showed bicuspid aortic valves with calcified vegetations. Postmortem cultures were negative.

The photographs demonstrate the gross postmortem appearance of the hearts of three patients, as examples of completely healed vegetations and ulcerations of the endocardium.

We attach significance to the observation that patients who clinically were typical cases of subacute bacterial endocarditis showed in the hearts healed ulcerative lesions with calcified vegetations, in addition to fresh vegetative processes. We also feel that it is important that hearts were observed with healed ulcerative lesions of the valves and fused aortic cusps from patients who gave no history or clinical evidence of subacute bacterial endocarditis.

These clinical and pathologic observations, together with the findings of Libman and those of Lewis and Grant, support our belief that the manifestations of subacute bacterial endocarditis may be quite variable. The patient may show a severe septicemia with generalized toxic and embolic manifestations, or may have complete absence of symptoms and signs with pathologic evidence of complete healing. It is probable that the well recognized form of the disease with toxic and embolic manifestations represents only one group of patients suffering from the disease. This form may result either from an overwhelming invasion of *Streptococcus viridans*, or may be the end picture of a chronicity of years duration. The clinical course of the patients and the specimens examined suggest that subacute bacterial endocarditis may be of a chronic nature with a continuous and variable attempt at healing by the body. These observations indicate that chronic valvular disease may result from healing or healed bacterial endocarditis, and that the prognosis in this disease may vary greatly with the patient. The diagnosis of mild cases of subacute bacterial endocarditis may be very difficult. Whenever a patient with chronic valvular disease of unknown etiology shows sudden circulatory failure without obvious cause, subacute bacterial endocarditis should be suspected and repeated efforts made to confirm this suspicion by bacteriological studies.

KETOGENIC DIET IN THE TREATMENT OF EPILEPSY

BY WILLIAM G. LENNOX, M.D.*

ONE who is confronted with the task of controlling seizures in a person with epilepsy grasps at any straw. When, some six or eight years ago, an osteopathic practitioner in Michigan stated that fasting would cure epilepsy, this seemed like a very frail straw. Dr. Geyelin, at the Presbyterian Hospital in New York, took up the matter, however, and found that in many patients there was freedom from seizures during fast. Others have since confirmed this observation. Geyelin suggested that the beneficial effect might be from the acidosis which is present during fasting and that more satisfactory results might be obtained from the use of a high fat, low carbohydrate diet. Various workers have corroborated the truth of this suggestion. There are various interesting questions which these observations raise, some of which we feel can be answered.

Is the beneficial effect due to correction of an underlying abnormality of acid-base equilibrium in epileptics? We believe that this is not the case, but that the salutary effect of acidosis is due to a decrease in the irritability of the nerves. Acidosis relieves conditions other than epilepsy, such as muscular cramp, hiccough or tetany. Furthermore, the blood of patients with epilepsy shows the normal degree of alkalinity.

Is the beneficial effect of ketosis due to the acidosis or to a specific sedative effect of acetoacetic acid, which is related to ether? We believe that acidosis is the significant factor. This is based on the fact that seizures may be reduced also by other methods of inducing acidosis; viz., the ingestion of acid or acid-forming salts or by breathing a mixture high in CO_2. Patients who are on a ketogenic diet, if given bicarbonate, will show an increase in the ketone bodies with, oftentimes, a coincident increase in seizures. Besides the administration of bicarbonate, overventilation may induce seizures.

A third question is whether ketogenic diet is effective only in patients with so-called essential epilepsy. If what we have said concerning the first question is true, we would expect that patients subject to convulsions from a definite cause, such as a brain lesion, would be improved as well as those who show no evidence of abnormality, the so-called idiopathic epileptics. In our experience, patients with traumatic epilepsy may be helped by induction of acidosis.

Again one may ask, what degree of ketosis is needed to prevent seizures? This depends upon the severity of the case. In mild cases, the presence of a positive ferric chloride or sodium nitroprusside test in the urine may be sufficient. In severe cases, a change in the *p*H of the blood may be necessary. The comparatively good results obtained in children are partially due to the fact that ketosis is more readily maintained in children than in adults.

These various statements may be illustrated in two patients whom we now have under treatment. The first is a girl of 13 years, who, for the last 4 years, has been having 10 to 15 attacks of petit mal daily. She has never had a convulsion. These attacks are not observable to an onlooker. They are the type termed pyknolepsy and are not influenced by luminal or bromide. With six days of fasting the spells disappeared. Follow-

*For record and address of author see "This Week's Issue," page 102.

ing this she was placed on a high fat diet with a constant ketogenic, anti-ketogenic ratio. On this diet she had a strong sodium nitro-prusside test in the urine, a normal blood CO_2 content and 5 to 10 spells daily. With ingestion of ammonium chloride, the spells disappeared entirely. They recurred when the patient was given bicarbonate and disappeared again when she was given ammonium nitrate. A typical spell can be induced in this child with about two minutes over-ventilation.

The second patient illustrates an entirely different condition. He is an intelligent boy of seven years, the first born. His mother had a prolonged and difficult labor and the child had three convulsions when three days old. In the intervening years he has had seizures only periodically. During the last five months he has had increasing seizures so that for several weeks previous to his entrance he was having from three to six a day. In some of these attacks he simply fell headlong without convulsive movements. In others he did not fall, but his right arm jerked and was paralyzed for a few minutes after the attack. Following lumbar puncture and drainage of the spinal canal, these Jacksonian-like attacks did not occur for several weeks. In this child there would seem to be definite evidence of intracranial damage at birth with present pathology over the right arm area of the cortex, perhaps an area of arachnoiditis and cyst formation. On a high fat diet this patient lost his seizures and has had none for the past week. The curious feature of his ketosis is that, although there is a strong sodium nitro-prusside reaction in urine and blood, the concentration of bicarbonate in plasma is normal and his urine is strongly alkaline.

These cases demonstrate that, in young persons, the induction of acidosis, by means of fat diet, supplemented, if need be, by ingestion of acid-forming salts, is effective, temporarily at least in inhibiting epileptic seizures.

Demonstration of Thyroid Cases. Cases presented and discussed by Dr. Robert Cochrane.

The Problem of a Patient in whom an Instrumental Delivery Has Been Attempted without Success. Case discussed by Dr. Frederick J. Lynch.

Use of X-ray as an Aid in Obstetric Diagnosis. Cases presented and discussed by Drs. Nathaniel R. Mason and Pierce J. Dunphy.

Case of Perinephritic Abscess (Left) and Nephrotomy (Right) for Drainage of Blocked Ureter. Case presented and discussed by Dr. Augustus Riley.

Pain in Back for Ten Years. Case presented and discussed by Dr. Thomas K. Richards.

At the Staff Clinical Meeting held January 28, 1928, papers were read as follows:

Bullet Wound of Abdomen with Septicemia. Case presented and discussed by Dr. Edward Harding.

Compound Fracture of Left Ankle with Amputation, Compound Fracture of Left Patella Into Knee Joint, Fracture of Neck of Left Femur, Compound Fracture of Both Bones of Left Forearm, Shock, and Gas Bacillus Infection in One Patient. Case presented and discussed by Dr. J. J. Hepburn.

Chronic Lymphatic Leukemia with Changing Blood Picture. Case presented and discussed by Dr. E. N. Libby. Further discussion by Drs. R. C. Larrabee and F. W. O'Brien.

Undescended Testicle. Cases presented and discussed by Dr. Halsey B. Loder.

Carcinoma of Rectum in Young Adult. Case presented and discussed by Dr. I. J. Walker.

Chronic Osteomyelitis. Fistula in Ano. Cases presented and discussed by Dr. T. W. Wickham.

Tuberculosis of the Spine Simulating Duodenal Ulcer. Case presented and discussed by Dr. R. G. Larrabee. Further discussion by Drs. F. J. Cotton and I. J. Walker.

Case of Aortic Aneurysm in which Circulation Is Maintained in Spite of Absence of Pulse in the Brachial Arteries. Cases Illustrating the Differential Diagnosis of Ascites. Cases presented and discussed by Dr. F. W. Palfrey.