ing to this method, the duodenum and the stomach folds lie neatly side by side, thus obviating the necessity of guides.

The two folds are fastened together with a continuous sero-muscular stitch. It is better to start this stitch at the pyloric angle to make sure that this point comes at the apex of the tongue to be cut out later.

As mentioned before, the incisions are like those of a gastrojejunostomy, except that they are united at one end. The stomach incision is made first, and is carried down until the mucous membrane pouches freely between the cut muscular walls. The stomach is then left and the duodenum opened until the mucous membrane of the stomach is met at the pyloric angle. Before going further it is occasionally necessary to trim off the mucous membrane from the edges of the duodenal incision. The pouching mucous membrane is finally removed from the stomach by cutting with scissors close to one muscular edge, returning on the other side. The completed incision leaves a tongue-like process made up half of gastric and half of intestinal walls.

After the incisions have been made the exploration of the pyloric portion is easily accomplished by loosening without withdrawing the stomach clamp. After inspection the jaws can be fastened again and the suture continued.

The two edges of the tongue are next sewed together with a continuous through and through chromic stitch, which starts from the apex of the tongue and goes across to its base. At this point it is interrupted with a tie before continuing the suture across over the front. When operating with the clamps placed according to the older method, the sewed over tongue protrudes up into the wound and must be buried with guide stitches before the through and through stitch can be carried over the front. No such difficulty is met with correctly applied clamps, for the outer edges tie well for accurate apposition. When within an inch from the pylorus and the suture over the front is nearly completed, the clamps are loosened to relieve the tension and allow the last few stitches to be placed.

The clamps are now removed altogether, and the suture buried with a sero-muscular stitch. The closing in of the inaccessible pyloric angle is made easy by the introduction of the writer's mattress stitch. The rest of the sero-muscular stitch may be continuous.

CARDIAC COLLAPSE DURING EXAMINATION OF A POST-PHARYNGEAL ABSCESS; INCISION; CIRCULATION RE-ESTABLISHED AND MAINTAINED FOR FOUR HOURS BY MASSAGE OF THE HEART; DEATH.

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For years physiologists have demonstrated that the oxygenation of the blood may be carried on and automatic respiration re-established by artificial means, which have come into daily use

clinically for the resuscitation of patients. It has been equally well known that under certain conditions pulsation may be re-established in the arrested heart of animals, both in situ and even some hours after its removal from the body. Recent investigators in the field of surgical physiology have endeavored to develop a rational method based on these and similar experiments for restoring to life patients whose vital functions have been suddenly arrested either by traumatic or surgical shock or by mechanical conditions obstructing these functions. Such a method depends chiefly on the restoration of respiration and of cardiac pulsation and the maintenance of the blood-pressure at an approximately normal level. Clinical experience is still scanty, however, and the following case is reported with a view of adding to the evidence in this important field.

The patient, Eleanor S., three years of age, was brought to the Children's Hospital, on Feb. 23, 1904, with a history of about two weeks' duration of illness, feverishness and anorexia. There was complaint of sore throat and difficulty in swallowing, and the neck became swollen, chiefly on the right side. The symptoms became progressively worse, the child became practically unable to eat or to talk and during the last few days respiration had become labored. There had been no pre-existing symptoms suggestive of caries of the cervical vertebrae.

Physical examination showed a fairly developed and poorly nourished child, pale, dyspneic, considerably exhausted, with a pulse of 140, respirations 46, and slight cyanosis of the finger-tips and lips. Heart, negative; lungs, negative, except for shallow respiration and a few moist rales, most marked at the bases; abdomen, normal. The neck showed a diffuse fullness on the right, not red or tender and without perceptible fluctuation. The throat showed a swelling obstructing the oropharynx, but the struggles of the child made it both impossible and inadvisable to determine exactly its origin, whether from the tonsils and soft palate or from the pharyngeal wall.

The gravity of the situation was explained to the mother and her consent to incision obtained. It was found impossible to reason with or gain the confidence of the child, so the necessary manipulations were carried out by force, but as gently as possible. The arms were confined by a blanket swathe and the child held in a nurse's lap in the usual way. No anesthetic was employed. The child struggled ceaselessly. The introduction of the gag caused such choking and cyanosis that it was withdrawn, with immediate relief to the symptoms of asphyxiation. At a favorable moment the gag was again placed in position and the finger and knife introduced, but a point of fluctuation was not felt at once. The condition suddenly again became alarming and breathing ceased. The child was instantly laid on the table and artificial respiration begun. No pulse could be felt at the wrist, no cardiac sounds could be heard with the stethoscope, normal respiration had absolutely ceased; the face, finger-tips and mucous membranes were moderately cyanotic, the pupils dilated and unresponsive and the cornea insensitive. The picture was that of death. This occurred at 6.20 P.M. With the patient in the Rose-Trendelenburg position the abscess, which proved to be retropharyngeal, was opened and evacuated. The amount of air which was entering the lungs, as shown by stethoscopic examination, was not satisfactory, so a large

No. 28 French soft rubber catheter was introduced through the mouth into the trachea and the expansion of the chest by manipulation was supplemented by direct insufflation. No improvement followed; the moderate cyanosis was succeeded by extreme pallor and there was no evidence of any action of the heart. At once cardiac massage was begun by rhythmical pressure at the rate of sixty to the minute, over the third, fourth and fifth left costal cartilages, and this massage together with the artificial respiration was continued for four and one-half hours until further efforts were evidently useless. Throughout this time, the writer was aided by Dr. James S. Stone and house-officers and nurses. As rapidly as possible brandy and strychnine were injected directly into the heart, the legs were bandaged firmly from toes to groin, the abdomen manually compressed and heaters and blankets applied, without interruption of the respiration or massage.

Coincident with these measures and apparently directly following the pressure over the heart, the color returned to the lips and face, and capillary circulation could be distinctly demonstrated by the blanching and return of color after pressure on the cheeks, tongue, lips and finger nails. No heart sounds were heard at any time with the stethoscope, but feeble pulsations were detected in the radial and femoral arteries always immediately following the pressure on the heart; these pulsations were never felt when the massage was interrupted for a moment. The pupils remained dilated and without reaction; one observer thought that he detected a very slight movement of the eye-ball, but this was not verified. About this time oxygen gas under considerable pressure was forced into the lungs through the catheter, but the color in the mucous membranes became worse at once, so insufflation by the lungs of the assistant was again resorted to. At 8.30 P.M. about one pint of normal salt solution was infused into the median cephalic vein with transitory improvement of the color and of the artificial pulse. There was sluggish capillary oozing from the subcutaneous tissue in this incision and marked hemorrhage from the vein. The blood was but slightly darker than normal. At about this time *mx* of Parke, Davis' solution of adrenalin chloride was injected into the pectoral muscle, and soon after repeated without noticeable effect of any kind. Constant friction of the body surfaces toward the heart was kept up together with occasional injections of the usual stimulants. At nine o'clock the tube was accidentally pulled out of the trachea, and its re-insertion being difficult on account of the beginning rigidity of the jaw, tracheotomy was performed and the insufflation continued. This wound bled less actively than the other. No arterial bleeding followed either incision, but it is probable that no arteries were cut. The color now began to fail steadily and the skin became mottled in appearance, although the capillary circulation could still be demonstrated in the lips. Finally, the injection of stimulants into the spinal canal was determined on, but in turning the body over it was found that rigor mortis was well established in the legs, and further efforts at resuscitation were reluctantly abandoned, four and one-half hours after they were begun.

Death was evidently caused by cardiac collapse due to shock, in a patient whose condition of extreme exhaustion made the necessary manipulations in preparing to open the abscess a source of grave danger. Death was not due to suffocation; there was no inhalation of pus, as the abscess was not evacuated until after efforts at

resuscitation had been begun. In death by asphyxiation the action of the heart continues for a time after the cessation of the respiration; in this case stethoscopic examination failed to reveal any action of the heart from the very beginning. There was no serious mechanical obstruction to respiration and hence no indication for tracheotomy; but a rubber tube was introduced into the larynx to supplement the usual method of artificial respiration by direct insufflation, which proved very satisfactory in inflating the lungs and in facilitating the employment of oxygen. Later, a tracheotomy was done when the onset of rigor mortis made the re-insertion of the tube through the mouth difficult.

Although success had been scarcely hoped for at first, the final failure to restore life, at least for a time was very disappointing. To the observers it seemed beyond controversy: (1) that the circulation of the blood was restored and maintained; (2) that the blood was fairly well oxygenated. Add to this that the body warmth was artificially kept up, stimulants supplied and efforts made to raise the blood-pressure to an efficient level, and it seems as though the conditions necessary for the existence of life were present. It is tempting to invoke the theory of the "vital spark," and perhaps the simile is not so very far-fetched. The spark simply raises the temperature of the combustible to the point of ignition and combustion ensues; in the same way the oxygenated blood must be supplied to the nerve cells in the vital centers in an amount sufficient to excite them and cause them to discharge their functions, in order to produce the phenomena of life. Granting that the heart is keeping the blood in circulation, means must be found to maintain a proper level of blood-pressure, and this is best accomplished, as shown by the researches of Crile and other investigators, by increasing the peripheral resistance. Crile¹ obtains this by the use of adrenalin, which directly stimulates the walls of the blood-vessels and causes them to contract, and by the employment of his inflated pneumatic rubber suit, which offers a mechanical resistance which can be regulated at will. In the case above reported the attempt was made to secure this mechanical resistance by bandaging firmly the extremities and compressing the abdomen.

Keen,² in a recent article, gives twenty-seven cases collected from the literature where massage of the heart was employed in efforts at resuscitation of the human subject, with three successful cases and twenty-four failures, and adds an unsuccessful case of his own. Cohen³ has also reported a successful case. In several cases which ultimately failed life was restored for periods up to twenty-four hours.

Maag⁴ reports a case where a patient collapsed under chloroform; fifteen minutes after apparent death the thorax was opened and direct massage of the heart was performed, the pulsations were restored for some hours, later failed and were again restored by massage, but death finally ensued after twelve hours.

Sick⁵ reports a case of collapse under chloroform during an operation for tubercular peritonitis in a boy; three-quarters of an hour after the heart had ceased to beat it was exposed by incision, and after fifteen minutes' massage pulsation and respiration became re-established and consciousness returned; the boy lived twenty-four hours but finally collapsed and died with great dyspnea.

In a case reported by Starling and Lane,⁶ collapse occurred during abdominal section; the heart was squeezed through the diaphragm once or twice and pulsation returned, artificial respiration was continued for twelve minutes and then became automatic, and recovery ensued.

Crile, in one case, nine minutes after death, employed pressure on the chest, artificial respiration, adrenalin and the rubber suit: the heart began to pulsate and continued for twenty-eight minutes but respiration was not re-established. In a second case, eight minutes after death, the same means were employed and the functions of both heart and lungs re-established; operation was done for the relief of a depressed fracture of the skull, during which the patient moved his head, but sudden death occurred after thirty-four minutes had elapsed. In a third case during an operation for tumor of the brain the patient collapsed and the usual measures with the substitution of the Fell-O'Dwyer apparatus for artificial respiration were at once begun. In nine minutes the heart began to beat and in seventeen minutes respiration was re-established, but death occurred two hours later. In a fourth case, during excision of an exophthalmic goitre there was sudden cessation of the heart and respiration. Crile at once inflated the rubber suit which had been put on as a precautionary measure, and began to make pressure over the heart; in six minutes the functions were restored and complete recovery took place.

In Cohen's case an operation was done on an otherwise healthy woman for the removal of an ovarian cyst, under chloroform. Fifteen minutes after the operation had begun sudden collapse occurred with cessation of heart and respiration. After vainly trying artificial respiration for two minutes the operator introduced one hand into the abdomen and began bimanual massage of the heart; in thirty seconds the heart began to beat; in one minute it was pulsating 80 to the minute, and in two minutes respiration became normal and the operation was brought to a successful issue, with ultimate recovery.

The writer's case differs from most others reported in that automatic cardiac pulsation was not re-established, but apparently blood was pumped through the vascular system by the rhythmical mechanical pressure on the heart, much after the fashion of a rubber compression syringe with inlet and outlet valves. Doubtless exposure of the heart by incision and direct massage would be a more efficient method, but in a child the costal cartilages are so elastic and yielding that the heart can be strongly compressed without difficulty between them and the vertebral

column. Indeed, in some cases reported such pressure was sufficient in adults. In the writer's case the occasionally felt radial and femoral pulse coincided exactly with the pressure on the heart, the capillary circulation in the face and lips and the bleeding from the incisions in the arm and neck proved the existence of circulation in the smaller vessels and capillaries, and the color of the blood and mucous membranes was evidence of a fair degree of oxidation. The blood pressure was without doubt very deficient, but probably a very important factor in the failure to restore even temporarily the vital functions was the extreme exhaustion of the patient before she applied for measures of relief. In most of the cases reported in the literature the patients were in a reasonable state of health before the collapse or traumatic shock which necessitated efforts for their resuscitation.

A limited experience at the Children's Hospital has afforded a vivid impression of the gravity of these cases of inflammatory conditions and abscesses of the throat in children. A somewhat similar case occurred soon after the one above reported. The patient, Stanley G., entered the hospital on May 25, 1904, with a history of sore throat and swelling of the neck for four weeks. Examination showed a fluctuating swelling on each side behind the angle of the jaw and a large mass bulging from the posterior wall of the pharynx. The condition was poor although the dyspnea was not extreme. Primary ether was given in Rose's position and the pharyngeal abscess incised by the house surgeon; collapse instantly ensued and respiration ceased, although apparently no pus was drawn into the respiratory passages. Cardiac pulsation could be faintly heard with the stethoscope, but the usual measures for resuscitation were unsuccessful until a hasty tracheotomy by the writer finally resulted in the re-establishment of the respiration. This patient again collapsed an hour later in the ward and was with difficulty revived. He was finally immobilized on a Bradford frame which was then inverted, so that the patient hung face downward with the head at a lower level than the feet. This position afforded drainage for the abscess cavity and for the respiratory passages and kept the blood in the vital centers, and the patient finally recovered. On March 7, 1904, another case came under the care of Dr. James S. Stone: the patient collapsed immediately after the incision of a retro-pharyngeal abscess and made a slow recovery only after vigorous measures for resuscitation.

Acute abscesses around the tonsil and soft palate usually run a short course and burst spontaneously or are opened in from three to five days. They may be serious owing to their tendency to extend downward and cause an inflammatory edema in the larynx, which may be rapidly fatal, but they are seldom accompanied by the extreme exhaustion which is seen in cases of acute retro-pharyngeal abscess. These are usually of longer duration, owing probably to their situation behind the dense pharyngeal aponeurosis, which retards

their progress to the surface and frequently determines their pointing externally behind the angle of the jaw. In six cases which occurred at the Children's Hospital between November and May, 1904, the duration varied between ten days and four weeks. Chronic, slowly accumulating "cold" abscesses due to cervical caries are not included, of course, in this category. The grave condition of exhaustion frequently seen in a patient with an acute or subacute retro-pharyngeal abscess is due to several factors: to the enforced starvation for many days, to sleeplessness, to toxemia, and to insufficient oxygenation of the blood in cases where the respiration is embarrassed. If now, preliminary to operative interference, the head is thrown back and the mouth held wide open, the tendency is for the base of the tongue and the posterior wall of the pharynx to become still more closely approximated, unless, indeed, the tongue is drawn strongly forward, which perhaps is neglected in the operator's effort to get a clear view. Thus a sudden temporarily complete asphyxiation may ensue, which, with the frenzied struggles of the unreasonable child, may result in cardiac collapse. Perhaps, also, the stimulation of the sensory terminations of the superior laryngeal nerve in the mouth and pharynx by the necessary manipulations may cause a reflex inhibition of the heart and respiration through the pneumogastric and sympathetic nerves, which contributes to the fatal result.

In cases similar to the one reported above, a preliminary tracheotomy would seem to be a conservative procedure. It could be quickly done under cocaine or even without anesthesia, and although the child's struggles might be exhausting they would, at least, not be accompanied by the element of suffocation. The incision of the abscess might then be deferred, if necessary, until the general condition had improved, or, if artificial respiration were required, the opportunity would be most favorable.

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Clinical Department.

A CASE OF ACUTE HEMORRHAGIC PANCREATITIS.

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DIAGNOSIS, OPERATION, RECOVERY.

PATIENT, A. B., female, forty-eight years old, married. First seen by the writer Jan. 10, 1904, at her home, in answer to an urgent summons referred to him by Dr. J. M. B. Farnham.

Family history. — Born in Connecticut. Husband well, but has lived apart from patient for several years. One son, twenty-seven, well. Causes of grandparents' death not known. Father died of acute diabetes

following an attack of "grippe." Mother is well, except for varicose ulcers of leg. One brother subject to malaria and severe dyspeptic attacks. Three sisters died in youth of typhoid and another of "bone-cancer." Two sisters are living at present, the elder, forty-nine years old, is a diabetic of several months' standing.¹ The younger, forty-five years old, was operated on four years ago for uterine trouble, and has been in delicate health since.

Personal history. — Typhoid at age of sixteen. Two miscarriages, the more recent being fifteen years ago. Menstruation has been irregular since, varying from three to six weeks. Has been subject to frequent attacks of indigestion and epigastric pain for many years. Is habitually constipated. Sour foods in particular are poorly borne. Four years ago was treated by a stomach specialist for chronic gastritis, and for a few days was fed by rectum because of nausea and vomiting. Later was sent to hospital, where she was kept on a liquid diet and gradually improved. There she was told that she had a small uterine fibroid. Diphtheria one year ago. Four months ago had a sudden attack of severe epigastric pain with vomiting and marked local tenderness. Was sick for three weeks, then resumed her customary household duties. The epigastric soreness persisted more or less, however, and from time to time she has been treated for it since.

Present illness. — The patient felt as well as usual this morning until nine o'clock, when she was seized by violent pain in the epigastrium radiating to left hypochondrium and scapular region. Vomiting and retching was constant, but without relief of pain. At first, she raised partially digested food, but after that only an occasional mouthful of greenish fluid. No blood has been raised. When seen, twenty minutes after the onset, she was upon her knees on the floor, straining violently in effort to vomit, but raising nothing. She was very pale, beads of perspiration stood upon her forehead, and the radial pulse was thread-like and barely perceptible. Morphine sulphate $\frac{1}{2}$ gr. was immediately given hypodermically, and patient placed on the bed. An additional $\frac{1}{2}$ gr. brought slight relief.

Physical examination. — Well developed and fairly nourished. Pulse small and compressible, 120 per minute. Temperature, 95.5° F. Skin pale, moist and cool. Pupils equal and now contracted. Tongue lightly coated. Heart sounds rapid and feeble. No murmurs. No cardiac enlargement or displacement. Lungs negative. Upper limit of liver dullness at sixth rib, lower not determined because of tenderness. There is extreme tenderness over entire epigastrium, extending over left hypochondrium around the costal margin to the back, where there is a point of especial tenderness to the left of the twelfth dorsal vertebra. Palpation of upper abdomen unsatisfactory because of muscular spasm.

Blood. — A leucocyte count made two hours after onset of symptoms showed 37,000 per cubic millimeter.

Urine. — About 120 cc. passed later in the day. Analysis as follows: Pale; acid; specific gravity, 1.028; albumin, a large trace; sugar, absent; sediment, considerable, showing under the microscope numerous hyaline and finely granular casts, a few coarsely granular casts, very little free fat, a few large and small round cells, some of which are fatty, and numerous squamous epithelial cells.

During the day the morphine was repeated as needed. The pulse remaining of poor quality, $\frac{1}{2}$ gr. of strychnine sulphate was given every four hours. Calomel in $\frac{1}{10}$ gr. doses was ordered hourly during the night. Sips of water were taken from time to

¹ Personal observation.