ABSTRACTS
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BLOOD COAGULATION


The authors studied in anesthetized dogs the effect on intravenous injection of 40 to 80 mg. Tromexan upon blood flow through the right coronary artery, the arterial and venous coronary pressure and oxygen consumption of the heart. In addition, the cardiac output and the blood flow through the femoral artery or femoral vein were recorded. The results were as follows: Coronary blood flow increased whereas arterial and venous pressure and cardiac output remained unchanged. The total oxygen consumption of the heart declined slightly, the arterial oxygen desaturation was unchanged and the saturation of the blood of coronary veins usually increased. It is concluded that Tromexan, applied intravenously, has definite vasoactive effects which are more pronounced in the coronary than in the peripheral circulation.

Pick


The influence of the ingestion of fat as cream or a butter-egg-bacon feeding upon the coagulation time was observed in 18 patients. In addition, the clot retraction and prothrombin consumption were determined. The ingestion of cream was followed by lipemia, the degree of which was correlated with the fat content of the cream samples. The oral ingestion of varying amounts and types of fat had no significant effect upon blood coagulation. The age of the patients did not influence the results.

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There was no effect observed on clot retraction or on prothrombin consumption times.

Shuman


The authors were stimulated to make the studies reported by the observation that in the course of routine one-stage prothrombin determinations serum clotted more quickly than did plasma. Calcium oxalate is felt to remove a clot inhibitory principle from human blood because: (1) at one and the same ionic strength and final concentration of the clotting mixture citrated blood clots more slowly, and oxalated blood more quickly than whole blood, (2) stored autolyzed blood has less anticoagulant effect if calcium oxalate has been added to it before storage, (3) the calcium oxalate precipitate formed on decalcification of blood with oxalate contains an inhibitory principle as well as prothrombin and (4) Amberlite plasma no longer responds with shorter clotting times on dilution after treatment with calcium oxalate. Prothrombin adsorbing salts other than calcium oxalate were also found to remove an inhibitory principle as well as prothrombin from the blood. In the citrate eluate from adsorbate from human oxalated plasma an anticoagulant as well as prothrombin was recovered. This anticoagulant resembles heparin and is believed to be present in normal human blood in sufficient quantity that physiological significance can be attributed to it. In the citrate eluate prothrombin occurred in association with the anticoagulant and could be activated to thrombin by the removal of the anticoagulant.

Rosenbaum
CONGENITAL ANOMALIES


The authors report the case of a five year old Negro child with unilateral clubbing of the fingers, due to absence of the aortic arch. The blood supply to the right upper extremity came through the aortic remnant while the left arm and the remainder of the body were supplied through a patent ductus arteriosus which opened widely into the descending aorta. Preoperative cardiac catheterization studies, roentgenograms of the heart with the catheter passing from the right ventricle into the descending aorta are presented in addition to the operative findings.

HARRIS


Individuals with pure pulmonary stenosis frequently have normal blood flow and normal arterial oxygen saturation. Yet cyanosis is commonly precipitated by exposure to cold, not sufficient to produce it in the individual with a normal heart. This phenomenon suggests an abnormal distribution of blood. By comparing the relationships of the oxygen saturation of the superior and inferior vena cava to the mixed right ventricular blood in the normal and in the individual with pure pulmonary stenosis, the author deduces that in the latter there is a redistribution of blood with blood flow from the upper half of the body exceeding the normal value of 40 per cent of the cardiac output.

SOLOFF


The clinical features and hematologic findings as well as the post mortem findings of a case of congenital absence of the spleen of a year old infant are presented. Because the blood findings (target cells, decreased osmotic fragility, H-J bodies, and siderocytosis) in association with findings (cyanosis, clubbing, and cardiac murmurs) suggestive of congenital cardiovascular abnormalities were present, the diagnosis of splenic agenesis was made prior to death. The authors point out the characteristic blood picture of the absence of the spleen, and this picture in an infant with other signs of congenital abnormalities suggests splenic agenesis. Post mortem findings verified the clinical diagnosis.

HARVEY


A thoughtful and well done study of infants in 5904 pregnancies is reported. Particular attention is paid to the incidence of cardiovascular abnormalities. The infants were carefully studied during the first year of life and subsequently, if doubt still existed after the first year about the presence of an abnormality. There being 86 multiple births, the total studied was 6053 infants. Fifty infants showed a cardiovascular abnormality, an incidence of 0.83 per cent. The incidence rate was higher in the still born group (5.4 per cent) and in those who died within one month of birth (10.2 per cent). Cardiovascular malformations were three times more common in the premature, than in the full term infants. Etiologic factors were considered. The incidence is higher with advancing maternal age and multiparity reaches a peak at the third pregnancy and falls off considerably with subsequent ones. These data submitted to careful statistical evaluation are shown to be significant. Maternal infections during pregnancy were shown not to be a factor in the etiology of these abnormalities, although there were four cases of rubella in the first trimester of pregnancy in the maternal population. It is of interest, but not statistically significant, that three of the mothers who had herpes simplex during the first trimester produced infants with the tetralogy of Fallot. It was shown statistically that no acute or chronic medical conditions in the mothers, nor any complication of the pregnancy per se was a factor in the production of the abnormalities. In the 27 proven cases (verified by operation, or autopsy), the abnormalities were many, including nine abnormalities of the great vessels, five patent ductus arteriosus, five tetralogy of Fallot. It was found that during the first week of life, the physical findings were more of a reliable index of abnormality than chest x-ray films. Both, however, revealed only 50 per cent of the abnormalities which, eventually, during the follow-up period, were brought to light. Associated congenital abnormalities of other organ systems arising from other germ layers were found, but the majority of the other defects did arise from ectoderm. There was a statistically significant association between congenital cardiac abnormalities and those infants who were mongoloids as well as those infants who have diaphragmatic hernias and die in early life.

HARVEY


In a series of 100 cardiac catheterizations at Brooke Army Hospital over a period of three years, nine patients were found to have anomalous pulmonary veins. It was the only malformation in five patients (except for one who had a persistent left
superior vena cava); in three patients there was also an atrial septal defect (one with pulmonic stenosis in addition), and one patient had a possible atypical patent ductus arteriosus. This anomaly, therefore, is not rare and must be considered in the differential diagnosis of patients with increased pulmonary blood flow. If it is the cause of disability, the possibility of surgical cure exists. Cardiac catheterization is the best method for detecting this condition. However, as has been pointed out, this procedure is subject to misinterpretation and may result in the erroneous diagnosis of the malformation. This is because the right pulmonary veins empty into the left atrium close to the atrial septum, so that if the catheter tip enters the left atrium through an atrial septal defect, it may immediately pass out into the right lung field, appearing in the fluoroscope screen or roentgenogram similar to cases where the catheter has entered an anomalous pulmonary vein from the right atrium, an appearance, which up until recently was considered pathognomonic of an anomalous pulmonary vein. Angiocardiography, dye dilution curves, and even conventional chest roentgenograms are also useful in the diagnosis.

WENDKOS


Five cases of this combination are reported bringing the total to 96. One 25 year old patient was delivered by caesarean section because of the development of precordial pain and tachycardia at the thirty-seventh week. She was well thereafter for five months and then died suddenly. No post-mortem examination was performed. A 21 year old patient with coarctation was delivered by Caesarian section because of placenta previa. A 43 year old mother of four children died suddenly, two weeks before the expected date of confinement. Autopsy revealed dissection of the ascending aorta with rupture into the pericardium. There was a bicuspid aortic valve. A 24 year-old, mother of one child, died suddenly at about the twentieth week of her second pregnancy, as a result of rupture of an intracranial aneurysm. Coarctation of the aorta and bicuspid aortic valve were present. A 30 year old primipara died suddenly at the thirty-eighth week of pregnancy. Dissecting aneurysm of the ascending aorta had ruptured into the pericardial sac.

Although the successful termination of multiple pregnancies, 11 in one case, 7 in another are reported, the maternal prognosis is generally poor in coarctation of the aorta with pregnancy. Two instances of successful surgical correction of the coarctation in pregnant women have been reported.

MCKUSICK


A survey of 723 patients ranging from new-born infants to persons 63 years of age was made in a state institution for mental defectives. The incidence of acquired heart disease was 4.42 per cent and that for congenital heart disease was 2.35 per cent. The incidence of congenital heart disease appeared to be seven times as great as that in mentally normal persons. Seven cases of heart disease were detected by a mass electrocardiographic technic which might have escaped diagnosis by x-ray or clinical survey alone. Fourteen cases would have escaped detection if auscultatory observations had not been made and an additional seven cases were discovered only by measurement of the blood pressure. The frequency of congenital heart disease was seven per cent in the mongoloid patients, the highest incidence associated with any of the specific mental diagnoses. However, this figure was much lower than that of 50 per cent often quoted as the incidence of congenital heart disease in mongoloid patients studied at post-mortem. The authors feel that this figure is not applicable to adults with this condition. The experience with this group suggested that it was impossible to evaluate the pulmonic systolic murmur of moderate intensity which changes with respiration and position without the benefit of electrocardiographic and x-ray methods.

The authors found mass survey x-ray studies an inefficient means of detecting heart disease. Even when the films were deliberately “over-read”, only 12 of 45 cases of heart disease were discovered. The 4-lead electrocardiogram (leads I, aV_F, a lead between V_l and V_s, and a fourth, one interspace above the usual V_d disclosed only 23 of 49 instances of cardiac disease. The combination of radiographic and electrocardiographic methods revealed 28 cases. False-positive interpretations by either method were also common. It was concluded that any survey method which excludes auscultation and blood pressure measurement may well miss almost half the cases of heart disease in the group. Surveying by auscultation presents the problems of the frequency of murmurs without heart disease, the need for x-ray and electrocardiographic study for the evaluation of murmurs, the requisite skill and experience of the examiner and examiner fatigue. These authors found that it was difficult to examine more than 10 or 15 patients in a session without a recess, particularly because of the intense concentration necessary to detect minimal diastolic murmurs.

ROSENBRAUM

A patient referred for study of hemoptysis was found to have an abnormal chest roentgenogram with a shift of the mediastinum to the right and a diminution of the volume of the right lung. Pulmonary ventilatory studies revealed a moderately reduced vital capacity. Bronchspirometry revealed that, although 43 per cent of the ventilation was performed on the right, there was only a negligible uptake of oxygen on this side even when 100 per cent oxygen was breathed. Angiocardiography demonstrated the absence of the right pulmonary artery. Cardiac catheterization disclosed minimal elevation of pulmonary artery pressures. It was impossible to pass the catheter into the right pulmonary artery. It is suggested that enlargement of the bronchial arteries may be responsible for hemoptysis in these cases and may represent an indication for pneumonectomy.

SHUMAN


The case of a young woman with a patent ductus arteriosus and reversal of flow, observed from the age of 10 to death during an operation at the age of 25, is reported. The diagnosis was established by clinical, angiocardiographic and cardiac catheterization studies. Differences in cyanosis between the two hands and between the upper and lower extremities were easily seen. Prior to operation the oxygen content of blood from the right radial artery was 17.4 vol. per cent (71.9 per cent saturated), whereas that from the right femoral artery was 13.3 vol. per cent (54.9 per cent saturated). During angiocardiography the ductus arteriosus was visualized and there was dense opacification of the descending aorta 1 1/2 seconds after the injection with some opacification of the aortic arch, right innominate and left brachiocephalic vessels apparently due to reflux of the contrast material. Death at operation resulted from ventricular tachycardia and fibrillation with alterations of the heart action beginning before the ductus ligated. Postmortem study disclosed advanced atherosclerosis in the larger intrapulmonary arteries, extreme narrowing of the smaller intrapulmonary arteries with intimal proliferations and fibrinoid deposits and some points of complete obliteration of the lumen associated with destructive medial alterations. The authors feel it impossible to state the age at which the right-to-left shunt began in this patient. Electrocardiograms at the age of 10 years showed right axis deviation. At 22 years, when the femoral-artery blood was 78 per cent saturated with oxygen, there was only faint cyanosis of the nailbeds of the finger.

The authors believe that closure of the ductus should be attempted in these cases. They do not agree with the concept that the patent ductus serves as a vent to the output of the right side of the heart in these cases. It is suggested that the ductus be closed slowly with technics available for venous bleeding, application of tourniquets and arterial transfusion, as well as other supportive measures, if closure of the ductus results in excessive stress upon the right ventricle or fall in the systolic blood pressure.

ROSENBAUM


Clinical features and physiological data on the circulatory dynamics of 32 children with atrial septal defects are presented. In 21 of these the pathologic proof is clear cut, obtained from either operation or autopsy. The clinical features are basal systolic murmur, fluoroscopic hilar dance, absence of left auricular enlargement, and incomplete right bundle branch block. All patients were shown to have a left-to-right shunt with considerable increase in pulmonary flow, but normal pulmonary pressure and pulmonary vascular resistance. Indications for operative repair are the evidences of large shunts, congestive failure, marked exercise intolerance, marked cardiomegaly alone, or underdevelopment. Of this group, nine children were operated. The operative mortality was 30 per cent. The six children who are presently alive had some increase in exercise tolerance, disappearance of murmurs and decrease in heart size. Electrocardiographic patterns are unchanged.

HARVEY


The surgical treatment of certain congenital anomalies characterized by non-function of the right atrium or ventricle may depend upon the delivery of vena caval blood into pulmonary arterial circulation. It has been estimated that in the human there is a mean pressure of about 13 to 17 mm. Hg would be required to maintain a normal flow through the pulmonary artery. A venous pressure of this magnitude would probably not cause edema, though it would lead to varicosities and growth of collaterals.

The authors describe their technic of anastomosing the azygos vein to the right pulmonary artery and then ligating the superior vena cava at its entrance to the heart. This procedure was carried out on three dogs. Superior vena caval pressures after the establishment of the shunt varied from 118 to 250 mm. saline. Angiocardiograms demonstrated the passage of dye into the right pulmonary arterial circulation.
These preliminary experiments show that at least some blood from the superior vena cava passes through the right lung. It is possible that pulmonary arterial resistance may fall after prolonged exclusion of the pulmonary artery from direct continuity with the heart. By-pass of the right heart might be expected to benefit conditions such as tricuspid or pulmonary atresia, Ebstein's anomaly, bilocular heart, transposition of great vessels, and perhaps Eisenmenger's complex.

Enselberg

The clinical features of 10 children, seven females and three males, with moderate pulmonic stenosis and left-to-right intracardiac shunt are reviewed. Six had atrial defects, three ventricular defects, and one an ostium auriculoventriculare commune. Studies of the estimated blood flows revealed systemic blood flows within normal range in all cases. The pulmonary blood flows were larger than the respective systemic flows due to left-to-right shunting of blood. A significant mean systolic pressure gradient between the right ventricle and pulmonary artery was demonstrated in all cases ranging from 15 to 49 mm. Hg. In some instances, it was suggested that the nature of the pulmonic stenosis is relative to enlargement of the right ventricle and pulmonary artery. In large left-to-right shunts, the authors state that closure of the defect may be advisable and the mild pulmonic stenosis should not deter surgical elimination of the shunt.

Rinzler

Maxwell, Jan and Wilson, R.: Cor Pulmonale in Infancy Simulating Congenital Heart Disease. Pediatrics, 14: 857 (Dec.), 1954.
Two cases of cor pulmonale in infants under one year of age are presented. The clinical features of these cases, the authors believe, permit differentiation from congenital heart disease. The children appear normal at birth but in a few months develop easy tiring, failure to maintain weight and mild cyanosis. The clinical findings and electrocardiogram show right sided hypertrophy and preponderance. The anatomic cause of the cor pulmonale revealed at autopsy was an apparent change in the pulmonary circulation. In one instance, medial hypertrophy of the muscularis coat occurred in widespread fashion throughout the whole pulmonary tree; in the other case there was an arteriolitis with minute thrombi in the arterial tree of the right lung only. A discussion is presented upon possible causes for these pathological changes.

Harvey

CONGESTIVE HEART FAILURE

In three cardiac patients with oliguria, two controls and two patients with liver cirrhosis and ascites, the effect of oxygen therapy on diuresis and excretion of antidiuretic factors in the urine was investigated. In addition, the effect was studied of an antidiuretic hormone preparation (Tonephin) with or without concomitant Oxygen therapy.

In the cardiac patients O2 application increased the diuresis in contrast to the controls and the patients with liver disease. The urine of the cardiac patients contained increased amounts of antidiuretic substances which were reduced to below normal by O2 treatment. Furthermore, in the cardiac patients, injection of the antidiuretic hormone resulted in a far more pronounced drop of diuresis than in the controls, and this too was partially counteracted by Oxygen.

It is concluded that in cardiac patients with oliguria, the increased content of antidiuretic substance in the urine is probably due to increased excretion of posterior pituitary hormone and to its inadequate inactivation in the peripheral tissues. The diuretic effect of oxygen treatment in such cases is attributed to inhibition of secretion and increase in peripheral inactivation of the antidiuretic hormone.

Pick

Seventeen patients hospitalized because of severe congestive failure due to cor pulmonale were treated with Diamox. A large diuresis and corresponding clinical improvement were observed in approximately half the trials, with an average weight loss of 15.5 pounds in five to 12 days of treatment. The remaining cases lost little or no weight and showed no clinical improvement. Most patients became slightly more acidic as the result of treatment. The partial pressure of carbon dioxide in the blood usually did not change significantly. The only difference noted between the responsive and unresponsive groups appeared to be the initial level of blood bicarbonate, which was slightly higher in the patients who responded to treatment. In the patients who had a diuresis, loss of bicarbonate appears in some manner to have allowed renal excretion of chloride despite low plasma chloride levels. Explanation of this phenomenon must await further elucidation.
tion of the mechanisms regulating renal tubular transport of chloride. In any event, it is probable that chloride loss prevented more rapid reduction in plasma bicarbonate and thereby enabled these patients to continue their diuresis for several days. It has been previously shown that without chloride loss, the bicarbonate diuresis is rapidly self-terminating and patients soon become refractory to continued treatment as the plasma bicarbonate level falls. In the present study, administration of Diamox at intervals throughout the day appeared to be a satisfactory dosage schedule; however, there are insufficient data to indicate what the optimal regime might be.

**Wendkos**


Forty-five patients with congestive heart failure and 32 patients with the anginal syndrome were treated with choline theophyllinate (Cholexyl). Improvement in congestive heart failure patients, consisting either of removal of the need for mercurial diuretics or decreased need for mercurial diuretics, was noted in 62 per cent. Satisfactory relief and control of the anginal syndrome occurred in 23 of 32 patients (or 72 per cent). Because of the high predictability of therapeutic response to this medication, the absence of gastro-intestinal irritation, and the low likelihood of the development of tolerance, it is suggested that choline theophyllinate is an effective and safe xanthine with none of the disadvantages that may be encountered with aminophyllin or other theophylline salts.

**Kitchell**


In 1947 the authors observed that massage in the region of the carotid sinus could stop or improve rapidly the acute crisis of pulmonary edema in persons with arterial hypertension. Since then the procedure has been used routinely in this type of case and frequently the results have been excellent. Unilateral massage is applied over the carotid sinus region by moving the thumb firmly under the anterior border of the sternocleidomastoid muscle. The pressure over the carotid sinus in some patients is continued for as long as half an hour. When the reflex becomes exhausted on one side, a good response is often obtained on the opposite side. The response is considered effective when cardiac rate and blood pressure decrease to normal. In order to avoid accidents and overeffects, the intensity of the pressure on the carotid sinus is controlled through auscultation of the heart and frequent blood pressure readings. This method produces a rapid improvement in hypertensive patients with acute pulmonary edema or cardiac asthma and will considerably shorten the recovery period in the same type of patient after standard exercise tolerance tests.

**Kitchell**


Cerebral hemodynamics were studied by the nitrous oxide method in 20 patients with hypertension complicated by heart failure. Cerebral blood flow and oxygen consumption were not altered. Likewise, rapid digitalization did not alter cerebral hemodynamics.

Cerebral blood flow was somewhat depressed in six other patients with failure and aortic insufficiency or mitral stenosis. However, this reduction may be due to the mechanical alterations resulting in a depressed cardiac output and not to congestive failure per se. In severe cardiac failure with dyspnea due to severe pulmonary congestion, accurate blood flow determinations by this technic are not possible.

**Waife**


Transcapillary loss was measured by injecting a non-diffusible dye (T-1824, Evans blue) and the substance studied (deuterium oxide, D₂O and thiocyanate ion) into an afferent vessel of an organ and sampling from an efferent vessel during the first circulation. The difference between the expected concentration of the diffusible substance, as indicated here by the dye, and that experimentally determined is a measure of transcapillary loss.

It was found that deuterium oxide freely and rapidly passed through pulmonary capillary walls, but the curve differed markedly from that of the forearm and indicated a small pulmonary extrascular tissue space. This extravascular water space averaged 190 cc. in the lungs of normal subjects, but 290 cc. in patients with congestive failure. The lung capillaries were relatively impermeable to thiocyanate ions as compared to forearm capillaries.

**Waife**

Thirteen separate menus prepared by a metabolic kitchen each constructed to contain 200 mg. of sodium and providing 70 Gm. of protein with calories ranging from 1900 to 2300, were analyzed for their electrolyte composition by a method described by the author. In addition, a sample menu of the Kempner rice and fruit diet was prepared for analysis. In the preparation of the diets the tables of Bills and associates were employed. In the group of 13 diets analyzed, the actual sodium content was found to range from 304 to 812 mg. with an average of 513 mg. The Kempner diet was found to have 189 mg. rather than the 20 mg. expected. It is suggested that the actual determination of the sodium content of diets is required since there is some doubt as to the validity of the tables used for computing these values.

SHUMAN


Regardless of the etiology of the pulmonary edema, whether cardiac, anoxic or toxic, one common factor, partial or complete obstruction by the edema fluid, quickly develops. If these patients die, it is usually by drowning. Yet nearly all reported medical regimen overlook the important possibility of mechanically removing the edema fluid. As a result of the ensuing bronchial obstruction, there develops a variable degree of anoxia. Anoxia causes both pulmonary-artery hypertension and capillary dilatation leading to congestion, stasis, mucosal edema, and further transudation of edema fluid with increased obstruction and greater anoxia. It seemed extremely important to interrupt this cycle at some point, and the mechanical removal of the accumulating transudate appears to be the most feasible and rewarding.

The authors inserted an endotracheal tube with an inflatable cuff into the trachea with the patient still asleep or under local anesthesia, if he is awake. Oxygen is administered under a positive pressure of 5 or 6 cm. of water. Brief periods of suction through the endotracheal catheter with a smaller urethral catheter are repeated as frequently as may be necessary. The authors at times had to suction a patient as often as once each minute and found that, with a little practice, it is quite possible to discontinue the positive pressure oxygen for only about five seconds during each aspiration. In addition, all the usual adjunctive measures have been used including intravenous digitalis and aminophyllin, restriction of fluids, mercurial diuretics, rotating tourniquets on the extremities, and actual phlebotomies. The authors present four cases where this technic was employed successfully. One patient died on the third postoperative day.

The authors point out the large part anoxia plays in the precipitation of pulmonary edema. The oxygen given under pressure combats bronchospasm and mucosal edema as well as directly increasing the intra-alveolar pressure which helps prevent transudation of fluid from the capillaries into the interstitial tissues of the lungs. In addition, the increased pressure retards pulmonary blood flow, thereby reducing the pulmonary capillary blood pressure. Positive pressure oxygen should not be used in the presence of shock.

It has been clearly demonstrated that the endotracheal tube can be left in place for a period of days without causing great tracheal or laryngeal damage. It is the authors preference, if the tube is to remain in place longer than forty-eight hours, to perform a tracheotomy which is much more satisfactory for removing the crusted secretions that inevitably seem to form.

DENNISON


Arfonad is a ganglion blocking agent which has an effective blood pressure lowering effect probably through direct peripheral vasodilation as well as through ganglion blockade. In this report, the drug was administered intravenously for a total of 11 days to a patient with chronic glomerulonephritis complicated by hypertension and pulmonary edema. During the treatment period, the blood pressure decreased, and the signs and symptoms of pulmonary edema subsided. The hypotensive effects were readily controlled by regulation of the infusion rate. Tolerance of the drug did not develop and untoward reactions were minimal. The latter effects consisted of photophobia due to fixed pupillary dilatation and a fall of the basal body temperature. The urinary volume was not increased and the patient became more uremic and acidotic; death occurred following cardiac arrest.

CORONARY ARTERY DISEASE


The intermediate coronary syndrome is the name given by Graybiel to a syndrome of coronary artery disease which differs from that of angina pectoris in pain characteristics, and in other features from myocardial infarction. The pain in this syndrome lasts longer than a few minutes after the precipitating factors are no longer present and after nitroglycerin; furthermore, the pain often arises spontaneously and is not intimately related to effort.
There are few other symptoms; the physical examination is usually negative. There is little if any evidence of circulatory failure or systemic effects. Depression of RS-T segments and lowering or inversion of the T waves may be seen, but these changes are transitory. The clinical course ends either in apparent recovery or in the development of infarction. The term "coronary insufficiency" resembles but is not identical with this term.

Waife


An analysis of the relationship between the sudden changes in weather and the onset of cases of acute myocardial infarction was made in three Dallas hospitals, comprising a series of 1,386 patients admitted during a five-year period from 1946 to 1951. An increased frequency of occurrence of acute myocardial infarction was noted during periods of sudden inflows of polar and of tropical air masses. It appears from the present study that sudden meteorologic changes exert an adverse effect on patients with coronary artery disease.

Rinzler


A method is described for producing gradual coronary occlusion and subsequent myocardial infarction in dogs. Such a technic would provide a better base for various experimental surgical studies of methods for "revascularization" of the heart. The method consists of inserting a small piece of polyethylene tubing into the anterior descending coronary artery. The tubing clots over in about three to six hours, as judged by electrocardiographic evidence, and is complete in about 24 to 30 hours as judged by postmortem study.

The authors had no operative mortality after the technique was mastered, and found a much lower late mortality than would have been expected after acute ligation. Myocardial infarcts were uniformly produced. Ventricular fibrillation was uncommon. The mechanism of protection against ventricular fibrillation is not clear. Possibly vasomotor tone in existing collateral channels is relaxed when coronary occlusion is gradual.

Enselberg


The series consisted of 80 consecutive admissions to the hospital of patients with acute myocardial infarction who had lived 24 hours or more. All patients were given an anticoagulant, Dicumarol or Tromexan, and prothrombin time determinations were performed once or twice daily. All patients remained in the hospital for 28 to 38 days. They were given morphine or Demerol to control pain and were placed on a diet limited in calories. Patients, who were treated in a chair, are referred to herein as "Up Patients," and those confined to bed as "Down Patients." The Up Patients were allowed in a chair for increasing lengths of time from the second to the fifth day after the infarction. No patient was allowed up until shock, if present, had been controlled or pain had almost disappeared. The Down Patients were kept in bed for 28 days and were not allowed to bathe, shave or feed themselves until the second week after the infarction. They were encouraged to flex and extend their feet frequently, and several were allowed use of a bedside commode once daily. Three of the 39 Up Patients and six of the 41 Down Patients died, a mortality of 7.7 per cent and 14.7 per cent respectively. The two groups were reasonably comparable as to age and severity. The chair treatment apparently did no harm and seemed to be attended by psychologic and physical benefits.

Wendkos


The authors report a follow-up study of 500 patients who have survived coronary occlusion for from one to 29 years, and find that two out of every five patients made a complete functional recovery. A similar number made a satisfactory recovery in that they experienced only mild angina or dyspnea on exertion. Three-quarters of these patients were working. Over half the patients have survived more than five years after the initial attack; one out of every five survived the attack for more than 10 years. Among the patients making complete, or satisfactory, recovery, only one out of every five died and this was usually the result of another coronary occlusion or congestive failure. The most reliable sign of recovery after coronary occlusion is the absence of cardiac symptoms, regardless of whether the patients have large hearts, marked electrocardiographic changes or even ventricular aneurysm. On the other hand, when physical examination and laboratory studies are normal, the patient has almost always made an excellent recovery and his outlook is good. Evidently the site of the infarction does not affect the prognosis; the outlook is somewhat better in a younger patient. The patient and the physician should be optimistic about the prognosis of coronary
occlusion, both during the attack and afterward. In this series the outlook of the patients who returned to work was at least as good as it was in those who retired. For this reason, the medical profession should take the lead in acquainting the public with these facts and should enlist the cooperation of business and of social agencies in placing the cardiac patient in industry.

Kitchell


It is true that trauma and its complications may damage the heart, and it is equally true that cardiac disability may develop after injury even though there is no causal relationship between the two events. Workmen's Compensation laws that prevail throughout most of the United States make it important to differentiate between these two whenever the injury is occupational in nature. The various kinds of direct injury to the heart that may result from trauma to the thorax are discussed under the headings of commotion (cardiac shock), myocardial contusion, laceration of the heart, laceration of parietal pericardium, valvular avulsion, and coronary artery contusion. In the absence of direct injury to the heart or thorax, exertion, pain, fear or anger may cause a pressor reaction which, in the presence of coronary atherosclerosis, may lead either to hemorrhage into atheroma or relative coronary insufficiency. Either of these two may lead to immediate cardiac arrest, delayed thrombosis, immediate transient or persistent evidence of myocardial ischemia; or may go on to transient dilatation with recovery on rest. Evidence from postmortem examinations of persons who have died violent deaths indicates that coronary thrombosis is rarely the direct result of trauma. The contention that such was the case is probably never tenable unless supported by facts obtained through postmortem examination. In the presence of coronary atherosclerosis, various secondary effects of trauma or stress are probably capable of either inducing a state of coronary insufficiency or of causing the heart to fail by imposing an excessive work load on it.

Kitchell

ELECTROCARDIOGRAPHY


Of 1370 individuals with pain of cardiac origin, 10 were found whose electrocardiograms showed transient inversion of the T waves in CR to CR, and often beyond this lead. This mutable electrocardiogram is ascribed to spasm of the left coronary artery distal to the circumflex branch and proximal to the left marginal branch unless this branch takes origin from the left circumflex. Exercise may reproduce this deformity. The author attaches a favorable prognosis to this syndrome.

Soloff


The authors have previously demonstrated a lack of correspondence between the vectorcardiograms of the normal and premature beats. They demonstrate that there is no constant relationship between the vectorcardiograms of the normal and that of the premature beats. Such a lack of correspondence is attributed to local factors such as an uneven distribution of adipose tissue around the heart.

Soloff


Changes have been frequently observed in the electrocardiograms of normal persons made after the ingestion of food. Twenty-seven consecutive cases with clinical and electrocardiographic diagnosis of acute myocardial infarction were studied before and after food ingestion. All tracings were made with the patient recumbent, and the positions of the precordial leads were carefully marked on the chest so that comparable leads were obtained in the repeated electrocardiograms on the same patient. The postmeal electrocardiograms were obtained a half hour after eating. Change in the polarity of the T wave was classified as a major alteration and variation in magnitude of the T wave without polarity alteration was classified as a minor change. The other components of the electrocardiogram were not significantly affected. Major T wave changes were noted in 10 of the 27 patients studied and very frequently such change appeared in several leads of the electrocardiograms in these 10 patients. The findings suggest there should be a modification of current electrocardiographic technique to obviate the effects of eating, and ideally serial electrocardiograms should be performed in the fasting state; at least several hours should be allowed to elapse between the taking of a meal and the taking of the electrocardiogram.

Kitchell


The authors compared vectorcardiograms with scalar electrocardiograms (including precordial leads V2R through V6) in 18 patients with right
ventricular strain (proven by cardiac catheterization), 10 normals (1 catheterized), 5 athletes (2 catheterized) and 8 patients with right bundle branch block without clinical evidence for right heart strain.

There was no definite correlation between the shape and direction of the vector loop and the right ventricular pressure. Abnormalities in the beginning of the vector loop consisting in deviation to the left were found only in cases with right heart strain, and this in 80 per cent of cases in which the right ventricular pressure was more than twice of normal. The direction of the rotation of the horizontal loop could be determined correctly in 85 per cent from the precordial electrocardiogram.

This study, according to authors, failed to reveal any vectorcardiographic signs of right heart strain which were not evident in the customary electrocardiogram. However, the interpretation of the vectorcardiogram proved simpler than that of the electrocardiogram.


The authors produced in dogs pretreated by DOCA, elevation of blood potassium levels by massive infusion of potassium solutions, and reduction of potassium levels by infusion of sodium solutions. Electrocardiographic alterations occurring during these experiments were correlated with the potassium and sodium concentrations in the heart muscle and serum.

There was no consistent relationship between the electrocardiographic alterations on one hand and the absolute intracellular or extra-cellular amount of K or Na in the heart on the other hand. However, a definite relationship could be established to the gradient between intracellular and extracellular K concentration. In normal dogs the ratio intracellular to extracellular concentration of K (termed by the authors cardiac potassium quotient) is between 25 and 32. Reduction of this quotient by increase in serum potassium produced typical hyperkalemie changes in the electrocardiogram disappearance of P and increase in T waves, impairment of A-V and intraventricular conduction and development of idioventricular rhythms with progressive slowing terminating in cardiac standstill. An increase of the quotient, usually corresponding to reduction of the serum potassium, caused in the electrocardiogram augmentation of P waves and P-R intervals, reduction of T waves and depression of the S-T segment. Under both circumstances the Q-T duration became prolonged and the duration of the mechanical systole (the distance from Q to the second heart sound) was shortened.

These experiments can explain clinical observa-

tions of hyperkalemic alterations of the electrocardiogram in the presence of normal potassium level as well as the absence of the electrocardiographic alterations in the presence of severe hypopotassemia.


In the course of intended or fortuitous introduction of a cardiac catheter into the coronary sinus, disturbances in the origin of the cardiac impulse were observed and recorded in simultaneous peripheral and intracardiac leads. The P waves became inverted in leads II, III and V₅, and changed from diphasic to inverted in the cavity lead, with little or no shortening of P-R, whenever the tip of the catheter was at the entrance into the coronary sinus or at the beginning of the great posterior coronary vein. These changes in contour, ascribed to origin of the impulse in tissues surrounding the coronary sinus, were recorded in form of sporadic premature beats, of bigeminy, or of transient and persistent ectopic rhythms. Transitional complexes between the two types of P waves could be attributed to auricular fusion beats from simultaneous operation of the sinus and ectopic pacemaker or to wandering of the pacemaker from the sinus node to the area of the coronary sinus and vice versa. Transient upward displacement of the S-T segment was sometimes seen in the course of coronary sinus catheterization with or without simultaneous P wave alterations. This can be explained either by accentuation of a TP directed opposite to the inverted P, or to transitory posterior wall ischemia following occlusion of the main venous channel by the catheter.


Continuous electrocardiographic recordings during surgery on 40 cases of pulmonic stenosis, one case of aortic stenosis and 6 cases of mitral stenosis are reported. In all, the opening of the valvular ostium was achieved by a transventricular approach. Thoracotomy and incision of the pleura were followed by insignificant disturbances of rhythm. Instillation of novocaine into the pericardium caused transient abnormalities of the T waves, ascribed to alterations of the superficial layers of the ventricular myocardium. Mechanical stimulation, such as infiltration of the myocardium by novocaine and application of ligatures, produced premature ventricular systoles originating in the area of manipulation. Runs of such ectopic beats and rapid ectopic rhythms were usually recorded at the time of the
actual valvotomy. However, antecedent novocaine infiltration seemed to prevent persistence of the ectopic beats into the post-operative period. In addition to these abnormalities, the procedure usually caused the appearance of intraventricular conduction defects and positional contour alterations caused by the handling of the heart. Contour alteration of the electrocardiogram occurring subsequent to surgery are mostly due to the development of a pericarditis. An instance is illustrated of successful resuscitation in which ventricular fibrillation developing during the operation was abolished by cardiac massage.


Epicardial, intramural, cavity and septal leads were used to study depolarization in normal dog ventricles. The commonest type of epicardial complex was an RS wave with a notch on the initial upstroke. All epicardial leads were observed to have an S wave of variable size following the R wave. The size of epicardial R and thickness of ventricular myocardial layers were not correlated. Cavity and leads from inner layers were observed to have pure QS waves on the left side and either rS or QS on the right. Records from the inner third of the wall occurred almost simultaneously with those from the cavity. Subendocardial depolarization had only a minor or no effect on the EKG. Middle and outer layers of both ventricles produced R waves with distinct intrinsic deflections. These R waves were produced progressively later in time passing from mid-myocardium to epicardium. Depolarization of middle and outer myocardial layers is apparently responsible for R waves recorded from both ventricles. Outer layers depolarized more slowly than middle. Base was slower than apex. Later epicardial depolarization at the base depended on slower depolarization in outer layers rather than on a greater thickness of myocardium at this point. On the right side, the inner myocardial layers depolarized almost simultaneously. However, middle layers were depolarized rapidly and outer layers more slowly at rates which could be measured.


This paper introduces a new empiric formula which expresses in a single equation the opposite changes of the QRS complex and T wave in limb leads I and III, and which thus permits a quantitative estimation of the intensity of existing ventricular strain. It is \( [R_1 - S_3 - 2T_1] + [S_3 - R_3] + 2T_3 \).

Standard values are established in a group of 100 healthy individuals. The mean was found to be +1.84 with a range from –12.5 to +12.5. In cases of left ventricular strain the index is always positive, with a mean of +47.2 and a range from +32.5 to +79.5. In cases of right ventricular strain the index is always negative with a mean of –27.6 and a range from –20.0 to –40.0. Correlations between the strain index and its components, the QRS and T factors, (leads I and III), and the position of the electrical axis are established as much in normal individuals as in cases of left and right ventricular strain. Their pathophysiologic and clinical aspects are discussed. The strain index expresses in a quantitative manner the intensity of the response of the ventricular musculature to the required overwork, regardless of causative factors. It serves to indicate by a quantitative criterion the presence of ventricular overactivity and permits following and comparing the mentioned changes in different cardiac conditions.

Rinzler