THE VALUE OF LABORATORY TESTS IN THE DIAGNOSIS OF TUBERCULOSIS

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Abstract

Background and aim. In the last decades, the inhabitants of the Romanian region known as Jiu Valley underwent changes in their social and economic status which determined changes in behaviour and health, which influenced their general health condition. One of the consequences was the exacerbation of tuberculosis. In order to control this situation, there was a need to increase the efficiency of diagnosis. This optimization can be reached by a better detection of mycobacterium infection, optimal isolation of strains and identification of the resistance of strains to antituberculous drugs.

Methods. In order to identify the best diagnostic modality, we compared the efficacy of the classical bacteriological diagnosis, still performed in the field, to the modern methods of molecular biology. The study included two groups, one represented by 213 patients who were investigated using the classical bacteriological methods, and 49 who were diagnosed using the PCR method.

Results. The tuberculosis patients who have been evaluated only with the classical bacteriological methods where diagnosed as TB positive and treated according to the national guidelines, which are in agreement with the international guidelines. The PCR diagnostic methods had a superior diagnostic value compared to the traditional bacteriological method.

Conclusions. The results revealed the superiority of the modern molecular biology methods based on PCR. However the bacteriological method remains useful in areas where PCR cannot be afforded.

Keywords: tuberculosis, bacteriological diagnosis, laboratory diagnosis, PCR

Introduction

The pathology of tuberculosis exhibited recrudescence in some regions of Romania. The phenomenon was correlated with uncontrolled movements of the population, with the promiscuity characterizing this movement, with the destruction of surveillance mechanisms and control of the disease and with a deterioration of compliant behaviour towards the rules that guide cohabitation in good sanitary conditions [1,2].

One of the regions which did not escape this trend was Jiu Valley, a region which has known all the phenomena mentioned above along with economical convulsions which made the situation worse [3].

One of the collateral effects of these economic convulsions was the reorganization of the health network in the region, which was characterized by the disappearance of a number of medical centres and/or significant reductions in their activity. This has lead to a particular situation characterised by a disproportionate influx to the remaining centres, thus losing the connection to the patients' home and their health needs.

As a result of this phenomenon, a great number of patients asked for medical care in the bigger hospitals of the region, which were forced to face unexpected challenges.

In a previous study we carried out a characterization of the population of Jiu Valley based on the social and economic changes which obliged the population to adapt to the new situation and finally of the effect of all these changers on their health condition.

Aim

Analyzing these evolutions, we realized that one of the ways to resolve this situation would be to improve the level of medical care and suggest a better diagnosis of tuberculosis [4,5].

When we say better diagnosis we mean rapid detection, better results and thus higher sensitivity and specificity [6,7].

The evolutions in this field were characterized by a transition from the conventional bacteriological practice (carried out with good results) to methods of molecular biology which are faster, more specific and sensitive and which allow an earlier identification of the resistance to antituberculous medication. Last but not least, the medical act is of better quality [8-13].

Material and methods

Our study included two groups, the first represented by 213 patients who were part of the 528 subjects recorded as pneumological patients in different hospitals in Jiu Valley. Most of them received the bacteriological support afferent to conventional bacteriology. The second group was represented by a number of 49 patients who were referred to a tertiary center laboratory where they could benefit from the PCR methods. Unfortunately the access of our patients to these methods was limited [14-16].

The studied group had access to the best microbiological methods available [17,18]. The use of laboratory animals was reserved to situations when microbiological examination failed.

Immune chromatography was used as a rapid alternative solution relying on the determination of the protein composition of mycobacteria.

For the second group we used the techniques of molecular biology. These techniques were represented by tests for the amplification of nuclear acids. Genetic methods for chain amplification and linear hybridization were also used [19].

Results

Distribution by age shows that patients belong to the active groups (30-60 years), most of them being males aged between 40-50 years.

Most of them were persons with medium education levels, originating from the six towns in the Jiu Valley,

especially from the towns Petrosani, Lupeni and Petrila.

The microscopic results revealed that according to microscopic finding 98% were positive to a variable degree. (Table I).

Table I. Distribution of patients according to the microbiological culture.

Culture	N	P+	P++	P+++
Number of patients	5	75	127	6
Percentage [%]	2	35	60	3

The resistance to antibiotics could be determined based on bacteriological identification and we concluded that this method was very efficient. It allowed us to identify resistance to isoniazid (HIN), rifampicine RMP) and finally to back up the diagnosis of multidrug resistance (MDR).

The second group of the study included 49 patients. They were 5 females (10%) and 45 males (90%).This method allowed us to obtain results very quickly (24-48 hours). That is why the method looks very satisfactory, especially when we compare it to the 60 days necessary for conventional bacteriological examination. The value of the method was expressed by its sensitivity reaching almost 100% and it allowed the highest rate of mycobacterium identification. Resistance to HIN and RMP and even MDR was identified. These results are presented in table II.

Table II. Distribution of patients according to drug resistance.

	RMP	HIN	MDR
Results for the determination of sensitivity/resistance	6	10	6

Discussion

This study was the result of authors' desire to better comply with the National Tuberculosis Control Programme, as well as with the recommendations of the World Health Organization. We noticed that the Jiu Valley exhibits a poor situation when it comes to tuberculosis, the frequency of the disease being above the national average. In these circumstances, we find that our effort to improve the health situation of this population and to decrease tuberculosis is justified.

We believe that the means which can help us see an improvement consist in better early diagnosis. We estimated the prevalence of tuberculosis by two methods: the bacteriological one and the PCR based one. A limitation of our study is the difficulty to compare the two groups that differ so much in terms of number of patients. Still we considered that an analysis is mandatory because it allows intuitive conclusions [20,21].

As we revealed, the difference between the two groups of methods is represented by the time required for diagnosis and by the possibility to obtain very good

information concerning resistance. This way we made early introduction of adapted antituberculous therapy possible which will have effects both on the health condition of patients but also on cost reduction because of an early efficient treatment. Unfortunately, for the time being, the prices of PCR examinations remain high.

Conclusions

The methods of molecular biology have proven their high sensitivity and specificity in the diagnosis of tuberculosis. It allowed good identification of resistance to antituberculous therapy overcoming traditional methods. For the time being, these traditional bacteriological methods remain useful and dominant, offering satisfactory results. The use of the methods of molecular biology seem to be the option for the future, offering chances of a very good and early diagnosis.

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