Diabetes Mellitus and Tuberculosis

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The fact that patients with diabetes mellitus easily acquire pulmonary tuberculosis is still true, despite the institution of insulin therapy.

Of the wide variety of infectious diseases that the diabetic patient must guard against, the most serious is tuberculosis. According to some statistics, pulmonary tuberculosis ranks second only to coma as a complication of diabetes. It has been found also that pulmonary tuberculosis frequently occurs in diabetic patients following hyperglycemic coma. Of 748 diabetic patients seen at Bellevue Hospital by Ralli and Steinberg, 1 33 had active pulmonary tuberculosis, and in 29 of these the diabetes had preceded the tuberculosis. Himsworth 2 found 15 cases (6.5 per cent) of pulmonary tuberculosis in 230 consecutive diabetic patients seen by him. In 13 of these the diagnosis was made by x-ray examination. From this he concluded that every diabetic patient should have a routine x-ray examination of his chest when first seen by his physician.

It is believed by most observers that the reason for the diabetic patient’s increased susceptibility to infectious diseases is his lowered resistance. Steinback, Klein and Deskowitz, 3 in 1935, showed that following experimental removal of the pancreas, dogs lost their natural resistance to tuberculosis. For this reason it is felt that in the presence of diabetes, pulmonary tuberculosis shows special features. The exudative type of pulmonary tuberculosis is usually common in tuberculous diabetic patients. The lesions, pathologically, are large and confluent, and are infiltrations which tend to liquify extensively. This type of lesion is of uniformly bad prognostic import. The tuberculosis increases the severity of the diabetes and makes the latter disease more difficult to control. It was formerly thought that tuberculosis caused the death of no less than 40 to 50 per cent of diabetics, but extensive autopsy statistics have modified this figure to approximately 25 per cent.

Because of the liability of patients having a severe diabetes to develop tuberculosis, this complication should be kept in mind always. The possibility of this complication having occurred always should arouse the suspicion of the physician, when, for no obvious reason, a previously controlled diabetic patient requires larger doses of insulin, or begins to lose weight and fail in general health. This danger is present particularly in patients who have had diabetic coma, and also in diabetic children. All of these cases should be examined at regular intervals for the specific purpose of excluding tuberculosis. This should include a careful physical examination of the individual, with specific reference to the chest, an x-ray examination of the chest, and careful observation of the sputum for acid fast bacilli. With early diagnosis of the tuberculosis and efficient treatment of the diabetes, there is no reason to believe that diabetes will have any adverse effect on the tuberculous process.

Before the advent of insulin, only the mildest cases of diabetes complicated by tuberculosis offered any hope; but since the discovery of insulin we now can give the diabetic tuberculous patient the liberal diet which he requires. Such a diet may be very high in protein, carbohydrate, and fat, in the quantities and proportions that will maintain the best vigor, weight and resistance. The diet must be high in calories, often as much as 3500. The protein content of the diet may average between 70 to 90 grams. The carbohydrate factor can be as high as desired to get the best result, sometimes 300 to 400 grams being given without difficulty. The rest of the diet, of course, may be made up in fats. The diet may be given in more frequent feedings, dividing the total into five or six parts. Thus the patient can be given a higher calorie intake. The insulin should be given in whatever dosage may be required to keep the blood sugar as nearly normal as possible during the twenty-four hours. Sometimes it is necessary to use as much as 100 to 150 u. per day, and often it is more practical to divide this amount so that it can

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be given more frequently, say three to four times a day. Such a dosage is necessary in treating very ill patients, where only small amounts of food are taken frequently, and whose diabetic status is best evaluated by daily or hourly blood sugar determinations. In treating relatively normal individuals whose dietary intake is stable from day to day, the use of a daily morning dose of protamine insulin has been found most satisfactory.

The treatment of the tuberculous patient having diabetes should be the same as that of any non-diabetic tuberculous patient. Of course, bed rest is highly important and these individuals should be placed in a sanatorium if at all possible. This will afford better control of the tuberculosis and the diabetes, both from the standpoint of the patient and that of the physician. All forms of mechanical control of the tuberculosis can and should be used to their fullest extent. The institution of pneumothorax should be done when possible, and should afford no difficulties in the controlled diabetic. Crushing or section of the phrenic nerve can be done when necessary. These patients have been subjected even to thoracoplasty without detrimental results.

Except in extreme cases, it is not difficult to maintain a normal blood sugar level. Also, as tuberculosis improves clinically, less rigorous therapy of the diabetes is required, and must be modified in anticipation of hypoglycemic shock. For this reason, the internist and phthisiologist must cooperate closely in the management of tuberculous diabetics. Thus, under proper treatment, the prognosis is just as good in the cases having tuberculosis and diabetes, as it would be if the diseases were not associated.

Case 1—W. I., colored male, aged 24, was followed in the Diabetic Clinic at Cincinnati General Hospital for two years before entering the Hamilton County Tuberculosis Hospital. He was first seen there on October 6, 1937, in diabetic coma and with a blood sugar of 422 mg. per cent and CO₂ combining power of 19 vol. per cent. The existence of diabetes was not previously known. He was admitted to the Cincinnati General Hospital, the diabetes was regulated, and he was discharged to be followed in the clinic. Regulation was not very well carried out at home for financial reasons. On May 16, 1939, he was again admitted to the Cincinnati General Hospital in impending diabetic coma. At that admission, X-rays of his chest were made because of the history of fatigue, twenty pounds weight loss, weakness, pleuritic pain, cough, and hemoptysis, all within the previous two and one-half months. X-rays disclosed pneumonic infiltrate, especially in the left lung with thickened pleura on the right side. The sputum was positive for acid fast organisms. The diabetes was again regulated with diet and insulin, and the patient was referred to the Hamilton County Tuberculosis Hospital on July 11, 1939.

The patient’s tuberculous contact was with his mother, who died in this hospital in January, 1939, seven months before his admission here. The past history and marital history were non-contributory.

Course—On admission, the patient’s diabetes was apparently under control, and remained so on a diet of C 240, P 100, F 120, plus 145 units of insulin daily. The blood sugar was below 175 mg. per cent except on three occasions. The x-ray diagnosis here was active, far advanced pulmonary tuberculosis, “pneumonic” type. Cavities were present in both upper lobes, with solid exudate in the lower lobes. The prognosis on the basis of the x-ray findings was considered grave. The patient developed a tuberculous laryngitis two months after admission. His downhill course was very rapid, and he expired on the 75th hospital day.

Case 2—E. W., colored female, aged 23, was admitted to the Cincinnati General Hospital on six occasions in diabetic coma before entering the Hamilton County Tuberculosis Hospital. She had been a known diabetic since September, 1936. On December 31, 1938, she was admitted to the Cincinnati General Hospital because of symptoms of fatigue, dyspnea, cough, and pain in the left chest. These symptoms began five months previously. She noted a 20-pound weight loss during that period. Because of persistent fever, chest x-rays were taken in December, 1938, and a diagnosis of possible tuberculosis was made. The sputum was not found positive until January 9, 1939. She was transferred to the Hamilton County Tuberculosis Hospital on February 18, 1939. Her diabetes was not controlled.

The family history was non-contributory.
The tuberculous contact was probably with a neighbor. The marital history was non-essential. In her past history it was noted that she had a long-standing P. I. D. with a subsequent arthritis, probably related.

Course—On admission here, the sputum was positive for acid fast organisms.

The diagnosis made on the admission x-ray was: "Pulmonary tuberculosis, far advanced, active, probably basal type, complicated by cavities, thickened pleura, and caseous broncho-pneumonia." The blood sugar on admission was 236 mg. per cent, and there was persistent glycosuria. She was put on a diet of P 85, F 110, C 220, and insulin units 45 daily. The insulin was gradually increased to 72 units daily before her diabetes was controlled, four months after admission. The pulmonary lesions showed extension with each routine x-ray, in spite of phrenemphraxis, done on February 23, 1939, on the left side. Pneumothorax treatment had been attempted on the left side but was unsuccessful. The course was further complicated by an acute otitis media, developing two and one-half months after admission. Her diabetes was completely uncontrolled for one month before her death, which occurred on the 276th hospital day.

Case 3—M. H., white female, aged 52, was admitted to the Hamilton County Tuberculosis Hospital on February 9, 1937, complaining of a cough of about two months duration. The onset was sudden, with generalized aching, fever, and occasional night sweats. She had no hemoptysis, dyspnea, or chest pain. The cough was productive of tenacious, yellow sputum. She lost about 30 pounds in weight during the two months illness. She had noticed increasing fatigue for five years. Two weeks before coming to this hospital, she was sent by her physician to The Christ Hospital. X-rays taken there showed lesions in the right lung, and a diagnosis of diabetes was also made. She had had no symptoms of this latter condition, nor was she previously aware of its existence.

The family, marital, and past histories were non-contributory. The tuberculous contact was probably with a fellow office worker at her place of employment.

On admission to the Hamilton County Tuberculosis Hospital, x-rays disclosed lesions, probably pneumatic, in the first and second interspace trunks of the right upper lobe, and in the apex of the right lower lobe. The diagnosis of tuberculosis was confirmed by a positive sputum. The blood sugar on admission was 247 mg. per cent with four plus urine sugar.

Course—Pneumothorax was started on the right side on February 22, 1937, and continued until May 30, 1938 (15 months). The sputum became negative as a result of the pneumothorax treatments, and remained so for two years, except on three examinations. For the first six months following the institution of pneumothorax treatment, the diabetes was well controlled. She developed a hydropneumothorax in June, 1937, and two months later her diabetes became worse. A diagnosis of empyema was made in July, 1939, and treatment with gomenol was instituted. With improvement of the empyema, the diabetes was again brought under control. She developed a broncho-pleural fistula, however, in October, 1939, so gomenol therapy was discontinued. Her tuberculous condition remained stationary with the diabetes under control until March, 1940, when, after re-expansion of her right lung, the pre-existing cavity reopened. Simultaneously, she began showing glycosuria. She was then prepared for thoracoplasty on the right side, this being done in three stages, from May 21 to July 19, 1940. The sputum became negative the next month and has continued so since then. The diabetes is now practically controlled with a diet of P 94, F 121, C 190, and crystalline insulin of about 30 units daily. She has been discharged from this hospital.

Conclusions

1) Pulmonary tuberculosis occurs two to three times as often in individuals with diabetes mellitus as it does in the general population, and the combination appears to be on the increase.

2) When the two diseases co-exist, the diabetes usually precedes the tuberculosis.

3) The exudative type of tuberculosis is usually common in the tuberculous diabetic.

4) Tuberculosis increases the severity of the diabetes and makes the latter disease more difficult to control.

5) Pulmonary tuberculosis frequently occurs in diabetic patients after coma.

6) Because of the susceptibility of the dia-
abetic patients to tuberculosis, all persons having diabetes should be given an x-ray examination of the chest and frequent physical examinations of their lungs.

7) Tuberculous diabetic patients can safely be given insulin, and their diets should be given to the point of tolerance.

8) Well controlled tuberculous diabetic patients can withstand all forms of mechanical collapse therapy.

References


Staphylococcus Empyema Sterilized With Sodium Sulfathiazole

Case Reports

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Both the grave prognosis associated with mixed infection tuberculous empyema and the prolonged treatment technique now employed have in two cases of staphylococcus empyema been greatly modified to the favorable side by the use of a sodium salt of sulfathiazole currently being used for intravenous medication.

Case I

White, male, age thirty-nine, gardener who gave a history of onset of his pulmonary tuberculosis twenty-six months previous to admission. He had received several months' sanatorium treatment, was classified as moderately advanced (A) reinfection type; and a left side artificial pneumothorax started on admission had been continued by private physicians. Early in the course of the pneumothorax spontaneous collapse occurred followed by mild temporary symptoms. Subsequently thoracoscopy was done. Five weeks previous to admission to this sanatorium pleural effusion developed in the pneumothorax space accompanied by all clinical signs of acute nontuberculous empyema. Two weeks later a pleurocutaneous fistula with considerable surrounding cellulitis developed at the fourth anterior interspace.

On our first observation the patient was emaciated, severely ill, unable to be out of bed. The fever was 102.2° F., pulse 118, respiations 25. Physical examination and chest x-ray revealed a fifty per cent left side artificial pneumothorax with extensive pleumopulmonary adhesions and pleural effusion filling one-half the space. The right lung was normal. The pleurocutaneous fistula discharged an odorous pus and the surrounding zone showed a localized cellulitis. Other tuberculous complications did not exist.

The sputum amounted to 4 cc. in twenty-four hours, was mucopurulent and positive on plain smear for tubercle bacilli. Erythrocyte sedimentation rate, 30 mm. in one hour; red cells, 2,980,000; hemoglobin, 55 per cent; white cells, 18,000 with a moderate neutrophilia. Nephritis did not exist. Gentian violet instilled into the left pleural space was discharged through the pleurocutaneous fistula and not raised with the sputum. Pneumothorax pressures indicated that spontaneous pneumothorax did not exist. Bacteriological examination of the aspirated pus revealed staphylococcus aureus and tubercle bacilli.

Treatment—Complete aspiration of all pus and instillation of Azo-T (azochloramide 1:2000 and Sod. Tetradecyl sulphate 1:800) according to the technique of Palitz and Herman1 was done for eight weeks. General improvement was prompt and excellent. The pleurocutaneous fistula healed, the fever re-

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