of the right ventricle, the whole suggesting the shape of a Dutch wooden shoe. There is no pulsation in the area of the pulmonary vessels or conus arteriosus, and there is a defect in the heart shadow here which indicates lack of development of these structures. There is no pulsation in the lung fields, so the condition cannot be confused with Eisenmenger's disease.

Further important information may be obtained by catheterization of the heart as described by Cournand *et al.* (1945) and as used by Bing (1946) in Blalock's clinic. The catheter is passed through one of the superficial veins to reach the right auricle under fluoroscopic control. From the auricle blood for oxygen saturation is taken and the pressure recorded. The catheter is then passed on into the right ventricle, when more blood samples are taken for oxygen saturation and pressures are recorded. The catheter can then usually be passed into the pulmonary artery, and saturation and pressures are again recorded. From this evidence one can determine the presence of an interauricular septal defect, an interventricular septal defect, or pulmonary stenosis. The proportionate amount of flow through the pulmonary circulation can also be determined on this information. The information is useful in making a diagnosis, in forming a decision on whether operation is indicated, and in considering the improvement to be expected from it.

Most of the children with this condition die at birth or soon after. A few live to 6 or 7 years, even to 10 or 12. Very occasionally one will survive to adult life. The patient suitable for surgery is the child who has survived for perhaps a year or more, has limited exercise tolerance, and has the findings already enumerated.

Treatment

I think the physicians will agree that there is no specific medical treatment that will alter the course of this disease to any great extent. It is due to the pioneer work of Blalock and Taussig (1945) that fairly effective surgical treatment has been devised. The principle of such treatment is to take a large branch from the aorta and anastomose it with the pulmonary artery so that more blood passes through the pulmonary circulation (Murray, 1940). When successfully carried out with a large branch, the results are very impressive. The patient turns from blue to a satisfactory pink colour.

Naturally the operation is one of considerable magnitude and the dangers are not few. In Blalock's early series the mortality rate was about 25% ; but according to a more recent publication he has reduced this to 17%. Such a mortality is not surprising, since the patient is a poor subject to stand operation. Moreover, the adjustment in circulation necessary after operation imposes considerable strain on a poorly developed organ. In some patients the heart is too defective, and the cardiac reserve too small, to withstand the change.

In my series of 60 cases of congenital heart disease operated upon there were 40 of Fallot's tetralogy, 11 of patent ductus arteriosus, and 9 others, with an overall mortality of 11.7% and in the tetralogies 7.5% (see Table).

Disorder	No. of Operations	Deaths
Fallot's tetralogy	40	3 (7.5%)
Patent ductus arteriosus	11	0
Others:		
Pulmonary stenosis, no patent septum	1	
No pulmonary artery	1	
Persistent truncus arteriosus	2	
Eisenmenger's malformation	3	
Single pulmonary artery	1	
Roger's malformation	1	
Total	9	4
Total	60	7 (11.7%)

After operation the patients are nursed in an oxygen tent for a few days. If a satisfactory anastomosis has been performed, their recovery is surprisingly smooth and the benefits of improved oxygen saturation are obvious usually within a matter of hours. All my patients have received heparin (Murray, 1940) post-operatively to aid in keeping the anastomosis patent.

The surgical treatment of many cases of the tetralogy of Fallot is very satisfactory, bringing relief of symptoms, improvement in colour, and greatly increased vigour.

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COMPLETE HEART BLOCK IN YOUNG PEOPLE

BY

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Persistent complete auriculo-ventricular heart block is rarely seen in young people, and when it does occur it is almost always congenital. Cardiac irregularities, with varying degrees of defective conduction between auricles and ventricles, are not uncommon during the course of diphtheria, acute rheumatism, and occasionally other infections. If complete heart block develops, however, the usual outcome is either recovery, with restoration of normal rhythm, or death.

We describe in this paper three cases of persistent complete auriculo-ventricular block in young people. The first case (O.C.) came under our observation at the age of 12 years; the second (J.M.D.) when she was 17, though the pulse rate was known to have been slow from the age of 7; and the third, a male (D.R.), when he was 18 years old, though his cardiac condition was noted a few weeks after birth.

The following review of the literature shows the comparative rarity of complete auriculo-ventricular heart block even in adults. White (1944) states that 10,000 patients with cardiac signs or symptoms were examined by electrocardiograph at Massachusetts General Hospital: auriculo-ventricular heart block was diagnosed in 641, and of these 79 (0.79% of the total) had complete heart block. He thinks that cases of acquired complete heart block except those due to coronary disease are rare. Yater (1929) described 30 cases of congenital heart block. Jaleski and Morrison (1943) state that up to 1942 only 80 cases of congenital complete heart block had been described; they reported two cases in female patients aged 20 and 21, both living normal lives, in whom the lesion was diagnosed at the age of 6 years and a few months respectively.

Campbell and Suzman (1934) reported 8 cases between the ages of 12 and 33 years. Campbell (1943) had followed up these 8 cases, and of the 7 alive all were in good health and were then between the ages of 22 and 42 years. He states that few of the reported cases of congenital complete heart block have been over the age of 20 years. Leys (1943) described a girl of 23 with complete heart block, dextrocardia, and septal defect. The dextrocardia had been known for some years, but the heart block was first noticed at the age of 20. Peel (1943) reported a similar case in a woman still in good health at the age of 46. The lesion was diagnosed at the age of 38, though at 5 her heart was known to be defective.

Most authors agree on the even greater rarity of persistent post-diphtheritic complete heart block. Jones and White (1928) investigated 100 cases who had suffered from diphtheria at least five years before. In this series the electrocardiograms did not show one example of complete heart block. Fishberg (1940) states that he has seen only one patient surviving the appearance of complete heart block in diphtheria. He refers to 19 cases described by Stechner in 1928, all of which were fatal.

Leys (1945), however, reported a case of complete dissociation of auricle and ventricle in a married woman aged 25 who had had severe diphtheria with palatal and ocular palsies at the age of 10. The available evidence suggested that the lesion was diphtheritic in origin, but proof of a normal heart before the infection was not available. Cookson (1945) investigated 83 cases of diphtheria and stated that the cardiac lesion, however severe, clears up completely if the patient survives; exceptions to this rule are extremely rare.

Case Reports

Case 1.—O. C. attended the children's out-patient department of the Leeds General Infirmary in November, 1929, at the age of 6 on account of her obesity. She was regarded as a case of pituitary dysfunction, but there was no record at that time of the pulse rate or cardiac findings. She was seen again early in March, 1935, suffering from psoriasis, and her notes record a pulse rate of 60 per minute. Almost immediately afterwards (March 13, 1935) she was admitted to the Seacroft Infectious Diseases Hospital, Leeds, with moderately severe faucial diphtheria, which was uncomplicated; the pulse rate on admission varied between 40 and 58 per minute. Three weeks after her discharge on Sept. 7, 1935, when she again attended the Leeds General Infirmary, an electrocardiogram (Fig. 1)

FIG. 1.—Case 1, 1935. Complete heart block; ventricular rate 50 per minute (lead II).

showed complete heart block with ventricular rate of 50 per minute. She lived a normal life with few complaints until June, 1944; she then began to have attacks of "light-headedness," but without actual fainting or loss of consciousness; these have persisted.

FIG. 2.—Case 1. Some increase in transverse cardiac diameter.

She has recently been admitted to St. James's Hospital, Leeds, with the diagnosis of high-grade mental defective. Her present weight is 13 stone 12 lb. (87 kg.), and her obesity is of the pituitary type. The heart is slightly enlarged to the left, and a loud blowing systolic bruit can be heard all over the praecordium; B.P. is 130/80; lungs, abdomen, and C.N.S. are normal. Skiagram (Fig. 2) of

chest showed normal lung fields, some increase in the transverse cardiac diameter, but no posterior enlargement. Blood count showed no anaemia or alteration in white-cell count; B.M.R. was +2. Electrocardiograms taken at intervals during 11 years have always shown a complete heart block with a ventricular rate of about 40 per minute (Figs. 3 and 4).

FIG. 3.—Case 1, 1940. Complete heart block; ventricular rate about 40 per minute (lead II).

FIG. 4.—Case 1, 1946 (lead II).

This is considered to be a case of congenital complete heart block with ventricular septal defect complicated by pituitary dysfunction and high-grade mental deficiency. The attacks of dizziness are regarded as of the Stokes-Adams type, and it is noteworthy that these did not appear until she was 21 years old—nine years after the complete heart block had been demonstrated cardiographically; moreover, apart from her mental condition her general health is unimpaired. Particularly interesting is the comparatively high ventricular rate up to the age of 13; it probably accounts for the lesion not being diagnosed in spite of the fact that the patient was attending hospital for various other conditions.

Case 2.—J. M. D., a single girl, was first seen on June 6, 1944, at the age of 17 complaining of transient attacks of "light-headedness" without loss of consciousness. She gave a history of diphtheria at the age of 7, for which she was treated at the City Fever Hospital, Bradford. This attack apparently was severe, for she was kept in hospital for a period of 80 days, and her mother was told that the state of the child's heart was endangering her life. Palatal paralysis also occurred. She had a year's convalescence before being allowed to go back to school. For five years she was free of symptoms, but at the age of 12 her present symptoms appeared—i.e., attacks of transient dizziness. These do not seem to cause her much inconvenience, and her general health is good. She is in regular employment as an office clerk.

FIG. 5.—Case 2. Cardiac outline normal.

Physical examination revealed a slim girl who weighed 7 stone 5 lb. (46 kg.). The radial pulse was regular at 42 beats per minute; the heart was normal in size, and on auscultation presented no abnormality except a short basal systolic bruit; the B.P. was 120/75; a skiagram of the chest (Fig. 5) showed no lung lesion, and the cardiac outline was normal in size and shape; the blood count and B.S.R. were normal. An electrocardiogram (Fig. 6) showed complete dissociation between auricles and ventricles, with auricular rate of 80 and ventricular rate of 42 per minute. There is no earlier electrocardiogram, but the general practitioner commented on the slowness of the pulse after the diphtheria. The girl's condition has remained unchanged since 1944; she continues her work as an office clerk and lives a normal life; serial electrocardiograms show no change in the block (Figs. 7 and 8).

This case is one of persistent complete heart block which has certainly been present from the age of 7 to the patient's present age of 21. The lesion was first noted after a severe attack of diphtheria at the age of 7; there is no record of the heart rate before this. The patient's own medical practitioner, however, tells us that before the diphtheria the rate was normal, that this was observed during the course of several small ailments,

and that he compared and contrasted the heart condition on her return from the fever hospital with that before her return. The patient's general health has not been affected although she has had the lesion for 14 years. The attacks of faintness are regarded as those of Stokes-Adams type; they first appeared five

FIG. 6.—Case 2, 1944. Complete heart block; ventricular rate 42 per minute (lead II).

FIG. 7.—Case 2, 1945 (lead II).

FIG. 8.—Case 2, 1946 (lead II).

years after the slow pulse was noted. The severity of the attack of diphtheria, the fact that the cardiac condition was regarded as grave at the time, and the absence of an associated congenital lesion raise the possibility that this is a post-diphtheritic lesion.

Case 3.—A young man (D. R.) was first seen on Nov. 22, 1946; he was then 18. His father stated that he had been told shortly after the child's birth that the heart was defective. The patient never suffered from rheumatism, chorea, or diphtheria, and throughout his boyhood he was free of symptoms. He went away to boarding-school and has since been doing heavy work on his father's farm. In February, 1946, he developed a pyrexial illness. The abnormal temperature lasted three days; on the tenth day the patient had an epistaxis followed by a series of faints occurring as often as one every minute. After three days these ceased; he has had none since. However, he

FIG. 9.—Case 3, 1946. Complete heart block; ventricular rate 42 per minute (lead II).

has never completely recovered from this illness and has since been listless, disinclined to do much, and readily fatigued.

Examination revealed the presence of aortic incompetence with a long diastolic murmur down the left border of the sternum and a systolic bruit at the apex. The skiagram showed considerable left ventricular enlargement; the B.P. was 170/60 and in keeping with the valve defect. The electrocardiogram (Fig. 9) showed complete heart block with a ventricular rate of 42 per minute.

This is regarded as a case of congenital aortic incompetence with complete heart block. For 17 years the patient was symptom-free until February, 1946, when he developed fainting attacks of the Stokes-Adams type followed by incipient heart failure.

Summary

Three cases are recorded of complete heart block, which was first noted at the ages of a few months, 7 years, and 13 years respectively. In all of these there is a history of transient attacks of faintness first manifest at long intervals (17, 10, and 9 years) after the heart block was discovered. In two of the three cases there is an associated congenital heart defect: in one, patent ventricular septum; in the other, aortic incompetence. The third case is regarded as free from a congenital heart lesion.

Two of the three cases are in good general health. The third case has led a normal life (including, up to the age of 17, five years at a boarding-school and two years working on a farm) although the lesion was noted shortly after birth.

Two of the cases (1 and 2) had diphtheria; two of the three cases (1 and 3) are certainly of congenital origin; Case 2 is regarded as diphtheritic in origin.

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TONSILLECTOMY AND ADENOIDECTOMY UNSATISFACTORY RESULTS DUE TO CHRONIC MAXILLARY SINUSITIS

BY

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Ayrshire, 1,132 square miles in extent, partly industrial and partly rural in character, has a pre-school population of approximately 23,000 and a school population of approximately 47,000. In this county since 1936 the local authority has reserved a minimum number of 25 beds for such children as have required operative treatment for affections of the ear, nose, and throat. The number of beds at present so reserved is 34.

In the case of the children who have been dealt with under the treatment scheme in question—children who have been referred by the school medical officers or by private practitioners—the notes about the operations and the follow-up notes were made by the operator himself. The case histories were taken under the supervision of one person—the matron in charge of the hospital.

It became more and more apparent during recent years that a considerable proportion of the cases which were referred for operative treatment of tonsils and adenoids had failed to benefit thereby, even though the operations were technically perfect. With increasing frequency children who had been operated upon months or years previously were referred afresh by school medical officer or family doctor, disgruntled parents declaring that the child's signs and symptoms were much as they had been before operation or that they had become more pronounced. The position was studied, therefore, and it became evident that the unsatisfactory results were due to infection of the maxillary antra.

The following data were derived from the cases of chronic maxillary sinusitis found among the total number of cases referred for tonsillectomy and adenoidectomy in 1946. Of the 1,779 cases operated upon that year—boys and girls in equal proportion—for the removal of tonsils and adenoids, 442 (or 25% of the total) were considered to have sufficient signs or symptoms, or both, to warrant the proof-puncturing of both antra immediately before operation. (The method used was to continue lavage through the antral cannula with normal saline until all traces of pus had disappeared. Swabs were taken at once from the gross pus and sent for culture. In 106 cases no pus was