

Approaches to the Systematization of the Trigeminal Nerve Disorders*

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ABSTRACT

Purpose.

To systematize secondary neurogenic lesions of the trigeminal nerve branches.

Patients and Methods.

We observed 1096 patients with secondary neuronal lesions of the trigeminal nerve system.

Results.

The systematization of lesions of trigeminal nerve branches is proposed, taking into account the mechanisms of development, the course of the disease, secondary complications and localization.

Conclusion.

Systematization can be recommended for doctors to improve the diagnosis and treatment of diseases of the trigeminal nerve system.

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Introduction

Maxillofacial area is one of the most frequent localizations of chronic pain syndromes, which are caused by injuries of the peripheral nerves. Among the latter, the injury of the trigeminal nerve takes the leading place [1-3]. The problem of pain syndromes associated with the trigeminal nerve is very relevant, is difficult to diagnose and has not been adequately studied in relation to the pathogenesis. In search of medical assistance, patients with this pathology are forced to contact many specialists of related fields: neurostomatologists, otolaryngologists, maxillofacial surgeons, dentists, and neurologists.

The maxillofacial area has abundant innervation. We have become accustomed to the fact that after a certain type of surgical intervention in this area, post-operative pains, which are eliminated through the use of analgesic drugs, are expressed to varying degrees, as well as sensitivity dysfunction that lasts for a long time. Often we have to deal with persistent, long-existing pains that can not be eliminated by prescribing analgesics. This fact also helped to analyze the incidence of these syndromes

(symptoms) after surgical interventions in various maxillofacial pathologies.

In his daily practice, a dentist faces neurogenic lesions that have clinical manifestations in the facial area. These neurological diseases of the trigeminal nerve branches have not only different clinical manifestations, depending on the severity of nerve damage, but also differ in the mechanism of their occurrence and other factors [4-6]. Attempts to systematize neurogenic lesions of peripheral branches of the trigeminal nerve, in the dental literature, were not found. Unfortunately, we can even note that many neurogenic disorders of the trigeminal nerve system that arise as complications of diseases, as well as after trauma, surgical interventions, are perceived as a clinical symptomatology that can be characteristic of many nosological forms, thus, an adequate medical neurological evaluation, and, consequently, the corresponding treatment are not carried out.

Materials and Methods

We observed 1096 patients with secondary trigeminal neuronal lesions of the trigeminal nerve system who were referred for treatment to the Department of Maxillofacial Surgery, Shupyk National Medical Academy of Postgraduate Education.

All patients underwent general clinical examination methods, which included: examination, palpation, collection of anamnesis, radiography of the bones of

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the facial skeleton, etc. The distribution of patients with localization of the trigeminal nerve neuropathy on the maxilla and mandible by the age and sex is presented

in Table 1.

The control group consisted of 35 people – practically healthy people in the same age range (from 17 to 47 years).

TABLE 1. Distribution of Patients With Trigeminal Neuropathy in the Examined Groups, Depending on Age and Sex.

Observation Group	Total Number of Patients	Age and Sex of Patients											
		18-19		20-29		30-39		40-49		50-59		60 and More	
		M ^a	F ^b	M	F	M	F	M	F	M	F	M	F
Maxilla	541												
Neuralgia	161	10	8	16	12	20	17	23	17	16	11	7	4
Neuralgic neuritis	184	15	10	19	14	21	19	23	20	18	11	8	6
Neuritis	196	17	8	21	17	24	20	25	19	21	12	7	5
Mandible	524												
Neuralgia	146	11	7	16	14	18	15	20	13	13	8	7	4
Neuralgic neuritis	192	16	9	22	20	24	20	23	19	14	10	8	7
Neuritis	186	14	8	23	15	26	18	25	17	16	10	9	5

^a M – Men

^b F – Females

In addition to general clinical examination methods, we used special methods: the study of the electrophysiological parameters of the peripheral branches of the trigeminal nerve on the hardware-software complex “DIN-1” [7-9], as well as the study of pain, tactile, and temperature sensitivities. All special methods of examination were carried out in the dynamics of treatment of the revealed neurogenic complication.

Results

Depending on the mechanism of development of secondary lesions of the trigeminal nerve system, they need to be divided into those that arise in non-tumor and tumor diseases (Table 2) of the maxillofacial region. Non-tumor lesions include neurogenic complications that arise in odontogenic inflammatory diseases of the jaws (periodontitis, periostitis, osteomyelitis, odontogenic subcutaneous granuloma, sinusitis, etc.), non-odontogenic inflammatory diseases (sinusitis, arthritis of temporomandibular joint, nonspecific and specific non-odontogenic inflammatory diseases of the jaws, etc.), traumatic injuries to the facial bones (maxillary and mandibular fractures, fractures of the skull, (hematoma, post-traumatic scars, etc.), postoperative lesions of the peripheral branches of the trigeminal nerve (after sequestrectomy, Caldwell Luc surgery (*synonym*: highmorotomy) [10], removal of impacted teeth, or/with bone-plastic and reconstructive operations on the facial skeleton, etc.), post-treatment injuries of nerves (trauma with endodontic instruments in the treatment of teeth, compression and toxic effects of the filling material when it is moved below tooth root apex, etc.) after dental

implants placement (nerve compression with hematoma, displaced bone portion or dental implant, surgical instrument trauma etc.), as well as narrowing of the bone canals where peripheral branches of the trigeminal nerve are located [11-13].

We found that neurogenic disorders are also revealed in tumor diseases of the bones of the face and soft tissues of the maxillofacial area. This group includes neurogenic disorders in tumor-like formations of the jaws (odontogenic and non-odontogenic cysts, epulis, fibrous dysplasia of the jaws, etc.), benign tumors (fibromas, osteomas, osteoblastomas, ameloblastomas, etc.), malignant tumors (osteosarcomas, primary forms of jaw cancer, malignant neuromas, etc.), as well as post-surgical interventions that are carried out to remove tumor-like formations and tumors. Depending on the pathogenesis of neurogenic complications, they have their own characteristics of clinical course, treatment and outcome.

According to the clinical symptoms of secondary lesions of peripheral branches of the trigeminal nerve, we consider them to be divided into three groups (Table 3): neuralgia, neuralgic neuritis and neuritis. Neuralgia, occur when irritating sensitive fibers and are characterized by paroxysmal intense pain along the nerve trunk and its branches. Neuritis is characterized by changes in interstitium, myelin sheath and axial cylinders, and manifested by symptoms of loss of sensitivity in the corresponding zone of innervation. The combination of clinical symptoms of neuralgia and neuritis should be referred to as neuralgic neuritis.

Depending on the severity of clinical neurological symptoms, the disease can be divided into acute,

subacute and chronic (Table 4). This division should be attributed to the neurogenic complications that develop with odontogenic and non-dental diseases, tumor-like formations and tumors.

If neurogenic complications occur after trauma (post-traumatic), after surgical interventions (post-operative), as well as post-implantation or post-consolidation complications, division should be applied to them depending on the timing of patients seeking medical help after the appearance of symptoms of a neurogenic complication (Table 5). According to this principle of all patients, we divided into those with whom neurological treatment was initiated no later than 10 days after the action of the damaging factor (trauma, surgery, compression of the nerve with filling material, etc.) and the appearance of the first symptoms of neurogenic complications. In these cases, we observed no favorable outcomes for more than 90% of those who applied for help. In those cases when patients seek treatment in 11-30 days after the action of the damaging factor and the appearance of the first clinical neurogenic symptoms, the effectiveness of treatment is reduced to 75%, and if treated after 1 month or more – the favorable outcomes are much lower and constitute up to

50% [14-17].

In case of traumatic effects (post-traumatic or postoperative neurogenic lesions of the branches of the trigeminal nerve) it is necessary to use systematization depending on the degree of nerve injury (Table 6). According to the above, the nerve injury, depending on the degree of its damage, should be divided into the following groups: contusion, stretching (with and without rupture of the vascular bundle that accompanies the nerve), incomplete rupture and complete nerve rupture. Each of these groups has its own characteristics of clinical manifestation, course, diagnosis, and treatment. The effectiveness and timeliness of the treatment applied is directly dependent on its adequacy. Therefore, there is a need for early differential diagnosis of the degree of severity of nerve damage.

For topical diagnosis (localization), i.e. depending on the name of the affected sensitive peripheral nerve, they should be divided into: injury of the ophthalmic nerve (frontal, tear, etc.), maxillary nerve (zygomatic, infraorbital, superior alveolar nerves, etc.), and the mandibular (inferior alveolar, auriculotemporal, buccal, and others nerves) nerve (Table 7) [18].

TABLE 2. Systematization of the Secondary Neurogenic Lesions (in Peripheral Branches of the Trigeminal Nerve) According to Pathogenesis.

Systematization According to Pathogenesis	
Non-Tumor Lesions	Tumor Lesions
• Odontogenic inflammatory diseases of the jaws • Non-odontogenic inflammatory diseases of the jaws • Post-traumatic • Postoperative • After dental treatment (post-filling) • After dental implants placement • As result of narrowing of the bone canals	• Tumor-like formations • Benign tumors • Malignant tumors • Postoperative

TABLE 3. Systematization of the Secondary Neurogenic Lesions (in Peripheral Branches of the Trigeminal Nerve) According to the Clinical Manifestation (Clinical Symptoms).

Systematization According to the Clinical Manifestation (Clinical Symptoms)
• Neuralgia • Neuritis • Neuralgic neuritis

TABLE 4. Systematization of the Secondary Neurogenic Lesions (in Peripheral Branches of the Trigeminal Nerve) According to the Severity of the Manifestation of Clinical Symptoms.

Systematization According to the Severity of the Manifestation of Clinical Symptoms
• Acute • Subacute • Chronic

TABLE 5. Systematization of the Secondary Neurogenic Lesions (in Peripheral Branches of the Trigeminal Nerve) According to the Terms of Medical Care After the Appearance of First Neurologic Symptoms.

Systematization According to the Terms of Medical Care After the Appearance of First Neurologic Symptoms
• Up to 10 days • On the 11-30 day • After one month or more

TABLE 6. Systematization of the Secondary Neurogenic Lesions (in Peripheral Branches of the Trigeminal Nerve) According to the Degree of Nerve Injury.

Systematization According to the Degree of Nerve Injury
• Contusion • Stretching (with or without rupture of the vessel) • Incomplete rupture • Complete rupture

TABLE 7. Systematization of the Secondary Neurogenic Lesions (in Peripheral Branches of the Trigeminal Nerve) According to the Localization of the Affected Nerve.

Systematization According to the Localization of the Affected Nerve
• Ophthalmic nerve and its branches • Maxillary nerve and its branches • Mandibular nerve and its branches

On the basis of studying the clinical symptoms of neuropathic complications in maxillofacial patients and taking into account the phase of nerve damage, we propose to classify secondary neurogenic lesions in the trigeminal nerve system, taking into account the phase (or stage) of pathology development, namely the phase of irritation and the phase of loss of function.

To the phase of irritation of the function, we recommend to include odontogenic algia, hyperalgesia and neuralgia. The phase of irritation is represented by clinical manifestations in the form of odontogenic algia, hyperalgesia, neuralgia.

The phase of loss of function include hypoalgesia, neuritis, secondary disorders in motor and trophic functions. The phase of prolapse corresponds to neuritic manifestations with hypoalgesia, motor and trophic disorders. In the phase of the loss of the function, a subphase should be distinguished in which the features of irritation persist (neural-neuritis should be included in this subphase).

The problem is ambiguous, as many considered it. We believe that the process of neuropathic lesions is one, but in it there are different phases (with the greatest likelihood, even subphases) of pathophysiological changes in the trigeminal nerve system. These phases (subphases) are not static, but are in dynamics and therefore a transition from one phase to another is possible.

Clinical symptoms of secondary lesions in the trigeminal nerve system are manifested in the form of pain of varying severity and/or as a violation of the sensitivity of the soft tissues of the maxillofacial region. These clinical manifestations of neurogenic symptoms are

directly related to the dysfunction of the nerve.

Based on the results of a comprehensive survey of more than 1096 patients with a variety of maxillofacial pathology, accompanied by signs of structural lesions in the trigeminal nerve system, we suggest that clinico-pathophysiological approaches should be taken into account in the classification of the corresponding lesions.

Conclusions

Offering doctors this classification, we hope that it will help them in the early diagnosis of neurogenic lesions of the trigeminal nerve system in patients, help to correctly assess the degree of nerve damage and timely appoint an adequate treatment [19-22], which will greatly improve the beneficial outcomes of treatment of patients.

Conflict of Interest

The authors declare no conflict of interest.

Role of the Authors and Co-authors

Oleksii O. Tymofiev (material collection, concept of the paper and writing)
 Olena P. Vesova (material collection)
 Natalia O. Ushko (material collection)

Ethical Approval

None.

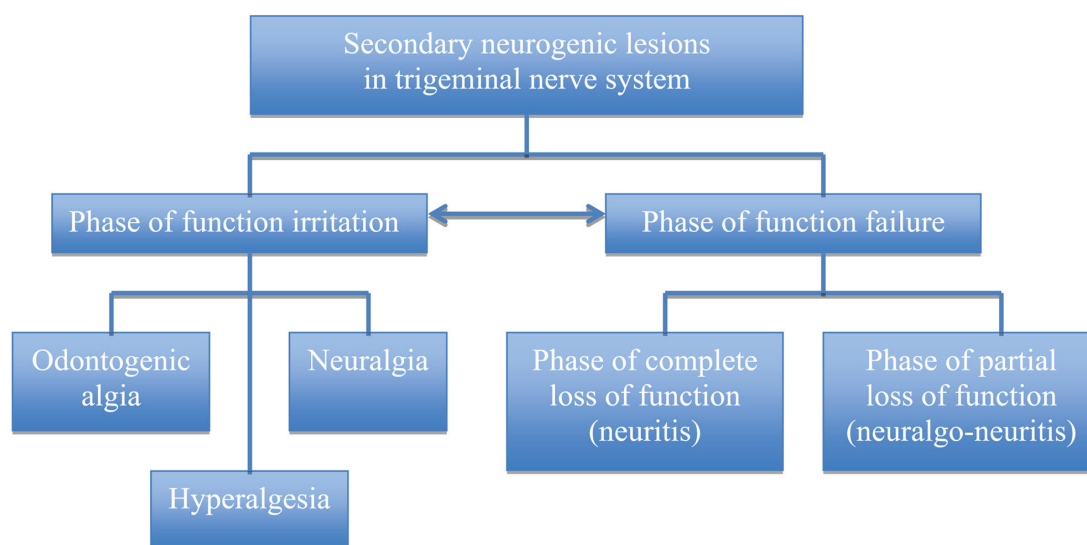


FIGURE 1. Scheme of classification of secondary neurogenic lesions in the trigeminal nerve system.

Term of Consent

No needed.

Ethical Approval

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