Chest Microfilm Versus Direct Microscopic Sputum Examination in Tuberculosis Control in the Developing Country

C. T. Hsing, M.D., F.C.C.P.*
Taiwan, Republic of China

It is well known that to control tuberculosis in the developing countries in a short period of time is difficult, to say nothing of eradication of the disease. In Taiwan, an organized tuberculosis control program has been carried out in the past 16 years. From the results of the two prevalence surveys, there is a strong indication that some improvement has been achieved in "quality," but the "quantity" of the tuberculosis problem remains unchanged. There is progress, though slow.

In implementing tuberculosis control, we have to find the tuberculous patients, treat them and cure them so that they will not infect others. Case-finding is thus the foundation of the whole control program, and two methods are in use in Taiwan: (1) to find the cases by using chest x-ray examination with 70 mm microfilms, and (2) to find the cases by using microscopic sputum examination.

Either method has its pros and cons. To understand their merits and demerits in effect, both methods are used so that a comparison can be made. Given below are the results of the two methods.

Chest Microfilm

In order to explore the prevalence of tuberculosis, certain groups of people in the cities and villages of northern, central and southern Taiwan are examined with 70 mm chest microfilm. Of the 26,031 individuals 15 years old and above who are to take this examination, 25,850 (99.3 per cent) have completed this examination. The result is shown in Table 1.

Of these 25,850 persons examined, 1,981 persons (7.7 per cent), have abnormal shadows on their microfilms. Following examination revealed that 1,047 (4.1 per cent) persons were suffering from clinically significant tuberculosis (Table 2). For these 1,047 patients, direct microscopic examination of their sputum was done, and it was found that 26 (2.5 per cent) of them had acid-fast bacilli in their sputum.

Sputum Examination

In Kinmen, an islet close to the Chinese mainland, the Health Center has implemented an integrated disease control program, including venereal disease, trachoma, and tuberculosis since 1962.

For tuberculosis control, direct microscopic examination of sputum was used for case-finding. Paper sputum cups were distributed to 26,109 people above 16 years of age. Among them, 18,884 (72.3 per cent) specimens were returned. Of these, 8,803 (46.6 per cent) were examined, since the rest were only saliva. To reckon it

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*Secretary General, National Tuberculosis Association of the Republic of China and Chief, Chest Department, Veterans General Hospital.

Table 1—Results of Prevalence Survey by 70 mm Chest Microfilms in Taiwan

<table>
<thead>
<tr>
<th>Classification of Disease</th>
<th>No. Patients</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimal</td>
<td>749</td>
<td>38.0</td>
</tr>
<tr>
<td>Moderate without cavity</td>
<td>182</td>
<td>9.1</td>
</tr>
<tr>
<td>Moderate with cavity</td>
<td>49</td>
<td>2.4</td>
</tr>
<tr>
<td>Far-advanced without cavity</td>
<td>26</td>
<td>1.3</td>
</tr>
<tr>
<td>Far-advanced with cavity</td>
<td>39</td>
<td>1.9</td>
</tr>
<tr>
<td>Pleurisy with effusion</td>
<td>2</td>
<td>0.01</td>
</tr>
<tr>
<td>Fibrosis</td>
<td>816</td>
<td>42.0</td>
</tr>
<tr>
<td>Non-tuberculous</td>
<td>118</td>
<td>5.1</td>
</tr>
</tbody>
</table>
according to the number of persons who received the sputum cups, only 33.3 per cent had completed the examination.

From this direct microscopic examination of sputum, 89 cases (1.0 per cent of the examined) were found to be positive for acid-fast bacilli (Table 3).

Of these 89 positive cases, 65 were examined by 14" x 17" chest x-ray films. It was found that ten (15.4 per cent) of these, had normal chests. This finding reveals that in examining the sputum by direct smear, the false positive rate could be high.

**DISCUSSION**

In reviewing the results of these two methods—chest microfilm and direct microscopic sputum examination—used in Taiwan the following facts are observed:

When microfilm was used in case-finding, 99.3 per cent of the prospective examinees came for the examination. When sputum examination was employed, only 72.3 per cent of the prospective examinees sent in their specimens. It evidently reflected that the general public had a much better response to the microfilm method. This is important because no tuberculosis control program can be carried out successfully without enthusiastic support and cooperation of the public. Furthermore, among the sputa that were sent in, only 46.6 per cent could be examined, as the rest were saliva.

The yield of tuberculous cases by the microfilm method was 4.1 per cent, while it was 1.0 per cent by the sputum examination method. Among the 1 per cent (89) positive cases by direct smear, at least 11.2 per cent (ten cases) are most likely not tubercle bacilli. The false positive rate is rather high. It is interesting to note that although WHO claims that direct microscopic sputum examination is the most accurate method of diagnosing tuberculosis," their staff reported a 15 per cent false positive rate in Africa.

"Early diagnosis and early treatment" is often used as a slogan for publicity by the tuberculosis control workers. It is apparent, from the results of these two methods, that x-ray has its important role in the early discovery of pulmonary tuberculosis, and it is a better one in case-finding than the direct microscopic sputum examination method.

The above stated opinion can be further substantiated by our observations in the Taiwan Veterans General Hospital. It was reported in 1962 that the positive rate for minimal cases was 13.4 per cent and it was 57.7 per cent for far-advanced cases by direct smear examination. Our recent analysis in the same hospital showed that among the 1,347 proved cases of minimal pulmonary tuberculosis, 34 were positive by direct smear examination, constituting only 2.5 per cent (Table 4). Obviously, it is very difficult to detect minimal cases by means

**Table 3—Results of Case Finding by Means of Direct Microscopic Examination of Sputum in Kinmen**

<table>
<thead>
<tr>
<th>Classification of Disease</th>
<th>No. Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimal</td>
<td>1,347</td>
</tr>
<tr>
<td>Moderately advanced without cavity</td>
<td>1,073</td>
</tr>
<tr>
<td>Moderately advanced with cavity</td>
<td>242</td>
</tr>
<tr>
<td>Far-advanced without cavity</td>
<td>134</td>
</tr>
<tr>
<td>Far advanced with cavity</td>
<td>156</td>
</tr>
</tbody>
</table>

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of direct smear examination for tubercle bacilli. If early diagnosis is still believed to be an important measure in tuberculosis control, it seems that direct microscopy is not very dependable.

It is understandable that in the developing countries it might be difficult to implement an “early discovery” program due to the limited resources—manpower, equipment and money. Therefore, some workers suggest the reverse, that is, to carry out “late diagnosis, late treatment” in the developing countries, concentrating case-finding on direct smear and treating only the symptomatic patients with positive sputum. By so doing, it is hoped the fountain of infection thus may be controlled.

It is true that the majority of tuberculous patients do have symptoms (Table 5), but it is also true that not the majority of them are sputum positive by smear. Of the 2,952 tuberculous patients hospitalized in the Taiwan Veterans General Hospital, 1,347 have minimal diseases. Of these minimal cases, 80 per cent are coughing, 57 per cent have chest pain, 45 per cent are afflicted with hemoptysis, but only 2.5 per cent are found to have tubercle bacilli in their sputum. Among the 290 far-advanced cases, 96 per cent have cough, but only about 60 per cent are found positive for tubercle bacilli. If attention is limited to these positive patients alone, which are a minority (14.4 per cent), we would lose the confidence of the negative cases which are a majority (85.6 per cent). They are pulmonary tuberculosis cases, but because they are negative by smear, they are not supposed to have any specific treatment. As days go by, the reputation and ability of the responsible health officer will be questioned. The doctor-patient relationship, an important factor in tuberculosis control among human beings, will be ruined.

When we limit our attention to finding the symptom-motivated patients and treat only the positive cases, the result would be that while a minority of positive cases may be cured, the majority of negative cases, through late treatment, would become posi-
tive. This cycle turns around and the tuberculosis problem remains unchanged, if not more serious. The problem cannot be solved unless all the patients—positive as well as negative sputum cases—can be well treated.

The reality is that if the financial resources in a locality are limited, one can only carry out tuberculosis control work by the less expensive measures. This proposition is permissible on the ground that there is no other way out and the second or third best is better than none. When the people of a locality are starving and naked, the most urgent thing to do is to feed and clothe them, keeping them alive to live with the disease. But it is not justified to tell the world that the best method of tuberculosis control is to feed and clothe the people.

SUMMARY

In comparison to the methods of case-finding presently used in Taiwan—chest microfilm and direct microscopic sputum examination—the former is better in that it is more popular with the general public and its yield is higher and fewer errors are made. However, in the face of economic stringency, lack of personnel or limited resources, the more economical and less idealistic method—the direct microscopic sputum examination—may well be used. As far as the method itself is concerned, it behooves us to believe that the direct smear examination is inferior.

In implementing a tuberculosis control program, merely treating a few cases of symptom-motivated cases with positive sputum by direct smear may cause misunderstandings among the populace which will in turn deter our activity.

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RESUMEN

Comparando los métodos de prospección de la tuberculosis usados al presente en Taiwan (microfilm y exámen directo de la expectoración) el primero es el mejor, en cuanto a que es más popular con el público en general y su rendimiento es mayor, con menos errores. Sin embargo, ante las realidades de estrechez económica, falta de personal, y limitación de recursos, el método más económico y menos ideal del exámen directo del esputo puede ser empleado.

En lo que al método en sí concierne, tenemos que aceptar que es inferior. En la práctica el tratar meramente algunos casos con síntomas y esputo positivo al exámen directo, puede dar lugar a ideas erróneas en el pueblo, perjudiciales al desenvolvimiento de la lucha contra la tuberculosis.

ZUSAMMENFASSUNG


REFERENCES


For reprints, please write: Dr. Hsing, Chest Department, Veterans General Hospital, Shih-pai, Taiwan, Republic of China.