Obstructing Tuberculosis of the Main Bronchi
A Syndrome

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During the past decade the literature has been replete with contributions to the subject of tuberculosis of the bronchi and trachea. That this condition has been recognized for the past century is well known; but early reports on its existence were either to be found in postmortem reports or, less frequently, clinically as a terminal picture. Before the advent of present day concepts of adequate collapse therapy, the average patient with well established tuberculosis presented more varied and numerous reasons for not showing more satisfactory progress than he does today. Today, however, with the usual case more or less under control, there still remain in the clinical field an appreciable number of posers, and these sometimes persist as a challenge to the clinicians. The fact that these are becoming fewer in number bespeaks the encouraging progress in general tuberculosis therapy.

During an earlier period of diagnostic procedures, bronchoscopy in the field of tuberculosis was deemed to be a somewhat heroic and precarious maneuver by almost everyone familiar with the subject; even as recently as ten years ago it did not enjoy a very wide popularity. Its present day general acceptance has clarified many previously intangible diagnostic problems in tuberculosis. In the many sanatoria where this procedure is a matter of routine, it has come to be considered a safe procedure if performed by those with experience. It has been a most valuable means of clearing up many puzzling cases diagnostically and, to a less degree, therapeutically.

The incidence, pathology, treatment, and certain other aspects of tuberculous tracheobronchitis have been reported frequently in many excellent contributions throughout the literature and need not be reviewed or enumerated in detail in this one. In spite of this fact, it must be somewhat apparent to all that our general and specific knowledge on this subject has at times seemed to be incoherent as well as only slowly progressive. The gradual assimilation of data culled from the literature as well as personal experiences has led to a few rudimentary conclusions concerning

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obstructing tuberculosis of the main bronchi which might be expressed as a syndrome.

We may reasonably assume that patients in most sanatoria are receiving optimum therapy, even though its execution may show divergent methods and opinions. Among this group there are an appreciable number who have failed to show anticipated improvement in spite of employment of accepted measures. In this institution we feel that many of these should have a thorough investigation of the lower air passages, even though the referable symptoms be indefinite. Unexplained positive sputum, persistent sibilant wheeze, unexplained fever, or sputum unduly purulent or copious in amount seem to be the most outstanding signs suggestive of tuberculosis of the bronchial tree. To this may be added a lowered vital capacity which is not commensurate with the clinical and laboratory findings. Certainly we could not reasonably fasten a diagnosis of tuberculous bronchitis on every patient who shows one or several of these signs without further investigation, but they are nevertheless valuable clues in clearing up many cases diagnostically. The signs and symptoms alone are not always too characteristic, but their sequence and course are at times more valuable. Non-obstructing tuberculous bronchitis may never be able to push its own signs and symptoms past those of the advanced pulmonary disease, in which category this complication usually occurs. Postmortem reports give us ample evidence that this bronchial complication occurs far more frequently than we are able to detect by present available methods.

Tuberculosis is universally characterized by its protean forms, and every phthisiologist is well aware of the pitfalls entailed in the didactic mapping of its course or prognosis. The particular complication of obstructing tuberculosis of the main bronchi seems, however, to present a fairly definite pattern and sequence frequently enough so that a syndrome might be fabricated therefrom. It may be in order at this time to state that only a few years ago the complication of tuberculous bronchitis was first diagnosed by the endoscopist and only later by the clinician; today this order has been frequently reversed with the result that the clinicians are able to diagnose or strongly suspect a certain number of these cases themselves. I feel that this is due not only to the recognition of the aggregate signs and symptoms of this complication but to an important degree the recognition of the general pattern which they frequently assume.

Apparently severe bronchial disease has not been met with for a sufficiently adequate period of time to permit formulation of a practical classification of its various types. Its presence may be accounted for by the eruption or erosion of peribronchial glands.
and by direct implantation; it is most likely that direct implantation is the more prevalent. In those few cases of severe bronchial tuberculosis occurring in patients with clear, or relatively clear, lung fields, the glandular etiology is probably dominant. Any passageway in the human body which is acutely or chronically obstructed, from whatever cause, will have certain findings in common. Primarily, there is a disturbance of the physiology with the result that the substance which normally passed through becomes blocked and distal or proximal pathology occurs; secondly, the local disturbance is reflected as a generalized condition. This pattern is a well known entity in cases of urethral, intestinal, bile-duct, or lymphatic obstruction. That the fundamental principles which apply to the above could be applied to obstruction of the bronchi seems to be a reasonable assumption. The outline of the following syndrome has nothing to do with other types of tuberculosis of the smaller bronchi or non-obstructing tuberculosis of the larger ones.

SYNDROME

Prodromal Stage: Since tuberculosis of the bronchi and trachea occurs most frequently in the advanced stages of parenchymal pathology, its early presence may be concealed by one or more signs or symptoms of the attendant pulmonary disease. Should the subjective and objective chest findings show any sustained disparity, we should always consider tuberculosis of the bronchi as the predominant possibility. The absence of positive sputum need not rule out tuberculosis of the air passages any more than it should rule out the presence of pulmonary disease. During the very early stages of bronchial tuberculosis, failure to recognize its presence is not a reflection on the clinician.

Early Closure: As in other passageways of the body, the diameter of the normal airways is more than adequate. It is only when the decrease in size impinges on physiological needs that signs and symptoms first present themselves. The early closure is often accompanied by a persistent wheeze or other sibilant sounds more easily recognized than described. Suffice it to say that there is no one characteristic sound or tone which may be described as typical of this condition; its persistence, however, is of considerable import. Since the opening is becoming smaller than adequate, there will be slightly more difficulty in expelling the secretions; this situation is more pronounced when there is a collapse on the homolateral side. There may also be a variable amount of exudate present at the site of the lesion itself which may further burden the ability of the secretions to be expelled; if these be thick and stringy, they may contribute to the development of rhonchi. Early
closure may be largely due to the presence of edema; this may be relieved for a while by vasoconstrictive cough mixtures only to return following their withdrawal. Too much emphasis cannot be placed on the persistence of the early signs and symptoms in the diagnosis of this particular complication.

Granulation Formation (Soft obstruction): The formation of early granulations is rather rapid. They may be both fragile and friable and produce slight streaking. If the symptom of wheezing is present, it now may become more harsh and irregular in tone. The orifice, of course, becomes smaller at this time, and the symptoms progress. Should the diagnosis be made at this stage, the granulations may be periodically removed for better drainage of distal pulmonary disease. The secretions, however, can be expelled relatively easily past the soft granulations, and no temperature elevation may be noted. As long as the bronchial and pulmonary lesions are draining well there may be no elevation of temperature, even though either or both be extensive. I have felt that this stage represents the point after which local therapy in the form of chemical cautery is of little value.

Granulation-Edema: The granulation tissue in the air passage-way is present but a short time when it invariably acts as a foreign body. This may produce an irritative cough or may exaggerate one which is already present. This foreign tissue also elicits a response locally in the form of edema. Thus, the obstruction becomes harder and more pronounced. At this stage the secretions are more difficult to expel, and some slight and rather uniform increase in temperature is to be expected. If a wheeze or rhonchi have been present up to this time, they may disappear. Clinical examination of the homolateral lung may at this time bear out the presence of early trapped secretions. Since the entire bronchial tree distal to the obstruction is to some extent bathed in these trapped secretions, we may note a variable amount of bronchogenic spread. Since the air exchange at this time is considerably altered, early atelectasis may also be noted. A lung which has rather extensive disease seems to be able to avoid bronchogenic spread and atelectasis somewhat better than one which is only slightly involved. This paradox is not easily explained other than by postulating that the former has developed more local immunity. A number of cases in this institution have shown this phenomenon.

The accepted requirements for bronchiectasis are gradually being fulfilled up to this stage; and if we were able to map out the entire bronchial tree, we could establish its early presence.

Induration (Hard obstruction): Tuberculosis of the soft tissues is characterized to some extent by the formation of fibrosis, if the disease is not too rapidly progressive. This tissue response
creates an exaggeration of the signs and symptoms as outlined for soft obstruction. Unfortunately many cases of bronchial tuberculosis are not discovered until this stage presents itself. The signs and symptoms now for the first time become clear-cut and the prognosis more unfavorable. The trapped secretions induce generalized toxic manifestations as evidenced by increased malaise and a moderately sustained temperature elevation. The patient may from time to time expel a copious amount of purulent material which is followed by a subsequent fall in temperature and apparent improvement in general well-being. This temporary situation disappears and the same pattern repeats itself, so that a careful temperature line may show many subsequent episodes of toxic elevations with short periods of regression.

The distal secretions may be seen bronchoscopically to be forced through the bronchial opening under pressure. This pressure, of course, exerts itself not only toward the bronchial opening but in all directions. Should this pressure persist for more than a few weeks, the lung tissue becomes irreparably damaged and will be of no practical physiological value to the patient. The roentgenograms do not always show the true picture of profound parenchymal damage which follows extensive bronchial obstruction.

Resolution: If the patient has survived the above stages, there now occurs a period during which the obstruction will subside to some degree. During the fulminating phase of obstructing bronchial disease, the submucosal tissues will have become involved extensively. The cartilaginous structures will either have become absorbed or partially destroyed by infection. These and other underlying structures will have become displaced by scar tissue. Cartilage has a poor blood supply and consequently a minimum of resistance; it does not regenerate and will not unite, once its continuity has been disrupted, except by fibrosis. During the period of resolution, the bronchial opening is either circumscribed by hard or soft scar tissue, and the opening becomes more or less patent.

Under the heading of therapy the literature mentions the advisability and feasibility of dilatation of stenosis of the main bronchi. Whether or not this can be satisfactorily accomplished remains a somewhat mooted question. If it can be done, its only practical application lies in draining the affected and useless lung and not in supplying air to a lung which is unable to utilize it. Since most patients with extensive parenchymal destruction have bacilli laden spuota, there are but few cases eligible for this procedure as the danger of perforating the delicate tissues is obviously great.
COMMENT AND SUMMARY

Patients who have had obstructing tuberculosis of the main bronchi are permanent pulmonary cripples. The pattern leading up to this status has been outlined as a syndrome. This condition and sequence undoubtedly occur in the smaller divisions of the bronchial tree. Since the parenchymal pathological changes occurring in these elicit a much smaller response, evidence of its presence may be blanketed by manifestations of already existing pulmonary disease. It is impossible for the very smallest branches to avoid involvement even in minimal tuberculosis. It would appear that the more proximal it becomes the more important and dangerous it becomes.

Obstructing tuberculosis of the main bronchi carries with it a very unfavorable prognosis in spite of whatever favorable clinical and laboratory findings may be present. Should the patient survive the above outlined sequence of events, the expected outlook for local or general recovery is indeed unfavorable. There are those who have seemed to belie this fact by surviving beyond their anticipated expectancy, but these are of the smallest percentage.

COMENTARIO Y RESUMEN

Los enfermos que han sufrido de tuberculosis obstructiva de los grandes bronquios son inválidos pulmonares permanentes. Se ha bosquejado el síndrome que conduce a este estado. Es indudable que esta condición y sus consecuencias ocurren en las divisiones menores del árbol bronquial. Como quiera que las alteraciones patológicas parenquimatosas que ocurren en estos casos producen reacciones mucho menores, la prueba de su presencia puede estar oscurecida por las manifestaciones de la neumopatía pre-existente. Es imposible que las más pequeñas ramificaciones puedan evitar la invasión aún en tuberculosis mínima. Parecería que la afección se vuelve más importante y peligrosa mientras más grandes son los bronquios hasta donde haya llegado la invasión.

La tuberculosis obstructiva de los grandes bronquios acarrea un pronóstico muy desfavorable a pesar de los hallazgos clínicos y de laboratorio favorables que puedan existir. Aún si el enfermo sobrevive a la serie de acontecimientos aquí bosquejados, las perspectivas de que tenga lugar la reposición local o general son muy escasas. Hay algunos enfermos que parecen desmentir este hecho pues sobreviven más allá de la expectativa anticipada, pero estos forman parte de una minoría muy pequeña.