

AMBULATORY TREATMENT
AND
PUBLIC HEALTH MEASURES
FOR A PATIENT WITH
UNCOMPLICATED PULMONARY
TUBERCULOSIS

(UPDATE 2004)

Internal guidelines of
the Tuberculosis & Chest Service of
the Department of Health of
the Government of the Hong Kong SAR

INTRODUCTION

In Hong Kong, there are around 7,000 notified cases of tuberculosis (TB) each year. Ambulatory chemotherapy has been the mainstay of anti-TB treatment. The majority of notified TB cases are managed in the chest clinics of the Tuberculosis & Chest Service (TB&CS) under the administration of the Department of Health (DH). Others are treated at various medical units of the Hospital Authority and in the private sector. It is a statutory requirement for every case of active TB to be notified to DH according to the Prevention of the Spread of Infectious Diseases Regulations under the Quarantine and Prevention of Disease Ordinance (Cap. 141). Notification serves two main purposes, namely, epidemiological surveillance and contact investigation. Prompt notification facilitates contact tracing procedures and helps to contain the spread of the infection. Details of the notification procedure can be found in the “Guidance notes for notification of tuberculosis” [1].

The TB&CS operates 18 chest clinics located at various sites in the Hong Kong Special Administrative Region. The services are free of charge to ensure that TB patients will not be denied access because of financial difficulty. Today, emphasis is placed on encouraging patients with symptoms suggestive of TB to seek medical attention early, so called “passive case finding”, rather than indiscriminate screening of asymptomatic individuals. This article provides a general view of the practice of the TB&CS in the management of a patient with uncomplicated pulmonary TB.

MANAGEMENT OF THE PATIENT WITH TB

Aim

There are two main objectives in managing a TB patient. The first is to cure the individual patient. The second is to contain the spread of the infection. In this regard, the health care provider has a responsibility to monitor every TB patient for treatment adherence till completion.

History

As TB is endemic in Hong Kong, a high index of suspicion should be maintained, especially for patients presenting with symptoms like persistent cough for over 3 to 4 weeks, blood in sputum, weight loss, persistent fever, or night sweating. In assessing a patient presenting with persistent chest and/ or constitutional symptoms, a full

medical history is essential. Particularly important issues in the history include previous history of TB, coexisting medical illnesses, occupational history, contact history, and smoking status. If a positive culture of *Mycobacterium tuberculosis* has been isolated from the sputum of the probable source case, the sensitivity pattern may help in the choice of initial drug regimen for the patient. Any evidence of previous BCG vaccination is to be noted especially if the patient is a child.

Physical examination

Physical examination not uncommonly yields negative findings. Some features may be worth mentioning, including: general condition, cervical lymph node enlargement, features of pleural effusion, and unilateral wheeze related to endobronchial involvement. The physical findings may help in the consideration of differential diagnoses, e.g., a lung nodule is more likely to be a carcinoma than a tuberculoma in the presence of finger clubbing.

Investigation

Chest radiograph and sputum examination for acid fast bacilli (AFB) are essential tools employed for the diagnosis of pulmonary TB. The chest radiograph is a relatively simple and sensitive test. Typical radiographic changes, like apical lesions, tend to have a higher positive predictive value for TB in an endemic area like Hong Kong. Sputum samples, preferably collected on two to three consecutive mornings, are sent for direct smear and culture examination. Positive smear results are reported back to the clinics over the phone or by fax so that patients can be called back for early commencement of treatment. If direct smears are negative, clinico-radiological correlation is essential in deciding the next step of action. In certain situations, trial of antibiotics, and follow-up chest radiograph in one to two weeks may be required to differentiate TB from other types of community-acquired pneumonia. The use of radiometric cultures and the more advanced laboratory techniques like molecular and amplification tests can shorten the time required for bacteriological diagnosis and susceptibility tests, though at a higher cost. In more difficult cases, it may be necessary to resort to further investigations like CT scan, fiberoptic bronchoscopy, and percutaneous transthoracic fine needle aspirate. Thus, the diagnosis of active pulmonary TB may be based on any combination of clinical, radiological, bacteriological, and sometimes histological grounds. The use of tuberculin test is rather limited in the local setting, partly as a result of widespread BCG vaccination and revaccination, although the latter has been stopped since September 2000. Despite such limitation, the test may still give

useful information in certain clinical situations, especially among the younger age group, and in case assessment for need of treatment of latent TB infection is required.

In the TB&CS, identification and susceptibility tests to the first-line anti-TB drugs (isoniazid, rifampicin, ethambutol and streptomycin) are regularly performed for all pretreatment culture isolates which are positive for *Mycobacteria tuberculosis*. Susceptibility tests to second-line drugs are performed, if there is multi-drug resistance (resistant to at least isoniazid and rifampicin), or with other clinical indications. The drug susceptibility test results provide a guide to the clinical management of the patient, and also allow epidemiological surveillance of drug resistance rates and evaluation of the local TB control programme.

Notification

Cases diagnosed as active pulmonary TB should be notified promptly to DH [1]. If the patient happens to be a health-care worker or working in other relevant occupations with increased risk of exposure to TB, notification to the Labour Department is required under the Occupational Safety and Health Ordinance [2].

Treatment

“Short course chemotherapy” is the current standard treatment for active pulmonary TB. The regimen consists of a two-month initial phase comprising four drugs, namely, isoniazid, rifampicin, pyrazinamide, and either ethambutol or streptomycin, plus a four-month continuation phase of two drugs, namely, isoniazid and rifampicin, making a total duration of six months [2,3,4]. The drugs can be given either daily or three times weekly at the appropriate dosages (Tables 1 and 2). The drugs should, as far as possible, be taken together in one single dose each time and not in split doses in order to achieve good therapeutic efficacy. Combined drug preparations (e.g. rifater, rifinah) are useful alternatives but have to be given daily. While they help to avoid monotherapy with a single drug, they do not allow flexible dosage adjustment of the individual components of the regimen. TB patients are generally managed as an outpatient for ambulatory care unless there are other indications for hospital admission.

Contraindications to the use of the anti-TB drugs should be noted prior to commencement of therapy, in particular: history of major diseases such as liver and renal diseases, visual problem, hearing problem, drug allergy, and concomitant treatment with other medications. Young females are counselled on pregnancy-related issues, especially

the reduced efficacy of oral contraceptives due to interaction with rifampicin, and alternative contraceptive methods may have to be recommended. Pretreatment blood tests for liver function, renal function, HBsAg [2,5] and HIV antibody (after counselling and obtaining patient's consent) are performed. Baseline vision tests for visual acuity and colour perception are also performed if ethambutol is to be started [2,6]. There have been accumulating evidences to indicate that closer monitoring of liver function for HBsAg carriers may be required during anti-TB treatment [5]. Health education is given on the nature of the disease, personal hygiene, necessity for full adherence with drug treatment, and the possible pharmacological and side effects of the anti-TB drugs (e.g., discoloration of urine, faeces, tear and other body fluids). This is supplemented by written educational materials. Self-reporting of side effects is also advised. The importance of health education on drug-induced hepatotoxicity and ocular toxicity have been emphasized in the two relevant sets of local guidelines [2,5,6]. The establishment of good rapport from the very beginning is essential for the success of the treatment programme.

Public health measures

The health nurses will enquire the patient about his close contacts (usually the household members), and contact screening will be offered to them. Casual contacts are, in general, not targeted for screening because of the low cost-effectiveness, although this has to be assessed on a case-by-case basis. Contact tracing normally follows the "stone-in-the-pond principle". Under this principle, contact tracing will be limited first to the innermost circle with the highest degree of close contact, and if more cases are found, consideration may be given to screen successively the outer circles with lesser degree of contact. However, examination of contacts should be considered mainly as an adjunctive measure in the overall TB control programme as only a relatively small proportion of TB cases can be found through this route. A more effective approach would be to emphasize on health education and early awareness of suspicious symptoms.

The sputum smear status is a general guide to the infectiousness of the TB patient. Those patients with severe cough, cavitary disease, and positive sputum smear are likely to be highly infectious. Prompt initiation of treatment is crucial as infectiousness rapidly decreases with effective treatment. Health education, personal hygiene measures, maintenance of good indoor ventilation and screening of close contacts are useful adjunctive measures to reduce the risk of transmission. Sick leave may be granted for the period during which infectivity is considered significant on a case-by-case basis. In general, infectivity is reduced very significantly when two weeks of anti-TB

treatment containing rifampicin has been taken. Particular concern should be paid to infectious patients who are in frequent contact with susceptible people, such as teachers, staff of homes for the elderly, and medical personnel working for debilitated patients, where more stringent measures may be necessary.

DOT and other monitoring measures

In the chest clinics, anti-TB medication is given under direct observation by the health nurses to ensure full adherence. Directly observed treatment (DOT), complemented by holistic care, is strongly recommended by the World Health Organisation (WHO) as one of the most important TB control measures, and is crucial for the success of the treatment programme. DOT by a health care worker also facilitates closer clinical monitoring of adverse drug effects.

During the initial phase of chemotherapy, follow-up consultation is arranged monthly to assess progress, and to reinforce patient adherence. For patients at risk of drug-induced hepatitis, including HBsAg carriers, those with pre-existing liver diseases, the alcoholics, the very old, and the malnourished, it would be desirable to monitor liver function tests once every two weeks during the initial two months of treatment, or more frequently as clinically indicated [2,5]. In the absence of any risk factors, routine biochemical monitoring may not be necessary, but liver function test should be performed if clinical features suspicious of hepatitis arise, such as fever, nausea, vomiting, anorexia and jaundice.

There is controversy about the role of regular follow-up visual testing for patients put on ethambutol. This may, however, be considered if ethambutol is to be prescribed to some patients at a higher risk of oculotoxicity, especially when a high dose (25 mg/kg/day) is used or treatment is prolonged [2,6].

A chest radiograph is usually taken at the second or third month to assess progress. If the pretreatment bacteriology is positive, sputum examination after the second month will be done to assess whether there is conversion to negativity. If the bacteriology then is still positive, a further sputum examination after the third month is indicated. Prolongation of the treatment duration has been recommended by some authorities in case the sputum shows slow bacteriological conversion and cavitory disease is present [7].

Treatment defaulters will be approached by the health nurses through various

means, including telephone calls, visits, and mail. Adherence is positively enhanced through health education and an assisting approach. The underlying reasons for defaulting should be identified and possible solutions are provided to restore adherence. Through the work of the medical social workers, incentives like nutrition allowance or other forms of social assistance may be introduced for eligible patients to enhance treatment adherence. Minimizing non-adherence is vital for the overall success of the TB control programme.

At the end of six months' treatment, the patient is assessed with a repeat chest radiograph and sputum examination. After stopping treatment, further health education is delivered to the patient on issues like maintenance of a healthy lifestyle, and returning for assessment should symptoms suspicious of TB recur. Relapse of TB should be uncommon after adequate chemotherapy and regular follow up is not a necessity in general. However, for the purposes of outcome evaluation, TB patients are followed up in the chest clinics periodically for two or more years. In fact, standardized "Programme Forms" are being used for continuous evaluation of the service programme in the TB&CS since 1998 and an updated version of the Forms has been introduced since 2001 and extended for use to other health care sectors including the Hospital Authority and the private sector. Data collected include information on demography, past history of treatment, type of TB (pulmonary or extrapulmonary), extent of disease (if pulmonary), case category (new, relapse, treatment after default and treatment after failure), date of starting treatment (DOS), bacteriological status at certain time points, drug susceptibility test results, and treatment outcome at selected time intervals from DOS. Monitoring of treatment outcome is an essential component of the Directly Observed Treatment-Short Course Programme (DOTS) advocated by the WHO.

Complicating issues

From time to time, complicating issues may be present, including extensive disease, slow bacteriological conversion, poor general condition, diagnostic dilemma, treatment failure related to poor adherence and drug resistance, concurrent medical diseases, and adverse drug reactions etc. Opinion from experienced physicians in this field has to be sought and hospital admission may be required. Modification of the drug regimen may be necessary, for example, in cases with drug-induced hepatitis [5]. Transient rise of liver enzymes may occur, and it does not, by itself, represent genuine hepatotoxicity. The following cut-off levels are recommended for withholding potentially hepatotoxic anti-TB drugs in patients without symptoms: (i) alanine transaminase rising to three times the upper limit of normal or the baseline; or (ii) bilirubin

level rising to two times the upper limit of normal or the baseline. A more cautious approach should be adopted in the presence of symptoms suggestive of hepatitis, in which case anti-TB drugs may have to be stopped before the availability of the test results.

Care should also be taken not to add a single drug to a failing regimen (the addition phenomenon), otherwise resistance to the newly added drug will soon develop. Desensitization may be required with drug-induced hypersensitivity skin rash, but care should be taken not to induce emergence of drug-resistant organisms during this process. TB in children is more difficult to diagnose, and treatment with ethambutol should be avoided especially for those under six years old as they may not be able to report visual symptoms reliably. Thus, childhood TB should be managed by an experienced physician. On the other hand, TB in the elderly may have atypical presentations, and there is a higher incidence of side effects from drugs among this population.

The American Thoracic Society, Centres for Disease Control and Prevention and Infectious Diseases Society of America have recently issued a joint official statement on the treatment of tuberculosis [7]. The interested reader may also refer to it for further information.

CONCLUSION

The most important reason for failure of anti-tuberculous treatment is poor adherence. Studies have shown that there is no good way to predict adherence to drug therapy. DOT is thus the best available tool to ensure drug adherence. The cost of DOT is justified because it avoids the greater cost required for the management of failure cases, relapse cases, complications, late effects and even worse, drug-resistant cases. Furthermore, without an effective treatment programme, the spread of TB would lead to an even higher healthcare and economic burden. The management of a case of TB demands the combination of good professional knowledge in clinical medicine as well as adequate attention on public health measures.

Although the local TB situation has much improved in the past 50 years, it is certainly still a major public health concern. In fact, the notification rate has remained relatively stagnant, staying at around 100 per 100,000, in the past decade. The maintenance of a strong infrastructure for the delivery of anti-TB service is required to combat and prevent the resurgence of this disease. The rate of latent infection in the local population is still high, especially among senior citizens. Many more years of work will be required before any sign of elimination of the disease will come to light.

REFERENCES

1. Leung CC, Tam CM. Guidance notes for notification of tuberculosis. *Public Health & Epidemiology Bulletin* 1999;8(4):36-9.
2. Website on "Tuberculosis in Hong Kong". <http://www.info.gov.hk/tb_chest>
3. The Tuberculosis Control Coordinating Committee of the Hong Kong Department of Health and the Tuberculosis Subcommittee of the Coordinating Committee in Internal Medicine of the Hospital Authority, Hong Kong. Chemotherapy of tuberculosis in Hong Kong: a consensus statement. *Hong Kong Med J* 1998;4:315-20.
4. The Tuberculosis Control Coordinating Committee of the Hong Kong Department of Health and the Tuberculosis Subcommittee of the Coordinating Committee in Internal Medicine of the Hospital Authority, Hong Kong. Chemotherapy of tuberculosis in Hong Kong – update in 2001: a consensus statement. *Annual Report of TB & Chest Service of Hong Kong Department of Health; 2001 (Suppl)*.
5. The Tuberculosis Control Coordinating Committee of the Hong Kong Department of Health and the Tuberculosis Subcommittee of the Coordinating Committee in Internal Medicine of the Hospital Authority, Hong Kong. Monitoring for hepatotoxicity during antituberculosis treatment – general recommendations. *Annual Report of TB & Chest Service of Hong Kong Department of Health; 2002(Suppl)*.
6. Tuberculosis & Chest Service of the Hong Kong Department of Health. Preventive measures against drug-induced ocular toxicity during antituberculosis treatment – internal guidelines. *Annual Report of TB & Chest Service of Hong Kong Department of Health; 2002(Suppl)*.
7. American Thoracic Society/ Centers for Disease Control and Prevention/ Infectious Diseases Society of America: Treatment of tuberculosis. *Am J Respir Crit Care Med* 2003;167:603-62.

Table 1: Standard regimen for anti-tuberculosis treatment

Initial phase (2 months)	Isoniazid+Rifampicin+Pyrazinamide+Ethambutol/Streptomycin
Continuation phase (4 months)	Isoniazid+Rifampicin

Table 2: Usual dosages of first-line anti-tuberculosis drugs

Drug	Daily dosage			Intermittent dosage		
	Adults and Children (mg/kg)	Adults		Adults and Children (mg/kg)	Adults	
		Weight (kg)	Dose		Weight (kg)	Dose
Isoniazid ^{*@}	5	-	300 mg [#]	10-15 three times/week	-	-
Rifampicin [*]	10	<50 ≥50	450 mg 600mg	10-12 three times/week	-	600 mg
Streptomycin [*]	12-15	<50 ≥50	500-750mg 750-1000 mg	12-15	<50 ≥50	500-750mg 750-1000 mg
Pyrazinamide	25-30	<50 ≥50	1.0-1.5 g 1.5-2.0 g	30-40 three times/week	<50 ≥50	2.0 g 2.5g
Ethambutol	15	-		30 three times/week	-	-

^{*} Some authorities recommend higher dosages of isoniazid, rifampicin, and streptomycin for children.

[#] Some elderly and/or malnourished patients can only tolerate isoniazid 200 mg daily.

[@] Pyridoxine supplement should be considered for those with malnutrition or at risk of neuropathy, e.g. pregnancy, diabetes mellitus, alcoholism, chronic renal failure, and HIV infection.

(Abstracted from Annual Report 2004 of the Chest Service of the Department of Health, HKSAR)