ISSN 2521-1455 (Print)
ISSN 2523-4250 (Online)

ВИПАДКИ З ПРАКТИКИ

DOI: 10.21802/artm.2021.3.19.147
УДК 616.8-00:616.831-005.1

CLINICAL-NEURO-PHYSIOLOGICAL CHARACTERISTICS OF MYOFASCIAL PAIN SYNDROME IN A PATIENT WITH LEFT HEMYPLEGIA AFTER INTRACEREBRAL HEMORRHAGIC STROKE

S.L. Popel[1], T.P. Vasylyk[2], I.M. Boiko[3], S.L. Anokhina[3], M.V. Koval[4]

[1]Vasyl Stefanyk Precarpathian National University, Department of physical therapy and ergotherapy,
[2]Municipal Non-Profit Enterprise City Clinical Hospital" Ivano-Frankivsk City Council, Department vascular neurology,
[3]Municipal Non-Profit enterprise city clinical hospital №1 of Ivano-Frankivsk city council, Department vascular neurology,
[4]Ivano-Frankivsk National Medical University, Department of Neurology and Neurosurgery, Ivano-Frankivsk, Ukraine,
ORCID ID: 0000 -0001-9019-3966, e-mail: popelsergij@gmail.com;
ORCID ID: 0000-0001-5223-1239, e-mail: tarasvasylyk1967@gmail.com;
ORCID ID: 0000-0002-3407-1427, e-mail: irina96desire@gmail.com;
ORCID ID: 0000-0002-5970-4040, e-mail: svetlana.anochina@gmail.com,
ORCID ID: 0000-0002-4617-0828, e-mail: mkoval2904@gmail.com

Abstract. Myofascial pain syndrome (MFPS) is one of the most common comorbid pathological processes that develops in skeletal muscle in patients with stroke, which is manifested by local seals and pain in various parts of the muscle. Despite the fact that the interest in MFPS arose in the last century, the intimate mechanisms of its development and course remain to be fully explored. It was found that the main manifestations of MFPS were the presence of mio-fascial trigger point in the area of palpation of the corresponding muscle with local pain and hypersensitivity within the palpated cord-segmentes, the characteristic pattern of reflected pain and reflected autonomic phenomenon, local con-vulsive response during transverse palpation. It is accompanied by muscle fatigue and significant muscle weakness without severe atrophy. Attention is drawn to the clear recurrence-reproducibility of pain, ie the so-called "recogniza-ble" pain. All of the above symptoms constitute a general pattern of the disease, which has diagnostic value and is pro-posed for use as prognostic parameters with the obligatory use of the results of electromyographic examination. Diag-nosis of active and latent MTP was performed on the basis of generally accepted l signs. The greatest discomfort for the patient is the presence of active MTP with characteristic spontaneously reproducing pain. Latent MTP is detected in up to 90% of cases among healthy people, and adverse factors only contribute to their transition to an active state with a characteristic symptom complex. The presence of an active myofascial trigger point with a characteristic spontaneously reproducing pain is the most painful manifestation. Latent MTP is also detected in most cases among healthy people, and unfavorable factors only contribute to their transition to an active state with a characteristic symptom complex. The study of the number of turns of the adhesive part of the potential in the zone of active ICC showed that there is a con-centration of fibers in the zone of one motor units (MU). The average value of this indicator increases in the early stages of the process by 2 times. Even a small degree of desynchronization of the potentials of individual MU causes an in-crease in the number of rounds, which reflects the number of fibers involved in the generation of MC PMU.

Absence of spontaneous muscle fibers (MF) activity, registration of end plate (EP) activity, PMU parameters such as amplitude decrease, shift of neurohistogram of potential distribution by duration towards smaller values or high percentage of polyphasicity, due to increase in number of turns, and also change their adhesive part, increase of MF density in zone MTP - they all determine changes in structural and functional parameters by muscle type. The work is devoted to the clinical, neuro-physiological characteristics of a patient with MFPS on the background of intracerebral hemorrhage and left hemyplegia based on the analysis of the neuro-functional organization of the motor units of the back muscles. Substantiated genesis and possible mechanism of development and formation of myofascial trigger point in such patients.

Keywords: Myo-fascial pain syndrome, myofascial trigger point, motor unit, electromyography, muscle fiber, end plate.

Introduction. Myo-fascial pain syndrome (MFPS) is a classic clinical phenomenon caused by the myofascial trigger point, covers up to 85% of people with strokes in the entire population and does not tend to reduce it, despite numerous therapeutic methods. MFPS is a cause of pain in the shoulder, neck, back, head and is often the cause of low efficiency of post-stroke rehabilitation programs. The pathognomonic sign of MFPS is highly sensitive myofascial trigger points (MTP) in the causal muscle. Fundamental research

ISSN 2521-1455 (Print)
ISSN 2523-4250 (Online)

conducted in recent years has not solved this problem definitively and the main problem remains the question of myogenic or neurogenic mechanism of MFPS development. Numerous studies have shown that the leading role in the pathogenesis of MTP is played by neuromuscular dysfunction with abnormal activity of abnormally functioning end plates (EP) of extrafusal muscle fibers (EMF), which causes threshold pathological muscle contraction. The reason for this is repeated microtraumas or biomechanical overloads, such as prolonged stay in an awkward position or discontinuous dynamic physical activity, alimentary metabolic disorders, psychological factors, or comorbidities [1,2].

Materials and methods. The examination was performed in a patient PSL (age 58 years, duration of the underlying disease 1.4 years) with right-sided intracerebral hemorrhagic stroke and left-sided paraplegia with concomitant MFPS. Conducted a standard neurological examination according to conventional methods. Diagnosis of MTP was performed in the presence of characteristic complaints, palpation data and the results of the study by additional methods[1,2] and pathology of the neuromuscular apparatus in the anamnesis, as well as vertebral or extravertebral manifestations of reflex or compression genesis, and the absence of clinical manifestations of spondylogenic lesions of the peripheral nervous system. A comparative research of active and latent MTP was performed to study the neurophysiological features of morpho-functional organization of motor units (MU) and skeletal muscle MF. Standard methods were used to study the potentials of MU (PMU) and their adhesive part - the main component (MC) in the state of EP, as well as individual MF [1]. All researches were performed under standard conditions on an electromyograph "NeuroSoft" (Russia).

Results. This is accompanied by muscle fatigue and significant muscle weakness without severe atrophy. Attention is drawn to the clear recurrence-reproducibility of pain, ie the so-called "recognizable" pain. Diagnosis of active and latent MTP was performed on the basis of generally accepted features (table 1). The greatest discomfort for the patient is the presence of active MTP with characteristic spontaneously reproducing pain. Latent MTP is detected in most cases among healthy people, and adverse factors only contribute to their transition to an active state with a characteristic symptom complex.

Table 1

Clinical signs found in patients with myofascial pain syndrome (%)

Signs	Active	Passive
Reproducible (recognizable) pain	96	-
Local pain	100	42
Spontaneous pain	100	2
Pain in response to compression	100	92
Local seal	100	100
The area of hypersensitivity within the local seal	100	82
Local convulsive response	78	-
Reflected pain	84	-
The vegetative phenomenon is reflected	84	-
Muscle weakness	52	-
Atrophy	28	-
Restriction of complete stretching of the involved muscle	59	12

The onset of pain was gradual and associated with prolonged uncomfortable static position of the patient. Latent MTP occurred during movement or palpation [2]. Pain during active MTP occurred every day, especially after sitting monotonous work at the computer and had a long aching nature. The patient was asked to mark on a visualized analog scale (VAS) to objectify the pain. The intensity of pain for you reached 5.0 points before the study, on palpation reached 8.0 points. The pain was more intense in the presence of active MTP. EMG studies were performed in the area of active MTP (1050 PMU) and latent MTP (490 PMU). As a result of spontaneous activity of MF or MU was not detected. However, in the area of active MTP are detected PMU lasting more than 30% in both the right and left part of the histogram, with a predominance in the left part, and a decrease in the average normalized duration. The change of PMU parameters is characterized by a decrease in the amplitude, an increase in the number of phases and turns of the potential and its adhesive part (table 2). Only a small part of the fibers forms the adhesive component of the MU, which explains the early changes in the parameters of the MC PMU. An increase in the average duration of MC PMU with a shift of the histogram of the distribution to the right was revealed. The increase in the parameters of the duration of the MC PMU is the result of early adjustment of MU, when the early concentration of MF, which are in the discharge zone of one electrode, in the center of MU, and their elimination at the periphery. Study of the number of turns of the adhesive part of the potential in the zone of active MTP, which is the concentration of fibers in the zone of one MU.

A 2-fold increase in this indicator at the initial stages and associated with it even a small degree of desynchronization of the potentials of individual MUs causes an increase in the number of turns, and indicates the number of fibers involved in the generation of MC PMUs.. The reorganization of the structure of the MU in the MTP area is confirmed by analyzing the distribution

ISSN 2521-1455 (Print)
ISSN 2523-4250 (Online)

of CF of individual MU. Complexes were recorded that consisted of potentials with one (A) spike, and of potentials 2 (B), 3 (C) and even 4 (G) muscle fibers (Fig. 1).

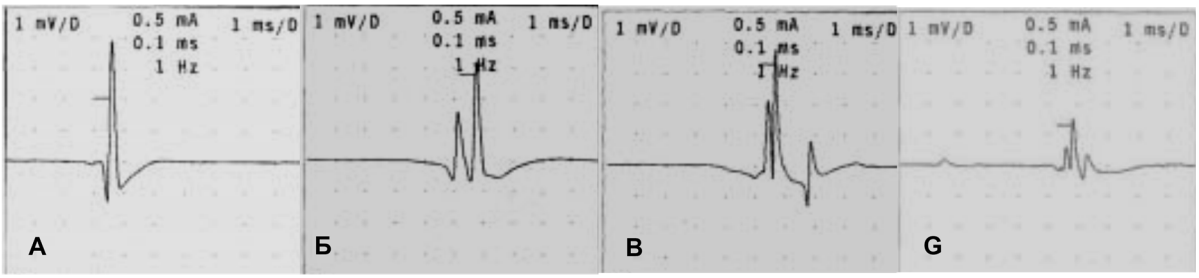

Fig. 1. Electromyographic curves of the patient PSL in the post-stroke period with MFPS.

Discussion. The results of our research indicate that the post-stroke period is accompanied by functional disorders in various parts of skeletal muscle. The authors paid little attention to this fact, but this combination often creates significant difficulties not only in diagnosis but also in rehabilitation, because in this situation, depending on the severity of the underlying disease, trigger points can often be formed not only in contractile components of muscles, but also in ligaments and fascia [3].

Studies by Dommerholt & Bron, [5] found that these anatomical formations have contractile properties, so they may be involved in the formation of primary or secondary fascial-ligament trigger loci. We found that the primary fascial ligament trigger points are formed due to the local contractile property of the ligaments without muscle involvement. Secondary fascial-ligament trigger points are formed in dynamic parts of muscles (fascia, aponeurosis, etc.) and appear after the formation of a myogenic trigger point. Both types of fascial-ligament trigger points have a very similar pathogenetic mechanism, and in the proximity of the subjective manifestation, some authors combine them under the name of myofibrillar pain syndrome [6]. A number of researches [11] have shown that long-standing myogenic and fascial ligament hypertonia lead to fibrous degeneration of muscle tissue. It is known [3] that local, latent muscle pain has a local manifestation and occurs when stretching and local pressure. According to G.A.Ivanichev, [2] in the latter case the pain may disappear after a slight stretching.

Our data are consistent with the results of researches by other authors [6,11], which indicate that such people often have excessive combined involvement in the contractile activity of near and far agonists, which is manifested by regional muscular-tonic reactions and they have no adaptive value. In our opinion, the increased synergistic activity of agonists reciprocally creates an effect on antagonists, forming pathological coordination complexes. This position is confirmed in the work of a number of authors [9], who indicate a directly proportional dependence and direct influence of suprasegmental regulators of motor acts on the level of pain in local muscle seals in the post-stroke period.

It has been established that myofascial pain syndrome in post-stroke patients occurs during the acute stage of the disease, when spasticity and violation of motor stereotypes increase sharply [8]. The most common localization of trigger points in the shoulder girdle muscles was observed in the rotator cuff muscles, the biceps brachii and the upper trapezius muscle. In this case, the trigger points are located both in the muscle and in the muscle tendons.

Our specific nature of the proportionality of the distribution of the action potential of the motor unit (50.0% - in the area of medium duration and 25.0% in the area of shortened and long-term potentials) indicates "volley" electromyographic activity on transverse palpation of muscles, which corresponds to local spastic response [10].

In this case, latent MTP were registered in the corresponding muscle of the contralateral side. It can be assumed that the latent MTP is at the stage when an adverse factor at any time can modulate its active state. In general, the division into active or latent state is justified only from the point of view of the clinician-practitioner, as such division is conditional because activity and latency are two sides of the same process and only require timely intervention and adequate neurological correction. Lack of spontaneous MF activity, registration of EP activity, PMU parameters such as amplitude decrease, shift of histogram of potential distribution in duration towards smaller values or high percentage of polyphasicity, due to increase in number of turns, as well as change of their adhesive part, increase in MF density MTP- they all determine changes in structural and functional parameters by muscle type.

In this case, latent MTP were registered in the corresponding muscle of the contralateral side. It can be assumed that the latent MTP is at the stage when an adverse factor at any time can modulate its active state. In general, the division into active or latent state is justified only from the point of view of the clinician-practitioner, as such division is conditional because activity and latency are two sides of the same process and only require timely intervention and adequate neurological correction. Lack of spontaneous MF activity, registration of EP activity, PMU parameters such as amplitude decrease, shift of histogram of potential distribution in duration towards smaller values or high percentage of polyphasicity, due to increase in number of turns, as well as change of their adhesive part, increase in MF density MTP- they all determine changes in structural and functional parameters by muscle type.

Conclutions. Neuromuscular dysfunction in the patient in the post-stroke period is associated with changes in the state of motor EP. Analysis of background activity, PMU parameters, and their adhesion in the MTP

ISSN 2521-1455 (Print)
ISSN 2523-4250 (Online)

area, as well as an increase in MF in this area indicate structural and functional disorganization of MU, the presence of changes in neuromuscular transmission and confirm the muscular nature of the pathological process in the formation of MTP, in which is based on neuromuscular dysfunction of end plate extrafusal muscle fibers.

Table 2

Comparative analysis of potentials motor units

Parameters	Active MTP	Latent MTP
Duration. PMU, %	93,9±17,3	93,8±18,2
Amplitude PMU, мкВ	559±247,3	563±211,7*
Phases PMU	3,9±1,1	3,9±1,3
Tourns PMU	4,1±1,3	3,8±1,4
Latency MC PMU, ms		
Duration MC PMU, ms	2,3±0,1	2,2±0,4
Terminal duration of MC PMU, ms	5,1±1,3	5,0±1,1
Amplitude MC PMU, мкВ	610 ±299,3	609±301,5
Phases MC PMU	2,1±0,3	2,2±0,4
Tourns MC PMU	2,5 ±0,7	2,1, ±0,5**
Capacity building time, ms	0,28±0,14	0,30±0,16

Note: when compared with active MTP: * - p <0,05; ** - p <0.01.

References:

1. Hekht BM. Teoreticheskaya i klinicheskaya elektromiografiya. L.: Nauka,1990. P.230.
2. Ivanichev GA. Hvoroblyvi myazovi ushchilnennya. Kazan: vyd-vo Kazan. Un-tu 1990. P.156.
3. Buskila D. Fibromyalgia, chronic fatigue syndrome, and myofascial pain syndrome. Current Opinion in Orthopedics. 2010; 11(1):49-55. Available from: https://doi.org/10.1097/00001433-200002000-00009
4. Colbert M, Borg-Stein J. Fibromyalgia, Myofascial Pain Syndrome, and Related Conditions. Pathology and Intervention in Musculoskeletal Rehabilitation, 2016. P.1164-1174. Available from: https://doi.org/10.1016/b978-0-323-31072-7.00033-6
5. Dommerholt J, Bron C. Myofascial Pain Syndrome: Trigger Points. Journal of Musculoskeletal Pain. 2013; 21(2):183-195. Available from: https://doi.org/10.3109/10582452.2013.796337
6. Partanen JV, Tuula A, Ojala, TA, Arokoski JPA. Myofascial syndrome and pain: A neurophysiological approach. Pathophysiology. 2010; 17(1):19-28. Available from: https://doi.org/10.1016/j. pathophys. 2009.05.001
8. Daniels JM, Ishmael T. Managing Myofascial Pain Syndrome. The Physician and Sports medicine. 2010; 38(4):39-45. Available from: https://doi.org/10. 3810/psm.2003.10.522
9. Gerwin R. Myofascial Pain Syndrome: Here We Are, Where Must We Go? Journal of Musculoskeletal Pain. 2010; 18(4):329-347. Available from: https://doi.org/10.3109/10582452.2010.502636
10. Miller AE. The best clinical paper on Myofascial Pain Syndrome in 2012. Multiple Sclerosis Journal. 2013; 19(5):520-521. Available from: https://doi.org/10. 1177/1352458513482386
11. Hsieh YL, Chou LW, Joe YS, Hong CZ. Spinal cord mechanism involving the remote effects of dry needling on the irritability of myofascial trigger spots in rabbit skeletal muscle. Archives of Physical Medicine and Rehabilitation. 2011;192:1098-1105. doi: 10.1016/j.apmr.2010.11.018.

УДК 616.8-00:616.831-005.1

КЛИНИКО-НЕЙРО-ФИЗИОЛОГИЧЕСКАЯ ХАРАКТЕРИСТИКА МИОФАСЦИАЛЬНОГО СИНДРОМА В ПАЦИЕНТА С ЛЕВОСТОРОННЕЙ ГЕМИПЛЕГИЕЙ ПОСЛЕ ВНУТРИМОЗГОВОГО ГЕМОРРАГИЧЕСКОГО ИНСУЛЬТА (СЛУЧАЙ ИЗ ПРАКТИКИ)

С.Л. Попель[1], Т.П. Васылык[2], И.М. Бойко[3], С.Л. Анохина[3], М.В. Коваль[4]

[1]Прикарпатський национальный университет имени Василия Стефаника, кафедра физической терапии и эрготерапии,
[2]Комунальне некоммерческое предприятие «Городская клиническая больница №1 Ивано-Франковского городского совета», отделение сосудистой неврологии,
[3]Комунальне некоммерческое предприятие «Городская клиническая больница №1 Ивано-Франковского городского совета», отделение сосудистой неврологии,
[4]Ивано-Франковский национальный медицинский университет, кафедра неврологии и нейрохирургии,
г. Ивано-Франковск, Украина,
ORCID ID: 0000-0001-9019-3966,
e-mail: popelsergij@gmail.com;
ORCID ID: 0000-0001-5223-1239,
e-mail: tarasvasylyk1967@gmail.com;
ORCID ID: 0000-0002-3407-1427,
e-mail: irina96desire@gmail.com;
ORCID ID: 0000-0002-5970-4040,
e-mail: svetlana.anochina@gmail.com,
ORCID ID: 0000-0002-4617-0828,
e-mail: mkoval2904@gmail.com

Резюме. Миофасциальный болевой синдром (МФБС) является одним из наиболее распространенных коморбидных патологических процессов, развивается в скелетных мышцах у пациентов с инсультом, проявляется локальными уплотнениями и болями в различных участках мышцы. Несмотря на то, что

ISSN 2521-1455 (Print)
ISSN 2523-4250 (Online)

интерес к МФБС возник еще в прошлом веке, интимные механизмы его развития и течения остаются до конца еще не изученными. Работа посвящена клинико-нейро-физиологической характеристике пациента с МФБС на фоне внутримозгового кровоизлияния и левосторонней гемиплегии на основе анализа нейрофункциональной организации двигательных единиц мышц спины. Обоснован генезис и возможный механизм развития и формирования миофасциального триггерного пункта у таких пациентов. Основными проявлениями МФБС были наличие мышечных триггерных пунктов (МТП) в области пальпаторного уплотнения соответствующей мышцы с локальными болями и участком гиперчувствительности в пределах пальпаторно обнаруженного тяжа, характерный паттерн отраженной боли и отраженный вегетативный феномен, локальный судорожный ответ при поперечной пальпации. Наряду с этим развивается мышечная усталость и значительная мышечная слабость без выраженной атрофии. Обращает внимание четкая повторяемость-воспроизводимость боли, то есть так называемая «узнаваемая» боль. Наибольший дискомфорт для больного представляет наличие активных МТП с характерной спонтанно воспроизводимой болью. Латентные МТП выявляются в 90% случаев среди здоровых людей, а неблагоприятные факторы только способствуют их переходу в активное состояние с характерным симптомокомплексом.

Выводы. Нервно-мышечная дисфункция у пациента в постинсультном периоде связана с изменениями в состоянии моторных концевых пластинок.

Ключевые слова: миофасциальный болевой синдром, миофасциальная триггерная точка, двигательная единица, электромиография, мышечное волокно, замыкательная пластинка.

УДК 616.8-00:616.831-005.1

КЛІНІКО-НЕЙРО-ФІЗІОЛОГІЧНА ХАРАКТЕРИСТИКА МІОФАСЦІАЛЬНОГО СИНДРОМУ У ПАЦІЄНТА З ЛІВОБІЧНОЮ ГЕМІПЛЕГІЄЮ ПІСЛЯ ВНУТРІШНЬОМОЗКОВОГО ГЕМОРАГІЧНОГО ІНСУЛЬТУ (ВИПАДОК ІЗ ПРАКТИКИ)

С.Л. Попель[1], Т.П. Василик[2], І.М. Бойко[3], С.Л. Анохіна[3], М.В. Коваль[4]

[1]Прикарпатський національний університет імені Василя Стефаника, кафедра фізичної терапії та ерготерапії,
[2]Комунальне некомерційне підприємство «Міська клінічна лікарня №1 Івано-Франківської міської ради», відділення судинної неврології,
[3]Комунальне некомерційне підприємство «Міська клінічна лікарня №1 Івано-Франківської міської ради», відділення судинної неврології,
[4]Івано-Франківський національний медичний університет, кафедра неврології та нейрохірургії,
м. Івано-Франківськ, Україна,
ORCID ID: 0000-0001-9019-3966,
e-mail: popelsergij@gmail.com;
ORCID ID: 0000-0001-5223-1239,
e-mail: tarasvasylyk1967@gmail.com;
ORCID ID: 0000-0002-3407-1427,
e-mail: irina96desire@gmail.com;
ORCID ID: 0000-0002-5970-4040,
e-mail: svetlana.anochina@gmail.com,
ORCID ID: 0000-0002-4617-0828,
e-mail: mkoval2904@gmail.com

Резюме. Міофасціальний больовий синдром (МФБС) є одним із найбільш розповсюджених коморбідних патологічних процесів, що розвивається у скелетних м'язах у пацієнтів з інсультом, який проявляється локальними ущільненнями і болями в різних ділянках м'язу. Незважаючи на те, що інтерес до МФБС виник ще в минулому столітті, інтимні механізми його розвитку і перебігу залишаються до кінця ще не вивченими. Робота присвячена клініко-нейро-фізіологічній характеристиці пацієнта з МФБС на фоні внутрішньомозкового крововиливу і лівобічної геміплегії на основі аналізу нейрофункціональної організації рухових одиниць м'язів спини. Обгрунтований генез і можливий механізм розвитку і формування міофасціального тригерного пункту у таких пацієнтів. Основними проявами МФБС були наявність м'язових тригерних пунктів (МТП) в ділянці пальпаторного ущільнення відповідного м'язу з локальними болями і ділянкою гіперчутливості в межах пальпаторно виявленого тяжа, характерний патерн відображеного болю і відображений вегетативний феномен, локальна судомна відповідь під час поперечної пальпації. Поряд із цим розвивається м'язова втома і значна м'язова слабкість без вираженої атрофії. Звертає увагу чітка повторюваність-відтворюваність болю, тобто так званий «впізнаваний» біль. Найбільший дискомфорт для хворого представляє наявність активних МТП з характерним спонтанно відтворюваним болем. Латентні МТП виявляються до 90% випадків серед здорових людей, а несприятливі фактори тільки сприяють їх переходу в активний стан з характерним симптомокомплексом.

Висновки. Нервово-м'язова дисфункція у пацієнта у постінсультному періоді пов'язана із змінами в стані моторних кінцевих пластинок, про що свідчить аналіз параметрів потенціалів рухової одиниці.

Ключові слова: міофасціальний больовий синдром, міофасціальна тригерна точка, рухова одиниця, електроміографія, м'язове волокно, кінцева пластинка.

Стаття надійшла в редакцію 10.07.2021 р.