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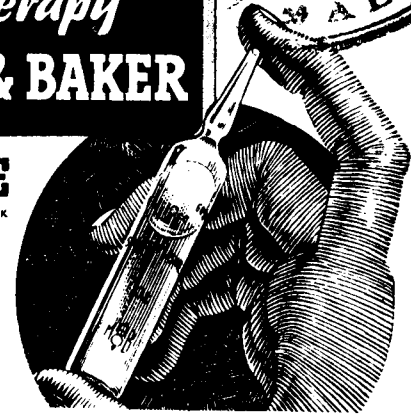
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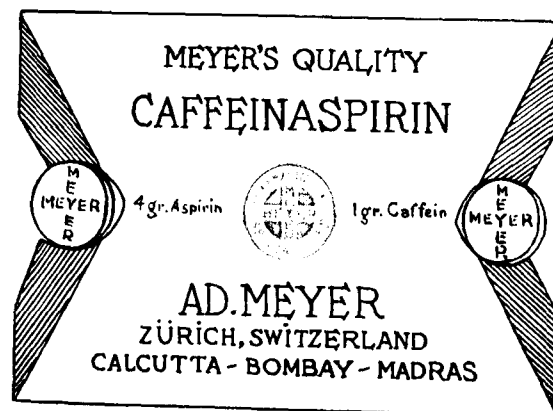
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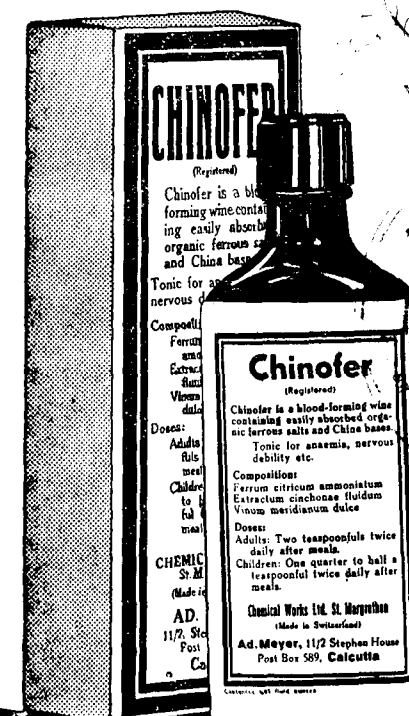
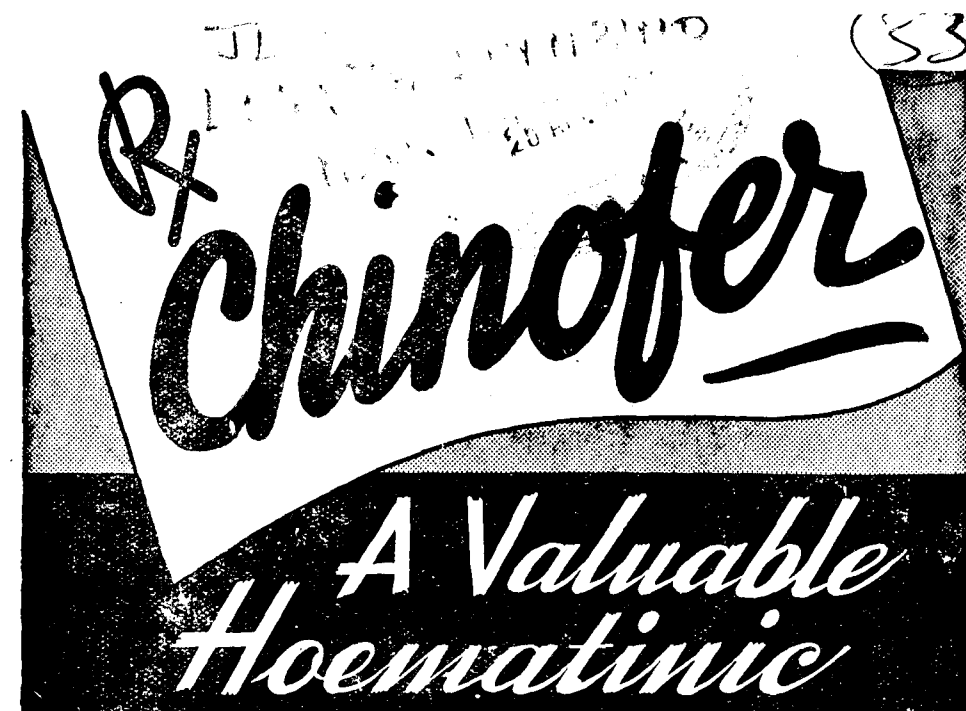
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EMERGENCY TREATMENT OF ACUTE HEART FAILURE.

This is a clinical lecture given at the 1939 St. Louis session of the A. M. A. by Alphonse McMahon.

The type of emergency treatment indicated in heart failure depends to some extent on the etiologic basis of the heart failure. The need for emergency treatment depends on the character of the pathologic process which preceded the break in compensation and on the severity of the clinical abnormality which is the expression of this particular underlying pathologic condition.

In the presence of heart failure the clinician must attempt to establish, if possible the underlying cause and the type of failure which is present. This assumes that he is not misled by the many vagaries of cardiac rhythm which are so often misinterpreted as evidence of true failure. Inability to diagnosticate properly the cardiac state and evaluate the abnormalities of rhythm often lead to grave mistakes in diagnosis, resulting in many cases in unending psychologic turmoil in the patient who has been exposed to the incorrect diagnosis. Cardiac neuroses that may serve to incapacitate a patient are often born of the fear which arises from the false diagnosis of "heart trouble."

In emergency cardiac states it may not be possible to determine the underlying cause. In such conditions the emergency treatment must be instituted which is indicated by the evident clinical manifestations. Such treatment must needs be prompt to be life-saving. However, when the time permits, a brief history of the condition may be obtained from the patient or his relatives. Valuable information as to the possible underlying clinical factors responsible for the acute attack may be obtained in the history. Much of value regarding the existence and progression of preceding cardiac or cardiovascular factors may be learned by well chosen questions. Such apparently simple facts as those detailing the onset and progress of the acute attack may give information of inestimable value with specific clues as to the required treatment.

The physical examination of the heart in cardiac failure is a *sine qua non* of diagnosis. Such important facts as the rate, rhythm and character of the heart sounds should be carefully noted. Disturbances of mechanisms indicating heart block, auricular fibrillation or flutter may be evident and extremely valuable in determining causation of failure and in indicating treatment. When possible, a general examination of the patient should be conducted with particular regard to other signs of cardiac failure such as orthopnoea, enlarged liver, ascites and peripheral oedema or anasarca.

For the purpose of classification, acute cardiac failure may be grouped into that associated with the infectious diseases such as pneumonia, diphtheria, sepsis and that occurring in the course of thyrotoxicosis, syphilis, arteriosclerosis, hypertension and rheumatic heart disease. The clinical cardiac manifestations in the latter diseases may be protean, seldom conforming to a constant pattern and hence seldom of themselves indicative of the underlying pathologic condition.

The provoking causes of heart failure are multiple. Acute infections sometimes mild in character, such as a grippal or a respiratory infection may serve to initiate a break in compensation in a heart previously diseased but well compensated. Recurrent rheumatic infections may undermine the integrity of the heart muscle, as will repeated carditis with tonsillitis occurring regularly once or twice a year. Arrhythmias are often the determining causes of acute cardiac failure. The postoperative cardiac failure is often transient, and may be associated with pulmonary embolism. Extensive embolism may result in immediate death. Extreme emotional states, excitement, grief or sorrow may play significant roles in the causation of cardiac failure.

The acute heart failure of the infectious diseases may respond to emergency treatment, but since it occurs after severe and prolonged toxæmia the response to treatment may be unsatisfactory. The most important fact in the therapy of this type of cardiac disturbance is concerned with the prevention of serious cardiac accidents. This may be effected by the exercise of proper care of the patient by the physician during the acute illness. The heart should be carefully watched during the acute stages of the disease so that when signs of failure appear, proper therapy may be instituted early. Prevention of cardiac disability in the infectious diseases is far more important than the treatment of the cardiac emergency.

In the diagnosis and evaluation of cardiac states associated with failure, it may be well to mention some clinical conditions which, in the intensity of the cardiac manifestations, may simulate acute cardiac failure. Chief among these is pulmonary embolism with infarct, presenting a symptom complex that closely simulates coronary thrombosis with many of the dramatic phases of the latter

condition. Cardiac deterioration in pulmonary infarct may be rapid and startling. The symptomatology of pulmonary embolism bears so striking a resemblance to that of coronary thrombosis that it may be differentiated only by means of the electro-cardiogram. Sufficient time must elapse to produce diagnostic changes adequate to assist in the solution of this difficult problem.

Other conditions which may cause difficulties in diagnosis are spontaneous pneumothorax inducing severe cardiorespiratory symptoms, massive collapse or atelectasis producing a clinical picture often confused with true heart disease because of the respiratory difficulty and pleural effusion. The last-named condition is often characterized by a slowly developing dyspnoea chiefly on exertion, closely simulating heart failure.

SYMPTOMS AND SIGNS.

The symptoms and signs of cardiac failure may be grouped for purposes of convenience into those occurring with left ventricular failure and those occurring with right ventricular failure. In left ventricular failure, cardiac asthma or paroxysmal dyspnoea with oedema of the lungs is a frequent sign alone or with Cheyne-Stokes respiration. These will be discussed later at greater length. The cardiac rhythm in this type of failure may be of the gallop type, or any of the arrhythmias may be present. Pulmonary congestion is frequent and in this condition the X-rays may aid in diagnosis. Vital capacity is reduced to as low as 60 per cent. of normal while circulation tests reveal a prolonged decholin time with a normal ether time.

In the right ventricular failure, dyspnoea is likewise common, but it is more apt to be of the simple type. The liver is, as a rule, enlarged and may be tender and pulsating. Hydrothorax, frequently unilateral, is common. With dilatation of the right ventricle and right auricle, and dullness to percussion may be elicited at the lower end of the sternum. This may also be determined by means of X-ray examination. Generalized oedema with marked gain in weight may be present early in the failure. A gradual unexplained weight gain may be the forerunner of a break in compensation. Jaundice is not uncommon. The finding of albumin and erythrocytes in the urine indicates the existence of a renal congestion. Special tests of the circulation reveal an increased venous pressure together with a prolongation of the ether time. Prolonged ether and decholin time indicate a failure of both right and left ventricles.

In addition to the foregoing symptoms and signs of cardiac failure, others of variable frequency and significance may be added. The following may serve to aid in the diagnosis of the underlying pathologic condition producing the failure:

1. Pallor may be present more frequently than cyanosis.

2. Precordial discomfort may or may not be present. When present and related to exercise, it may have a definite significance.
3. Palpitation is frequently present without a clue as to the underlying associated rhythm.
4. Tachycardia is common but bradycardia may occur at times with disturbance of the sinus node or the bundle of His.
5. Heart measurements may be greater than normal as evidence of hypertrophy or dilatation in true heart disease.
6. Heart sounds may be variable in character. They are usually weak; they may be irregular. The type of arrhythmia must be determined. Murmurs vary with the type of disease. A systolic murmur at the apex is most frequent.
7. Gallop rhythm, as mentioned, is common. Heart block may appear with involvement of the conduction system.
8. Lungs may show evidence of basal congestion with rales and impaired resonance. Dullness may be found when fluid is present in the pleural cavity. The respiratory rate is usually increased.
9. Fever and leukocytosis may coexist with infectious processes. Both are found consistently with coronary thrombosis.

DYSPNOEA.

Among the premonitory symptoms of heart failure, dyspnoea stands out pre-eminently. Dyspnoea may of itself serve to call attention to an impending heart failure. It may manifest itself as the simple or exercise type evident on moderately strenuous exertion such as walking fast or climbing stairs. It may or may not be accompanied by a sensation of precordial pressure or pain. Cardiac palpitation is a common associate of the exercise, dyspnoea disappearing with rest. Such a complex symptomatology may be present for months before more evident signs of failure appear.

A second form of dyspnoea may occur as a paroxysmal or nocturnal dyspnoea, sometimes termed cardiac asthma. Accompanying this is a pulmonary oedema present in varying degrees. The onset of the attack is as a rule sudden, occurring during sleep or after some exertion such as coughing. The patient often awakens gasping for breath and conscious of the rapid heart action. Precordial pain is frequently present and sweating is a distressing symptom. Cough with varying amounts of sputum is present with oedema. The attack is at times accompanied and aggravated by severe fright.

The mechanism of the attacks is probably an acute left ventricular failure following sudden elevation of blood pressure occurring during sleep as a result of exciting dreams, urinary bladder discomfort or other sensory stimuli. This is the so-called "back-pressure theory" in which a pulmonary congestion occurs. Other suggested explanations have been the "nerve theory" which presupposes an alteration in the nervous control of the bronchial

musculature and the theory of "failure of forward pressure" with consequent accumulation of acid-substances in the tissues.

A third type of dyspnoea which is important, extremely distressing and often unrecognized as a sign of cardiac failure is the Cheyne-Stokes respiration. This type of dyspnoea occurs frequently in heart disease, being found most often in arteriosclerotic and hypertensive states. It may be an index of left ventricular failure in these two conditions. The duration of the periods of apnoea varies from ten to forty seconds. The apnoea is more disturbing when nocturnal. The patient often awakens during the long periods of apnoea to find himself struggling for breath. The fear induced by this attack prevents sleep and so the element of prolonged exhaustion is added to the already embarrassed myocardium, further reducing the cardiac reserve.

The foregoing forms of dyspnoea, from the simplest or exercise type to the most complex, may be valuable in determining the extent and severity of cardiac disability. Immediate understanding of the significance of this symptom, particularly in its more serious manifestations, the nocturnal dyspnoea with pulmonary oedema and the Cheyne-Stokes respiration will result in prompt and adequate therapy with the consequent restoration of cardiac integrity.

The essential treatment of cardiac failure depends, as has been said, on the factors underlying the failure and also on the clinical expressions of the failure. It is necessary then, in any failure, to determine whether the heart action is arrhythmic or rhythmic and whether or not oedema exists. The location of the oedema, whether general or pulmonary, may be of great importance.

If the heart is arrhythmic, the character of the arrhythmia should be determined, instrumental aids being used for more accurate determination when possible. An electrocardiogram may reveal not only the arrhythmia but also the character of any underlying myocardial changes.

GENERAL PRINCIPLES OF TREATMENT.

With the foregoing differentiations and clinical determinations in mind, one may proceed to the consideration of certain general principles of treatment as applied to acute cardiac failure.

1. Rest in bed should be absolute. It presupposes adequate and proper nursing care. In simple congestive heart failure with normal rhythm, rest in bed may be modified to prevent formation of venous thrombi, which may develop as a result of the marked slowing of the circulation.

2. Sedation should be obtained by morphine given subcutaneously or intravenously in adequate doses. In the acute stages of heart failure, rest is most important. Dilaudid hydrochloride may be used in doses of $\frac{1}{4}$ to $\frac{1}{2}$ grain (from 1 to 2 mg.). Respiratory depression may be controlled by using caffeine, atropine or a

respiratory stimulant such as lobeline or coramine. Barbiturates may well serve the purpose.

3. When cardiac failure is accompanied by arrhythmia, the tachycardia should be treated and for this purpose digitalis or quinidine should be used in adequate doses. When sinus rhythm is present with cardiac failure the effect of absolute rest in restoring cardiac integrity may be determined before digitalis is used. Digitalis has its most pronounced effect in cardiac failure. In circulatory failure the effect of digitalis is less pronounced and may even be negative.

When auricular fibrillation or auricular flutter exists, digitalis should be used in large and adequate doses. In the former condition quinidine may be of value in restoring rhythm. When the arrhythmia is due to auricular or ventricular paroxysmal tachycardia, quinidine is usually of greater value. In the latter condition digitalis may prove to be dangerous by converting the tachycardia to ventricular flutter or fibrillation.

What may be expected from the use of digitalis in cardiac failure due to the various underlying causes? In auricular fibrillation accompanying mitral stenosis, arteriosclerotic or thyroid heart disease the results following its use may be excellent. In thyroid heart disease the effect is usually less satisfactory than in the two preceding conditions. In mitral stenosis with sinus rhythm the results with digitalis are, as a rule, not as good as when fibrillation is present. In hypertensive and arteriosclerotic heart disease with failure and sinus rhythm a good result may be obtained. Aortic insufficiency with failure shows but little result from the use of digitalis.

The method of dosage of digitalis varies with the urgency of the condition to be treated. Hence digitalization may be accomplished slowly or rapidly. Oral administration of the drug is the method of choice and can be used when the stomach will tolerate the drug. When a gastric upset renders this route impossible of use, other routes of administration may be employed, such as the intramuscular, the intravenous or the rectal route. In oral administration, the dosage and the rapidity of administration will depend on the severity of the failure. Where the urgency of the case demands rapid digitalization, the total dosage of 15 cc. or $22\frac{1}{2}$ grains may be given orally in three equal doses within eight, twelve or twenty-four hours.

The dosage of digitalis when administered either intravenously or intramuscularly will likewise vary as it does with the oral administration. A dose of 2 cc. twice daily will usually suffice to restore compensation.

The drug may be administered rectally in the form of suppositories, as an infusion or as the fat-free tincture. The strength of the

infusion is usually from 15 to 22 grains (1 to 1.4 gm.) of the powdered leaf in 60 cc. of water. Of this, 30 cc. is given morning and evening. The fat-free tincture may be given in doses of 40 minims (2.5 cc.) twice a day. In severe auricular flutter this dose may be increased to 60 minims (4 cc.) twice a day.

A fact of great importance during the process of digitalization is the incidental occurrence of nausea and vomiting or the persistence of these symptoms, present before using digitalis. These are often falsely interpreted as signs of digitalis intoxication. The failure to understand properly and evaluate these symptoms, which are due to the congestive failure frequently, results in a catastrophe because of the discontinuance of the digitalis before adequate digitalization has been obtained. Definite signs of digitalis toxæmia such as pulsus bigeminus, premature beats or the electrocardiographic signs of overdigitalization should be present before one discontinues the drug in the presence of gastric symptoms.

Digitalis may be dangerous when used in conduction disorders and in coronary sclerosis with a high degree of block. In the latter condition it may set up a ventricular fibrillation.

Strophanthin (crystalline ouabain) may be used in acute failure with or without generalized œdema in cases in which digitalis has not been given for at least three days. The dose of 0.0003 gm. ($\frac{1}{3000}$ grain) is given intravenously and repeated in twelve hours. Subsequent doses may be given at twenty-four hour intervals. It may have some value in cases of gallop rhythm with failure. Here it may be given in two daily doses combined with theophylline with ethylene diamine (aminophyllin) or mercupurin.

Diuretics have their most important use in the treatment of subacute or chronic congestive heart failure. However, they may prove to be valuable in restoring compensation in acute failure by prompt reduction of blood volume with rapid and increased diuresis, thus removing one source of ventricular strain. The diuretics most frequently used are the xanthine derivatives and the mercury compounds.

Of the former group the most common are theobromine, with sodium salicylate, theobromine with calcium salicylate, theophylline, theocin, theophylline with ethylene diamine or aminophyllin. The last named is used orally, rectally or intravenously. When given intravenously with dextrose, from 10 to 20 per cent. in amounts of from 50 to 500 cc., it serves as an excellent diuretic. The intravenous dosage of the drug varies from 3 to $7\frac{1}{2}$ grains (0.2 to 0.5 gm.). It may be given twice a day, the frequency of dosage and amount of the drug being governed by the existing condition.

The mercurial diuretics most commonly used are mercupurin, salyrgan and novasurol. The last-named, being more toxic than the two preceding, is seldom used. There is little choice between the

first two drugs either as to effect or as to tolerability. The former of the two may be slightly less irritating to kidney tissue. These diuretics may be used in the presence of acute congestive failure and the diuresis may be immediate and effective. They may be given intramuscularly, intravenously, rectally as suppositories and intraperitoneally diluted with ascitic fluid. The dose varies from 0.5 to 2 cc. and the administration may be daily or every three to five days depending on the severity of the condition and the result obtained with a given dose.

I have discussed the symptoms of paroxysmal dyspnoea as evidence of acute left ventricular failure. Since this condition may at times be extreme, it is possible that one may be obliged to regard it as of such severity as to require immediate and urgent treatment. In that case morphine should be given in adequate doses to produce complete relaxation. Any respiratory depression following the use of this drug may be combated by the drugs mentioned. Venesection with the removal of from 400 to 500 cc. of blood may produce striking immediate results when pulmonary congestion is severe. Strophanthin intravenously may be given with the usual precaution relative to the antecedent use of digitalis. Dextrose in a concentration of from 25 to 50 per cent. and in amounts of 50 cc. may be given intravenously with or without aminophyllin. The latter is of value in arteriosclerotic and hypertensive heart failure. Ligation of the lower extremities may be of value by reducing the volume of blood flowing to the heart. Mercurial diuretics may be given at the time of the attack. When these are given nightly for a few consecutive nights they may quiet the nocturnal attacks occurring in aortic regurgitation of syphilitic origin.

Glyceryl trinitrate may be of value. Oxygen inhalations usually are of definite benefit. The concentration of the oxygen may be from 50 to 90 per cent. with a flow of from 4 to 6 litres a minute. Caffeine with sodium benzoate from 1 to 3 grains (0.06 to 0.2 gm.) may be given intramuscularly or subcutaneously every three to four hours.

The distressing nocturnal symptoms accompanying the apnoeic intervals occurring in Cheyne-Stokes respiration may be relieved by the intravenous use of aminophyllin twice daily in doses of $7\frac{1}{2}$ grains (0.5 gm.). This may be given in water, saline solution or dextrose solution. It should be given slowly. The determination of the possibility of the Cheyne-Stokes respiration as the factor responsible for the nocturnal dyspnoea may be made by using a test dose of 5 grains (0.3 gm.) of aminophyllin given rectally by suppository. If relief is obtained by this means the active intravenous treatment as mentioned before may be instituted.

Acute heart failure may supervene in clinical conditions other than those so far considered. It may not present evidence of congestive failure. In heart block and the accompanying Stokes-Adams

syndrome ventricular standstill may be followed by syncopal attacks and even convulsive seizures. The treatment of the ventricular standstill is designed to effect restoration of normal ventricular function and hence must be specific for that purpose. Epinephrine hydrochloride may be given intracardially in doses of 1 cc. in 1:1,000 solution. This treatment may likewise be effective in postanaesthetic ventricular standstill. The technique of this injection is simple. A lumbar puncture needle is used and the needle is inserted into the heart through the fourth left intercostal space 2.5 cm to the left of the left sternal border. Subcutaneous injections of the same drug in from 0.3 to 0.6 cc. doses may be given at frequent intervals as often as every two hours. As much as 1 cc. of the drug may be injected at two hour intervals without distressing constitutional symptoms. The drug should be avoided in ventricular tachycardia or fibrillation. Atropine sulphate in doses of from one-twentieth to one-twelfth grain (0.003 to 0.005 gm.) may be given subcutaneously. Ephedrine sulphate may be of value and is given orally in doses of from three-eighths to one-half grain (0.024 to 0.032 gm.) from three to four times a day. Barium chloride is used to increase ventricular irritability and is given in one-half grain (0.03 gm) doses three times a day. Digitalis and quinidine should be used only when acute failure supervenes.

Coronary thrombosis with extensive cardiac infarction may result in immediate death from cardiac failure. When this eventuality does not supervene, the cardiac manifestations may be severe and if not properly treated may terminate in failure. The general reaction to the thrombosis may be striking with all the signs of severe shock, including sudden reduction of blood pressure, tachycardia and interference with cardiac and peripheral circulation. The mechanism of the heart may be regular or irregular. When irregular, various types of arrhythmias may be present. The arrhythmias most apt to be present are paroxysmal ventricular tachycardia, ventricular fibrillation, auricular fibrillation, auricular flutter, bundle branch block, usually transitory, and auricular-ventricular block. This may be complete and, when so, usually indicates an involvement of the right coronary artery with posterior infarction.

The sequelae of this coronary accident may be striking and may appear separately or as steps in a gradually progressive condition. The most common of these sequelae are oedema of the lungs, sudden cardiac failure, shock persisting to the second and third days with an unresponsive low systolic blood pressure, embolism either pulmonary or peripheral following the formation of mural thrombi at the site of the infarct, rupture of the heart muscle that may be partial and nonfatal, and lastly cardiac aneurysm, which may be diagnosticated by means of the fluoroscope.

The treatment of the acute coronary thrombosis, with which acute cardiac failure is always potentially associated, consists of rest, which must be immediate and absolute. Morphine should be used in large doses for relief of pain. It may be given intravenously if necessary to relieve severe pain and to secure rest. Vasodilators should be used and for this purpose theobromine with sodium salicylate (diuretin) or aminophyllin is most effective. The latter may be given intravenously in a dose of $7\frac{1}{2}$ grains (0.5 gm.). Glyceryl trinitrate should be avoided except when the systolic blood pressure is unusually high and when more rapid reduction of blood pressure is desired.

Strophanthin, to be given intravenously during the attack, is recommended by some foreign observers. Its use does not seem to be justified in the absence of cardiac failure. The existence of cardiac failure should likewise be the indication for the use of digitalis. The latter drug may be dangerous, as has been mentioned, when used in the presence of a high degree of heart block. Quinidine should be used when multiple extrasystoles appear. It may be used in a dose of 3 grains (0.2 gm.) four times a day. Its use may prevent the development of paroxysmal ventricular tachycardia and ventricular fibrillation. The dose may be increased to 60 grains (4 gm.) daily if needed to prevent the development of the latter condition. Oxygen inhalations may be of value in the first twelve hours after the attack.

It is not possible, in a limited presentation of this type, to discuss all the cardiac conditions that may result in failure. At best only general principles of therapeutic procedure can be discussed. Many of the cardiac arrhythmias, when severe, produce an appearance of failure and, in fact, with persistence of the arrhythmia may actually result in cardiac failure. Of these, perhaps the most common are auricular paroxysmal tachycardia and ventricular paroxysmal tachycardia. The former may be identified by the character of the onset and the cessation of the attack, which is typical. Treatment in the transient attacks seldom need be applied. In the more prolonged attacks, however, cardiac failure may supervene and so it may be advisable to restore normal rhythm as quickly as possible. For this purpose vagal or ocular pressure may be applied. Emetics may be of value. More recently acetyl-beta-methylcholine chloride has been used in doses of from 10 to 50 mg. It is injected subcutaneously and has given good results. Quinidine in doses of 6 grains (0.4 gm.) every two to four hours for five doses gives good results in selected cases. The use of digitalis to sensitize the vagus in the recurrent cases has many adherents.

Ventricular paroxysmal tachycardia is a far more potentially dangerous arrhythmia than the preceding because of the possibility of its transition into ventricular fibrillation or flutter. The attack

is often ushered in by frequent runs of extrasystoles; clinically it may be indistinguishable from the auricular type. Quinidine in adequate doses, as much as 60 grains (4 gm.) a day in divided doses, should be given at once. Digitalis, as has been said, may convert the condition into the more dangerous ventricular fibrillation.

CONCLUSION.

A recapitulation may be made of some of the more important points mentioned in the emergency treatment of heart failure. Most important of all these points is the necessity for proper diagnosis of the type of existing heart failure. This should be arrived at by a history, physical examination and other diagnostic aids when possible. The diagnosis of the underlying pathologic state of the heart and its clinical expression will determine the indications for the type of treatment to be instituted.

It is well to remember that it is not possible to group all cases of cardiac failure together and so to institute one type of treatment. Not all cases of acute failure require digitalis; in fact, in some cases the use of this drug may be dangerous. When the drug is required it should be given in adequate doses with the hope of restoring cardiac compensation as quickly as possible.

Adjuvants, such as rest and diuretics, should be used as indicated. One fact should stand out above all others: that is, one should not cease treating acute heart failure because of apparent lack of response, for restoration of the heart muscle to a compensation state is often obtained when least expected.

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THE ACUTE "MEDICAL" ABDOMEN.

The condition which surgeons call an "acute abdomen" and which requires urgent operation is often simulated by medical conditions in which surgery is not indicated. Many medical diseases can simulate acute abdominal conditions.

In an article by C. Allan Birch in *The Medical World*, July 7, 1939, he considers some of the more important medical causes of acute abdominal symptoms. For convenience they will be grouped under the following headings:—

1. Cardiovascular; 2. Respiratory; 3. Nervous; 4. Generalized infections and toxæmias; 5. Abdominal; 6. Urogenital; 7. Metabolic and allergic.

CARDIO-VASCULAR.

(1) *Coronary thrombosis.*—In most cases the pain of coronary thrombosis is substernal, but occasionally it may be in the epigastrium and associated with rigidity and tenderness. Even then there

is often some substernal pain too, but the resemblance to a perforated peptic ulcer is great. An accurate diagnosis is of paramount importance since operation on a patient with coronary thrombosis is a greater risk than on a patient with a normal heart.

An ashen grey pallor and a feeble rapid pulse in a patient between 50 and 60 with a history of anginal attacks is suggestive of coronary thrombosis. Since it is in the early hours that diagnosis is of great importance, the leucocytosis, pericardial rub and signs of congestive failure which appear later are not of great help. Special consideration should be given to the following points:—

(a) The blood pressure. There is a more sudden and greater drop in coronary thrombosis than in the shock of an acute abdominal catastrophe and if the patient's previous pressure is known this sign may be very significant.

(b) The ophthalmoscope and palpation of peripheral vessels may show signs of arteriosclerosis.

(c) Dyspnoea, especially of Cheyne-Stokes type, suggests a cardiac lesion.

(d) The electro-cardiogram may show low voltage and a high take-off of the T wave with inversion of T and T. A prominent Q wave is suggestive of coronary thrombosis and may be present soon after the attack.

(e) The response to morphine. The abdominal rigidity of cardiac origin is a response to severe pain and being cortical in origin will diminish after morphine, whereas the rigidity due to intra-abdominal disease persists after morphine.

Rupture of the heart resulting from coronary thrombosis may closely resemble an acute abdominal catastrophe.

(2) *Congestive cardiac failure.*—Epigastric pain and vomiting may be the presenting features of some cases of congestive cardiac failure, but examination also reveals auricular fibrillation in many cases and other evidence such as jugular engorgement, oedema and basal rales.

(3) *Acute pericarditis*, when sudden in onset and associated with epigastric tenderness, may closely resemble cholecystitis until the rub appears.

(4) *Mesenteric vascular occlusion.*—It is probable that spasm and thrombosis of branches of the mesenteric account for attacks of abdominal pain in old people which pass off without operation. Sometimes such attacks occur in patients known to be the subjects of arterial disease such as thrombo-angiitis obliterans. Rarely periarteritis nodosa has been found in such cases.

When the superior mesenteric artery or vein is obstructed by an embolus, or thrombus, an acute abdominal catastrophe results and accurate diagnosis is difficult. The essential features of a typical case are intense abdominal pain without at first rigidity or other signs. The contrast between the severity and persistence of the pain

and the scantiness of the physical signs is of diagnostic importance. The temperature is subnormal, but there is a leucocytosis. Later the distension of intestinal obstruction appears. If there is a history or source of embolism the diagnosis is easier and if melaenia occurs or can be shown by enema the diagnosis can be made with some confidence.

Lakin has described angina abdominis in which a rise of blood pressure is accompanied by widespread abdominal pain without tenderness. It is relieved by nitrites and has as its basis sclerosis of the mesenteric vessels.

RESPIRATORY.

(1) *Acute diaphragmatic pleurisy and pneumonia*—In these conditions, the patient may be suddenly seized with severe pain round the lower ribs and upper abdomen. Sometimes there is pain above the clavicle, but not at the tip of the shoulder as in cholecystitis. Vomiting occurs and if conspicuous the condition may be mistaken for cholecystitis or appendicitis or perforation or acute pancreatitis.

The skin is hyperaesthetic but pressure affords relief. Abdominal rigidity is minimal, however, and more a stiffness than the boardlike rigidity of perforation. Careful search must be made for a pleural rub or a patch of bronchial breathing. Diaphragmatic pleurisy, however, can occur without pneumonia or effusion. An X-ray examination of the chest may show a very early pneumonia.

If the pain can be shown to be associated with deep inspiration and muscle rigidity is absent then laparotomy can be postponed. The respiratory movements of the abdominal wall may be helpful since in respiratory infections there is no restriction of movement such as occurs in appendicitis.

(2) *Pulmonary tuberculosis.*—Patients with pulmonary tuberculosis and no intestinal involvement may have attacks of abdominal pain, nausea, distension and vomiting—particularly when there is an exacerbation of the disease.

(3) *Spontaneous pneumo-thorax and haemopneumothorax.*—These conditions and especially the latter may closely resemble a perforated peptic ulcer. A careful history of the onset and a search for physical signs will usually reveal the condition, but without X-ray examination a partial pneumothorax may be very difficult to detect.

NERVOUS.

(1) *Tabes dorsalis*—In acute abdominal conditions where temperature, pulse and white count are normal, it is wise to think of syphilis of the central nervous system, particularly if there is much retching but little vomit. It is not sufficient to test the knee jerks alone. They will be absent only when the lumbar posterior roots are involved, and though they usually are affected sometimes the disease affects mainly the dorsal roots and the picture of a tabetic crisis with normal knee jerks can occur. The important diagnostic

point is that the pains in the epigastrium have the same characteristics as the tabetic pains elsewhere. They are lancinating and occur in rapidly repeated paroxysms and are associated with marked superficial hyperaesthesia in the epigastrium. A history of previous attacks may be helpful, particularly in these cases with much vomiting and little pain. A tabetic may, of course, perforate his peptic ulcer and the diagnosis in such a case must depend on judgment based on experience.

(2) *Herpes zoster* may simulate appendicitis, cholecystitis or acute renal conditions. The pain may precede the rash by several days and make diagnosis difficult. Exposure to varicella may be in favour of zoster.

(3) *Lesions of the spinal cord and column* may cause abdominal pain. It is usually definitely localized and persistent, and associated with neurological signs.

(4) *Hysteria*.—All practitioners of experience will have met patients with severe abdominal pain without organic basis. They are examples of the conversion of ideas buried in the patient's subconscious mind into disturbance of bodily function. In the diagnosis of acute abdominal symptoms of this type we must not only show that clinical examination is negative but should also demonstrate a psychogenic basis.

Absence of the corneal reflexes, anaesthesia of the pharynx and patches of analgesia to pin prick may help in making the diagnosis.

Even in patients not the subject of psychoneurosis it must be realised that, as Libman pointed out, there are hyper and hyposensitive types. The hyposensitive may give no evidence of pain or say they feel none, whereas the hypersensitives react excessively to any pain. They are differentiated by their response to pressure over the styloid process. Hypersensitives who expect a pain will get it. As Sir James Paget said, "Pain expected, watched for and long thought of will come; it will come in or from the nerve centre and be as bitter as any from the nerve's end." It must be remembered that although the psychological state of the patient may determine whether pain be present or not, or the degree of such pain, the type of pain is determined by the underlying pathological lesion.

GENERALIZED INFECTIONS AND TOXAEMIAS.

(1) *Infections*.—Abdominal symptoms have been recorded in many of the acute infectious fevers. In scarlatina and measles it appears that a true mild appendicitis may occur. The complete examination of the child including a search for Koplik's spots and subsequent watchfulness are necessary to make the correct diagnosis. In pancreatic mumps the patient has epigastric pain, vomiting and pyrexia and there is epigastric tenderness without rigidity. If this occurs when typical parotid mumps is subsiding the diagnosis is easy.

Rheumatic fever may sometimes resemble an acute abdominal condition when it causes severe lancinating abdominal pain. On examination there is rather diffuse abdominal tenderness and the pain is often worse on movement. If there is a history of rheumatic fever or chorea, the diagnosis of abdominal rheumatism can be more confidently made.

Malaria may cause nausea, vomiting and abdominal pain in addition to the pyrexia, but there is no muscle rigidity.

Abdominal influenza seems to be an entity and in addition to the headache, backache, pharyngitis and pyrexia there is gripping abdominal pain and tenderness. Rigidity, however, is absent and the extra-abdominal symptoms suggest the correct diagnosis. In typhoid pain and tenderness may be marked in the right iliac fossa so that appendicitis is resembled. But there is marked headache and pyrexia, but no rigidity.

(2) *Toxaemias*.—Acute lead poisoning may cause severe colic and vomiting. The occupation of the patient and the absence of fever and distension should lead one to suspect plumbism and to look for confirmatory evidence in the gums (blue line), blood (punctate basophilia) and urine (lead). Carbon tetrachloride may be given as an anthelmintic or inhaled from certain fire extinguishers. It can cause many symptoms and when burning epigastric pain, vomiting and slight jaundice are the chief features difficulties may arise. Calcium intravenously causes marked improvement.

Uraemia when associated with intense vomiting may resemble a high intestinal obstruction. But the general toxic appearance, the absence of increased peristaltic sounds and the presence of urinary abnormalities usually indicate the correct diagnosis.

The abdominal crisis of pernicious anaemia may be mentioned here. When this was a fatal disease excessive haemolysis led to the formation of "bile mud" and biliary colic. This with the marked pallor made the resemblance to gall stone colic very great.

ABDOMINAL.

(1) *Mesenteric lymphadenitis* occurs especially in children and resembles appendicitis which, indeed, may be its cause. The abdominal pain in the condition is associated with tenderness along the root of the mesentery. The mechanism of production of the pain is that a wave of peristalsis pulls on the mesentery and the enlarged glands in it and this irritates the nerve fibres passing around and through the glands. Similar pain can occur in glandular enlargement from other causes such as Hodgkin's disease.

(2) True enterospasm or spastic ileus is an uncommon condition in which attacks of nausea, vomiting and distension occur and which are due to partial obstruction caused by tonic spasm. It appears to be due to some interference with the innervation of the bowel.

(3) *Round worm infestation* in children may cause puzzling symptoms and examination of the stools should not be overlooked.

(4) *Acute gastro-enteritis*. In a puny child enteritis may closely resemble an intussusception, and especially one of some days' standing because of the passage of blood and mucus. In a plump healthy child no difficulty is found. Careful palpation should reveal the presence of a tumour which may be felt to harden in intussusception. Excoriation of the buttocks and early pyrexia are in favour of enteritis.

(5) *Constipation*, if severe, may cause pain, vomiting and distension. But flatus is passed and visible peristalsis is not seen unless the abdominal walls are very thin. Rectal examination must not be omitted.

(6) *Viscero-ptosis*.—If this is general, obscure abdominal pain may occur. In most cases the diagnosis of viscero-ptosis is of long standing and rigidity is absent. When the kidney is involved, kinking of the ureter may produce a temporary hydronephrosis (Dietl's crisis). Sometimes the right kidney drags on the duodenum and by kinking the bile duct causes biliary colic with jaundice. Neurasthenic symptoms are usually present in these cases and a careful weighing up of the whole picture usually brings one to the correct diagnosis.

(7) *Haematoma of the rectus muscle*.—Rarely in debilitated patients bleeding into the rectus sheath may occur without obvious cause. The lower part of the rectus abdominis has no posterior sheath and a haematoma there may cause peritoneal irritation. Discoloration of the skin and a lump may be present.

UROGENITAL.

Acute pyelitis with pyrexia and pain in the right side of the abdomen may resemble appendicitis. But pyelitis usually causes a higher temperature and greater leucocytosis than appendicitis and examination of the urine reveals pus and organisms. Occasionally the urinary findings may be absent because of blockage of the ureter.

A careful menstrual history should always be taken so as to avoid missing a pregnancy in a case where vomiting and abdominal discomfort are the presenting features and also to confirm a diagnosis of ectopic gestation.

Sometimes a tense Graafian follicle may cause nausea and vomiting and be associated with tenderness and rigidity. A history of menstrual disturbance and the presence of painful breasts may be helpful and sometimes a cystic mass can be felt in the ovary during an attack. Occasionally bleeding from a ruptured follicle causes acute peritoneal irritation which may be puzzling if blood accumulates in the upper abdomen.

METABOLIC AND ALLERGIC.

(1) *Diabetic ketosis*.—Sometimes a Diabetic in a precomatose state may present a picture closely resembling an acute surgical abdomen, possibly owing to distension of the liver with fat. If the patient is not a known diabetic and this condition is not thought of the resemblance is even greater until the urine is tested. This shows a complete reduction of Benedict's solution and the presence of diacetic acid by the ferric chloride test. Even so the diagnosis of an acute surgical catastrophe cannot be excluded at once since it may coexist and if it is inflammatory in nature may be the precipitating cause of the precomatose condition in the diabetic. A white blood count will not be of much help since the patient is probably dehydrated and will therefore show a leucocytosis. A history of anorexia, nausea and drowsiness before the onset of abdominal pain is in favour of the diabetic acute abdomen. In appendicitis pain usually precedes vomiting, whereas in diabetic precoma it more often follows it.

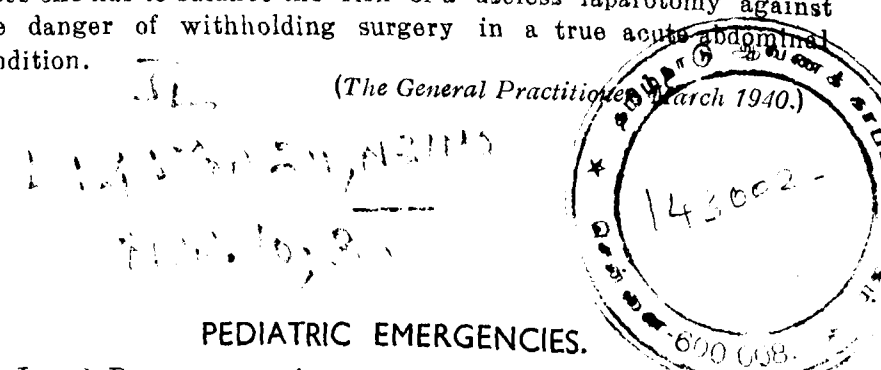
From the practical point the differentiation is not of the greatest urgency. We have to decide between ketosis only or ketosis plus perforation. Operation should not be undertaken anyway until ketosis is yielding to glucose and insulin, and so we are wise to wait until the clinical picture clears. If the signs and symptoms are still present when ketosis has gone, operation should be undertaken, preferably avoiding a general anaesthetic especially ether.

(2) *Abdominal allergy (Henoch's purpura)*.—In this condition pain of a colicky nature is due to spasm of the bowel and infiltration of its wall with blood and serum. In addition vomiting, distension, rigidity and fever with leucocytosis may all occur. The diagnosis may be in doubt until purpura or urticaria is seen. Marked albuminuria and the presence of joint symptoms may be helpful. In some cases one has to balance the risk of a useless laparotomy against the danger of withholding surgery in a true acute abdominal condition.

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PEDIATRIC EMERGENCIES.

Joseph Brennemann, in an article on this subject in the *Jour. A.M.A.*, March 16th, 1940, says that relatively few of them require medicinal treatment. When they do, however, the indications are nearly always simple, single, and mandatory, and the results are favourable.



NEWBORN PERIOD.

The newborn infant presents emergencies that are unique. Asphyxia of any degree calls for respiratory stimulation. In the mildest cases flicking cold water or ether on the chest is often all that is necessary. In all the more serious cases the methods of choice, and the most effective, are the use of carbon dioxide inhalation and the Drinker respirator. Yandell Henderson gives the following directions: "The carbon dioxide required for the initial resuscitation should be of whatever strength is needed to induce respiration, but after respiration is started 7 per cent. or even 5 per cent. is generally sufficient. . . . In premature or otherwise weak babies . . . the inhalation of 5 or 6 per cent. carbon dioxide should be repeated several times during the first few days." If these resources are not available some gentle form of artificial respiration must be employed.

Intracranial haemorrhage due to injury at birth, even if it is of clinical significance, offers serious difficulties both as to diagnosis and as to its relationship to asphyxia in a given case. If there has been a difficult and prolonged or a precipitous labour, if the anterior fontanelle is tense and full, if there are convulsive seizures, especially if unilateral together with coma, one may assume that this is due to a haemorrhage. If such conditions are not present it is commonly impossible at this time to differentiate a birth injury from a developmental anomaly of the brain. Lumbar puncture probably does no good and from the very nature of the procedure may do harm by increasing intracranial pressure at the time and so inducing more bleeding. If the fontanelle is very tense and coma persists, the intravenous injection of from 20 to 50 cc. of 20 per cent. dextrose may be of value. Since rest, as nearly absolute as possible, with the use of sedatives if necessary, is the one imperative indication, it is obvious that no disturbing procedure should be employed unless it is clearly indicated. Gavage is necessary after a time if food is not taken naturally.

Haemorrhagic disease of the newborn is one of the dramatic emergencies of this period. About the third day of life the baby begins to bleed from multiple sources—mouth, nose, bowels, vagina, subcutaneous tissues, body cavities, internal organs, and even into the brain. Bleeding from the bowel and a slight oozing from the vagina, when this occurs alone, has a different cause and is of little significance. Injection of 20 cc. of human blood, usually from the father, 10 c.c. in each buttock followed on the next day by an equal or greater amount of blood serum if the bleeding has not been arrested, has reduced a former mortality of nearly 100 per cent. to one that approaches zero. The disease is apparently on the wane, and may have something to do with the mother's diet.

Tetany, or hypocalcaemia, of the newborn has attracted increasing attention in recent years. The symptoms are much like those of tetany of a later period, with convulsions as the outstanding and most alarming symptom. Chvostek's sign is usually positive but often occurs in the normal newborn infant. The blood calcium is far below the normal 9 to 10 mg. per hundred cubic centimetres of blood. If there is no other obvious cause for the convulsions, treatment should be begun at once without waiting for a calcium determination. In milder cases calcium chloride or calcium gluconate may be given by mouth. In more serious cases 10 cc. of a 10 per cent. solution of calcium gluconate should be given intravenously or intramuscularly. To this may be added 20 units of solution of parathyroid subcutaneously. Calcium chloride by mouth may be continued for a time, if necessary, until a sufficient amount of calcium has been obtained from milk in the infant's food.

Congenital atresia of the oesophagus is not an extremely rare condition. In nearly all reported cases the upper dilated portion of the oesophagus ends blindly at about the bifurcation of the trachea, and the lower attenuated portion passes directly from the stomach into the trachea at or near the bifurcation or into a bronchus. The stomach is usually distended, the lower part of the abdomen retracted. Saliva runs from the dependent corner of the mouth, and after taking more than two swallows of water the infant chokes, water gushes from his mouth and nose, he becomes profoundly cyanotic and death seems imminent. The diagnosis may be confirmed by X-ray examination after a small amount of barium sulphate is given by mouth or by finding that a catheter passed into the oesophagus ends at about 12 cm. from the alveolar border of the mouth. Gastrostomy, with and without preliminary tying off of the gastric end of the oesophagus, and jejunostomy have been tried. No child has ever lived, and with the consent of the parents one is justified in letting the child die without treatment. Death follows around the end of the first week of life from bronchopneumonia and starvation.

GASTROINTESTINAL TRACT.

Appendicitis presents a true emergency in the first day or two or even three. If uncomplicated, the fever is usually low, the pain not intense, the white blood count moderately high, and vomiting nearly always occurs early. Point tenderness, more marked and more significant than unelicited pain, occurring most often at or below McBurney's point but also anywhere from the flank to the pelvis and, rarely, even to the left of the left rectus muscle, is the single most important sign in the early stages. In this early period there is usually a voluntary protective contraction of the muscles; involuntary boardlike rigidity indicates peritoneal involvement.

Operation is usually clearly indicated in the first two or even three days and at any time if there is spreading peritonitis. If the patient is seen on the third or fourth day and there is an evident tendency for the inflammatory process to become walled off, it is safer to await the disappearance of the mass and to operate a month or two later. In an instance of acute so-called primary peritonitis, non-appendical in origin and due to a pneumococcus or a streptococcus, is it usually better not to operate until localization has taken place. Sulphanilamide or sulphapyridine is indicated, depending on whether the cause is a haemolytic streptococcus or a pneumococcus.

Acute intestinal obstructions are relatively frequent in childhood. In the newborn there may be congenital absence or narrowing of a portion of the intestine, more often in the distal ileum, leading to great distress, distention of the abdomen, uncontrollable biliary vomiting and absence of meconium and faeces. Surgery is indicated but offers little as a rule. The commonest type of intestinal obstruction is intussusception, usually at the ileocecal junction and predominantly in the first year of life. The onset is uniquely sudden, so that the exact hour of its occurrence is nearly always stated. The child begins abruptly to scream with intense, intermittent colicky pain, soon followed by vomiting and a varying degree of shock. After a time the pain becomes less severe: he no longer screams or even cries, but with each return of the pain he winces or sighs, draws up his legs or turns over in bed. He no longer smiles, and there is a distant, abstracted, serious, resigned, apprehensive expression that may be misleading but is actually of diagnostic value. Cardinal signs in addition to those mentioned are a slightly tender, sausage-shaped mass, usually in the transverse or descending colon, occasionally in the rectum or even appearing externally, and blood in the stools, though not always in the first one. After this there may be some faeces, but there is characteristically an intimate mixture of blood and mucus—rarely only thick, white, glairy mucus. The blood is never copious and never clots, unless there is also a bleeding Meckel's diverticulum (to be discussed later). Of practically pathognomonic significance is a silent spurt of a small amount of a turbid currant jelly-like mixture of blood and mucus which follows the retreating finger after a digital examination. An early intussusception may occasionally be reduced by injecting air or barium sulphate and making gentle pressure under the fluoroscope. Valuable time, however, should not be lost before resorting to surgery, as the condition is a real emergency. Similar obstructions with like indications for treatment occur with valvulus bands, post-operative adhesions and Meckel's diverticulum. There is usually no definite mass, and there is no blood in the stools; however, both these conditions may occur if Meckel's diverticulum is the starting point of an intussusception.

A hernia, commonly inguinal, may become incarcerated or strangulated. An incarcerated hernia can often be reduced in infants and young children by suspending the body by the feet so that the hips are elevated some distance above the bed. If reduction does not take place after a reasonable time, operation is indicated. Strangulated hernia usually presents more serious symptoms and more urgent indications for treatment. There is persistent vomiting, pain, tenderness, and often shock. Reduction is no longer possible without operation.

Haemorrhage from the bowels is always an arresting symptom and a potential emergency condition. While slight haemorrhages, commonly of obvious causation, occur with papilloma, foreign body, dysentery, intussusception, scurvy, Henoch's purpura and blood dyscrasias, and larger ones with gastric or duodenal ulcers characterized by tarry stools, a copious bright red haemorrhage should always lead one to suspect a bleeding Meckel's diverticulum. The diagnosis is almost certain if the blood clots and is at times bright red and at others darker in colour. The bleeding is due to ulceration of so-called misplaced gastric mucosa in the wall of the diverticulum. Rarely, but ominously, the extent of the haemorrhage may not be obvious if only part of the blood is passed. Sudden pallor and marked evidence of secondary anaemia should lead to investigation. The haemorrhage commonly ceases spontaneously, but if it persists it is fairly free, and if the diagnosis seems justified the diverticulum should be removed. Perforation of the ulcer, with or without haemorrhage and simulating appendicitis, may occur and even more clearly calls for surgical intervention. Recent observations have shown that a like clinical picture can be produced by papillomas in the colon (demonstrable by X-ray examination).

Foreign bodies in the pharynx may present alarming symptoms, and removal may require skilled assistance. The usual attempt to remove the body with the finger should be avoided except in extreme emergency. If lodged in the oesophagus, usually in the upper part, the symptoms may be restricted to discomfort and difficulty in swallowing. Early removal is imperative for fear of rupture into the mediastinum and the pleural cavity, which carries a very high mortality. As a rule, a foreign body that has passed into the stomach will escape through the pylorus and cause no harm in the intestinal tract. Long or peculiarly shaped bodies such as a hairpin or a "bobby pin" may not be able to pass the windings of the duodenum and should be removed from the stomach by an endoscopist, if available; if not, by a surgeon. The X-ray examination is of great value throughout if the foreign body is radiopaque.

RESPIRATORY TRACT.

Foreign bodies in the respiratory tract are a common cause of emergency in childhood. In the larynx they may lead to alarming

obstruction to breathing. There is usually an inspiratory stridor, hoarseness and a croupy cough that may simulate membranous croup. A pedunculated papilloma of the larynx caught between the vocal cords may produce the same symptoms. There is, however, usually a history of preceding stridor and hoarseness of long standing. In the trachea, if the foreign body is large enough, both main bronchi may be obstructed, resulting in death. If there is only partial obstruction of the trachea or of one main bronchus, there will be an expiratory wheeze that may easily be mistaken for asthma. If the partial obstruction of the bronchus is of the right degree there will be, in addition to the wheeze, an obstructive emphysema on the affected side with possibly eventual respiratory silence and both exaggerated breathing on and displacement of the heart to the opposite side. If the bronchial obstruction is complete, the characteristic signs on the affected side are dullness, absence of breath sounds or bronchial breathing and bronchophony, with exaggerated breathing on the opposite and displacement of the heart toward the affected side. A roentgenogram is obviously of great confirmatory help in diagnosis whether the body is radiopaque or not. Bronchoscopic removal of the foreign body is indicated at the earliest possible time; imperatively so if it is of vegetable origin, because of the well known serious irritation produced by such substances. Three things may well be stressed: the suspiciousness of a wheeze, the fact that a large percentage of foreign bodies are peanuts, and the fact that, while a foreign body in the respiratory tract is always ushered in by sudden choking, commonly with cyanosis and coughing, the latter is no longer present if the body becomes fixed.

Empyema is a condition calling for immediate action only when there is profound impairment of vital capacity and great displacement of the heart and large vessels. Repeated aspiration or closed drainage with gradual removal of pus is then indicated. A tension pneumothorax, nearly always a pyopneumothorax following rupture of an empyema into a bronchus, with a valvelike mechanism permitting freer entrance than exit of air, commonly presents an urgent condition. There is a tympanic percussion note, sometimes hard to elicit, shifting dullness and absence of breath sounds on the affected side, together with exaggerated breath sounds on and displacement of the heart toward the opposite side. A succession sound, if present, is pathognomonic. Aspiration is futile. Drainage is indicated usually by the closed gradual method, though replacing tension by a simple pneumothorax through open operation would seem a safe procedure if the air is not allowed to escape too freely for a time.

The croup family, all characterized by laryngeal obstruction, requires careful differentiation, since some of the members are

urgently alarming and others only apparently so. Excluding those caused by congenital anomalies, foreign bodies and papillomas, they are all due to inflammation and in varying degree to spasm of the larynx. Spasmodic croup usually is easily recognized, especially if there have been previous attacks and if there is a familial tendency. A young child beyond the period of infancy who has seemed well during the daytime, or has at most a slight respiratory infection, after going to bed at night quite suddenly wakes up with a croupy, barky, brassy, sepulchral cough that is soon followed by loud stridulous breathing, profound respiratory obstruction and great restlessness. The condition seems truly alarming to the uninitiated but is usually quite readily relieved in a warm room by inhalation of steam from a croup kettle or some similar device. The ancient remedy of a teaspoonful of syrup of ipecac is effective but messy and distressing. There may be another attack the following night, but usually there is not.

Catarrhal laryngitis is a simple inflammation of the larynx as part of an infection of the respiratory tract, and is characterized by hoarseness, croupy painful cough, inspiratory stridor and fever. Spasm is absent or minimal. The onset is not explosively sudden nor restricted as to time, and the symptoms persist for from several to many days without interruption. The condition is rarely serious, and can be ameliorated by having the child kept in a warm room more or less saturated with moisture from a croup kettle or a pan of boiling water. It must be differentiated from membranous croup or laryngeal diphtheria, often not an easy matter at the onset.

Membranous croup is usually less febrile and more insidious in onset but more constantly and definitely progressive. The cough is usually more brassy and tight and the stridor more sharp than in simple laryngitis. As the disease progresses there is profound dyspnoea, a loud rasping stridor, retraction of the suprasternal notch and the lower end of the sternum, deep cyanosis and great restlessness. The initial hoarseness descends to a whisper and finally to a complete loss of voice such as rarely occurs with a simple catarrhal laryngitis. As the end approaches, the cyanosis gives way to an ashen grey colour and the child ceases to struggle. If there is a membrane in the throat or competent laryngeal observation is available, the diagnosis can usually be made early. A culture of material taken from the larynx may reveal the true nature of the disease, but is not dependable, and the result should never be awaited before treatment is begun in a suggestive case. From 20,000 to 40,000 units of antitoxin should be given at once and the result from the culture used as a guide to further treatment. If the dyspnoea becomes alarming, as shown by a great restlessness, increasing cyanosis and retraction, treatment by suction, intubation or tracheotomy is urgently indicated. Environmental factors will necessarily determine the method of choice in a given case.

Laryngotracheitis, if it can be distinguished except by the course from the more serious condition about to be discussed, usually can be relieved by palliative measures. True laryngotracheobronchitis, involving the bronchi as well as the trachea and larynx, is as serious as membranous croup, if not more so, since there is no specific antitoxin and the course is more prolonged, complicated and exhausting. There is sometimes supraglottic and always laryngeal and subglottic obstructive oedema, together with a characteristic involvement of the trachea and bronchi, that leads to the formation of thick, tenacious, gummy, ropy secretions that block the air passages. There are thus in a high degree essentially the symptoms and signs of other forms of croup plus those already described as occurring with foreign bodies in the larynx, trachea, and bronchi, together with obstructive subglottic and more rarely supraglottic oedema. The indications for treatment are to keep the airways clear. In milder cases bronchoscopic suction and intubation may be successful under favourable conditions. In severer cases presenting marked supraglottic and subglottic oedema and bronchial obstruction, tracheotomy is imperative. It alone relieves obstructive supraglottic oedema and permits as nothing else does the safe removal of the offending secretions by suction with a catheter or by bronchoscopic aspiration. Retention in a warm room saturated with moisture, not too hot, expert nursing and bronchoscopic and medical teamwork are essential to success in meeting the ominous obstructive conditions that often appear with startling suddenness.

GENITO-URINARY TRACT.

Uraemia or cerebral oedema occurring with nephritis, as manifested by headache, dizziness, somnolence, hypertension and eventually coma and convulsions, calls for prompt relief by intravenous injection of 25 per cent. dextrose, 0.5 per cent. magnesium sulphate or intramuscular injection of from 2 to 4 cc. of 50 per cent. magnesium sulphate at four hour intervals until the blood pressure reaches a safe level. A single, harmless but marked urinary retention of unknown aetiology occasionally occurs in childhood. Extreme retention may occur as a result of painful urination due to ulceration of the meatus from the "ammoniacal diaper." Immediate relief follows a drop of 5 per cent. cocaine hydrochloride solution on the ulcer. Repetition is avoided by wet boric acid dressings, or the application of petrolatum and attention to the ammoniacal diaper. The latter is carried out by thoroughly washing, rinsing, and boiling all diapers and soaking and drying those which are to be used at night in a saturated solution of boric acid.

Torsion of the testicle, or rather of the cord, is a rare but serious condition. There is sudden, exquisite pain and swelling of the testicle, nausea and vomiting, and often shock. Necrotic gangrene quickly supervenes with relief of subjective symptoms. Immediate

operation must be performed if the testicle is to be saved. Campbell states that removal of the testicle is indicated in 90 per cent. of the cases. Spontaneous or therapeutic untwisting of the cord may take place rarely, but even then atrophy is likely to result.

Rupture of a kidney due to a blow or a crushing injury, leading to haematuria and local pain, tenderness and possibly swelling, is nearly always best treated expectantly.

CENTRAL NERVOUS SYSTEM.

A convulsion in an infant or a young child occurring at the beginning of a febrile disease or, more rarely, even later in the course of the disease, if the temperature rises rapidly from a low to an adequately high point, has usually the same significance as a chill in an adult, and is of relatively little greater importance. It commonly ends spontaneously. If it does not, and especially if there is hyperpyrexia, a tepid, cool or even cold pack is indicated until the fever is reduced to a safe point. Only one thickness or at most two thicknesses of sheet should be used, so that the cooling effect of evaporation may also be called into play. The same procedure will prevent an impending convulsion. Two grains (0.13 Gm.) of acetylsalicylic acid for each year of age, best given in orange or some other heavy syrup, may have the same effect. The use of the conventional hot bath has probably survived only because the convulsion ends in spite of the treatment. If the convulsion still persists it must be controlled even if anaesthesia by means of chloroform or avertin with amylene hydrate is necessary. Convulsions occurring periodically during later infancy may be due to tetany and require antirachitic treatment. Occurring periodically at a later period without fever usually means idiopathic epilepsy, although organic disease of the brain must be excluded.

Concussion of the brain, with or without loss of consciousness, is characteristically accompanied by pallor, somnolence and nausea or vomiting. Since organic injury such as haemorrhage has probably taken place, rest is imperative. This is especially indicated if there is a skull fracture, as shown in the roentgenogram, by bleeding from the nose, mouth, ears or into the post-orbital space, or by leakage of spinal fluid. Coma and convulsions or localized twitchings, probably due to haemorrhage, are not infrequent. The present tendency is to avoid spinal puncture for either diagnostic or therapeutic purposes. Rest in bed with restraints for the younger child and elevation of the head of the bed should be enforced for a period of several weeks. The temperature, pulse, respiration and blood pressure should be carefully watched for a time. If coma and hypertension persist, the treatment described for cerebral oedema, or even surgical intervention, may be indicated, the latter especially if there are focal signs. Surgery is usually restricted to cases in which there

is obvious or well founded suspicion of a depressed fracture. X-ray examination may show a depression restricted to the inner plate of the skull.

METABOLIC DISTURBANCES.

Acidosis occurs as a symptom of many conditions, notably in diabetic coma and in alimentary or intestinal intoxications in infancy following great loss of body fluids and overdosage with salicylates or acetylsalicylic acid. The one dependable clinical symptom is hyperpnoea or deep breathing, which may early be of normal rate but in more advanced conditions is deep, rapid and pauseless. The urine shows the presence of acetone and diacetic acid, and in diabetic coma there is glycosuria and hyperglycaemia. Treatment is urgent. In all cases replacement of body fluids is indicated. In non-diabetic acidosis this should be done by intravenous injection of dextrose and physiologic solution of sodium chloride, or preferably lactate Ringer's solution. In diabetic coma the intravenous administration of Ringer's or lactate Ringer's solution and the intramuscular injection of insulin are urgently indicated. The volume of fluid should be from 20 to 30 cc. per kilogram of body weight and should not be injected faster than 5 cc. a minute. The insulin requirement during acidosis is not less than 1.5 units per kilogram of body weight plus 1 unit for each gram of sugar administered, usually dextrose in 5 per cent. solution.

Increasing interest has recently been directed to hypoglycaemia. The hypoglycaemia of hyperinsulinism is a familiar example. It may, however, occur with startling suddenness and seriousness in other conditions, such as prolonged starvation, inadequate intake of carbohydrate, liver damage, and under still other conditions the nature of which requires further observation for clarification. The symptoms vary from irritability, lassitude, and somnolence to convulsions and coma. The treatment consists in the prompt administration of orange juice or sugar to restore the blood sugar concentration to normal. If oral administration is impossible or ineffectual, or if the condition is alarming, from 10 to 25 per cent. dextrose solution should be given intravenously. The patient is commonly restored to normal while the injection is being given.

Allergy is widespread, and in the markedly hypersensitive individual the injection of a foreign protein such as horse serum may lead to anaphylactic shock and death. Before antitoxin is given the test for sensitivity of the skin should be performed. If positive, the procedure of desensitization should precede the administration of the full dose of serum and the latter should contain an adequate amount of epinephrine. A hypodermic loaded with this drug should be a part of the equipment whenever serum is given.

In acute poisoning the stomach should be washed out thoroughly unless the agent is an escharotic. If the latter is an acid, an alkaline

solution should be given: if an alkali, an acid solution, such as diluted vinegar, is given. Information as to antidotes and specific methods of treatment of all other forms of poisoning should be constantly and immediately accessible to every physician.

(*General Practitioner*, June 1940).

SURGICAL EMERGENCIES IN THE GENITO-URINARY SYSTEM.

In an article in "The Practitioner," April, 1938, W. D. Doherty considers the following surgical conditions, to any of which the practitioner may be called in an emergency: (1) acute retention of urine; (2) acute suppression of urine; (3) acute extravasation of urine; (4) renal colic; (5) profuse haematuria; and (6) injuries—(a) rupture urethra; (b) rupture of bladder (c) rupture of kidney.

ACUTE RETENTION OF URINE.

This is the commonest emergency. The irritability of the bladder is increased in the early stages of most of the obstructive lesions, so that the volume of urine in the bladder cannot be taken as a guide as to when immediate surgical interference is indicated. In acute retention, patients will be seen in severe pain, with a bladder containing only 8 to 10 oz. of urine, others relatively comfortable but unable to empty a bladder containing 5 to 10 pints.

The causes of urinary retention may be divided into two groups: (1) those due to obstruction in some part of the urethra—(a) fibrous or malignant stricture, (b) prostatic enlargement due to simple hypertrophy, neoplasm, or acute inflammation, (c) impaction of blood clots, stone, or foreign body, (d) acute urethritis, (e) pelvic tumors involving or pressing upon urethra; (2) those due to interference with the normal contractile mechanism of the bladder—(a) anxiety, (b) post-operative retention, (c) lesions of the spinal cord, e.g., tabes dorsalis, disseminated sclerosis, spinal cord injuries or tumors, (d) inflammatory lesions in contact with the bladder causing paralysis of the musculature, (e) pelvic abscess.

A previous history of urinary symptoms is essential, for a man may carry on with a urethral stricture, not noticing that he has a rather poor stream. A complete physical examination must follow. Rectal examination will determine the size of the prostate, but great obstruction may be caused by a prostate with little enlargement into the rectum.

TREATMENT.

Palliative measures come first. Cases due to anxiety or as a post-operative complication should seldom require catheterization.

It must be remembered that the greater the distention of the bladder the more the urethral mucosa becomes congested and instrumentation difficult. Doryl (Merck) and Esmodil (Bayer), both acetylcholine derivatives, act upon the parasympathetic system and have an anti-spasmodic effect on the sphincters of the bladder. Given subcutaneously they have a rapid effect, and are most valuable in post-operative and nervous retention. A hot bath and an injection of one of these drugs may be sufficient to overcome an early acute retention even due to a mechanical obstruction. A word of warning: if retention is due to congestion and spasm of acute urethritis, catheterization may spread the disease. If every method fails, suprapubic puncture is preferred to catheterization.

There are a few important points: 1. A congested urethral mucosa is very sensitive. Instrumentation will be easier if a local anæsthetic solution containing adrenalin is used; tutocaine (Bayer) is satisfactory. The instillation can be made into the anterior urethra with an ordinary urethral syringe and massaged back into the posterior urethra. 2. A set of gum-elastic straight and Coude catheters from 1 to 10E, and some filiform and olive-headed gum-elastic bougies of similar sizes, should be kept in readiness in a formalin container. A set of soft rubber catheters will also be useful. 3. Force is seldom necessary in overcoming an obstruction. If an obstruction is met with before the external sphincter is reached, a fibrous stricture is probably responsible and the Coude 8E catheter should be discarded. Smaller and smaller sizes of the straight catheter should be tried until the stricture is passed. If it is not possible to pass the stricture, resort should be made to the small and filiform bougies.

Having passed the stricture and entered the bladder with the filiform bougie, do not remove it, but fix it in position with thread and strapping, and it will be found that the urine will trickle away alongside it. After 24 hours it may be removed, and it will then be found possible to pass a larger-sized bougie.

In cases where there is failure to get any instrument through into the bladder, suprapubic drainage will be necessary. As an emergency measure, any 4-inch aspirating needle may be used. With the bladder fully distended and the skin anæsthetized, it should be plunged in the mid-line straight backward just above the pubes, and will enter the bladder. It may be removed as soon as the urine has drained away, without risk of leakage. If a more permanent drainage be required, a large trocar and cannula should be used for puncture. The cannula should be large enough to allow a self-retaining catheter to be passed along it into the bladder. On removal of the cannula, the catheter will be gripped tightly to the bladder and no leakage will occur.

ACUTE EXTRAVASATION OF URINE.

This may occur from rupture of the bladder or urethra, either due to trauma or disease. The immediate treatment of the condition is incision over the site of the rupture so that a urinary fistula may be formed.

ACUTE SUPPRESSION OF URINE, ANURIA.

This may occur from a number of causes, and must be distinguished from retention of urine—by catheterization, if necessary. It may result from an acute infection of the kidneys, or renal failure. Conversely, the sudden relief of a chronic distention of the bladder may produce anuria. For this reason, it is wise to decompress the bladder slowly. Severe trauma or operation may produce anuria. Perhaps the most interesting variety is calculous anuria. In patients who have bilateral calculi or a calculus on one side with a damaged kidney on the other, the impaction of a calculus in the ureter on one side, may cause complete suppression of urine from both kidneys. Immediate surgical measures are required to remove the impacted stone.

The general treatment of suppression of urine is to apply hot packs to the loins, and to increase the fluid intake by mouth. Diuretic drugs, such as caffeine citrate, 10 to 20 grains four-hourly, and the acetylcholine group, will be found useful. An attempt may be made to increase the cutaneous excretion by giving pilocarpine hypodermically.

RENAL COLIC.

This is associated with lesions of the ureter. It is brought on by the passage, through the ureter, of calculi, blood clot, debris, or tumor fragments. Treatment should be directed to the relief of pain. Morphine and atropine are both useful drugs, and should not be spared. It is a fact that the small stones cause the most severe colic in their passage down the ureter. The larger stones become impacted or slip back into the pelvis.

PROFUSE HAEMATURIA.

This may occasionally be so severe as to give rise to a surgical emergency. Malignant growth of the bladder is probably the commonest cause of this condition, but the possibility of a neoplasm of the kidney must be borne in mind. In growths of the bladder, attempts may be made to tide over the emergency by passing a large catheter and washing the bladder out with fluid at a temperature of 120 degrees Fahrenheit. Repeated doses of morphine, to keep the patient quiet and lower the blood pressure, are also indicated. But in most cases it will be wiser to open the bladder by the suprapubic route, wash out the clots, and drain with a large tube.

INJURIES.

Rupture of the urethra, bladder, or kidney may be the result of severe violence and may call for immediate surgical treatment.

Rupture of the urethra is most commonly due to a kick or blow in the perineum but may be associated with a fractured pelvis. It is most important that the patient should be instructed not to attempt to pass urine. Under strict aseptic precautions an attempt may be made to pass a catheter if a rupture is suspected.

Rupture of the bladder may occur from a blow on the abdomen when the bladder is distended or from a penetrating wound. The treatment is immediate exposure of the bladder with suture and drainage.

Rupture of a kidney may follow any severe abdominal injury. An interesting point is that severe intraperitoneal hæmorrhage may occur several days after a partial rupture of the kidney. Extraperitoneal hæmorrhage is not generally so severe but extravasation of urine may occur with perinephritic abscess formation.

(General Practitioner, April 1939.)

Medical News & Notes.

THE KRISTNA DISTRICT MEDICAL ASSOCIATION, MASULIPATAM.

The Monthly Meeting was held on Friday, the 28th February 1941, at the Government Head Quarters Hospital, Masulipatam. 25 Doctors, including 4 women doctors, were present. After tea, the business meeting started with Dr. M. Seshachari, L.M.S., Vice-President, in the Chair.

Dr. N. N. Sujeer, L.M.S., District Medical Officer, Kistna, was unanimously elected as President of the Kistna District Medical Association.

The Medical Meeting presided over by him was then conducted. Dr. N. V. Subbarow, L.M.P., read the case notes of the following: two cases of Filariasis and the Treatment adopted. A case of Eclampsia treated with Cæsarian. A case of Obstruction of Salivary Duct with Stones. A case of Perforated Appendix with Peritonitis.

The meeting came to a close at 7-30 P.M.

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The Indian Medical Association, Punjab Provincial Branch, represented to the Registrar of the High Court of Judicature, Lahore, that when a private medical practitioner is summoned to give evidence, the summons should show the specific hour at which he will be examined. Thereon, The Hon'ble Judges have decided that a medical practitioner should not be summoned for 10 A.M. as a matter of course, but should be summoned to attend at the time when the court thinks it will be able to examine him. His evidence should be taken at the time for which he is summoned, or as soon thereafter as is practicable.

These orders have been communicated to all the criminal courts in the Province.

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