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Case Review

Modern Didactic Problems of Acute Inflammation of Lung Tissue

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Acute pneumonia (AP) is one of the oldest nosologies known to medicine, which for many centuries has rightfully been attributed to severe diseases with high mortality. For most of its history, the search for ways to help patients with AP has been conducted empirically, but this disease has never been included in the category of contagious and did not pose a danger to others.

Understanding of the nature of the disease began to expand with the development of microbiology, which discovered and accumulated information about bacterial pathogens of AP, but the results of these studies, begun about a century and a half ago, did not affect the interpretation of the process as inflammatory, not infectious.

Cardinal changes in the views on the essence of acute inflammation of the lung tissue began to form after the discovery and widespread use of antibiotics. During this period, the gradual transformation of ideas about the nature of AP was accompanied by distortions of the essence of the process, which contradicted the facts of the observed reality and the laws of medical science. By now, the established doctrine of the AP is a psychological obstacle in solving the whole problem.

The first experience of using antibiotics gave not only phenomenal results, but also marked the beginning of blind faith in their exceptional purpose. Simplicity of application of the new therapeutic direction played an important role. In most cases, the introduction of antibacterial drugs gave a fairly quick effect and did not require additional efforts. This option of medical care was captivating with its simplicity, especially when it came to a large flow of patients. The desire and attempts to preserve the previous effect of this type of treatment at any cost are quite understandable, but such efforts not only went against the growing side effects, but also unreasonably turned the value of antibiotics into the main, and often the only help with AP.

Firstly, as is known, antibiotics can only act on bacteria, and selectively, but do not have a direct effect on the inflammatory process caused by the latter. In this regard, the principle of treatment "only antibiotics", which has been used for a long time in the treatment of AP, should be considered as a narrowly focused etiotropic, and not a special "anti-pneumonic" remedy. That's why the situation was quite familiar when one type of antibiotic began to be defined as the main means of treating completely incomparable diseases.

Secondly, even with the rapid action of antibiotics, which was observed in the initial period of their use, the final success was achieved by the body itself due to the subsequent elimination of the inflammatory reaction and its consequences. The effective action of antibiotics helped to eliminate one of the important factors of the disease, which greatly facilitated this task. If we evaluate the mentioned principle of "only antibiotics" from the point of view of the therapeutic range, then it should be recognized that their narrow etiotropic effect has undoubtedly been exaggerated and elevated to the rank of a general panacea. If we add to these circumstances the fact that a wide variety of inflammatory processes were treated with one antibiotic as the main remedy, it is difficult to imagine a comprehensive scientific (!) justification for such AP therapy.

Thirdly, antibacterial therapy initiated a grandiose process of its side effects. Unlike the bulk of drugs that affect the substances

and mechanisms of the macroorganism, antibiotics are directed at individual biological objects that are included in the spectrum of its support and are capable of their own adaptation. These circumstances gave rise to a complex of constant changes that is observed throughout the entire period of clinical use of antibiotics.

The slow but inevitable decline in the effectiveness of the drugs used, the constant need to develop and release new, more advanced antimicrobial forms, the emergence and expansion of the list of antibiotic-resistant strains accompany this type of therapy throughout its relatively short history. The ability of bacteria to resist the factors of external aggression, as well as to consolidate, develop and reproduce the acquired qualities did not allow the return of the original effectiveness of antibiotics, despite the introduction of more advanced drugs. These changes in bacteria, as living objects under the influence of external factors, are a convincing confirmation of the inevitability of the action of biological laws.

Fourth, the active use of antibacterial therapy has led to the emergence of a new phenomenon that was not observed in the pre-antibiotic era. We are talking about a periodic and rather obvious change of leaders among the agents of the AP. So, if before the use of antibiotics, pneumococcus was the causative agent of AP in 90-95% of cases [1-3], in recent years its participation in this disease has been confirmed only in 33-50% of positive bacteriological studies [4]. But in the general group of patients with AP, among whom in recent years in half or more cases it was not possible to identify the causative agent, the role of pneumococcus in the etiology of the disease decreases to 10.9% - 22.5% [5].

In this regard, it is necessary to recall that in the 60-70s of the last century, that is, in the time interval between the statistics presented, a "staphylococcal catastrophe" suddenly arose, in which pneumococcus actually disappeared from the pathogens of AP, and staphylococcus had almost total influence. In the future, there was an equally "spontaneous" decrease in the proportion of staphylococcus with the appearance of other microorganisms in the etiology of the disease and the gradual return of pneumococcus.

Fifthly, experts have been paying attention to the growing role of viruses in the development of AP for quite a long time. So, according to statistics, about two decades ago, 200 million cases of viral pneumonia were registered annually in the world, which at the time of analysis was almost half of all cases of AP [6-8]. It is quite acceptable to assume that the above-mentioned figures of negative etiology studies in bacterial forms of AP [5]

were caused by viruses, but timely virological diagnosis was not carried out.

The suddenness and surprise of the emergence of the SARS-CoV-2 pandemic, as it is presented not only by the media, but also often by professional publications, actually looks quite natural. The expectation of such an event was indicated by the growing rates of viral pneumonia, the transformation of influenza epidemics into an annual tradition and, of course, at least two severe coronavirus epidemics, which became a prelude to a pandemic [9].

Is it possible in this situation to deny the effect of antibiotics on the long-term growth of viral lung diseases? From my point of view, there are enough facts and patterns that may be the result of years of suppression of the bacterial segment of the microbiome and the growing role of viruses. Currently, this statement does not have sufficient objective arguments to be absolutely proven. At the same time, the information already available in this section does not allow us to reject this point of view. Therefore, at this stage, such an interpretation of the reasons for the growing viral expansion can be proposed in the form of a postulate.

If we summarize the dynamics of AP characteristics noted above over the period of antibiotic use in just a few decades, then the inevitable way out of this situation should be, first of all, a change in views on the role of this type of therapy in the overall treatment package, right? Unfortunately, reality shows that considerable efforts are being made to preserve the leading role of antibiotics in the treatment of AP without radical changes in the concept of the disease.

For many years, the decrease in the effectiveness of antibiotics and the growth of microflora resistance have been trying to compensate for various attempts at early recognition of AP pathogens. These efforts were undertaken in the hope of speeding up the administration of targeted antimicrobial therapy and improving outcomes. It took a long time to be convinced of the futility of these attempts and to recognize the absence of their impact on the final results of treatment [10,11].

It is symbolic that such confessions began to appear on the eve of the SARS-CoV-2 pandemic, but this did not change the previous strategic line. Not only a narrow etiotropic approach to solving the problem of AP in general and COVID-19 pneumonia in particular has been preserved, but also the leading role of antibiotics in this process. During the pandemic, more than 70% of patients with viral lung lesions continued to receive antibiotics, although indications for their use in the form of bacterial coinfection often did not exceed 10% [12-16]. Moreover, a number of reports noted the complete preservation of previous approaches to the treatment of pneumonia caused by COVID-19, and strongly recommended the continued use of antibiotics [17,18].

During the predominance of bacterial forms of AP, one of the ways to improve the empirical choice of antibiotics was to separate patients according to the place and conditions of the disease development. This classification of AP, which distinguishes groups of patients with community-acquired, hospital-acquired, ventilator-associated pneumonia, continues to be applied to the present day [19], despite the fact that its introduction did not affect the results, and its justification does not have a convincing scientific basis and contradicts existing facts [20].

The introduction of this gradation of the disease was due to only one didactic circumstance that arose as a result of the hyperbolization of antibiotics and the desire to apply targeted antimicrobial therapy as early as possible. It was not taken into account that in this situation it is not entirely correct to compare the initial state of healthy people with the condition of patients in hospitals with other diseases, and even more so on artificial lung ventilation. But it is this principle of separation of patients with AP that formed the basis of this classification. In the context of a pandemic, this trend was continued in an attempt to find an explanation for the varying severity of the disease depending on the place and conditions of its occurrence [21].

Continuing to be guided by the concept of the leading role of the pathogen in the development of AP, modern medicine is trying to find differential diagnostic criteria between bacterial and viral forms of lesion during the current SARS-CoV-2 pandemic. Attempts to solve this problem and reduce the inappropriate use of antibiotics were unsuccessful, which again showed the absence of dependence of clinical symptoms and severity of the disease on the etiology of the process [22-24].

In the latter connection, it is necessary to recall the classic signs of inflammation and answer the question of why, with the same etiology of inflammation, the symptoms and condition of patients will differ depending on the localization of the focus. For example, it is almost impossible to confuse pneumococcal pneumonia and pneumococcal meningitis, although we are talking about inflammatory diseases of the same etiology, isn't it? A comparison of these two diseases indicates that the specificity of the clinical picture in each case is due to a violation of the function of the organ affected by the inflammatory process, and therefore the picture of lung inflammation will differ from the clinic of inflammation of the meninges. At the same time, each of these diseases can have an infinite range of clinical manifestations due to the individual reaction of the body to the aggression of one type of pathogen.

These well-known facts once again convince us that efforts aimed at determining the causative agent of AP on the basis of clinical symptoms or indirect signs are devoid of scientific justification and, most importantly, practical sense, which has already been clearly demonstrated by attempts at etiological diagnosis of bacterial forms of the disease. The search for ways of such a simplified diagnosis indicates a clear deformation of views on the nature of the disease that arose under the hypnotic influence of antibiotics.

The danger of AP disease is greatly exaggerated even by the example of the current SARS-CoV-2 pandemic, despite the rapid spread of the coronavirus. Infection of the population during a pandemic gives the same results in different parts of the globe. Current statistics show that 80% of infected people tolerate contact with coronavirus relatively safely on an outpatient basis, despite the lack of specific treatment. At the same time, up to 20% of them learn about their infection based on tests, since there are no clinical symptoms. Only 20% of those infected need hospitalization, and 5% of them are in intensive care units [25-27].

It is possible to evaluate the effectiveness of professional medical care for coronavirus infection (excluding vaccination and taking into account only the results of treatment) only in a hospital setting. The progressive severity of the condition of patients admitted to hospitals is due to the development of COVID-19 pneumonia, and in this situation, maximum mobilization of the capabilities of practical medicine is required. Unfavorable results of such care are traditionally concentrated in intensive care units, where mortality reaches 30-50% [28-31].

The results show that every second or third patient with coronavirus pneumonia sent to intensive care units loses the battle with the disease. This situation creates an atmosphere of anxiety and fear, which is not only supported by media reports on morbidity and mortality, but is also described by professional doctors as a feeling of powerlessness in the treatment of such patients [32-34].

However, if we compare the presented mortality figures from coronavirus pneumonia with similar indicators for the so-called community-acquired pneumonia in recent years, it turns out that these data have remained at the same level of 30-50% and there is no reason to talk about their sharp deterioration [35-39]. In other words, even the most critical indicators of the results of medical care for patients with AP have not changed since the beginning of the pandemic, and the reason for negative assessments and stressful conditions recently is a change in some circumstances.

First of all, with the beginning of the pandemic, the epidemiological situation has changed. If in the old days there was no need to isolate patients with AP and observe the rules of personal protection when contacting them, now the rapid spread of coronavirus forces the use of the maximum possible set of anti-epidemic measures. It is only necessary to clarify that we are talking about the spread of the causative agent of infection, and not about the expansion of its consequences, which pose a real threat to the health and life of the population, but, fortunately, according to statistics, are observed only in a small percentage of observations (see above).

In addition, the widespread viral invasion has destroyed the widespread belief about the irreplaceable role of antibiotics in the treatment of inflammatory processes. Although with the onset of the pandemic, the final results of AP in the case of the disease have not changed (see above), but the previous belief in the curative possibilities of medicine has been replaced by an alarming sense of insecurity.

Finally, the epidemiological situation forced the concentration of patients with COVID-19 pneumonia in specialized departments, creating a kind of extreme stress ranges for working staff. When patients with AP were admitted to the hospital in previous years, they were among the most severe by the nature and dynamics of their disease, but they were among patients of a different profile. The organization of special purpose departments for patients with lung damage caused by coronavirus has excessively increased both the physical and psychological burden on medical personnel [32-34].

Unfortunately, the circumstances and facts listed above do not attract due attention to their assessment for reforming the ideology of the AP. In the current situation, the etiotropic strategy of the problem continues to dominate, under the flag of which the search for drugs capable of neutralizing the viral pathogen is being conducted. However, the prospect of success in these studies is very doubtful due to the peculiarities of the development of inflammation of viral etiology.

As you know, the presence of the virus in the body does not give any external signs. In order for the inflammatory process to begin with an appropriate clinical picture, the virus must enter the cell. In this regard, current research is conducted in two main directions. A significant amount of work performed today is devoted to the search for means of protecting cells from the penetration of pathogens. That is, we are talking about the prevention of viral pneumonia, and not about helping those who are already ill, which is what we are talking about in this case.

Virus neutralization is demonstrated in laboratory studies when the tested drug is in direct contact with the pathogen [40-42]. However, such attempts in the real conditions of the emerging disease cannot repeat the previous effect. In such a situation, drugs that can affect the virus in the laboratory are not always able to follow the pathogen into the cell, but when they have this ability, they can increase the toxic effect on cellular structures [40].

In addition, attention has already been drawn to the fact that the suppression of the pathogen during the growing cascade of severe functional disorders is a belated measure. In emergency situations, with the aggressive development of the process, even an effective effect on the pathogen does not leave the patient enough chances and time to successfully adapt to the emerging violations of the function of the affected organ. In such conditions, it is necessary to help the body to correct the mechanisms of the disease, focusing on the sequence of its pathogenesis. Currently, pathogenetic methods of assistance are more declarative, since the pathogenesis of AP is considered through the prism of pathogenic properties of the pathogen.

As evidenced by the above information about the AP problem, current trends in its solution are focused on the fundamental role of the pathogen, considering the latter as a factor determining the pathogenesis of the disease. In this regard, the localization features of the process and the important role of the dysfunction of the affected organ are lost. The unique mechanisms of the development of inflammation in the lungs pass into the category of unclaimed knowledge, while AP in its etiology and treatment methods occupies a place on a par with other incomparable diseases. The reason for such a deformation of ideas about the specifics of the disease is associated with a long and excessive attachment of medicine to antibiotics, which had a strong didactic influence on the professional worldview.

The effectiveness of antibiotics in the initial period of their use formed an idea of the universal therapeutic effect of this therapy. This initial impression continued to prevail and persisted throughout the subsequent time. The increased side effects of this therapy and the decrease in its activity did not entail a logical revision of its role and place in the overall complex of AP treatment. The natural result of the preservation of such orthodox views was the gradual transformation of the original idea of antibiotics into a so-called destructive meme with its spread through an information cascade [43,44].

To date, the main obstacle to the successful solution of the AP problem is not the difficulties in suppressing the pathogens of the disease, on which all attention is focused, but the distortion of professional ideas about the essence of acute inflammatory processes in the lung tissue. The pathogenesis of the disease remains one of the most important characteristics of AP, therefore, treatment carried out without taking into account the mechanisms of the process cannot count on success. Bringing the concept of the disease in line with the canons of medical science opens up the possibility of a successful solution to this problem, which has already been proven practically [45]. Such work is fraught with psychological difficulties, but without its implementation, further progress in this area is impossible.

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Conflict of Interest

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