Diagnosis and Treatment of the More Common Congenital Cardiovascular Anomalies*

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Malformations of the heart are the result of an arrest or defective development at some specific point. These developmental errors may be due to defective genes or to abnormalities in the environment. German measles during early pregnancy is associated with a high incidence of congenital cataracts and congenital heart anomalies. Since malformations of the heart result from localized arrest in development, the remainder of the heart progresses as nearly as possible in the normal manner. It follows in most instances the malformed heart occupies the normal position. This renders it possible to analyze which chambers are enlarged and which are absent. By this means it is often possible to make a relatively accurate clinical diagnosis as to the nature of the abnormality.

Before 20 years ago the vast subject of congenital cardiovascular anomalies was of academic interest mainly to the pathologist. Dr. Maude Abbott made a lifetime autopsy study of 1,000 cases with which she correlated clinical symptoms and signs presented by the various malformations. She emphasized the importance of a communication between the systemic and venous circuits. This communication usually presents itself as a patent ductus arteriosus, atrial septal defect, or ventricular septal defect. Because of the greater pressure in the left heart than in the right, blood is shunted from arterial to venous side in pure form of the above abnormalities. Since, in these instances, oxygenated blood is shunted through the lungs again, there is no cyanosis. If some complicating condition causes increased pulmonary pressure, blood may be shunted from right to left through a patent ductus or a septal defect. If the amount of blood shunted is such that at least 5 Gm. of reduced hemoglobin per 1,000 cc. of circulating blood is present, cyanosis will be present. In anomalies with no intercircuit communication cyanosis is absent. It is also not present in the absence of congestive heart failure.

In 1939 great practical interest turned toward congenital heart abnormalities because Gross successfully ligated a patent ductus arteriosus. In 1944 Blalock and Taussig developed a systemic pulmonic anastomosis for cyanotic conditions in which the primary difficulty is lack of adequate circulation to the lungs, and relative pressure of the two circulations is such that blood will flow through the new artificial duct. In 1945 Crafoord performed a direct resection for coarctation of the aorta. Potts in 1946 developed a modification of the Blalock procedure. This operation consists of a side anastomosis of the pulmonary artery and aorta. It is advantageous in that it is technically a much simpler procedure. In small infants the

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subclavian artery used in a Blalock may be too short, friable, and/or narrow in caliber for good results. By use of the Potts procedure the exact size of the shunt is known. Morbidity is much lower with employment of the Potts operation. Its main disadvantage is that at present, one cannot determine accurately the size of the shunt to make. There is much difference of opinion concerning this procedure. In 1948 Brock described valvulotomy for pulmonary stenosis.

Because of these vast surgical advances, interest now must be turned to accurate diagnosis in order to select patients who can hope to benefit from the various procedures. A good, thorough history and physical examination enables an acute physician to make a diagnosis in most instances.

Electrocardiography: Many children with congenital heart disease show normal electrocardiograms; however, characteristic patterns are frequently produced as a result of specific changes in size, shape and position of the heart chambers. The configuration of the ECG depends on the type of anomaly present, or, if more than one, the predominant one since this determines the part of the heart most changed. Ventricular hypertrophy is recognized best in unipolar precordial leads. Electrocardiographic findings must be correlated with clinical data to be of specific value.

Angiocardiography: This is a good means of studying the anatomy of the living heart. It is of great value from the surgical standpoint in delineating the anatomical arrangement of the arterial branches of the aorta and the position of the pulmonary artery. This is not an entirely innocuous procedure since death has been reported in about 0.3 per cent of cases. It is indicated in general diagnosis, especially in the presence of a poor pulmonary blood supply with the possibility of a Blalock operation in mind. Contraindications include liver and kidney disease, tuberculosis, hyperthyroidism, allergic history, and sometimes congestive failure. Before carrying out this procedure, one must have a working diagnosis in mind, for it is not required in all congenital heart abnormalities.

Catheterization: In recent years the technique of right heart catheterization has been applied to the diagnosis of congenital anomalies of the heart and great vessels. The technique of right heart catheterization allows a means of sampling mixed venous blood in the right heart and pulmonary artery. Abnormal connections between these structures and the pulmonary vein, left atrium, left ventricle, or aorta result in contamination of mixed venous blood with oxygenated blood, since pressure conditions favor shunting of blood from left to right cavities. Therefore, the approximate location of the shunt can be localized, and determined by gas analysis. The shunts can also be located by abnormal routes taken by the tip of the catheter. Contamination of pulmonary venous blood by mixed venous blood can also be recognized by arterial blood analysis. Such contamination occurs when the dynamic conditions prevailing in the heart in the presence of cardiac abnormality favor a shunt from right to left. In addition right heart catheterization and arterial puncture provide a means of recording blood pressures. Since the normal curve patterns and variations are well defined in the various heart chambers and major vessels, recording of blood pres-
sure allows identification of the chamber in which the catheter tip lies and study of the effects of cardiac manifestations upon dynamics of circulation. Most complications are of minor character. If technical acuteness is followed to the utmost, these will be of little consequence. Rhythm disturbance is the most important consideration. Premature beats are manifest on passage of the catheter through the tricuspid valve and in approximation to the septum. Blood loss must be considered and replaced after each step of the procedure in a small infant. Relatively rare complications include air embolism with right to left shunt, and venous thrombosis.

\textit{Oximetry:} This is a method used in conjunction with catheterization. It allows continuous measurement of oxygen saturation in arterial blood. Demonstration that this saturation decreases rapidly on exercise indicates a right to left shunt. Exercise in a normal person reveals an increase in oxygen uptake as compared to ventilation which reveals a decrease in oxygen content of expired air. If the blood flow through the lungs is limited (pulmonary stenosis, tricuspid stenosis), the oxygen content of expired air may increase during exercise.

\textit{Electrokymography} and \textit{ballistocardiography}, along with spatial vectorcardiography, appear to be promising diagnostic aids and are without hazard. \textit{Dye dilution} techniques also offer vast promise, especially in anomalies with shunts. At present Latson is developing and perfecting a new method of determination of dye dilution by using radioactive iodinated albumin and an external oscilometer over the brachial artery.

There have been numerous methods of classifying congenital cardiovascular disease. Since this paper is concerned only with the more common anomalies, I have chosen a rather simple classification of three main groups: 1) extracardiac, 2) non-cyanotic, and 3) cyanotic.

\textbf{EXTRACARDIAC ANOMALIES}

\textit{Patent Ductus Arteriosus}

The ductus arteriosus is a normal fetal structure shunting blood from the pulmonary artery into the aorta. At birth, when the lungs begin to function, the ductus normally ceases to function, and at about 10 weeks is completely obliterated. For some unknown reason, it may fail to close and shunt blood from the aorta back to the lungs. It occurs in girls two or three times as often as in boys.

\textit{Symptoms:} Usually there are no or only minimal symptoms presented. The most common complaint is delay in reaching the developmental milestone. Most are also underweight. Subacute bacterial endocarditis is a frequent finding.

\textit{Signs:} Probably the most striking murmur in cardiology is that of the patent ductus. It is a continuous machinery murmur heard best in the second left interspace. It is harsh, rasping, and louder in the recumbent position than erect. The systolic component is transmitted to the neck and back, while the diastolic continuation diminishes rapidly. The murmur is
not to-and-fro, for the blood flows only in one direction—from the aorta to the pulmonary artery. Therefore, the murmur is entirely systolic but with a continuation into diastole. It is important to remember that in young children it is the rule rather than the exception to hear no extension of the murmur into diastole because of the equality of pressure in the left and right ventricle. The murmur must be differentiated from a truncus arteriosus or pseudotruncus in which the murmur is diffuse due to many minute channels to the pulmonary circulation from the bronchial arteries. Pulmonary arteriovenous fistula is differentiated by presenting a murmur of less intensity, higher pitch, well localized anywhere in the precordium, and usually associated with distal telangiectasis. Other findings include a systolic thrill in the pulmonary area, wide pulse pressure with a low diastolic pressure, and no cyanosis or clubbing.

**Diagnostic Tests:** X-ray film reveals slight prominence of the pulmonary arc, and dilatation of the pulmonary artery and conus. Fluoroscopy usually shows prominent pulsation in the region of the pulmonary conus. Electrocardiogram is usually normal, as are routine laboratory examinations. In the typical case, angiocardiography and catheterization are not necessary; however, in some instances they are important to confirm diagnosis. In angiocardiography the pulmonary artery remains opaque due to the shunt. Catheterization reveals increase in oxygen in the pulmonary artery, and sometimes an increase in pulmonary pressure.

**Treatment:** Until the technique of ligation was developed, life expectancy was about 20 years. However, if the patient is asymptomatic and without complications, some authorities postpone surgery. The operation is relatively simple and carries a low mortality.

**Coarctation of the Aorta**

Two types of coarctation of the aorta have been described: infantile, in which the narrowing extends from the origin of the left subclavian artery to the entrance of the ductus; adult, consists of a local constriction of the aorta at or below the level of the ductus. The infantile type is usually complicated by more serious anomalies and death usually occurs within the first year of life. The adult is seldom complicated by other conditions and, therefore, the discussion will be limited to the latter. This condition occurs six times as often in boys as in girls.

**Symptoms:** There is no common complaint. Patients appear healthy and there is no cyanosis. There may be numbness of the feet or legs on exercise and difficulty in healing foot wounds.

**Signs:** There is increased blood pressure in arms and marked decrease in the legs. Femoral pulses are diminished or absent. There is increase in intercostal pulsations. The heart reveals a systolic murmur in the third left interspace and in the interscapular region. It, however, is of little aid in diagnosis.

**Diagnostic Tests:** X-ray film reveals notching of the lower borders of the ribs. Fluoroscopy shows either a normal heart or left ventricular hypertrophy. Electrocardiogram may be normal, or reveal axis deviation, high
voltage of QRS, depressed RS-T, and inversion of T. There is never right ventricular hypertrophy. Catheterization studies are normal. Angiocardiography reveals the coarctation. However, these adjuncts are not done routinely.

Treatment: Since only 25 per cent of patients with coarctation of the aorta live out a normal life span, surgical resection of the narrowed portion is indicated. Mortality at present is low.

Vascular Rings

There are several variations in position of the arch of the aorta and in the great vessels arising from the aorta. Persistence of both right and left aortic arches encircling the trachea and esophagus and uniting to form the descending aorta is the most important anomaly clinically.

Symptoms: There is no cardiac symptom. The most common complaints are wheezing, stridor, and dysphagia. Sometimes there is cough. There is frequency of pulmonary infections. Of course, there may be no symptom at all.

Signs: Physical examination is essentially negative. Direct bronchoscopy reveals tracheal narrowing.

Diagnostic Tests: X-ray film reveals constriction of the trachea and/or esophagus, usually by the right arch. Electrocardiogram, angiocardiogram, and catheterization are useless.

Treatment: Surgical resection of the smaller branch (usually anterior) is the treatment of choice. This is a serious procedure, mainly due to difficulty in anesthesia, and carries about a 35 per cent mortality.

ACYANOTIC CONGENITAL HEART DISEASE

Atrial Septal Defect

Atrial septal defects are of great importance, since such patients frequently seek medical attention. They are unusually susceptible to pneumonia, rheumatic fever, repeated bronchitis, and are liable to develop various cardiac arrhythmias. Among young adults it is probably the most frequently seen cardiac anomaly and the least frequently diagnosed correctly. This is probably because of the wide variability of auscultatory findings and also because of superimposed rheumatic infection. This abnormality may be seen in four entirely different instances: 1) defective septum primum, 2) defective secundum, 3) patent foramen ovale, and 4) with other abnormalities of the heart.

Symptoms: If the defect is large enough to produce symptoms, one presents with frail build, poor physical development, and repeated bronchitis.

Signs: There usually is a loud, harsh, systolic plateau or decrescendo murmur between the second to fourth left interspace near the sternum. The duration between the aortic and pulmonary valve elements is less than 0.07 seconds. There may be a high frequency, low amplitude diastolic murmur extending to presystole located at the apex. There may be en-
largement of the right heart. The right ventricular hypertrophy may cause left chest deformity. The pulmonary second sound is loud and snapping. There is a systolic thrill in the pulmonary area. The pulse pressure is narrow and the skin appears semitranslucent.

**Diagnostic Tests:** X-ray film shows great enlargement of the right heart, prominent pulmonary conus, small aortic knob, and increase of the hilar markings. Fluoroscopy frequently shows a hilar dance. Electrocardiogram reveals right ventricular hypertrophy, large and peaked P waves, right bundle branch block, and large equally diphasic QRS complexes which may be seen in all three standard limb leads. Angiocardiography is not diagnostic but shows right atrial dilatation and pulmonary congestion. Catheterization may reveal the defect directly by the tip extending through the defect, and indirectly by an increase in oxygen in the right atrium, and an increase in pulmonary artery pressure.

**Treatment:** In relatively small defects, closure is unnecessary. In the more serious cases, closure may be attempted. The present consensus of operative technique employs a purse string closure. Mortality is rather high, mainly due to the severity of malformation.

**Ventricular Septal Defect**

**Symptoms:** There is no symptom unless the defect is large. In that case one complains of the symptoms of heart failure, and/or bronchitis. There is never cyanosis. Growth is normal. As a pure malformation, this anomaly is probably more common than atrial septal defect.

**Signs:** The characteristic sign is a harsh plateau systolic murmur and thrill maximal in the third or fourth left interspace near the sternum and radiating in all directions and to the back. There usually is no heart enlargement.

**Diagnostic Tests:** X-ray film may be normal or reveal an enlarged heart, a bulge in the region of the pulmonary artery and conus, and a small aorta. Fluoroscopy may show pulmonary hypertension. Angiocardiography is not diagnostic, but reveals distention of the pulmonary artery and lung vessels. Electrocardiography reveals either normal tracing or high voltage diphasic QRS in all leads. Catheterization reveals increase in oxygen saturation in the right ventricle (which is higher than that in the right atrium).

**Treatment:** Prophylaxis against subacute bacterial endocarditis is important. Surgical closure is still in an embryonic stage, but a purse string closure has been successfully attempted.

**Pulmonary Stenosis**

Pure pulmonary stenosis is not a relatively common congenital heart malformation, but is important in that it must be distinguished from more complicated anomalies with a component of pulmonary stenosis. The stenosis is usually valvular rather than infundibular. The cusps are fused. This lesion does not produce cyanosis per se, but the increased right heart pressure causes a ball and valve right to left shunt through the foramen ovale.
Symptoms: The presenting complaints are poor exercise tolerance and tiring easily with squatting. Cyanosis depends on patency of the foramen ovale. If the heart is compensated, there probably will be no other symptom.

Signs: There is a harsh pulmonary systolic murmur and thrill and there may be some heart enlargement. The pulmonary second sound is weak or absent.

Diagnostic Tests: X-ray film reveals post-stenotic dilatation of the pulmonary artery, decreased pulmonary vascular markings, and clear lung fields. Fluoroscopy shows fullness of the pulmonary conus, slight cardiomegaly, and no pulsation in the hila. Electrocardiogram shows right axis deviation and either right ventricular hypertrophy or right bundle branch block. Angiocardiography shows normal dye circulation, pulmonary valvular stenosis and post-stenotic dilatation. Catheterization reveals a pulmonary artery pressure lower than that in the right ventricle.

Treatment: No specific treatment is advised in asymptomatic patients. If, however, there is progressive cardiac enlargement, cyanosis, dyspnea, right ventricular pressure over 80 mm. Hg., or congestive failure, a valvulotomy must be performed. Shunt operations are contraindicated for they fail to relieve the stress on the right ventricle and add to the work of the heart by increasing the amount of blood returned to the left auricle. Following valvulotomy right ventricular pressure falls and pulmonary blood flow increases. Although long term effects cannot yet be evaluated, there is great promise and apparent low mortality following this procedure.

CYANOTIC CONGENITAL HEART DISEASE

Tetralogy of Fallot

This is the most common cyanotic anomaly found in patients living past puberty. It is composed of pulmonary stenosis, dextroposition of the aorta, ventricular septal defect, and right ventricular hypertrophy.

Symptoms: Usually cyanosis may not be apparent until the child is three to six months old. Feeding is difficult and growth is retarded. There is decrease in exercise tolerance and often the child assumes a characteristic squatting position at play. There may be severe attacks of paroxysmal dyspnea. This may be the presenting symptom, especially if the child is very young. Sitting and walking are delayed. Occasionally the child has syncopal or convulsive tendency.

Signs: Cyanosis is usually obvious. There may be clubbing of the fingers and toes. The heart is usually apparently small, though right ventricular hypertrophy may be severe enough to cause left chest deformity. There is a basal thrill, and a systolic diamond shaped murmur in the second or third left interspace near the sternum. Both are louder in the recumbent than erect position. The pulmonary second sound is diminished. An increase in cyanosis indicates an increase in severity and a diminution of the murmur.

Diagnostic Tests: Blood count reveals polycythemia to the limits of 10,000,000 red blood cells, and a high hematocrit. Oxygen saturation of
arterial blood is decreased. X-ray film reveals a “wooden shoe” heart. There is a concave pulmonary conus and decreased pulmonary vascularity. Fluoroscopy reveals a clear pulmonary window, no vascular pulsation, translucent lungs, small heart in the transverse diameter, and a concave pulmonary segment. Electrocardiogram shows right axis deviation, right ventricular hypertrophy, and large and peaked P waves in lead II. Angiocardiography allows view of the degree of overriding of the aorta, position of the aorta, and determination of which side is best suited for anastomosis. Catheterization confirms the pulmonary stenosis, may enter the aorta from the right ventricle, decreased pulmonary blood pressure, and increased right ventricular pressure. Circulation time from arm to tongue is short.

_Treatment:_ Since life expectancy without surgery is about 12 to 15 years, surgery must be considered in every case. The principle of surgery at present is to create an artificial patent ductus, or a left to right shunt to supply the lungs with necessary blood for oxygenation. The Blalock procedure or the Potts modification are of choice at present. Direct valvulotomy has offered varied results, but surely is not the final word. Extracorporeal surgery may unveil many answers to a malady in which both mortality and morbidity are otherwise gloomy. A 35 per cent mortality in babies under one year is probably due to desperation of operation at that time.

_Complete Transposition of the Great Vessels_

In this anomaly, the aorta carries venous blood systemically while the pulmonary artery carries arterial blood back to the lungs. Life can be maintained only by the presence of intercirculation communications. This disease takes the life of more cyanotic babies under six months old than any other abnormality.

_Symptoms:_ Cyanosis develops after birth. The baby fails to gain weight, has repeated upper respiratory infections, rapid breathing, and dyspnea.

_Signs:_ Cyanosis in the head and upper extremities are more apparent than in the legs while the ductus is patent. There is a loud harsh systolic murmur in the third or fourth left interspace near the sternum. There is progressive heart enlargement, gallop rhythm, congestion of the lungs, bulging of the chest, and liver engorgement.

_Diagnostic Tests:_ X-ray film shows right and left ventricular enlargement, narrow great vessel shadow in the PA view and wide in the left oblique anterior view. There are increased vascular markings. Electrocardiogram reveals right axis deviation and right ventricular hypertrophy. Blood test reveals polycythemia. Angiocardiography shows the aorta filling fast and remaining opaque. There is no dye in the pulmonary artery. On catheterization the catheter enters the aorta from the right ventricle.

_Treatment:_ At present only the formation of an atrial septal defect along with a systemic-pulmonary anastomosis (Blalock) is the best that surgeons can offer. Retransfer of the great vessels so far has not been successful, even with hypothermia and heart-lung preparations.
Tricuspid Atresia

This abnormality is usually associated with hypoplastic right ventricle, pulmonary stenosis, and septal defects. Blood flows from right auricle to left auricle, mixes with blood from the lungs, and then to the left ventricle. From here some flows to the right ventricle, through the stenotic pulmonary valve to the lungs.

Symptoms: Presenting symptoms are similar to those in tetralogy of Fallot, except that cyanosis and dyspnea are more extreme. Those affected are slow to gain weight and tire easily.

Signs: There is clubbing of the fingers, left chest deformity, and palpable liver pulsations. Also a systolic murmur in the second left interspace near the sternum is present.

Diagnostic Tests: X-ray film and fluoroscopy show an enlarged heart, poor lung vascularity, no hilar pulsations, concave pulmonary conus, and small right ventricle. Electrocardiogram reveals left ventricular hypertrophy and left axis deviation. This is the only cyanotic congenital heart anomaly with left heart strain. Angiocardiography shows no dye in the right ventricle, communication between the right and left atria, direct aortic filling, and poor lung vascularity. The presence of a dilated pulmonary artery is necessary for surgery. Catheterization reveals increased right atrial pressure. The catheter enters the left atrium but cannot enter the right ventricle.

Treatment: Surgery is indicated generally only in seriously incapacitated patients. A shunt operation (Blalock) seems to offer improvement but not as much as in tetralogy. There is a high mortality rate, but without surgery the average life expectancy is only three to six months.

Eisenmenger Complex

This condition is identical to tetralogy except there is no pulmonary stenosis or right ventricular hypertrophy.

Symptoms: Patients present late cyanosis on exertion, fair exercise tolerance, repeated bronchitis, and hemoptysis. The cyanosis presents around age 30 years because of secondary pulmonary sclerosis due to increased pulmonary pressure.

Signs: There is slight cardiac enlargement, thrill, and a loud, harsh, rasping systolic murmur in the basal area radiating through the arterial tree. The pulmonary second sound is accentuated. Clubbing manifests late. Early there may be only left ventricular hypertrophy, for the right ventricular hypertrophy develops as pulmonary pressure increases.

Diagnostic Tests: X-ray film and fluoroscopy reveal the heart enlarged in its transverse diameter, pulmonary segment either normal or prominent, hilar dance, and narrow vascular shadows. Electrocardiogram shows left or right axis deviation and left and right ventricular hypertrophy. S is deep in lead I and S-T1 may be elevated. Angiocardiography shows overriding aorta with normal vascularity. Catheterization reveals increased pressure in the right ventricle, and pulmonary hypertension. Oxygen
saturation in the pulmonary artery is higher than in the right ventricle or right atrium. Oxygen in arterial blood is diminished.

_Treatment_: There is no satisfactory treatment for this malady. A shunt operation is contraindicated for it would further increase the pulmonary hypertension.

**Taussig-Bing Malformation**

This deformity consists of a transposed aorta and a pulmonary artery overriding the interventricular septum.

_Symptoms_: The most important complaint is cyanosis from birth. There is mild incapacitation, but no squatting or dyspnea.

_Signs_: There is slight enlargement of the heart and a soft systolic murmur in the pulmonic area. The pulmonary second sound is accentuated and reduplicated.

_Diagnostic Tests_: X-ray film and fluoroscopy show a full pulmonary conus, increased hilar shadows, and a large right ventricle. Electrocardiogram reveals right axis deviation and right ventricular hypertrophy. Catheterization shows oxygen saturation in the pulmonary artery greater than that in the aorta.

_Treatment_: Since this is a relatively newly described complex, treatment cannot be well correlated. At present the treatment of choice is creation of an atrial septal defect.

**Management of Patients with Cardiovascular Anomalies**

_Medical_: Infants and children should not be limited in activity except in the presence of pulmonary stenosis or severe coarctation. If there is decrease in exercise tolerance, the child will sufficiently limit himself. If tolerance is markedly limited, graded exercises should be inaugurated. It is important psychologically for these children to attend school and participate as nearly normally as possible. Routine immunizations should be instituted unless the child is ill. Good oral hygiene is of the utmost importance and prophylactic antibiotics should be given before extraction. Tonsillectomy is indicated more in congenital heart disease than in the normal population. Operations should be performed as needed. Pregnancy should be undertaken only if the heart is not enlarged and is functioning well. Intercurrent illnesses should be handled as if in a normal person. If cyanosis is persistent, one must guard against thrombosis and dehydration. Treatment for convulsions and thrombosis must be treated with venisection, oxygen, fluids, and heparin. Pneumonia and subacute bacterial endocarditis must be treated immediately with antibiotics. Cardiac failure is managed with bed rest, venisection, oxygen, diuretics, and digitalis.

_Surgical_: The surgical procedures now used have been described with the individual abnormalities. The future still offers great improvement in surgical management of many lesions, and extracorporeal surgery under hypothermic conditions seem to be the most promising of techniques still in the experimental and developmental stages. It is understood that none
of these delicate procedures would be possible without the assistance of an expert anesthesiologist.

SUMMARY

The classification, diagnosis, special diagnostic tests, and treatment of the more common congenital cardiovascular anomalies have been discussed. The indiscriminate use of angiocardiography and catheterization is discouraged, but must be used when diagnosis may not otherwise be made. Emphasis has been stressed that diagnosis in most instances can be made by an acute physician on history and physical examination alone if he retains a high index of suspicion.

RESUMEN

Se ha discutido la clasificación, el diagnóstico, las pruebas diagnósticas especiales y el tratamiento de las anomalías cardiovasculares congénitas más comunes.

El uso indiscriminado de la angiociardiografía y de la cateterización se desaconseja, pero debe ser usado cuando el diagnóstico no puede ser logrado de otro modo.

Se ha enfatizado, que el diagnóstico en la mayor parte de las circunstancias puede ser hecho por un clínico perspicaz basado únicamente en la historia y en el examen físico si guarda un alto grado de sospecha.

RESUME

L'auteur fait une revue critique de la classification, du diagnostic, des tests particuliers de différenciation et du traitement des anomalies cardiovasculaires congénitales les plus communes. L'emploi sans discrimination de l'angiociardiographie et du cathétérisme est déconseillé, mais ces techniques peuvent être utilisées lorsque le diagnostic ne peut pas être établi autrement.

Il met l'accent sur le fait que le diagnostic dans la plupart des cas peut être établi par un médecin entrainé, sur le seul interrogatoire du malade et l'examen physique, si la possibilité d'une telle éventualité retient son attention.

ZUSAMMENFASSUNG

Es werden Klassifizierung, Diagnose, spezielle diagnostische Untersuchungen und die Behandlung der häufigeren kongenitalen cardiovasculären Anomalien beschrieben. Die kritiklose Anwendung von Angiokardiographie und Katheterisierung ist abzulehnen; die genannten Methoden müssen aber angewandt werden, wenn die Diagnose nicht auf andere Art gestellt werden kann. Es wird besonders darauf hingewiesen, dass in den meisten Fällen die Diagnose durch einen tüchtigen Arzt aus Anamnese und klinischer Untersuchung allein gestellt werden kann, wenn ein hinreichender Verdacht vorliegt.

Bibliography will appear in reprints.