by the exhibition of Lead IV. In this case, the electrocardiographic tracing will show some abnormality, as described above.

There are, however, other changes which may occur in the electrocardiogram when the ventricular muscle has been affected by coronary changes. The following are some of the more typical changes, any, or groups of which, may of course be present in one particular tracing.

I. There may be a notching or slurring of the QRS complex.

II. There may be a prolonged duration of the QRS complex, i.e. it may be spread out over a period longer than 0.1 second.

III. The voltage of the QRS may be less than 0.5 millivolt.

IV. The T wave may be inverted, that is, it may turn downwards in Leads I or II, or both. An inverted T wave in Lead III usually has no pathological importance unless accompanied by inversion in I or II of the other leads. There is one exception to this rule, however, and that is in the later stages of a T_3 type of coronary thrombosis. In this type of coronary thrombosis there will be a large inverted T in Lead III, with a large, upright T in Lead I. The differentiation is made upon the history, upon previous electrocardiographic findings, and by noting the increased amplitude of these T waves.

V. Another change that may occur in the T wave is that the voltage may be less than 1 millivolt.

VI. The ST interval may arise from the proper level, but the graph may pass to the peak of the T wave by an abnormal course, leading to a deformity of the T wave.

VII. The ST segment may be abnormally elevated above, or depressed below the isoelectric line.

These, then, are some of the changes which may be present on the electrocardiogram taken from a heart which is the seat of coronary disease.

We have made no attempt to deal with the subject of electrocardiography in its entirety, but we have tried to point the way.

Clinical Page

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Case 1.—A CASE OF ENDOCARDITIS LENTA WITH INCONSPICUOUS SYMPTOMS

The following case illustrates how the existence and progress of a subacute infective endocarditis may sometimes be masked by conditions more common but less serious.

CASE NOTE

History: A housewife aged 37 was admitted to hospital for investigation in August, 1942. She complained of increasingly severe lassitude, breathlessness upon exertion, insomnia, giddiness, night-sweats and amenorrhoea for the past year, with loss of appetite and of weight. Twelve years previously she had had rheumatic fever, since when she had been liable to frequent rheumatism in the wrists and ankles. Her three confinements were uneventful, the last one being in 1936. The financial position of her family being extremely poor, the patient's diet for the past few years had been irregular and inadequate, consisting largely in milk, tea and fruit, with very little bread and potatoes, and no meat, bacon, cheese or vegetables.

Clinical findings: A pale, small, wasted and tired-looking woman with flushed face, toxic skin, and a dry furred tongue. Temperature 99 degrees, pulse 100. Respiration rate 20, B.P. 100/60, weight 5 stone 4 lbs. The mouth showed gross dental sepsis with spongy gums, which bled on examination and were incompletely healed at the sites of recent dental extractions. The buccal mucous membrane showed scattered patches of thrush. The chest wall showed signs of previous rickets, but no clinical abnormality was found in the respiratory system, apart from slight but definite finger-clubbing. The heart showed an established mitral stenosis with no evidence of cardiac enlargement or failure. Abdominal examination revealed marked tenderness in both renal angles, but no other abnormality. Pelvic examination was negative as was that of the central nervous system.

Investigations:

1. *Blood count:* Hb = 52 % Red cells: Aniso-poikilocytosis.
 RBC = 3,740,000 p.c.mm. Polymorphs 80.5 %.
 CI = 0.7 Lymphocytes, 18.5 %.
 WBC = 9,250 p.c.mm. *Blood culture* sterile after one week's incubation.
2. *Urine:* Acid reaction. A catheter specimen showed a trace of albumin, and a deposit of red and white cells and numerous organisms. Culture yielded a heavy growth of *Bacillus Coli*. Further specimens showed an occasional hyaline and granular cast.
3. *Oral Swab:* *Monilia Albicans*, grown on Sabourand's medium.
4. *Chest X-ray:* No active disease in the lungs. Heart shadow compatible with mitral stenosis of moderate degree.
5. *Renal X-ray:* No abnormality seen in plain film or intravenous urogram.

Treatment: This was directed towards the severe nutritional anaemia and the urinary infection present. The patient was given a diet as liberal as she would take, with supplemental Vitamins A, B, C and D, and ferrous sulphate 12 grains daily. A transfusion of one pint of fresh blood was given on admission. After alkali therapy for one week, sulphapyridine was administered as a urinary antiseptic, four courses of 10 grams of the drug being necessary to render the urine sterile. (Total dosage—40 grams over 21 days; leucocyte count unaffected.) The gums were painted with local antiseptics, and the remaining six carious teeth extracted two at a time at weekly intervals as the gingival condition improved.

Course: From the first, the patient's response to treatment was disappointingly slight. The temperature continued to swing between 99° and 103°, and was only partially controlled by chemotherapy. Transient pains in the joints and limbs occurred throughout the illness, and the general condition remained poor, with no increase in appetite or weight. The haemoglobin never exceeded 66 per cent, and red cells persisted in the urine after it had become sterile on culture. The patient remained weak and apathetic; the cardiac signs remained unchanged, and no embolic phenomena were noted at any time, but the spleen became palpable during the fifth week in hospital. At the end of the seventh week, the patient suddenly collapsed in the early morning without waking from sleep. There was no response to any resuscitative measure, and death occurred within three minutes.

Post Mortem Findings: The body was small and cachectic in appearance, with no external abnormality other than pallor of skin and mucous membranes. All the viscera were anaemic, oedematous, and poorly developed. The heart was considerably dilated, its muscle being thin, pale and flabby, and showing widespread fatty degeneration, with a few small sub-endocardial haemorrhages. The mitral valve showed a moderate rheumatic stenosis of some standing. Small recent bead-like vegetations were found upon the cusps of the mitral and aortic valves, with commencing spread to the endocardium of the left ventricle. The lungs showed terminal basal congestion only. The spleen was slightly enlarged and diffuent, and the liver presented the appearance of early fatty degeneration. The kidneys revealed no evidence of pyelitis, but suggested focal embolic nephritis in an early stage ("fleabitten kidney"). The brain was markedly oedematous throughout, with some increase in the intraventricular cerebrospinal fluid. The pituitary was extremely small, with pigmentary and cystic changes in its anterior lobe; in the absence of any local disease process in the skull or accessory nasal sinuses, the appearance of the pituitary was considered to be compatible with a state of chronic semi-starvation; clinical evidence of a primary pituitary cachexia had also been absent. No signs of any other causes of sudden death were found in the brain, circulatory system, lungs or suprarenals. Death was therefore considered to be due to acute myocardial failure supervening upon subacute infective endocarditis. (Histological and bacteriological reports from this autopsy were not available at the time of writing.)

Comment: The diagnosis of endocarditis lenta was repeatedly considered in this case, but received little support from the clinico-pathological findings. This was in fact an illness dramatic only in its termination, and singularly negative throughout its course. The recent dental extractions were almost certainly of some aetiological importance, despite failure to obtain a positive blood-culture.

At the present time, when nutritional anaemia and inter-current infections are regrettably increasing, it becomes the more important in any refractory case to consider the existence of some underlying condition which may alter both treatment and prognosis.

My thanks are due to Dr. A. M. C. Macpherson for permission to record this case, and to Dr. J. M. Ross for performing the autopsy.

Case 2.—A CASE OF BENIGN LYMPHOCYTIC CHORIO-MENINGITIS

Recent work having established the essentially benign course and prognosis of lymphocytic chorio-meningitis, its differential diagnosis from the more grave forms of meningo-encephalitis is a matter of some importance, especially in children. This is borne out by the following typical case.

CASE NOTE

History: A schoolboy of thirteen was admitted to hospital on July 16, 1942, with a provisional diagnosis of tuberculous meningitis. Five days previously he had developed a severe headache which had persisted, with general malaise, nausea, loss of appetite, and some mental confusion. Within the previous six years he had had measles, mumps, and typhoid fever. He was immunised against diphtheria in April 1942, but had not been vaccinated since infancy. The boy's father was known to have been an open case of pulmonary tuberculosis for the past four years, living at home in frequent contact with his children, and having a constant productive cough.

Clinical findings: A well-grown and well-nourished lad, fully conscious on admission, but somewhat dazed, with a toxic appearance, flushed moist skin, photophobia, and conjunctival infection. Temperature 100°, pulse 90, respiration 20, B.P. 108/56. Tongue dry and furred, throat clear. Right tonsillar glands enlarged. Both ear-drums normal. Generally restless and distressed. No clinical abnormality found in heart, lungs, or abdomen.

Neurological examination gave the following results: Pupils equal, central, circular, reacting normally. Retinal veins engorged, optic discs and ocular fundi clear. Kernig's and Brudzinski's signs strongly positive. Marked *tâche cerebrale*. Some neck rigidity, especially on sitting up, which also produced pain in the back and thighs.

Reflexes: Abdominal reflexes absent on the right side. All other reflexes present and brisk. No clonus. Plantar responses both flexor. Muscular tone and power normal. No sensory changes.

Investigations:

1. *Cerebro-spinal fluid.* A slightly turbid specimen, obtained at a pressure of 250 mm. C.S.F.

Cells: Leucocytes 352 per c.mm. 99 % Lymphocytes, R.B.C.s.**

Deposit: Mainly red cells and lymphocytes. No clot or organisms.

Protein: 35 mgms. per 100 c.c.

Chlorides: 700 mgms. per 100 cc..

Sugar: 92.5 mgms. per 100 c.c. Culture sterile.

2. *Blood count* within normal limits.

Hb = 90 %

R.B.C. = 4,670,000 per c.mm. Polymorphs 74 %

C. = 0.9 Eosinophils 5 %

W.B.C. = 7,500 per c.mm. Lymphocytes 17 %

Monocytes 4 %

3. Sedimentation rate of Red Cells—2 mm. in 1 hour (Westergren).

4. *Chest X-ray*—a few small scattered calcified lesions. Otherwise normal.

Course: Low-grade pyrexia not exceeding 100° F. continued for five days, during which symptomatic relief was given by lumbar puncture; this was repeated three times, and on the fourth day clinical examination revealed no abnormality in the nervous system. Recovery was complete in one week, and examination of the cerebro-spinal fluid on the tenth day showed it to be normal in every respect. The patient left hospital in excellent health at the end of the second week, and when seen two months later, he remained symptom-free, with no further change in the X-ray appearances in the chest. No other case of a similar nature had occurred at his school, but a few adult cases had been reported in the neighbourhood.

Comment: Although specific pathological tests for the presence of the virus and for fixation of complement were not available, this case would appear to have been one of benign lymphocytic infection of the meninges. Transient implication of the upper motor neurone was indicated by the temporary disappearance of the abdominal reflexes; this finding is not uncommon in virus infections of the nervous system. In view of the highly suggestive family history in the case reported, the results of lumbar puncture were of conclusive importance in excluding tuberculous meningitis.

I wish to thank Dr. Ursula James for permission to report this case.