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PATHOPHYSIOLOGICAL MECHANISMS OF CARDIALGIA AND PHARMACEUTICAL CARE IN THE HEART PAIN

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Key words: cardialgia; pharmaceutical care; coronary and noncoronary causes

In the modern concept of responsible self-medication the role of a pharmacist in taking care about a patient becomes the greatest relevance in the presence of symptoms and syndromes, especially in diseases widely spread in the world. Cardiovascular pathology currently prevails in the structure of general morbidity and mortality. Therefore, knowledge of the symptoms related to heart disease, such as cardialgia, the study of distinctive features in coronary and noncoronary causes undoubtedly determine the success of the pharmaceutical care of patients. Coronarogenic causes are a small part of all cardialgias (for example, according to MIRNET data they are only 16%). Consequently, pain in the heart is not always caused by coronary heart disease (angina or myocardial infarction). Noncoronary cardialgias can be conditioned both by diseases of other organs and some inorganic causes. The most common causes of noncoronary pains in the heart are manifestation of gastroesophagus reflux disease, intercostal neuralgia on the background of osteochondrites of the spine, cardioneurosis (neurocirculatory dystonia). The main differential diagnostic criteria of different variants of cardialgias that a pharmacist will be able to use when rendering a qualified pharmaceutical care have been described in the article; the signs of urgent conditions in cardialgia have been indicated. With this purpose the clinical picture of stable angina pectoris, myocardial infarction and other most important in the professional activities of a pharmacist diseases has been described; his actions have been identified at the stage of predoctor care. To optimize the practical work of a pharmacist the OTC drugs used in cardiology are given (from the order of the Ministry of Public Health of Ukraine No. 166 from 26.02.2013); the pathogenetic substantiation of drug therapy with OTC medicines for various causes of cardioalgia has been presented. As a practical guidelines the algorithm of the conversation of a pharmacist with a visitor of the pharmacy, who complains about the pain in the heart and / or chest pain, has been developed.

Cardialgia means a pain in the chest (or the heart) due to coronary (cardial) and other noncoronarogenic diseases. Differential diagnosis in case of cardialgia is difficult even for an experienced practicing physician having appropriate equipment and the help of the clinical diagnostic laboratory. Can a pharmacist without a physical examination and other additional methods in the pharmacy suggest the etiology of the pain during a short period of time and give the rational recommendation to the patient? Pharmaceutical care suggests symptomatic treatment of a patient [18], but in cardialgia a lot of different diseases can hide in one symptom. In other words, if a patient complains of the recurrent pain in the heart or the chest pain, then chances are small for the problem with the heart.

According to the data of Michigan Research Network (MIRNET) [15] coronarogenic causes of cardialgia are only 16%, and the remaining 84% of cases may be due to diseases of other organs (chest, mediastinum, and abdomen) or nonorganic factors (Table 1). According to the epidemiological study conducted among ethnic Chinese in Hong Kong during the year cardialgia was in 20.6% of the respondents, 13.9% had a noncardiac cause of the pain, in 6.7% the pain was cardiac [19]. Among patients with noncardiac causes 39% had drug therapy (5% took OTC drugs without a doctor's advice, 28% were outpatients, 3% were in the emergency department, 4% received the planned therapy in the hospital). In Australia noncoronarogenic causes of the chest pain are observed in more than 33% of the population [13]. According to the epidemiological study in Olmsted, Minnesota, 23% of the total U.S. population suffer from the chest pain of noncardiac genesis [16]. Every year the United States 8 million US dollars are spent for rendering the first aid to patients who assumed to have the acute coronary syndrome, but subsequently the signs of coronary heart disease (CHD) are not revealed [12]. An important criterion is the patient's age: people under the age of 35 have cardialgia due to coronary heart disease in 7% of the cases, and in patients older than 40 years old it is in 50% of the cases. Therefore, to construct an algorithm of the conversation of a pharmacist with a visitor having pain in the heart it is necessary to consider in detail all of the diseases associated with cardialgia and special complaints characterizing each of them.

There is no common classification of cardialgia nowadays. Most authors divide cardialgia into coronary (due to CHD) and noncoronary (all others) [9, 11, 12]. Other scientists classify diseases manifested by cardialgia (by topic) such as diseases of the heart and other mediastinal organs, diseases of the chest, abdomen, neurogenic diseases, diseases of the spine [7].

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There is also division into functional and organic disorders (by the presence of organic damage) [12, 14]. The London National Clinical Guideline Centre for Acute and Chronic Condition divides cardialgia into acute and chronic (this is crucial in the choice of the treatment algorithm) [10].

Recognition of coronary cardialgia symptoms is the most relevant in the practice of modern doctors and pharmacists because cardiovascular mortality takes the first place not only in Ukraine, but all over the world. For example, in Europe it is 47% [17]. According to the data of the Institute of Cardiology named after academic M.D.Strazhesko, mortality from cardiovascular diseases in Ukraine is 66.8% [3]. In Australia in 2009 about 80,000 patients were admitted to hospital with the acute coronary syndrome, 59% of them were diagnosed with the acute myocardial infarction, approximately 10,000 cases were fatal, the cost of treatment of heart attacks accounted for 15,5 million US dollars [13]. In the structure of cardiovascular mortality CHD takes the first place [17]. Pathophysiological changes in this disease are characterized by discrepancy of the oxygen supply to demand of the myocardium often caused by atherosclerosis of the coronary arteries. According to the modern working classification of the WHO with UCRC additions of 1984 CHD includes both acute and chronic conditions. A sudden coronary death, unstable angina and myocardial infarction are referred to acute conditions. Chronic conditions are stable angina pectoris, myocardial infarction and chronic heart failure. The former requires urgent medical aid, the latter needs the planned treatment by a cardiologist (physician, family doctor).

Classic angina is characterized by a pressing, constricting, burning pain in the chest and/or in the heart irradiating to the left arm, under the left shoulder and the left half of the neck. The most diagnostically significant is the "size" of the chest pain: it spreads occupying a large area. The second main symptom of angina is conditions of appearance and disappearance of the pain. The chest pains appear and increase with exercise, emotional stress, overeating, when going out abruptly from the warm room into the cold. If a patient indicates another reason for his pain and does not connect it with the above reasons, it is necessary to think about the noncoronary cardialgia. Anginal pains decrease and/or disappear at rest and when taking anti-anginal drugs (nitroglycerin), and have a short duration (from some seconds to 5-15 minutes).

Table 1

The causes of nonemergency cardialgia in MIRNET Michigan First Aid Centre [13]

Causes	Prevalence, %
Musculoskeletal Vertebrogenous	20.4 13.1
Gastrointestinal (including reflux esophagitis)	19 (13.4)
Cardiac – stable angina – unstable angina or myocardial infarction – other cardiac diseases	16* 10.3 1.5 4.2
Psychiatric	8
Broncho-pulmonary diseases	5
Other / unknown causes	18.5

Note: * as high as 50% in the older population.

Myocardial infarction is characterized by necrosis of myocardiocytes, and it is manifested in more pronounced cardialgic syndrome, symptoms of intoxication (fever), arrhythmias, drop in blood pressure and development of acute heart failure. The chest pain in myocardial infarction is similar to anginal pain, and it has a burning, pressing, squeezing character, but it is in many times stronger, a patient can not bear such pain; he tries to limit his physical (motor) activity. Taken within half an hour three nitroglycerin tablets (every 5-10 minutes) do not bring relief. The skin of the patient becomes pale, cold sweat and cyanosis of the lips appear. The inspiratory dyspnea (difficulty in breathing) is expressed.

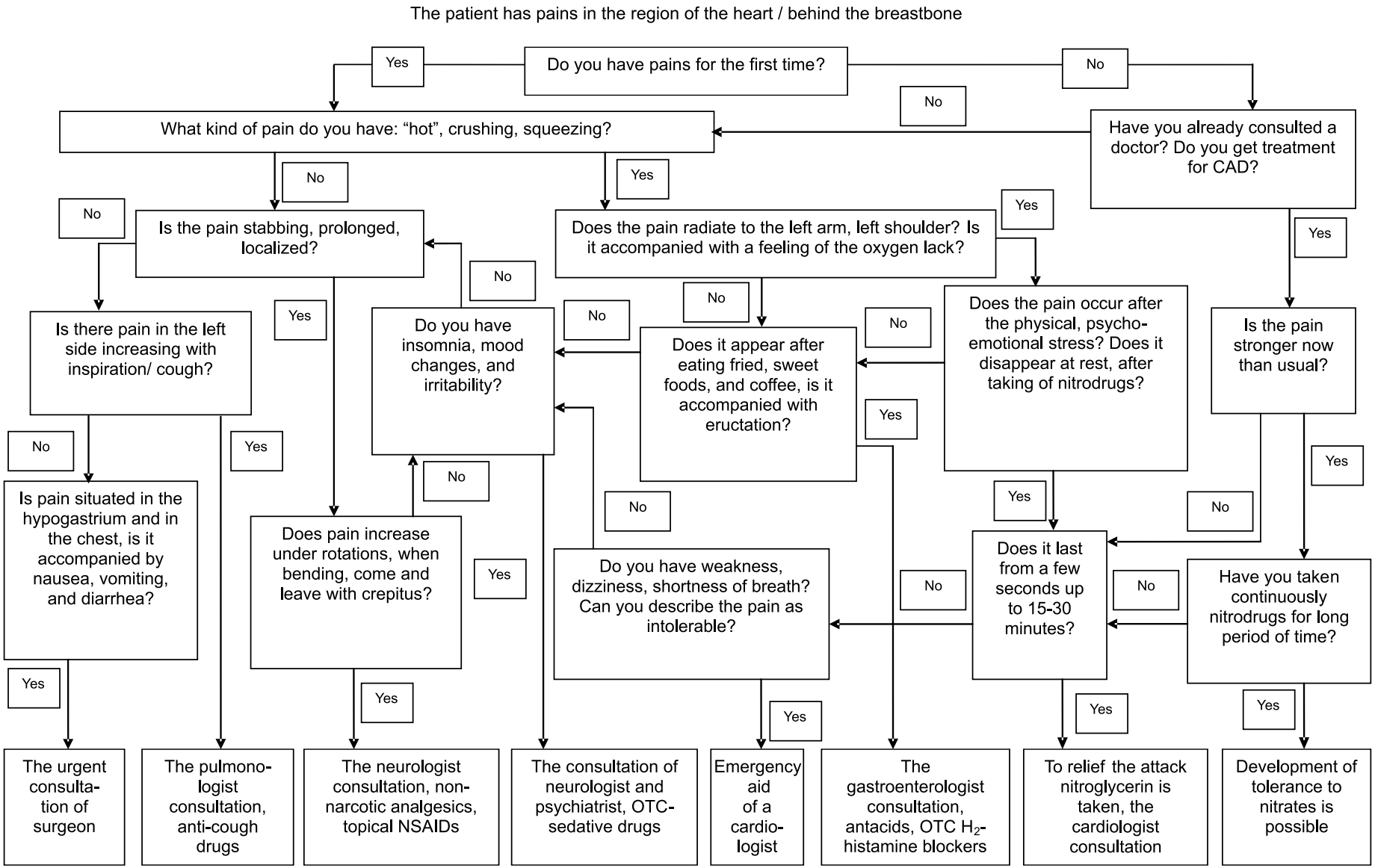
Development of tolerance to the nitro group is possible in case when a patient takes organic nitrates for a long period of time, has no pause in their administration and increases the dose by himself [5]. The effect of nitrates reduces slowly; there are no signs of myocardial infarction.

As the major anti-anginal medicines are prescription drugs, a pharmacist can recommend OTC sedative and anti-anginal drugs (Nitroglycerin) to the patient with a stable angina I-III FC (angina occurs only after a small, normal or severe physical activity), and then a consultation of a doctor. In Table 2 the list of OTC drugs that can be used in the treatment of CAD is given [4]. However, Nitroglycerin can not be used after taking certain medicines, such as Sildenafil [8]. In case of development of tolerance to Nitroglycerin the pharmacist should explain this side effect of nitrates and recommend contacting the physician to change the anti-anginal medicine. If there is any suspicion of myocardial infarction the pharmacist must call the emergency care team because the success of the therapy and prognosis depend on the time past from the coronary occlusion. The most common error of pharmacists is the recommendation of antispasmodics in coronary cardial-

Table 2

The list of basic OTC drugs used for the treatment of coronary artery disease and/or those positioned by producers as cardiac drugs (from the order of Ministry of Public Health of Ukraine No. 166 from 26.02.2013 [4])

Trade name	Description
1) Antianginal drugs	
– Nitroglycerin	Vasodilator (NO group)
– Cardiophytum	Herbal drug with the anti-ischemic, anti-arrhythmic, cardiotonic properties
– Corvalment	Contains menthol (coronary dilator)
– Kormentol	Contains menthol
– Validol	Contains menthol
– Pumpan	Homeopathic medicine with the anti-anginal and lipid-lowering effect
– Neocardil	Herbal medicine with the anti-anginal, antiplatelet, anti-oxidant effect
2) Cardioprotective drugs (correctors metabolism)	
– Cardioarginin-Zdorovie	Contains arginine, diarginin, magnesium, potassium, is the donor of NO, has the cardioprotective, anti-oxidant and anti-hypoxic properties
– Cardiolin	Herbal medicine with the sedative, cardioprotective effect, increases tolerance to exercise load
– ATP-long	Has the membrane-stabilizing, anti-arrhythmic, anti-ischemic effect
– Aurocard	Homeopathic medicine for treating heart failure (cardiotonic)
– Cardiplant	Cardiotonic plant (extract of hawthorn)
– Kordalon-ARN	Homeopathic medicine for treating cardioneurosis, angina pectoris, myocardial infarction, neuro-circulatory dystonia
– Cratal	Herbal medicine with the anti-anginal, cardiotonic, antioxidant, anti-arrhythmic, antiplatelet, antihypoxia action
– Drugs with Ginkgo Biloba (for example, Bilobil)	Have the antioxidant, vasodilatory, anti-ischemic, anti-edemic, antiplatelet, diuretic and neuroprotective effect, and also affect the mitochondrial respiration and regulate the vascular tone
3) Antiplatelet drugs containing acetylsalicylic acid (ASA)	
– Aspirin Cardio	Contains ASA
– Cardiomagnyl	ASA and Mg
– Trombolik-cardio	ASA
– Acecardin	ASA
– Acecor cardio	ASA
– Asafen	ASA
– Aspenorm	ASA
– Aspecard	ASA
– Thrombo ASS	ASA
4) Sedatives	
– Sedafiton	Herbal medicine with the cardiotonic and sedative action
– Sedatif PC	Homeopathic medicine with the sedative effect
– Leonuri tincture	Has the sedative and hypnotic effect
– Valocordin	Contains valerian, phenobarbital, peppermint oil, it has the sedative, hypnotic, vasodilation effect
–Corvalolum (Corvaltab)	Contains peppermint oil, phenobarbital, ethyl bromoisovalerate
– Barboval	Contains menthol, phenobarbital, ethyl bromoisovalerate
– Valocormidum	Contains belladonna, valerian, lily of the valley, menthol, sodium bromide. Has the sedative, antispasmodic and cardiotonic effect
– Florised	Contains motherwort, hops, mint, valerian and licorice
– Persen cardio	Contains passionflower and hawthorn
– Adonis-brom	Contains glycosides and potassium bromide; has diastolic, diuretic and sedative effects
5) Multivitamin and mineral medicines positioned in cardiology	
– Triovit cardio	Vitamins B_6, B_9, B_{12}
– Cardonat	Vitamins B_6, B_9, B_{12}, carnitine, lysine
– Magne B_6	Vitamins B_6 and Mg
– Asparkam	Contains potassium and magnesium
– Panangin	Contains potassium and magnesium
6) Lipid-lowering agents	
– Nicotinic acid	Has a lipid-lowering effect, improves tissue respiration
– Cardioace	Contains omega-3 polyunsaturated fatty acids, garlic oil, lecithine, vitamins B, C, E, zinc, selenium, chromium, carotenoids



Scheme. The algorithm of the interview with a patient having cardialgia

gia. If the cause of chest pains is CHD, it is necessary to improve the flow of blood and oxygen to ischemic areas of the myocardium, but antispasmodics lead to the "steal symptom", i.e. improve the blood circulation in nonischemic myocardial areas and reduce the blood flow in the ischemic area [5]. Analgesics and NSAIDS also do not give the therapeutic effect.

Noncoronarogenic cardialgias are most often caused by intercostal neuralgia on the background of osteochondrites of the thoracic spine, gastroesophagus reflux disease (GERD) and cardioneurosis (in persons under 32 years old it is called as neurocirculatory dystonia in the diagnosis).

In osteochondritis the pain is localized at one point (often in the apex of the heart), it is associated with the rotation of the body: «the pain comes and leaves with crepitus», anti-anginal drugs do not relieve pain, and duration of this pain is from several hours to days. To alleviate the condition before visiting a doctor administration of nonnarcotic analgesics, the use of irritant ointments and topical NSAIDs can be recommended to such patient.

Often patients take the heartburn symptoms for angina. The burning nature of pain and discomfort in the chest are similar in GERD and CHD, but the terms of appearance of pains are different. A patient with heartburn notes the appearance of symptoms after eating some food products (starchy foods, coffee, sweets, etc.), and there is no connection with the physical activity. GERD causes 51% of retrosternal pains of noncardiac genesis [19]. In the case of heartburn a pharmacist may recommend antacids and H_2-histamine blockers [1]. If the symptoms are repeated, the obligatory consultation of a doctor is required.

In cardiac neurosis pains in the heart are sometimes caused by unexplained reasons and are accompanied by different disparate complaints that are not associated with the pathology of the cardiovascular system. There is atypical manifestation of the pain: the patient says about the feeling of discomfort, bloating, difficulty of breathing. Besides, there are pronounced neurotic symptoms: complaints of sleep disorders, phobias, nervous tics. Such a patient should consult a neurologist (a psychiatrist), in the pharmacy conditions the episodic use of OTC sedatives can be recommended [2].

Chest pains can occur in diseases of the bronchopulmonary system. For example, dry pleurisy is characterized by pain in one half of the chest (in one side), which is intesified when taking a breath, coughing, increased body temperature. Since pleurisy is a complication of pneumonia or pulmonary tuberculosis, so it is necessary to have the lungs X-rayed and use antibacterial drugs. This is possible only in the hospital environment. In addition, pleurisy is dangerous by occurence of spontaneous pneumothorax ("break of the pleura").

Chest pains may be manifestation of the atypical pain syndrome in "acute abdomen" (acute cholecystitis, acute pancreatitis, perforation of gastric ulcer). In this case, the pain is accompanied by the dyspeptic syndrome (nausea, vomiting, and sometimes diarrhea). Pains will be strong like in myocardial infarction. A pharmacist should call the ambulance in this situation.

Thus, we succeeded in covering the list of the most common diseases, in which cardialgia is one of the symptoms. The issues of pharmaceutical care in the chest pain are avoided in modern literature. But understanding of the causes and pathophysiological mechanisms of cardialgia, correct tactics of a pharmacist will help to improve the quality of care for patients with the chest pain; it will contribute to the early diagnosis of diseases, improve the prognosis and increase the life duration. In conclusion, we present the algorithm of conversation of a pharmacist with a visitor of the pharmacy (Scheme).

REFERENCES

1. *Зупанец И.А. // Фармацевт-практик. – 2008. – №3. – [Електронний ресурс]. – Режим доступу: www.med-practic.com.*
2. *Зупанец И.А., Черных В.П., Сахарова Т.С. и др. Клиническая фармация (фармацевтическая опека): Учеб. для студ. высш. мед. (фармац.) учеб. завед. – Х.: НФаУ; Золотые страницы, 2011. – 704 с.*
3. *Кваша О.О., Малацківська О.В. // Новости медицины и фармации. Артериальная гипертензия. – 2007. – №216. – [Електронний ресурс]. – Режим доступу: www.mif-ua.com/archive/article/1263.*
4. *Наказ МОЗ України від 26.02.2013 р. №166 «Про затвердження лікарських засобів, дозволених до застосування в Україні, які відпускаються без рецептів з аптек та їх структурних підрозділів» // Аптека on-line. – [Електронний ресурс]. – Режим доступу: www.apteka.ua/article/224869*
5. *Налетов С.В., Зупанец И.А., Бахтеева Т.Д. и др. Клиническая фармакология: Учеб. для студ. вузов: в 2-х т. / Под ред. И.А.Зупанца, С.В.Налетова, А.П.Викторова. – Х.: Изд-во НФаУ; Золотые страницы. – 2005. – Т. 1. – 347 с., Т. 2. – 311 с.*
6. *Неврология для врачей общей практики / Под ред. А.М.Вейна. – М.: Эйдое Медиа, 2002. – 307 с.*
7. *Хэгглин Р. Дифференциальная диагностика внутренних болезней / Пер. с нем. под ред. Е.М.Тареева. – М., 1997. – 794 с.*

8. *Anderson J.L., Adams C.D., Antman E.M. et al. // Circulation. – 2007. – Vol. 116. – P. 803-877.*
9. *Cheng C., Wong W.-M., Lai K.-C. et al. // Psychosom. Med. – 2003. – Vol. 65. – P. 443-449.*
10. *Cooper A., Calvert N., Skinner J. et al. Chest pain of recent onset: Assessment and diagnosis of recent onset chest pain or discomfort of suspected cardiac origin. Full Guideline // London: National Clinical Guideline Centre for Acute and Chronic Condition. – 2010. – 393 p.*
11. *Dammen T., Arnesen H., Ekebergo O., Friis S. // Gen. Hosp. Psychiatry. – 2004. – Vol. 26. – P. 463-469.*
12. *Eslick G.D., Jones M.P., Talley N.J. // Aliment Pharmacol. Ther. – 2003. – Vol. 17. – P. 1115-1124.*
13. *Hobbs M. The economic costs of heart attack and chest pain (Acute Coronary Syndrome) // Access economics. – June 2009. – 86 p. – [Електронний ресурс]. – Режим доступу: www.accesseconomics.com.au/publicationsreports.php*
14. *Jerlock M. Patient with unexplained chest pain – Pain experience, stress, coping and health-related quality of life. Thesis work. – Institute of Health and Care Sciences. Goteborg University, 2007. – 64 p.*
15. *Klinkman M.S., Stevens D., Gorenflo D.W. // J. Fam. Pract. – 1994. – Vol. 38 (4). – P. 345-352.*
16. *Locke G.R., Talley N.S., Fett S.L. et al. // Gastroenterol. – 1997. – Vol. 112. – P. 1448-1456.*
17. *Nichols M., Townsend N., Scarborough P. and Rayner M. British Heart Foundation Health Promotion Research Group. Leal J., Luengo-Fernandez R., Gray A. Health Economics Research Centre. Editors: Logstrup S., O'Kelly S. European Cardiovascular Disease statistics. 2012 edition // Published by the European Heart Network AISBL and European Society of Cardiology. – 2012. – 125 p.*
18. *Wiedenmayer K., Summers R.S., Mackie C.A. et al. Developing Pharmacy Practice – A focus on patient care // The Netherlands: World Health Organization and International pharmaceutical federation. – 2006. – 87 p.*
19. *Wong W.M., Hui W.M., Xia H.H.-X. et al. // World J. of Gastroenterol. – 2004. – Vol. 10 (5). – P. 707-712.*

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ПАТОФІЗІОЛОГІЧНІ МЕХАНІЗМИ РОЗВИТКУ КАРДІАЛГІЙ ТА ФАРМАЦЕВТИЧНА ОПІКА ПРИ БОЛЯХ У ОБЛАСТІ СЕРЦЯ

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Ключові слова: кардіалгія; фармацевтична опіка; коронарогенні та некоронарогенні причини

В умовах сучасної концепції відповідального самолікування найбільшу актуальність набуває роль провізора в опіці пацієнта за наявності різних симптомів і синдромів, особливо при широко розповсюджених у всьому світі захворюваннях. Серцево-судинна патологія на сьогоднішній день має переважаюче значення в структурі загальної захворюваності. Тому знання симптомів, що пов'язані з хворобами серця, таких як кардіалгія, вивчення відмінних особливостей при коронарогенних і некоронарогенних причинах безсумнівно визначає успішність проведення фармацевтичної опіки пацієнтів. Коронарогенні причини складають незначну частину від усіх кардіалгій (наприклад, за даними MIRNET всього 16%). Отже, болі в області серця не завжди викликані ішемічною хворобою серця (стенокардією або інфарктом міокарда). Некоронарогенні кардіалгії можуть бути обумовлені як захворюваннями інших органів, так і неорганічними причинами. Найбільш часто некоронарогенні болі в області серця – це прояв гастроезофагорефлюксної хвороби, міжреберної невралгії на тлі остеохондрозу грудного відділу хребта, кардіоневрозу (нейроциркуляторної дистонії). У статті розглянуті основні диференційно-діагностичні критерії різних варіантів кардіалгій, якими зможе скористатися провізор-первостольник для проведення кваліфікованої фармацевтичної опіки, вказані ознаки ургентних станів при кардіалгії. З цією метою була описана клінічна картина стабільної стенокардії, інфаркту міокарда та інших найбільш значимих у професійній діяльності провізора захворювань, зазначені його дії в рамках долікарської допомоги. Для оптимізації практичної роботи провізора в огляді представлені безрецептурні препарати кардіологічного профілю (з наказу МОЗ України №166 від 26.02.2013 р.), наведене патогенетичне обгрунтування медикаментозної терапії OTC-препаратами при різних причинах кардіалгій. В якості практичних рекомендацій був розроблений алгоритм проведення бесіди провізора з відвідувачем аптеки, якого турбують болі в області серця і/або за грудиною (а також у грудній клітині).

ПАТОФИЗИОЛОГИЧЕСКИЕ МЕХАНИЗМЫ РАЗВИТИЯ КАРДИАЛГИЙ И ФАРМАЦЕВТИЧЕСКАЯ ОПЕКА ПРИ БОЛЯХ В ОБЛАСТИ СЕРДЦА

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Ключевые слова: кардиалгия; фармацевтическая опека; коронарогенные и некоронарогенные причины

В условиях современной концепции ответственного самолечения наибольшую актуальность приобретает роль провизора в опеке пациента при наличии различных симптомов и синдромов, в особенности при широко распро-

страненных в мире заболеваниях. Сердечно-сосудистая патология на сегодняшний день имеет превалирующее значение в структуре общей заболеваемости и смертности. Поэтому знание симптомов, связанных с болезнями сердца, таких как кардиалгия, изучение отличительных особенностей при коронарогенных и некоронарогенных причинах несомненно определяет успешность проведения фармацевтической опеки пациентов. Коронарогенные причины составляют незначительную часть от всех кардиалгий (например, по данным MIRNET всего 16%). Следовательно, боли в области сердца не всегда вызваны ишемической болезнью сердца (стенокардией или инфарктом миокарда). Некоронарогенные кардиалгии могут быть обусловлены как заболеваниями других органов, так и неорганическими причинами. Наиболее часто некоронарогенные боли в области сердца – это проявление гастроэзофагорефлюксной болезни, межреберной невралгии на фоне остеохондроза грудного отдела позвоночника, кардионевроза (нейроциркуляторной дистонии). В статье рассмотрены основные дифференциально-диагностические критерии различных вариантов кардиалгий, которыми сможет воспользоваться провизор-первостольник для проведения квалифицированной фармацевтической опеки, указаны признаки ургентных состояний при кардиалгии. С этой целью была описана клиническая картина стабильной стенокардии, инфаркта миокарда и других наиболее значимых в профессиональной деятельности провизора заболеваний, указаны его действия в рамках доврачебной помощи. Для оптимизации практической работы провизора в обзоре представлены безрецептурные препараты кардиологического профиля (из приказа МОЗ Украины №166 от 26.02.2013 г.), дано патогенетическое обоснование медикаментозной терапии ОТС-препаратами при различных причинах кардиалгий. В качестве практических рекомендаций был разработан алгоритм проведения беседы провизора с посетителем аптеки, которого беспокоят боли в области сердца и/или за грудиной (а также в грудной клетке).