

THE CHARACTERISTICS OF TRIGEMINAL NEURALGIA TREATMENT METHODS

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Summary

Pain is a crucial clinical, social and economical problem. Patients with trigeminal neuralgia, making up about 15-20% of all peripheral nervous system diseases, are especially suffering with pain. Trigeminal neuralgia - highly intensive sharp pain in one or both sides of the face. The disorder is caused by an inflammation of the trigeminal nerve (nervus trigeminus), the fifth cranial nerve composed of three branches. We compared trigeminal neuralgia treatment methods, that are used for patients hospitalised in Maxillofacial Surgery Clinic of Lithuanian University of Health Sciences Kaunas Clinics. Here are three main techniques for treating trigeminal neuralgia: pharmacotherapy, alcohol injection and surgical operation. The aim of our study was to analyse effectiveness (duration of disease remission period) of those treatment methods and to compare them with each other. According to our study we can conclude that the most effective method of trigeminal neuralgia treatment is surgical, resulting in a 27.53 months remission, less efficient are pharmacotherapy, resulting in a 15.51 months remission, and alcohol injections, resulting in a 12.89 months remission.

Aim of study: to compare trigeminal neuralgia treatment methods, that are used for patients hospitalised in Maxillofacial Surgery Clinic of Lithuanian University of Health Sciences Kaunas Clinics. Here are three main techniques for treating trigeminal neuralgia: pharmacotherapy, alcohol injection and surgical operation. The aim of our study was to analyse effectiveness (duration of disease remission period) of those treatment methods and to compare them with each other.

Background: Pain is a crucial clinical, social and economical problem. Patients with trigeminal neuralgia, making up about 15-20% of all peripheral nervous system diseases, are especially suffering with pain (Abduchakimov F.T., 1985). Trigeminal neuralgia - highly intensive sharp

pain in one or both sides of the face. The disorder is caused by an inflammation of the trigeminal nerve (*nervus trigeminus*), the fifth cranial nerve composed of three branches. It is mainly responsible for sensation in the face. Sensory information from the face is processed to trigeminal nucleus in the pons, the rhomboid fossa. Trigeminal neuralgia is one of the most painful conditions experienced by a human.

According to the literature trigeminal neuralgia most rarely affects the first branch of the trigeminal nerve (2-8%), while the second and third - approximately 30%. P. Sabalys (1990) provided data about the prevalence of trigeminal neuralgia: female and male ratio 3:2, most frequently this disease develops in the age of 40-50 years. Like the other authors (Gerhard H, Christopher F. Terrence, Joseph C. Maroon) he claims that the most frequently affected is the second branch (*n. maxillaris*) - 37.7%, the third branch (*n. mandibularis*) - 29.9%, and the second and the third together - 20.6%. The isolated injury of the first branch or combined with the other branches is found in less than 10% of cases. Love, Seth; Coakham, Hugh B (2001) suggests that trigeminal neuralgia in the right side of the face develops 1.5 time more often than in the left side [1].

ETIOLOGY OF TRIGEMINAL NEURALGIA

According to causes of the disease there are three forms of trigeminal neuralgia:

Primary idiopathic trigeminal neuralgia (more frequent in the older age, among female patients, starts with intensive paroxysmal pain in the facial or any part of the head area, pain attacks are unexpected, half-minute duration and regularly repeating, for some patients pain is provoked by eating, for the others - while speaking or contracting the mimic muscles, only tender, but not strong touch provokes paroxysmal pain) [2].

Secondary trigeminal neuralgia (brain tumors, atherosclerotic changes of trigeminal nerve, cerebrovascular diseases, bony foraminal narrowing, glaucoma, refractive errors, benign and malignant tumors of the mandible, foreign body around the trigeminal nerve, various diseases of the ear, sinusitis, incorrect bite, carious teeth, heavy metal poisoning, metabolic disorders). [3,4]

Trigeminal neuralgia caused by allergy. This cause was mentioned by J. Krasnovas (1981), who detected antibodies against the trigeminal nerve tissues in the blood serum of trigeminal neuralgia patients. P. Sabalys also proved the allergic origin of the disease by luminescence microscopy and immunofluorescence tests [5].

Clinical features of trigeminal neuralgia [1,5,6]. The main symptom of trigeminal neuralgia is a rapid, very intensive, stabbing, pricking, shooting, electric-shock like pain in the face. This pain is paroxysmal, and duration of episodes varies from few seconds to few minutes. These kind of episodes can repeat several times during the day with the interparoxysmal periods without pain. Pain attacks last from several weeks to several months, after them an asymptomatic remission period with the duration of months or even years is usually expected. Overall frequency of pain attacks tend to grow with time and become less responsive to treatment.

Pain attacks are provoked by the stimulation of trigger zones in the same side of the face. These trigger zones can be located anywhere in the face, mouth or nose, and in the different area than pain. Pain could be initiated by such stimuli as tender touch or vibration. Therefore the majority of daily routine activities can provoke the trigger zones stimulation and pain attacks. Pain might develop while:

- washing face, teeth, shaving;
- speaking;
- eating, chewing;
- with a stronger blow of wind.

Many trigeminal neuralgia patients do not eat or drink during pain attacks with the fear of pain. For this reason they are in a big risk of dehydration and losing weight. Pain can involve only an isolated area of the face or rapidly spread into a wider zone.

Trigeminal neuralgia treatment methods [6]. Firstly, trigeminal neuralgia is treated with medication. Aim of pharmacotherapy is to relieve or block painful symptoms. There are several drugs used to treat trigeminal neuralgia. If the response to a drug is too small or it causes severe side effects, an alternative drug can be prescribed.

Medications:

- carbamazepine. Carbamazepine is an antiepileptic drug often used for neuralgia treatment. In the early stages of disease carbamazepine effectively relieves pain for the majority of patients, although, with time its effect is weakening. The most frequent side effects - dizziness, confusion, somnolence, nausea;
- phenytoin. Another antiepileptic drug, causing such side effects as proliferating gums, somnolence, dizziness;
- gabapentine. Also an antiepileptic drug. All three me-

dications of this group are prescribed in a small starting dose, then titrated while clinical response is reached or side effects are intolerable.

- baclofen. A spasmolytic agent. It is more effective when combined with carbamazepine or phenytoin;
- during the acute pain attack opioid therapy could be efficient as well.

Medication therapy is successful in approximately 80% of cases. Unfortunately about 50% of patients positively responding to an antiepileptic agents are gradually becoming resistant to this treatment. For this group of patients surgical interventions are combined with pharmacotherapy.

Methods of surgical treatment:

- glycerol injections. A needle is introduced into the nerve in the base of the skull while it reaches the trigeminal cistern - a small cavity filled with cerebrospinal fluid, surrounding the trigeminal ganglion, and a small amount of sterile glycerol is injected. A location of a needle is checked with roentgen. After 3-4 hours glycerol destroys the trigeminal nerve fibers and painful impulses are blocked. Initially, this procedure relieves pain in most people, however, some people have a later recurrence of pain.

- alcohol injections. Alcohol is subcutaneously injected into those affected areas, where the trigeminal nerve enters the facial part of the skull. The procedure relieves pain and results in facial anaesthesia for a while, that is why later it might be repeated.

- balloon compression. During this intervention a hollow needle is inserted through the face skin into an opening in the base of the skull. Then a thin catheter with a balloon on the end is threaded through the needle. The balloon is inflated with enough pressure to damage the nerve and block pain signals. Balloon compression successfully controls pain in most patients, at least for a while. Most people undergoing this procedure experience some facial numbness, and some experience a weakness of the muscles used to chew.

- electric current. A hollow needle is inserted through the face into an opening of the skull. Then an electrode is threaded through the needle to the nerve root, the mild current pulsed through the electrode, while it heats to an appropriate temperature and damages the nerve fibers. If pain remains, coagulation is repeated. This procedure successfully eliminates painful symptoms for the majority of patients, even though, pain attacks can develop again after several years. Some patients experience facial numbness after the intervention.

- microvascular decompression. During this procedure the trigeminal nerve is not destroyed. Aim of microvascular decompression is to retract the blood vessel that is in con-

tact with the nerve. A tiny sponge like material is placed between the nerve and the vessel. The surgical operation is started with an incision behind the ear. The dura is opened from a small cavity, then a part of the brain is lifted allowing the visualization of the trigeminal nerve. The procedure effectively relieves pain, but for some patients pain recurrence is expected.

- severing the nerve. The trigeminal nerve is cut at the base of the skull. This procedure is effective in the majority of cases, but for some patients painful symptoms can develop again.

- radiotherapy. Gamma-knife radiosurgery allows to deliver a focused, high dose of radiation to the ganglion of the trigeminal nerve and to damage it. The procedure is usually effective, but the relief can take several weeks to begin. Longlasting outcomes of gamma-knife radiosurgery are not known, because the procedure is quite new. Unfortunately, there are no preventive means.

RESULTS OF THE STUDY

We randomly chose 100 medical histories of patients hospitalised in Maxillofacial Surgery Clinic of Lithuanian University of Health Sciences Kaunas Clinics and diagnosed with trigeminal neuralgia. 66 of them were women and 34 - men. All these patients were divided into four groups according to the age of the first disease symptoms (Table 1): the first group - 30-40 years, consisted of 6 patients; the second group - 40-50 years, 12 patients; the third group - 50-60 years, 24 patients; the fourth group - 60 and more years, 58 patients. Overall there were 148 diagnoses (Table 2), where the most frequently diagnosed was neuralgia of the third trigeminal nerve branch - 42 times, while neuralgia of the second trigeminal nerve branch was diagnosed 40 times, of both the second and third branches - 36 times, of the first and second branches - 22 times, neuralgias of the first branch and the first, second, third branches were respectively diagnosed 4 times, and there was no diagnosis of both the first and third branches.

Antineuralgic treatment was applied 726 times, here pharmacotherapy was used 376 times, alcohol injections - 226 times and surgical interventions - 124 times. One patient was treated at an average of 7.26 times, with medications - 3.76 times, with alcohol injections - 2.26 times, surgically - 1.24 times. The initial treatment choice for a patient hospitalised in Maxillofacial Surgery Clinic was medications, that resulted in a remission of an average 15.51 months duration. If medication therapy was not effective, alcohol injections or surgical treatment would be chosen as an alternative. An average duration of remission was 12.89 months after alcohol injections, and 27.53 mont-

Table 1. The age of the first symptoms

Age group (years)	Number of patients
30-40	6
40-50	12
50-60	24
60 and <	58

Table 2. Affected branches

Diagnoses of the affected branches of the trigeminal nerve							Overall
I	II	III	I, II	I, III	II, III	I, II, III	
4	40	42	22	0	36	4	148

Table 3.

Treatment method	Times (N)	An average of remission in months (R)	Standard deviation	Confidence interval 95%	
				Lower edge	Upper edge
Medications	376	15,51	1,545	12,473	18,548
Alcohol injections	226	12,89	1,922	8,976	16,812
Surgery	124	27,53	2,69	22,243	32,821

Table 4.

Method (a)	Method (b)	Difference between averages (a-b)	Level of significance (Dunn's Q)
Medications	Alcohol injections	2,617	p<0,01
	Surgery	-12,022	p>0,01
Alcohol injections	Medications	-2,617	p<0,01
	Surgery	-14,638	p>0,01
Surgery	Medications	12,022	p>0,01
	Alcohol injections	14,638	p>0,01

Figure 1

$$Q = \frac{\bar{R}_A - \bar{R}_B}{\sqrt{\frac{N(N+1)}{12} \left(\frac{1}{n_A} + \frac{1}{n_B} \right)}}$$

hs - after surgical operation. We got three samples (treatment methods), that according to Kolmogorov-Smirnow [7] and Shapiro-Wilk [8] tests were taken from non-normal populations (in all cases there was no normal distribution with p<0.01). Therefore in order to compare our samples we used Kruskal-Wallis test [9], which shows how different are the samples, but in case of more than two samples this test can show only the difference between samples having the biggest and the smallest average. In our case these differences were found in pharmacotherapy-surgical treatment and alcohol injections-surgical treatment. Statistically these samples or treatment methods differ with a one percent propability, therefore the difference could be occasional. In order to evaluate the difference between medication therapy and alcohol injections we used Dunn's Q test [10]. According to the formula (Figure 1) we coun-

ted $Q=0.376$, from the table of critical meanings $Q=2.394$, with $p<0.05$ and $Q=2.936$, with $p<0.01$. In both cases the meaning of our Q is lower than critical meanings, therefore there is no statistical significance between those treatment methods.

CONCLUSIONS

According to our study we can conclude that the most effective method of trigeminal neuralgia treatment is surgical, resulting in a 27.53 months remission, less efficient are pharmacotherapy, resulting in a 15.51 months remission, and alcohol injections, resulting in a 12.89 months remission. After the analysis of our results (using Kolmogorov-Smirnov, Shapiro-Wilk, Kruskal-Wallis, Dunn's Q tests) we can claim that surgical operation is the most effective method which significantly differs from two other treatment methods. When comparing those two other treatment methods, there was no statistical significance and their effectiveness was alike.

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TRIŠAKIO NERVO NEURALGIJŲ GYDYMO METODŲ YPATUMAI
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Santrauka

Raktažodžiai: neuralgija, alkoholizacija, chirurginis gydymas.

Skausmo problema yra svarbi medicininiai, socialiniai, ekonominiai požiūriu. Nuo skausmo ypač kenčia sergantieji trišakio nervo neuralgija, kuri sudaro 15-20% visų periferinių nervų ligų. Trišakio nervo neuralgija – labai stiprus, duriantis skausmas vienoje ar abejose veido pusėse. Jį nulemia trišakis nervas (nervus trigeminus), kuris yra mišrus ir susideda iš trijų šakų. Pagrindinė jo funkcija užtikrinti jutimus veide. Šiuo tyrimu mes palyginome trišakio nervo neuralgijos gydymo būdus, kurie taikomi pacientams, gydomiems Kauno medicinos universiteto Veido ir Žandikaulių klinikoje. Šioje klinikoje trišakio nervo neuralgijai taikomi tokie pagrindiniai gydymo būdai: medikamentinis, trišakio nervo šakos alkoholizacija ir chirurginis. Mūsų tikslas įvertinti šių gydymų efektyvumą (ligos remisijos laiką) ir palyginti juos tarpusavyje. Iš atlikto tyrimo galime daryti išvadą, kad efektyviausias trišakio nervo neuralgijos gydymo būdas yra chirurginis, po kurio ligos remisija - 27,53 mėnesio.

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