal capsule and corona radiata to the posterior central gyrus of the hemisphere of the cerebral cortex opposite to the nucleus. The motor nucleus (nucleus masticatorius) is located in the dorso-lateral part of the pons tyre; its fibers emerge from the pons in the form of a thin root (portio minor) next to the sensory one, are adjacent to the Gasser's node and join the III branch of the nerve (r. mandibularis), as part of which they are directed to the masticatory muscles. Thus, the first two branches are purely sensory nerves, and the third branch of the trigeminal nerve is mixed, i.e., sensory-motor; N. ophthalmicus exits the skull through the fissura orbitalis superior, innervates the skin of the forehead and anterior scalp, upper eyelid, inner corner of the eye and bridge of the nose, eyeball, mucous membranes of the upper part of the nasal cavity, frontal and ethmoid sinuses, and meninges. N. maxillaris exits the skull through the foramen rotundum, innervates the skin of the lower eyelid and the outer corner of the eye, the middle part of the face, the upper lip, the upper jaw and teeth, the mucous membranes of the lower part of the nasal cavity, and the maxillary



sinus. N. mandibularis is a mixed nerve. Sensory fibers innervate the lower lip, lower cheek, chin, lower jaw, teeth, buccal mucous membranes, oral floor and tongue. Motor fibers innervate the masticatory muscles: the masticatory muscle proper, the temporal, pterygoid – lateral and medial, the anterior abdomen of the digastric muscle.

Principles of clinical diagnostics

According to the canons of topical diagnosis of neurological disorders, when examining the patient, it is necessary to determine the level of damage, in particular of the trigeminal nerve system: **level 1.** Damage to one of the peripheral branches of the trigeminal nerve, as well as in the area of the pterygocephalic fossa. **Level 2.** Lesion of the Gasser's node in the cranial cavity. **Level 3.** Damage to the trigeminal nerve root at the level of the base of the brain. **Level 4.** Lesion in the area of the nuclei of the brainstem. **Level 5.** Supranuclear lesion. Clinically insignificant, since with the unilateral process no dysfunctions occur (due to bilateral cortical innervation).

Damage to the motor root and nucleus is manifested by unilateral paresis of the masticatory muscles, displacement of the lower jaw to the side when the mouth is opened.

I. Clinical manifestations of damage to the peripheral branches of the trigeminal nerve

Main syndrome:

– pain and sensory disturbances (pain and temperature) in the area innervated by this branch.

Localization of pain:

– in case of damage to the first branch – in the frontal region with radiation to the orbit, the inner corner of the eye; – in case of damage to the second branch – in the middle part of the face, along the upper jaw with radiation to the orbit, dorsum, wing of the nose, temporal region; – in case of damage to the third branch – along the lower jaw with radiation to the floor of the oral cavity, lateral surface of the tongue, ear, temporal region, neck [3]. Table 1 presents the main etiological factors of damage to the peripheral branches of the trigeminal nerve in the face. According to our data, the most common cause of facial pain is the pathology of one or more teeth. However, insufficiently thorough diagnosis of odontogenic factors by dentists forces such patients to be treated as having only neurological pathology. In this case, the most common diagnosis is "trigeminal neuralgia". As a rule, carbamazepine therapy is prescribed, which is not effective.

Таблица 1. Основные этиологические факторы поражения периферических ветвей тройничного нерва

I ветвь	II ветвь	III ветвь
постгерпетическая невралгия	одонтогенные боли (вследствие патологии зуба, периодонта)	одонтогенные боли (вследствие патологии зуба, периодонта)
ятрогенное повреждение в эстетической практике (косметология, пластическая хирургия)	при патологии верхнечелюстной пазухи (гайморит, введение пломбировочного материала в полость кисты)	ятрогенное воздействие в стоматологической практике – денальная имплантация, травматичное удаление 8 зубов, чаще ретинированных и дистопированных
	постгерпетическая невралгия	ятрогенное воздействие: токсическое повреждение нерва при эндодонтическом лечении, синус-лифтинг, денальная имплантация;
	компрессия нервных стволов фрагментами филлеров, вводимых в область лица с эстетической целью	
	одонтогенный остеомиелит верхней челюсти	

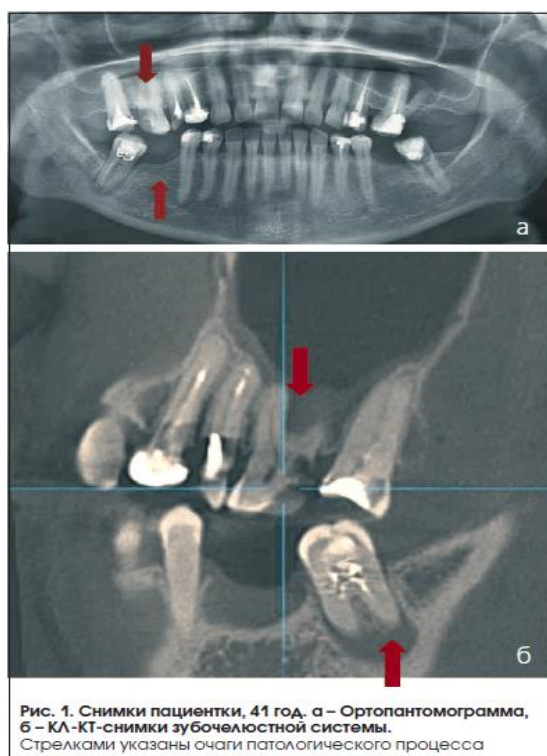


Clinical criteria for odontogenic pain:

1) persistent, unilateral pain in the face or oral cavity; 2) localization – in the projection of the upper or lower jaws with a characteristic zone of radiation; 3) the nature of the pain – aching, aching, burning; 4) the intensity of pain varies from monotonous, low-intensity to high; 5) a reaction to cold and hot food is possible; 6) the pain may increase at night, waking up the patient; 7) the effectiveness of drugs from the NSAID group! In this regard, patients are forced to take these drugs daily. The duration of the analgesic effect is from 4 to 12 hours; 8) ineffectiveness of drugs from the group of anticonvulsants and antidepressants.

Case study 1

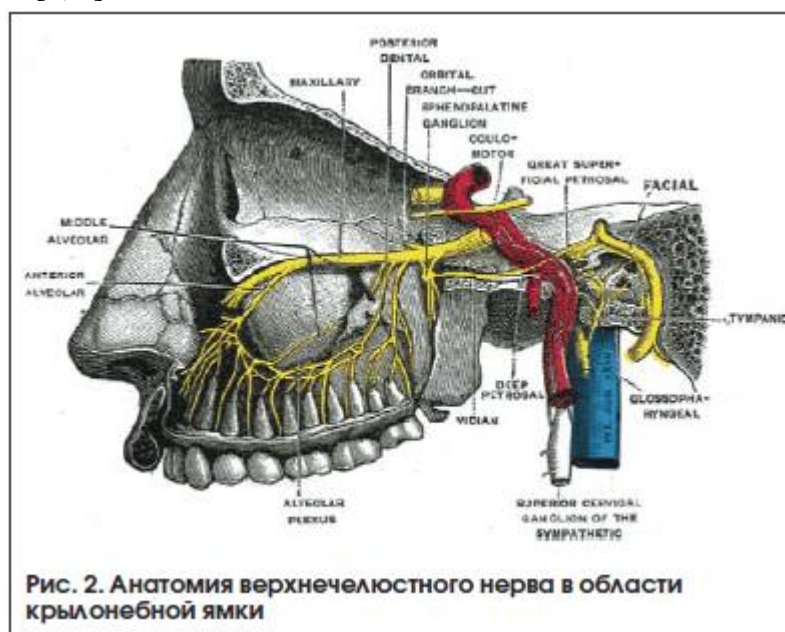
Patient, 41 years old. She came to the clinic with complaints of constant monotonous aching pain in the upper jaw area on the right. The pain radiates to the zygomatic region, orbit, temporal region, angle of the lower jaw on the right. Relief occurs after taking painkillers (ibuprofen). The effect lasts for 4-5 hours. Accompanying symptoms: numbness in the corner of the mouth and chin area on the right. Development of the disease: pain appeared about two weeks ago. Before that, I had an acute respiratory viral infection, which was complicated by bronchitis. I consulted a neurologist for pain. The diagnosis of trigeminal neuralgia was established. Carbamazepine, gabapentin were prescribed. Neurological status: no meningeal signs. Pupils are identical. Cranial innervation: hyperesthesia of the oral mucosa in the area of the teeth 1.5, 1.6. Palpation of the roots of these teeth is sharply painful. There are no paresis of the extremities. Muscle tone is not changed. Reflexes are of average vivacity, equal. There are no pathological signs. There are no sensitive, coordination disorders. Palpation of the masticatory muscles is sharply painful on the right. BP – 120/80 mm Hg. Orthopantomogram and cone-beam computed tomography of the dentoalveolar system were performed: signs of tooth pulpitis 1.6, chronic periodontitis of the tooth 4.7. (Fig. 1).



Catamnesis: after dental treatment, the pain phenomenon was completely eliminated. The clinical picture of iatrogenic damage to the peripheral branches of the trigeminal nerve **deserves special attention**. It is most often found in dental [6], as well as aesthetic practice (cosmetology, plastic surgery). **Clinical characteristics of iatrogenic neuropathic pain:** unilateral burning, aching, aching; as a rule, it quickly turns into chronic, daily. The intensity of pain varies from 3-4 points to 10 points according to VAS. Accompanying symptoms: sensory disorders - hypoesthesia, paresthesias, allodynia (occurs more often with damage to the I and II branches of the trigeminal nerve). In the case of lesions of the III branch, according to our data, signs of damage to deep sensitivity in the oral cavity on the side of the lesion are often noted in the form of impaired perception, difficult evacuation of the food lump. NSAIDs and other pain medications are usually ineffective. The use of anticonvulsants and antidepressants is also ineffective.

Pathological processes in the area of the pterygocephalic fossa

Let us recall the anatomy of the pterygopalatina (fossa pterygopalatina) (Fig. 2). The paired fossa, which is a triangular fissure, is located between the upper jaw and the pterygoid process of the sphenoid bone. On the medial side, it is bounded by the perpendicular plate of the palatine bone, on the outside it communicates with the subtemporal fossa), oral cavity (canalis palatinus major), nasal cavity (for. sphenopalatinum), external base of skull (canalis pterygoideus), orbit (fissura orbitalis inferior). It contains the maxillary artery, maxillary nerve, and pterygocephalic ganglion with their branches [2, 3].



Speaking about the pathology of the pterygocephalic fossa, first of all, we mean the diagnosis of neoplasms.

Clinical signs of damage to the maxillary nerve at the level of the pterygocephalic fossa:

- unilateral, monotonous pain, usually of an aching nature;
- the intensity of pain is low – 3-4 points according to the VAS;
- localization: zygomatic area, can radiate to the temple, orbit;
- accompanying symptoms: sensory disturbances in the form of decreased sensitivity (hypoesthesia, paresthesia) in the zygomatic, parotid-masticatory areas;



– the pain may increase at night, waking the patient from sleep; – on objective examination: pastosity of the zygomatic area, decrease in surface and temperature sensitivity in the middle part of the face; – NSAIDs and carbamazepine are ineffective.

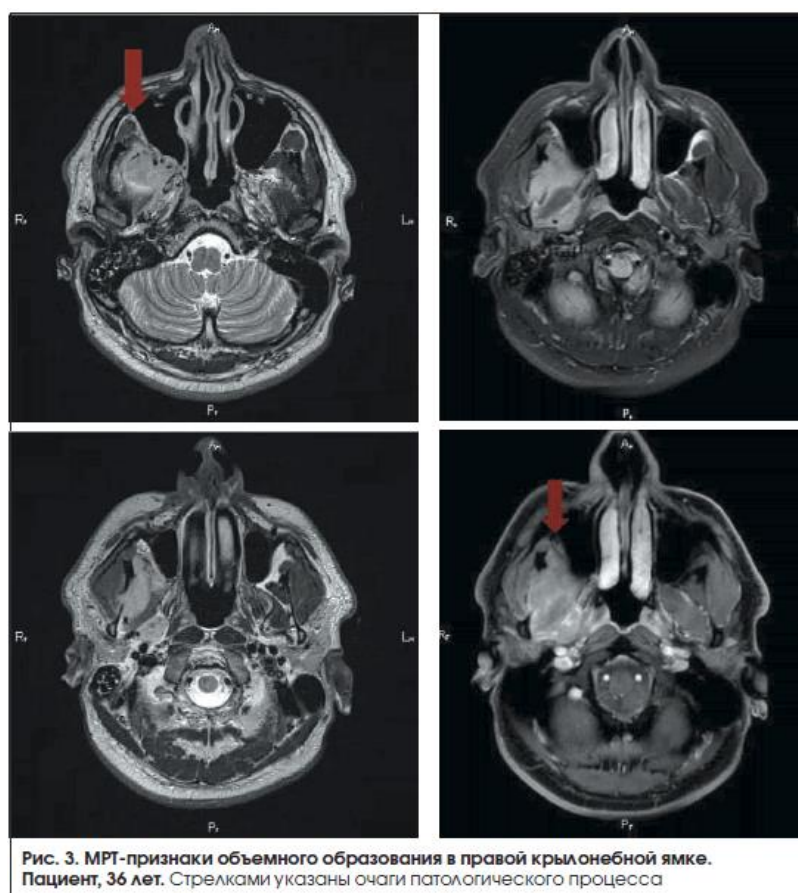
Necessary instrumental diagnostic methods

1. If an odontogenic process is suspected: – cone-beam computed tomography (CL-CT) of the dentoalveolar system; – consultation with a dentist (therapist and surgeon). Many dentists in the process of diagnostic search limit themselves to conducting an X-ray or orthopantomogram, which are not always informative. Our many years of experience in the differential diagnosis of patients with orofacial pain have shown that patients with long-term, diffuse pain relieved by NSAIDs must undergo a CT-CT scan. 2. If a pathological process in the area of the pterygocephalic fossa is suspected: – MRI of the soft tissues of the facial skull with a targeted examination of the pterygocephalic fossa. It is necessary to indicate that the goal is an oncological search; – consultation with a maxillofacial surgeon.

Case study 2

Patient, 36 years old. He was referred by a dentist. He came to the clinic with complaints of sensory disturbances in the form of decreased sensitivity (numbness) in the buccal area on the right, episodes of tingling sensations above the upper lip and in the chin area on the right. He also noted monotonous aching pains in the zygomatic area on the right, radiating to the temporal region. The pain can increase at night, waking the patient up from sleep. The patient consulted a neurologist. The diagnosis of trigeminal neuropathy was established, therapy was prescribed (vinpocetine, a combined drug containing pyridoxine + thiamine + cyanocobalamin + lidocaine). Then he was treated by a reflexologist (acupuncture, cupping massage). Carbamazepine was prescribed. An MRI of the brain was performed (section thickness 3 and 5 mm). Conclusion: MR signs of mild external hydrocephalus. Neurological status: pastosity of the right side of the face. No meningeal signs. Pupils are equal. Cranial innervation: decreased surface sensitivity on the skin of the face in the buccal and chin areas, in the area of the dorsum, wing of the nose and above the upper lip. Reduced sensitivity of the oral mucosa (along the upper and lower jaws, as well as the inner surface of the cheek) on the right. Hypoesthesia of the right half of the tongue. Hypotrophy of the masticatory muscle proper on the right. Limiting mouth opening. Deviation of the lower jaw to the right. The soft palate is phoning. The pharyngeal reflex is triggered. The right nasolabial fold is smoothed. Weakness of the orbicular muscle of the mouth (in the area of the corner of the mouth) on the right. There are no clear paresis of the limbs. Muscle tone is not changed. Reflexes are lively, S = D. There are no pathological signs. There are no other sensory disorders. Coordination tests are performed correctly. An MRI examination of the soft tissues of the facial skull was performed: signs of a volumetric formation in the area of the pterygocephalic fossa on the right (Fig. 3).





II. Lesion of the Gasser's node in the cranial cavity

Most often in our practice, herpetic lesions of the Gasser's node are noted. We are talking about the herpes virus type 3 (Varicella zoster). When examining saliva by PCR, herpes viruses 4 (EBV), 5 (CMV), 6 and 7 types are often detected. According to the literature, these types of viruses can be localized in the structures of the central nervous system. Their role in the genesis of multiple sclerosis, depression, and chronic fatigue syndrome is being investigated [4, 5]. Cases of compression of the Gasser's node by volumetric formations are practically not described.

Clinical manifestations of postherpetic neuralgia on the face

- Two localizations of pain are characteristic - the frontal region and the upper jaw.
- With frontal localization - constant deep pain of a pressing, aching nature in the specified area. By the end of the 4th week after the rash, as a rule, there is a transformation of pain, it becomes superficial, burning, itchy.
- In the middle part of the face and along the upper jaw – unilateral, paroxysmal pain of a shooting, burning nature (may resemble electric shocks) in the oral cavity. They radiate to the temporal region, the angle of the lower jaw.
- Decreased sensitivity (numbness), paresthesia (crawling goosebumps), allodynia on the skin of the face and in the oral cavity on one side.
- Seizures occur spontaneously. There are no clear provoking factors.
- There are no trigger points on the skin of the face, on the oral mucosa.
- The disease can be remitting. Exacerbations are provoked by hypothermia.
- In anamnesis: frequent herpetic rashes on the oral mucosa along the upper jaw. Frequent localization: in the projection of the 7th, 8th teeth, along



the transitional fold, or on the skin of the face: the area of the wing of the nose, the mucous membrane of the nasal passage, above the upper lip. • Finlepsin is ineffective [7].

Laboratory research methods:

– PCR diagnostics of various types of herpes virus in saliva; – consultation with a virologist-herpetologist.

III. Damage to the trigeminal nerve root at the level of the base of the brain

Paroxysmal pain of high intensity of the "electric shock" type. There may be a loss of sensitivity in the area of the zone of one of the branches [8]. Diagnosis of trigeminal neuralgia should not be difficult for neurologists [9]. Diagnostic criteria (International Classification of Headache Disorders, 2nd ed. 2005):

A. Paroxysmal attacks of pain lasting from a fraction of a second to 2 minutes in the zone of innervation of one or more branches of the trigeminal nerve, meeting criteria B and C. B. Pain has at least one of the following characteristics: – intense, sharp, superficial, stabbing; – is provoked by the impact on trigger points or under the influence of trigger factors. C. In the same patient, seizures have a stereotypical character. D. There are no clinical signs of obvious neurological deficits. E. Pain is not related to other causes. Thus, the main clinical criterion for trigeminal neuralgia is an attack of pain. Unilateral, paroxysmal pains have characteristic features in the description of patients: – sudden, "current", acute, superficial, burning; – pronounced intensity (at this moment, the patient freezes, pressing his cheek with his hand, as if trying to wait out the attack); – spread along the branches of the V nerve (as a rule, the II and III branches of the trigeminal nerve); – are caused by irritation of trigger zones – areas on the skin of the face and oral mucosa, irritating which can provoke an attack. Therefore, it is difficult to eat, articulate, wash, shave, brush teeth. The duration of attacks is up to 2 minutes. There are no neurological symptoms in the interictal period. Carbamazepine intake causes a short-term effect at the onset of the disease [10].

Instrumental diagnostic methods:

1st stage: MRI according to the standard (T2, FLAIR, T1-weighted images) – to exclude focal lesions; Step 2: T2 + Optional mode with very high spatial resolution and very small slice thickness (0.2-0.8 mm). Pulse Sequence: 3D FSE (Fast Spin Echo). Requirements for the tomograph: 1 Tesla (the device settings and the qualification of the radiologist play a role).

IV. Nuclear damage to the trigeminal nerve

Pain is less typical. Dissociated sensitivity disorders, i.e. loss of pain and temperature, sensitivity while maintaining tactile sensitivity[5]. Thus, if a doctor suspects neuropathic disorders associated with trigeminal nerve pathology in a patient with orofacial pain, he needs to conduct a thorough medical history, as well as a clinical examination. Having determined the topical level of lesion, continue the diagnostic search using instrumental, laboratory and other research methods.



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