

UDC 615.47

<https://doi.org/10.24959/sphhcj.21.219>

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THE STUDY OF THE PRODUCT RANGE OF MODERN ORAL CARE DEVICES – IRRIGATORS

Research over the past decade has found that the etiology of periodontal disease is a bacterial infection. Efficient ongoing removal of dental plaque is essential, but this may not be enough to completely eliminate the disease. An oral irrigator has been shown to be effective in reducing inflammatory responses associated with periodontal disease for daily use. It has been proven that the daily use of the oral cavity irrigator reduces plaque, concretion, gingivitis, bleeding, and the depth of periodontal probing.

Aim. To investigate the modern assortment of irrigators available at the domestic market, conduct the commodity analysis, study their purpose, design features of these devices and their components, as well as the principles of operation and consumer properties.

Materials and Methods. The informational, retrospective methods, as well as the materials based on research of scientific literature, Internet resources and own conclusions were used.

Results. As a result of the research the authors provided a short historical perspective on the features and necessity of creating devices – irrigators. The current assortment of irrigators, their diversity, purpose, elements of construction, configuration, principles of operation of the device, general technical characteristics have been analyzed. A detailed study of technical characteristics and the comparison of design features of different types of irrigators have been carried out. As a result of the research, it has been determined that this apparatus is represented only by foreign manufacturers at the Ukrainian market. Due to the annual modernization of dental equipment the commodity analysis of irrigators is a hot topic, which must be constantly studied. This will enable modern distributors and pharmacists to thoroughly possess information about irrigators and to bring it to consumers.

Conclusions. The knowledge of the assortment, types, principles of operation, peculiarities of construction and technical characteristics of irrigators are the basis for consumers to receive high-quality and affordable devices, which will guarantee timely and high-quality oral care.

Key words: commodity analysis; irrigator; assortment; classification; purpose; design features.

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ДОСЛІДЖЕННЯ ТОВАРНОГО АСОРТИМЕНТУ СУЧАСНИХ АПАРАТІВ ІЗ ДОГЛЯДУ ЗА РОТОВОЮ ПОРОЖНИНОЮ – ІРИГАТОРІВ

Останнім часом дослідженнями встановлено, що етіологія пародонтозу – це бактеріальна інфекція. Постійне ефективне видалення зубних відкладень має важливе значення, але цього може бути недостатньо, щоб повністю запобігти хворобі. Оральний іригатор продемонстрував свою ефективність у зменшенні запальних реакцій, пов'язаних із пародонтозом, за умови щоденного застосування. Щоденне зрошення ротової порожнини іригатором зменшує зубний наліт, конкремент, гінгівіт, кровотечу, глибину зондування пародонтальних карманів.

Мета: дослідження сучасного асортименту іригаторів, представлених на вітчизняному ринку товарів, товарознавчий аналіз їх призначення, вивчення конструктивних особливостей приладів та їх комплектувальних, а також принципів роботи та споживчих властивостей.

Матеріали та методи: інформаційний, ретроспективний, засновані на дослідженні наукової літератури, матеріалів інтернет-ресурсів і власних висновків.

Результати. За результатами досліджень авторами наведено короткі історичні аспекти щодо особливостей та необхідності створення іригаторів, проаналізовано їх сучасний асортимент, різновиди, призначення, елементи конструкції, комплектацію, принципи роботи, загальні технічні характеристики. Проведено детальне вивчення технічних характеристик та порівняння конструктивних особливостей різних видів іригаторів. Визначено, що цей апарат на ринку України представлений тільки зарубіжними виробниками. У зв'язку з удосконаленням з кожним роком обладнання у стоматології проведений товарознавчий аналіз іригаторів є актуальною тематикою, яку необхідно постійно вивчати. Це дасть можливість сучасним провізорам та фармацевтам досконало володіти інформацією щодо іригаторів та доносити її до споживачів.

Висновки. Знання асортименту, типів, принципів роботи, особливостей конструкції і технічних характеристик іригаторів є основою для отримання споживачами якісних та доступних приладів, що буде гарантією своєчасного та якісного догляду за ротовою порожниною.

Ключові слова: товарознавчий аналіз; іригатор; асортимент; класифікація; призначення; конструктивні особливості.

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ИССЛЕДОВАНИЕ ТОВАРНОГО АССОРТИМЕНТА СОВРЕМЕННЫХ АППАРАТОВ ПО УХОДУ ЗА РОТОВОЙ ПОЛОСТЬЮ – ИРРИГАТОРОВ

В последнее время исследованиями установлено, что этиология пародонтоза – это бактериальная инфекция. Постоянное эффективное удаление зубных отложений имеет важное значение, но этого может быть недостаточно, чтобы полностью предотвратить заболевание. Оральный ирригатор продемонстрировал свою эффективность для уменьшения воспалительных реакций, связанных с пародонтозом, при ежедневном применении. Ежедневное орошение ротовой полости ирригатором уменьшает зубной налет, конкремент, гингивит, кровотечение, глубину зондирования пародонтальных карманов.

Цель: исследование современного ассортимента ирригаторов, представленных на отечественном рынке товаров, товароведческий анализ их назначения, конструктивных особенностей приборов и их комплектующих, а также принципов работы и потребительских свойств.

Материалы и методы: информационный, ретроспективный, основанные на исследовании научной литературы, материалов интернет-ресурсов и собственных выводов.

Результаты. По результатам исследований авторами приведены краткие исторические аспекты относительно особенностей и необходимости создания ирригаторов, проанализирован их современный ассортимент, разновидности, назначение, элементы конструкции, комплектация, принцип работы прибора, общие технические характеристики. Проведено детальное изучение и сравнение конструктивных особенностей различных видов ирригаторов. Установлено, что на рынке Украины аппарат представлен только зарубежными производителями. В связи с совершенствованием с каждым годом оборудования в стоматологии проведенный товароведческий анализ ирригаторов является актуальной тематикой, которую необходимо постоянно изучать. Это позволит современным провизорам и фармацевтам в совершенстве владеть информацией об ирригаторах и доносить ее до потребителей.

Выводы. Знание ассортимента, принципов работы, типов, конструкций и технических характеристик ирригаторов является основой для получения потребителями качественных и доступных приборов, что и будет гарантией своевременного и качественного ухода за полостью рта.

Ключевые слова: товароведческий анализ; ирригатор; ассортимент; классификация; назначение; конструктивные особенности.

Statement of the problem. The knowledge of the assortment, purpose and principles of operation of irrigators is very important and relevant not only for pharmacists, but also for ordinary consumers. In the educational process, the Department of Commodity Science of the National University of Pharmacy (NUPh) teaches the topics of the discipline "Medical and Pharmaceutical Commodity Science", in particular "Commodity Analysis of Medical Devices and Apparatuses". The main task of the Department is to provide students with theoretical knowledge and practical skills when working with a range of medical devices, and it is certainly useful for the practical activities of future pharmacists. Studying the range of irrigators is one of the points of this topic. In recent years, the urgency of the problems of treatment and prevention of periodontal diseases, cleaning and prevention of plaque has grown significantly. Systematization of knowledge of the modern product range of irrigators will help the specialist to explain to the consumer all advantages or disadvantages of this type of product, to orient the consumer when choosing and purchasing these devices.

At the present stage of the economic development, including the medical industry, the issue of not only creating, but also bringing an innovative product to the consumer becomes relevant and timely. Recently, dentists are increasingly recommending their patients to purchase such device as an irrigator for oral hygiene. According to the dentists, the main problem of the 21-st century is periodontitis, which is caused by microorganisms that are found in large numbers in the oral cavity. The innovativeness of the irrigator is that the device is able to maintain the gum tissue and teeth in a constantly healthy condition due to the latest technology of irrigation of the oral cavity, teeth, gingival folds and hard-to-reach places with a pulsating stream of water with different supply pressures. Due to pulses of different strength, the creation of a directed thin flow of water and the use of the necessary nozzles of the irrigator there is a thorough rehabilitation of the oral cavity, even in patients with braces, implants and crowns.

Analysis of recent research and publications. Analyzing a number of the literature sources we found that the product range and

technical characteristics of irrigators were studied previously in the works of S. M. Kovalenko, T. R. Zemlyanoi, as well as C. Jahn, G. M. Kurtzman, Hughes – researchers at USA universities, who conducted clinical trials of irrigator nozzles and proved that the dental stream of water was a tool to reduce bleeding of gums and gingivitis [1-3]. However, there are almost no publications related to the analysis of the range of irrigators as one of the types of medical products. A detailed study and comparison of design features, range, features of the use of irrigators, as well as the commodity analysis have not been practically carried out.

Objective statement of the article. Taking into account the above-mentioned relevance the actual aim of this work is the study of the product range and the principle of operation of irrigators, as well as the stages of the commodity analysis; analysis of the modern range of irrigators, their varieties, purpose, design elements, equipment, principle of operation and calibration of devices, stages of the commodity analysis, general technical characteristics; a detailed study and comparison of design features of different types of irrigators.

Identification of aspects of the problem unsolved previously. Today, the pharmaceutical market offers consumers a wide range of irrigators of foreign production. This article is devoted to the analysis of the domestic market of irrigators, the study of their consumer properties, principles of work, the commodity analysis, and peculiarities of this type of goods.

Presentation of the main material of the research. The objects of these studies were the modern types of irrigators used to perform preventive and curative interventions in the prevention and treatment of periodontal infections.

Irrigators are a technical device designed to care for the oral cavity. They are used to clean the interdental space and gingival folds, massage gums and the oral cavity with a pulsating stream of water, improving the blood circulation [4-5].

The principle of operation of an irrigator is that a jet under pressure is fed into the oral cavity, washing away food debris and pathogens. When you turn the irrigator on, the compressor creates pressure in the tank, and under its effect the liquid enters the nozzle [6].

Purification occurs under the action of a pulsating water jet. The water pressure can be adjusted. Adjustable jet pressure allows a thoroughly cleaning of the interdental spaces where a toothbrush is ineffective, as well as makes it possible to massage the gums, thereby improving the blood supply in them. The entire surface of the teeth, gingival folds, gums, and the tongue are cleaned [7-9].

The clinical trials have shown that the key effect is the jet pulsation. Short strong pulses remove bacteria from under the gums and interdental spaces.

Purified water is supplied from the tank (in stationary models the volume of the tank is greater than in portable and flowing ones). The device of the irrigator allows using other liquids, which have a number of effects (antiseptic, refreshing, medical, etc.) [10].

Irrigators are classified by types of energy sources. They are stationary, portable, flow and mechanical [11].

Irrigators on water supply are classified into devices: with a single jet, a pulsating jet, pulsed water supply, microbubble technology.

Single jet. These devices form a thin continuous stream. This technology is considered obsolete as it does not clean the oral cavity efficiently.

Pulsating jet (turbo flow). The stream of water is thin and pulsating. The pulsation is very short; therefore, it is difficult to notice. Approximately 1200 micro-pulses occur per minute. Due to this feature, microhydraulic shocks are created, they are used to more effectively remove food debris and soft plaque.

Pulsed water supply. The liquid flows in waves, pulsating. These impulses are minimal and are not felt by the gums and teeth, but well remove tartar and plaque.

Microbubble technology. This technology is considered to be the most advanced. The water flow mixes with air bubbles; due to this microhydraulic shocks are created. They help to completely remove food debris between the teeth. Moreover, water is saturated with oxygen, which helps to destroy the pathogenic microflora. This is especially important for patients suffering from periodontitis [12].

Irrigators are also classified into family (stationary) and individual (portable, road, portable).

Table 1

CLASSIFICATION OF IRRIGATORS BY TYPES OF ENERGY SOURCES





Classification of irrigators	Description and the type of source	Type of irrigator
Stationary	They are rather large devices with a three-dimensional tank that allows using them for the whole family. Power supply from the electricity mains	
Portable	It is a compact type irrigator; battery powered. Due to the lower power, it is possible to use only by one person. This is an individual type of an irrigator	
Flow	They are installed on a water tap, work by using the pressure of the water supply system. They do not require electricity. The tap valves adjust the liquid pressure	
Mechanical	These are portable devices, in which the pressure required to form a jet is achieved by mechanical action on the piston. There is a button or key on the body of the device, which must be squeezed with the hand to create the necessary pressure	



Fig. 1. The structure of an AQUAJET LD-A8 stationary irrigator (firm Little Doctor (Singapore): 1 – the tank cover for water; 2 – the container for water; 3 – the device case; 4 – the regulator of the stream pressure; 5 – a nozzle; 6 – the department for storage of nozzles 7 – on / off button, 8 – the water supply switch, 9 – the irrigator handle, 10 – a tube

Let us consider the structure of a stationary irrigator on the example of the AQUAJET LD-A8 model (firm Little Doctor (Singapore) (Fig. 1).

Analyzing Fig. 1 by the complete set and structure of the irrigator the attention should be paid that the main components include the device case where the compressor, the water jet pressure regulator, the container and nozzles are located. The use of the device depending on the purpose is due to the use of different types of interchangeable nozzles [13].

After analyzing a number of stationary and portable models of irrigators it has been found that most modern models of irrigators are equipped with the following replaceable nozzles:

- a standard nozzle is used in regular cleaning of the oral cavity;
- a periodontal nozzle is designed for cleaning gingival (periodontal) pockets;
- a nozzle for cleaning the tongue frees from plaque on the tongue, refreshes the breath;

Table 2

THE ASSORTMENT ANALYSIS OF IRRIGATORS PRESENTED AT THE UKRAINIAN MARKET

Stationary irrigator	Waterpik (USA), Oral-B (Germany), SoWash (Italy), JETPIK (USA), Little Doctor (Singapore)
Portable irrigator	Waterpik (USA), Oral-B (Germany), SoWash (Italy), JETPIK (USA), Philips (Netherlands), Waterpulse (Italy)
Flow irrigators	SoWash (Italy), Philips (Netherlands), Oral-B (Germany)
Mechanical irrigators	Achepower (Chine), Power Floss (China)



Fig. 2. Nozzles of irrigators: 1 – a nozzle for cleaning the tongue, 2 – an orthodontic nozzle, 3 – a nozzle for washing of the nasopharynx, 4, 5 – a periodontal nozzle, 6, 7 – a nozzle for teeth whitening

- an orthodontic nozzle is used for care of braces and other orthodontic designs, maintains cleanliness of knots and details of systems, prolongs their service life;
- a nozzle-brush cleans the teeth like a classic toothbrush, massages the gums;
- a nozzle for teeth whitening is used for whitening and polishing the enamel;
- a nozzle for washing of the nasopharynx. This is a special nozzle for irrigation and cleaning of the nasal cavity.

It should be noted that the technical capabilities of irrigators are the most important characteristics that affect performance, efficiency and cost [14]. They are water jet power, jet pulsation, tank volume, number of modes.

Water jet power. By this indicator, you can fairly objectively assess the capabilities of the device. As a rule, in expensive models this value is higher. Stationary models have more jet

power than portable ones. Although there are exceptions: a Revelyne RL 400 portable irrigator develops pressure up to 820 kPa, which is higher than many stationary models have.

The power (pressure) of the irrigator jet is measured in kilopascals (kPa). The vast majority of models have the power control, which allows selecting the liquid pressure individually.

Jet pulsation. Most modern models of irrigators use a pulsating type of the working jet. The optimal frequency that provides effective and comfortable cleaning is 1200 pulsations per minute. There are models with a higher jet pulsation (1700 and above).

Tank volume. As a rule, 150-200 ml of water is required for one full-fledged brushing of the teeth. The volume of the tank, even in portable models, allows such cleaning to be carried out without additional water filling. In stationary models, the tanks are much more capacious (from 0.5 liters). This volume is enough for several procedures.

Number of modes. The ability to change the operating mode, and the pressure level of the liquid flow significantly expand the capabilities of the device, allow selecting the necessary ones.

We analyzed the modern range of irrigators presented at the market of medical devices in Ukraine (Tab. 2).

Analyzing the data obtained it has been found that today the following manufacturers supply irrigators to the Ukrainian market: Waterpik (USA), Oral-B (Germany), SoWash (Italy), JETPIK (USA), Philips (Netherlands), Little Doctor (Singapore) and others. It should be noted that this type of medical devices is not produced in Ukraine.

Conclusions and prospects for further research. According to the studies of the

product range of irrigators, it has been found that the largest assortment of these devices in Ukraine is represented by foreign manufacturers, namely a number of the world-famous manufacturers, such as Waterpik (USA), Oral-B (Germany), SoWash (Italy), JETPIK (USA), Philips (Netherlands), Little Doctor (Singapore) and others. Therefore, our country needs to improve its own research in the development of new types of this product, as well as to adopt the experience of foreign manufacturers.

To improve the practical training of students studying the discipline "Medical and Pharmaceutical Commodity" at the Department of

Commodity Science of the NUPh and to reduce the gap between theoretical knowledge and practical skills, practitioners from Little Doctor International (S) Pte. Ltd. (Singapore) were invited to conduct lectures and workshops on "Commodity analysis of medical devices and apparatuses" for full-time and part-time students.

It has been analyzed that the range of irrigators at the Ukrainian market is represented by rather large number of products, and it allows the consumer to choose the necessary product that will fully meet his needs.

Conflict of interests: authors have no conflict of interests to declare.

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Надійшла до редакції 03.03.2021 р.