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CURRENT VIEWS ON THE TREATMENT OF FACIAL FRACTURES ACCOMPANIED BY TRIGEMINAL NERVE DAMAGE

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Abstract
According to statistics, the incidence of injuries and accidents ranks third in the structure of mortality in the world: after cardiovascular diseases and neoplasms; second among the causes of disability and temporary disability. The incidence of trauma to the maxillofacial region (TMF) is steadily increasing, averaging 6-8% of the total number of injuries each year. Statistics from major cities show a marked increase in the proportion of maxillofacial trauma (OMT) with facial skull fractures, accounting for up to 42% of hospital admissions. According to the WHO, 350 000 working-age people die each year and more than 7.3 million injured people become disabled each year.

Keywords: facial bone fractures, trigeminal nerve

Introduction

The diagnosis and treatment of trauma to the maxillofacial region and the brain continues to be an urgent problem in emergency medicine. Over the last ten years there has been a quantitative leap in the number of injuries to the population. This is due to changing social conditions - income stratification of the population, the continued growth of large cities, the increase in the number of vehicles, the increasing speed of movement; failure to comply with elementary safety standards, especially in private businesses. The proximity of important anatomical structures (brain, large nerves and ganglia, upper airways, sinuses, eyeballs, etc.) makes diagnosis and treatment difficult, and often results in death, long-term disability and subsequent disability.

Purpose of the Study

To study and evaluate the effectiveness of the complex treatment of injuries of the peripheral branches of the trigeminal nerve in fractures of the maxillofacial region.

Materials and Methods of Research:

Clinical studies were carried out at the Samarkand branch of the Republican Specialized Scientific Center of Traumatology and Orthopedics. Observations were based on clinical and laboratory examination of 60 patients with fractures of maxillofacial region (fractures of maxilla, mandible, zygomatic bone and/or zygomatic arch), including 37 (61, 6%) male and 23 (38, 3%) female; in the age group - 38 (63, 3%) patients aged 18-30 years and 22 (36, 7%) - 31-50 years. The control group included 20 conditionally healthy individuals.

Based on the objectives of the study, 60 patients with traumatic fractures of the middle and lower thirds of the face with injuries of the trigeminal nerve branch were divided into 3 groups by random sampling, depending on the type of the conducted complex of therapeutic measures:

Group 1 consisted of 20 patients, whose complex treatment included surgical treatment (fracture repositioning, osteosynthesis immobilization) and traditional drug therapy, which consisted in the prescription of antibacterial drugs, mouthwash with 0.02% chlorhexidine bigluconate solution. For pain, non-narcotic analgesics or non-steroidal anti-inflammatory drugs Analgin 50% 2.0 v/m, diclofenac 2.0 ml 3 times a day were prescribed. To restore functions of damaged nerve fibers the patients received glucocorticosteroid therapy - a week's course of dexamethasone 8-12 mg daily; NSAIDs - ibuprofen 600-800 mg 3 times daily for 2-3 weeks; vitamin therapy - cyancobalamin (vitamin B12) 500 μg, alternating with 10-15 subcutaneous injections of 5% (1 ml) solution of thiamine (vitamin B1).

Group 2 consisted of 20 patients who besides surgery and traditional treatment included Neuromidin (1 tablet (20 mg) 1-3 times daily; daily dose varied depending on the severity of damage of peripheral branches of the trigeminal nerve, taking into account maximum daily dose of 200 mg) and Nucleo CMF Forte (2 ml of injections per day, course duration - 9 days);

Group 3 consisted of 20 patients who underwent electroneurostimulation (ENS) to restore sensory and motor functions of peripheral branches of the trigeminal nerve along with surgical treatment, inclusion of Neuromidin and Nucleo CMF Forte into the complex of traditional drug therapy.

The control group included 20 people without trauma to the maxillofacial region, somatically healthy without pathology of the central and peripheral nervous system for further comparative analysis of the recovery of the studied physiological indicators in the dynamics of treatment and rehabilitation.

Upon admission to the department, all patients were initially and dynamically examined by an oral surgeon, neurosurgeon (neurologist), and in some cases by

narrow specialists depending on the localization of the injury (ENT doctor, oculist). A clinical and neurological examination was performed according to standard procedures, and attention was paid to the symptoms of injuries to the trigeminal nerve branches (paresis, paresthesia, hyper- and hypoesthesia, etc.). The main complaints of the patients were determined, the anamnesis was studied, if the patient's condition allowed - life history, epidemiological anamnesis, if necessary this information was also obtained from relatives or persons accompanying the patient; the general condition was assessed - vital functions, general examination; if pathology of internal organs was revealed, patients were examined by profile specialists. The patient was examined to determine whether there had been an episode of unconsciousness, nausea and vomiting, which might suggest craniocerebral trauma. External examination of the maxillofacial region was aimed at determining asymmetry, bite disturbance, establishing the localisation of the fracture by testing and determining stress symptoms, haematomas and soft tissue swelling, and displacement of bone fragments.

Areas of hyper- and hypoesthesia were identified in the examination of superficial and deep facial sensitivity. Attention was paid to the presence of facial skin numbness, pronounced pain, paresthesias, which indicate a traumatic lesion of peripheral nerve fibers. To estimate objectively the zone of cutaneous sensitivity impairment, Avdeeva V.A. et al. (2011) proposed "Method of paresthesia zone assessment in traumatic inferior alveolar neuritis", which makes it possible to identify the boundaries of hypoesthesia zones using tactile test. To assess skin sensitivity impairment in malar bone and arch fractures, as well as fractures of the zygomatic arch and maxilla, we adapted the aforementioned examination method, taking into account the areas innervated by the zygomatic and infraorbital nerve, which are most frequently injured in this case. Electrodontodiagnostics was also used to assess the functional status of the inferior alveolar nerve as well as the superior alveolar branches (anterior, middle, posterior) when they are traumatically injured.

The state of the motor portion of the third branch of the trigeminal nerve was assessed by palpation of the masticatory and temporal muscles according to electroneuromyography (ENMG), in the long term by the presence of atrophy of the masticatory muscles on the affected side and the violation of the lower jaw movement pattern when opening and closing the mouth.

The results were further studied and evaluated using statistical methods of data analysis.

Research Findings

Among the hospitalised patients, 35 (58.3%) had an isolated fracture of the mandible, 15 (25%) had a fracture of the zygomatic bone and upper jaw, and 10 (16.7%) had an isolated fracture of the zygomatic arch and/or zygomatic bone. Of these, 41 (68.3%) patients had fractures with displacement and 19 (34.7%) had fractures without displacement (Table 1).

Complaints of pain in the localised area of the fracture predominated. The need for analgesics on the day of admission was high, i.e. more than 90% of patients were taking non-narcotic analgesics, of which 5 (8.3%) had no analgesic effect.

In 37 (61.7%) patients with displaced fractures, complaints of numbness of the skin in the projection of the zones of innervation of the peripheral branches of the trigeminal nerve predominated. In 22 (62.9%) out of 35 patients with mandibular fractures bite disorders of open, deep, cross-bite type were registered, in 13 (37.1%) - there was no bite disorders. Painful and limited mouth opening of various degrees was recorded in 44 (73.3%) patients.

The severity of damage to the peripheral branches of the trigeminal nerve correlated with the diastasis of the fragments detected by radiological examination (MSCT, OPTG). At a displacement of the bone fragments over 1.0 cm, a severe degree of nerve damage was observed in 13 (21.7% of cases) patients, at a displacement within 0.5-1.0 cm, a moderate degree in 29 (48.3%) patients and at a displacement up to 0.5 cm, a mild degree in 21 (35%) patients.

Clinical and radiological examination of patients revealed the following distribution of mandibular fractures by severity: unilateral fractures - 20 (57.1%), bilateral fractures - 11 (31.4%), triple fractures - 4 (11.2%). According to the localisation, the fractures of the lower jaw were distributed as follows: the angle of the lower jaw - 14 (40%), the mandibular region and the mental foramen - 7 (20%), the condylar process - 5 (14.3%), the body of the lower jaw (Fig. 1) - 5 (14.3%), the branch of the lower jaw proper - 4 (11.4%).

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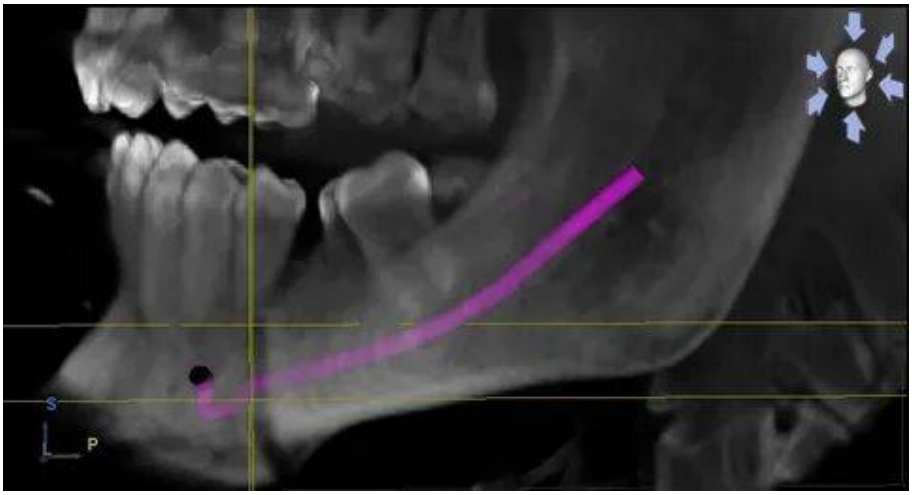

Fig. 1. Left mandibular body fracture with dislocation (colour indicates the projection of the mandibular canal and the course of the inferior alveolar nerve)

On palpation of Vale's points (the exit sites of the second and third branches of the trigeminal nerve), there was painfulness on the injured side; there were vegetative disorders (skin hyperemia, hyper salivation, swelling of the skin and mucous membranes).

The study of the motor portion of the trigeminal nerve in patients with mandibular fractures revealed disorders in 11 (18.3%) patients: all patients had hypertonicity on the affected side when palpating the masseter and temporal muscles; in 4 (6.7%) patients palpation caused pain sensations.

The area of decreased sensitivity was most often localised to the skin of the lower eyelid, cheekbone, lower lip and chin. In the oral cavity, hypoesthesia disorders were fixed on the mucosa in the area of the mandibular fracture and distally from it. By means of objective estimation of the skin sensitivity disturbance zones according to the method of Avdeeva V.A. et al. (2011), the borders of hypoesthesia zones were revealed with the tactile test. The results showed the average degree of sensitivity impairment in the patients of the studied groups (values within the range of 1.1-2 conventional units).

At fractures of zygomatic bone and/or arch, maxilla with injuries of peripheral branches of trigeminal nerve (II branch), ENMG results showed partial delay in sensory fibres (SPI is 15,8±0,3 m/s) and afferent irritation. There was also a phenomenon of compression of peripheral nerve fibres by soft tissues due to swelling.

In hypesthetical disorders signs of axonal-demyelinating lesion of motor fibres of the trigeminal nerve were revealed (marked prolongation of early and late components of reflex response by 51.7% and 23.3%, respectively), significant reduction of impulse conduction speed along the afferent fibres of the trigeminal nerve by 31.7%.

Thus, all of the subjects had nerve fibre conduction abnormalities of varying degrees according to the electrophysiological findings.

On the 14th day of treatment, patients in Group 1 who received conventional therapy had a slight decrease in the intensity of pain sensation, with patients experiencing moderate to mild pain. In patients with hyperaesthetic disorders, pain sensitivity disorders persisted in 15 patients, and tactile sensitivity disorders persisted in 13 patients. In patients with hyperaesthetic disorders, disturbances of tactile and temperature sensitivity persisted in 8 patients, and deep sensitivity in 2 patients. The area of numbness on the facial skin was unchanged.

The mean value of the EOD before treatment was 102.41±1.84, and after conventional therapy it was 89.31±1.58. After the conducted treatment the values of EDM improved by 12,8% The results of repeated EDM in a month showed that 8 patients' values were normalized, 7 patients still had higher threshold of excitability, 5 patients didn't have any positive dynamics.

ENMG data showed that in hyperaesthetic sensitivity disorders after a course of conventional therapy, the latent period of the reflex response decreased by 40%. In patients with hyperaesthetic disturbances the early components of the reflex response exceeded the normal values by 18%, the late ones - by 11%, the speed of nerve impulse conduction increased by 18% only.

ENMG data showed that in patients with hyperaesthetic sensitivity disorders, electroneuromyograms of the healthy and damaged sides were practically indistinguishable. When recording trigeminal SSEPs in patients with hyperaesthetic disorders after ENS, the curve of the healthy and affected sides also did not differ.

Patients with hyperaesthetic sensitivity disorders recorded early components of the reflex response after an ENS course, with the amplitude of oscillations increasing by 35%.

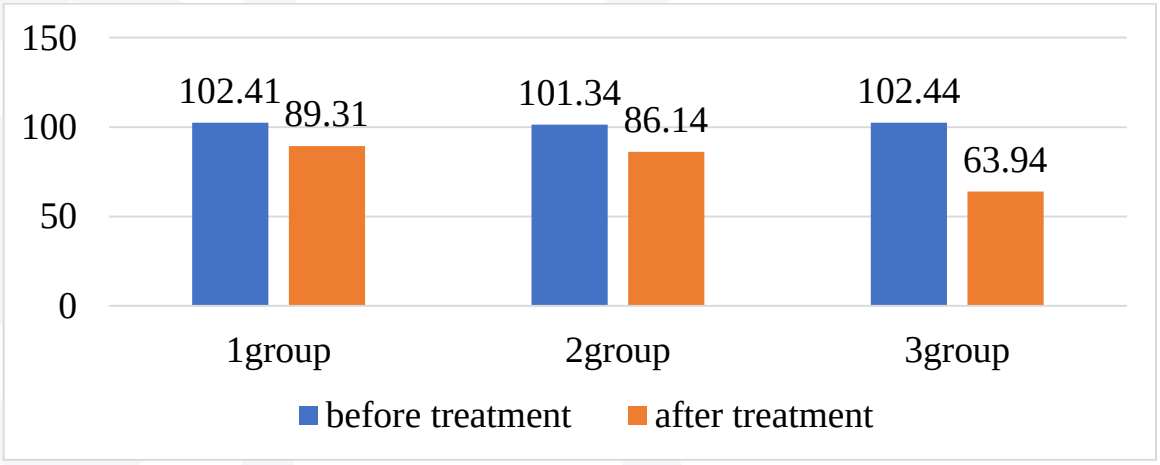

Fig. 2. EOD scores of the study groups of patients before and after treatment

In the fracture zone, the average optical density after one month was 127.2±5.6. The optical density of the intact bone tissue averaged 133.7±12.95 units. According to the formula, the average value of the optical density index one month after injury was: 1=0.96±0.1. On the day of admission 1=0.69±0.1, after traditional treatment 1=0.84±0.1.

The above data indicate that the rate of bone fragment consolidation is higher after complex treatment with ENS than after conventional therapy.

Conclusion

Thus, the results of clinical and functional studies demonstrate that the complex treatment of maxillofacial bone fractures accompanied by the damage of peripheral branches of the trigeminal nerve shows a more positive dynamics of the restoration of sensory and motor functions of nerve fibres, and also contributes to a comparatively rapid consolidation of fragments compared with the traditional method of treatment.

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