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ON SUDDEN DEATH IN LABOR AND CHILDBED.

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On the first of January of the present year at six o'clock in the morning I received a summons to attend a case of confinement. The patient belonged to the clientèle of Dr. Bangs, but owing to the illness of one of his children with scarlatina, he had from conscientious motives, requested the family to call upon me in case the labor should occur before the recovery of his child should place him at liberty to resume his midwifery practice. The patient was a very beautiful young woman, a primipara, 23 years of age, to all appearances in the enjoyment of excellent health, and full of happiness at the prospect of becoming a mother. In the brightsunshine of the early morning there was nothing to suggest the tragedy with which the day closed. The examination made upon my arrival demonstrated the beginning of cervical dilatation, and a head presentation. The parts were, however, at that time excessively sensitive to the touch. The pains recurred at intervals of ten minutes. When I entered the room the patient was pacing the floor.

Noticing that she did not, as is usual, sit down when her pains seized her, I questioned her as to her reasons, and was told in reply that she was determined that no sound from her lips should betray her sufferings, and that she found it easier to support the pangs of labor when in motion than when at rest. I likewise learned that with the view of carrying out her resolution, labor having begun late in the previous afternoon, in the place of going to bed she had kept upon her feet throughout the entire night. To my repeated suggestions that she would tire herself out, she assured me that I need not worry, as she felt no apprehensions about herself, and indeed her cheerful spirits and bright color seemed abundantly to support her hopeful words. The labor, however, dragged along slowly. The head dilated the cervical canal without the formation of the bag of waters, and, though the head was low in the pelvic cavity, at eleven o'clock the dilatation of the os externum had made but slight progress. I then told my patient that I thought, by a slight manœuvre, I could shorten materially the duration of the labor. Owing to the sensitiveness of the genital canal, to which I have already referred, I gave her enough chloroform to dull sensation, but not enough to abolish consciousness. With two fingers I next lifted the head from the cervical walls

so as to allow the bag of waters to form in front of the child's head. As I had anticipated, dilatation speedily followed, and, in about half an hour, the head, freed from the cervix, rested on the perineal floor. At noon I suggested to my patient that she must be tired, and that as there was no longer any difficulty or danger from the use of forceps I would advise her to allow me to hasten the birth of the child. To this she energetically answered "that she wished the glory of having her baby herself;" and as in reality she seemed to be making fair progress I unfortunately acceded to her wishes.

From this time on the patient remained in bed. Between 1 and 2 P. M., on going to the bedside to make an examination, I noticed that the color had left her face. Although straining energetically, she manifested no signs of suffering. On asking her whether she was in pain, she replied in a dazed way, "I don't know; I suppose I am; I don't know whether I am or not." After hastily making preparations for possible post-partum hæmorrhage, I once more gave chloroform, applied the forceps, and without difficulty extracted a child weighing between seven and eight pounds. The child was pallid, and breathed feebly at first but soon cried lustily. Before the forceps were applied meconium appeared at the vulva. The uterus was like an empty sac, and the anticipated hæmorrhage was not long delayed after the removal of the placenta. A hot water vaginal douche quickly arrested the flow, but not until after a couple of pints of blood had been lost. Meantime the room had grown dark and, as the curtains were raised to enable me to see the face of my patient, it seemed as though the stamp of death was upon it. The extremities were cold, and at the wrist no pulse could be felt. Still consciousness was not lost as the patient responded to questions, and manifested slight pain when brandy was injected under the skin. The respirations were quiet and undisturbed. Under the continued use of restoratives the color returned to the face. The patient began to complain of thirst, and begged for a goblet of water in place of the teaspoonful of fluid administered to her at short intervals. She likewise begged to be allowed to turn upon her side. In spite of the extreme feebleness of the radial pulse, the condition of the patient at seven o'clock was such as to inspire me with the expectation of her recovery, so that, placing her in the hands of my friend, Dr. Anderton, I went down stairs to dinner. In my absence she suddenly turned in bed. For a moment the heart ceased to beat, and, though she rallied for a time, by 7:30 P. M. I was called hastily to her room, arriving just in time to witness the final breath.

In prefacing his remarks upon the class of cases to which the sad history I have related belongs, Winckel says, "He who has once seen a puerperal woman happy and joyous in the expectation of soon leaving her couch, and then directly afterward has found her a corpse, will be able to comprehend the truth of Hervieux's words: 'In the twinkling of an eye all the calculations of prudence are set at naught; the most untiring vigilance, the best established rules of hygiene, all the varied resources and the ingenious combinations of therapeutics are shattered against an

invisible rock.' " And then Winckel adds: "The only thing which remains for the physician to do after such a depressing occurrence is to seek out the cause of the sudden death."

But when the conscientious physician seeks for light concerning the cause of the tragedy in which he has played the part of a powerless spectator, he will find but scanty guidance in the few brief lines devoted to the subject in the systematic treatises upon midwifery. He will learn in later works that, apart from such rare accidents as cerebral apoplexy or heart rupture, or fatal endings from hæmorrhage, from eclampsia and acute septicæmia, the causes of sudden death are to be found in the entrance of air into the circulation and in pulmonary embolism; and to these, in older works, he will find the admission added that death may be due to exhaustion or shock; but in spite of the very copious clinical material scattered through journals and society reports, there will be but little information concerning the pathology, the symptoms, and the mechanical conditions which respectively belong to the various processes to which death is attributable. For convenience of reference, but with no pretense at originality, I have thought it might be profitable to arrange in orderly sequence such facts bearing upon the question as have come to my notice in the inquiries which my own case has rendered it obligatory upon me to institute.

THE ENTRANCE OF AIR INTO THE CIRCULATION.

The passage of air from the uterine cavity into the circulation is rendered possible by the presence of open sinuses, or of sinuses closed by soft, easily detached thrombi. These conditions are always present previous to delivery in the case of partial separation of the placenta, and in the puerperal state, especially in the latter where, owing to debility, or the undue prolongation of labor, the expulsion of the ovum has been followed by imperfect retraction.

Air may be forcibly driven into the uterus by means of the uterine or even the vaginal douche. For this reason the syphon syringe ought to be discarded from midwifery practice. It is never a safe instrument, and I have prohibited its employment in all the public institutions with which I have been connected. The objections to the continuous stream furnished by a vessel placed at a height above the patient, based upon the insufficient force of the current, are purely theoretical. It is not necessary that the nozzle of the syringe should be introduced directly into the uterine cavity for accidents to occur. When the vaginal douche was much in vogue as a means of inducing labor after the prescription of Kiwisch, not a few instances of sudden death were reported as the result of its employment. In a case reported by Wiener¹ in Spiegelberg's clinic, where the tube of the douche apparatus was free from air, collapse, from which, however, the patient recovered, resulted from the hydrostatic pressure forcing air previously introduced into the vagina up into the uterine cavity. If the method of Kiwisch is selected to induce labor,

the stream should at first be introduced with great gentleness.

Less familiar than these cases of forced air injection, are instances of the spontaneous entrance of air into the uterine sinuses. Every day gynæcological experience teaches us the mechanism by which this phenomenon may be produced. In great part the modern advances in the treatment of the diseases of the genital canal result from the discovery we owe to Sims that, in certain body postures, the intra-abdominal pressure is reduced to such a degree that, provided the vaginal orifice be dilated by the speculum or the finger, air enters and distends the canal. The three positions which most favor this occurrence are, respectively, the knee-chest, the latero-prone and the lithotomy positions. In the non-puerperal conditions, owing to the closed canal of the cervix, the action is confined to the vagina. But in childbirth the sudden rupture of the membranes which have previously distended the vagina, or the rapid extraction of the child, may permit the ingress of air into the uterine cavity itself. Such an accident may not of necessity do harm, or the harm may be limited to the production of endometritis, but still there are recorded cases in which the occurrence has been followed by almost instant death.

In this category may be mentioned a very striking case reported by Kézmarysky,¹ of Budapest. The patient was 36 years of age, and in labor for the fourth time. An excessive amount of amniotic fluid was recognized. The patient entered the hospital at 10 A. M. At 3 P. M., as she lay upon her left side, the bag of waters was found protruding from the vulva. Spontaneous rupture occurred, and a gallon of water was discharged. Five minutes later the patient suddenly threw back her head, gasped a few times for air, the face became livid and respiration was arrested. In scarcely two minutes the clinical assistant, Dr. Liebmann, was at her side, but the pulse was extinct. An asphyxiated child was extracted with forceps, and the expulsion of the placenta followed during the tying of the cord. Meantime the heart had ceased to beat, and the woman was dead. At the post-mortem 20 hours afterward pale, reddish-brown blood, mingled with bubbles of air of large and small size were found in the veins of the uterus, in the vena cava inferior, in the left side of the heart, and especially at the orifice of the pulmonary artery. The lungs were pale, anæmic, and contained a small quantity of frothy serum. In the vena cava the blood was separated into distinct columns by intervening layers of air. Kézmarysky's explanation of the fatal issue is as follows: The patient lay upon her left side with the knees drawn up in very nearly the Sims position, with the vulva elevated above the concavity of the abdomen. As the membranes ruptured there was sudden diminution of the intra-abdominal pressure, so that the air passed through the open vulva between the collapsed membranes and the vagina to the uterus. The ensuing retraction of the uterus forced the head to the os externum, and caused partial placental sep-

¹Wiener. Zur Frage der Künstlichen Frühgeburt, bei Eugène Becken. Arch. für Gynæk. Vol. XIII, p. 94.

¹Kézmarysky. Ueber Lufttritt in die Blutbahnen durch den puerperalen Uterus. Arch. f. Gynæk., Vol. XIII, p. 200. To my indebtedness to this paper I herewith make my cordial acknowledgments.

aration. The next contraction caused the intra-uterine air to escape by the only channel that was possible, viz.: by the open mouths of the placental veins.

The aspiration force of the uterus in the knee-elbow position is thus illustrated by Hegar,¹ who, misled, he says, by the brochure of Ludwig, made some experiments with labor in that position. In one case delay in the expulsion of the trunk followed the birth of the child's head. Friction was employed upon the fundus, and then the body was drawn out by gentle traction made in the axilla. As soon as the child was born a stream of air rushed into the uterus with a gurgling sound. The patient was then placed upon her back, and the air, blood, and placenta were pressed out. The patient subsequently was attacked with endometritis and metro-peritonitis, from which, however, she recovered.

By way of warning I shall take the liberty of adding to these two cases the following, reported by Cordwent in the St. George's Hospital Reports (vol. vi):

At the patient's request she remained during labor in the standing position. Suddenly the child was precipitated to the ground, dragging the entire placenta with it. Immediately thereafter a gurgling sound was heard. The woman remained standing as before, and holding at the bed-post. Then she cried out: "I see nothing; I feel faint; put me to bed." Her request was carried out, but she died instantly. Air was found in the coronary artery of the stomach, the right side of the heart was slightly inflated, and air escaped from the punctured auricle. Here Kéz-marsky suggests that the sudden recession of the uterus after delivery exercised a suction force which drew the air directly into the uterus and into the uterine veins. With the body bent forward in the upright position Schatz has demonstrated the diminution of the intra-abdominal pressure.

These histories I present not as isolated instances, but as typical, and carrying with them the suggestions for the adoption of preventive measures.

The post-mortem examinations in these cases showed but little blood in the left side of the heart, frothy blood from the cut surfaces of the uterus, air in the uterine veins, the vena cava, the right side of the heart, and at the orifice of the pulmonary artery; the lungs were anæmic and contained much frothy serum; the brain was pale and infiltrated with serum. And corresponding to these conditions the hands were cold, the pulse scarcely perceptible, the face blue and livid, consciousness was lost, and the respiration was labored and jerky, with all the symptoms of intense air hunger.

In the case I have reported it is not possible in the absence of a post-mortem examination absolutely to exclude the entrance of air into the uterine vessels, for the vaginal douche was employed, and the excessive uterine relaxation might have conducted to the spontaneous aspiration of air, still such an event was improbable, for the douche was used with every known precaution, and the dorsal position was un-

favorable to the direct entrance of air into the genital passage. But the special reasons for discarding such an hypothesis were first the quiet, peaceful, and undisturbed respirations of the patient, and the fact that death from air in the veins is usually sudden. When life is prolonged for a few hours the dangerous symptoms as a rule subside, probably from absorption of the air.

ON THROMBOSIS AND EMBOLISM.

From this discussion I propose to exclude cases of phlegmasia dolens in which a detached portion of the thrombus in the femoral vein is suddenly carried to the right side of the heart and thence to the pulmonary artery, as this accident is one familiar to all practitioners, and occurs but rarely, if timely prophylactic measures are instituted. Death in such instances, though sudden, does not take place without warning, and lacks the element of unexpectedness which properly belongs to the class under immediate consideration. There are, however, two generally accepted forms which require closer study, viz.:

1. When the placenta is partially detached during labor, or the uterus after the birth of the child does not properly contract, sudden hæmorrhage followed by syncope or marked weakening of the heart's action may lead to the formation of large soft thrombi in the uterine sinuses, which by movement, by uterine action, or by the douche, may be set adrift and, carried by the vena cava to the left side of the heart and the pulmonary vessels, may cause extreme dyspnoea and death. That some of the reported cases of death from entrance of air into the circulation, where the diagnosis was not confirmed by a post-mortem examination, belong in this category, is inherently probable. I must, however, express my regrets that I have been unable to find a history which affords indubitable proof of such an occurrence.

2. It has been assumed, though not without question, that owing to the large proportion of fibrinoplastic and fibrinogenic substances in the blood during pregnancy and childbed, it is possible, when the heart's action is feeble, for spontaneous coagulation to take place in the pulmonary artery, and cause dyspnoea and death by obstruction of the pulmonary circulation. This theory, originally broached by Meigs, has been warmly supported by Playfair and Barker. Clinically, many striking facts have been adduced in support of this view. Playfair argues that when dyspnoea precedes phlegmasia dolens, the same causes which have led to thrombosis of the femoral vein had antecedently been at work in the formation of coagula in the pulmonary artery. But the post-mortem evidence of such a connexion is not conclusive. Dr. Mary Putnam Jacobi reported to the New York Pathological Society a death which occurred in a primipara five hours after childbirth. Two hours after the delivery was completed, the patient complained of præcordial oppression and dyspnoea. These symptoms continued to increase until the fatal termination. No lesions whatever to account for these symptoms were found at the autopsy. Her own opinion that the clots found in the two sides of the heart were formed subsequently to death,

¹Hegar. Sangphänomene am Unterleib. Arch. f. Gynæk., Vol. IV, p. 535.

was sustained by Dr. Janeway and other members of the Society who examined the specimen she presented. In a case reported by Dr. Playfair of sudden death occurring in a rheumatic patient, which he referred to thrombosis of the pulmonary artery, Drs. Wilks and Weber, of the London Pathological Society, reported upon the specimen as follows: "The characters of the clot are such as are not very rarely seen in cases of slow death, and there is nothing in its appearance to lead us to the belief that the clot was the cause of the death; in fact, judging simply from the specimen before us, we should have considered that it resulted merely from the diminution and gradual cessation of the heart's action." (Path. Trans., vol. xviii). Nor is it possible, when we recall the frequency with which thrombosis of the uterine veins precedes that of the veins of the thigh to be sure, in the absence of an autopsy, that the dyspnoea observed might not have been due to an embolus from a clot formed in a uterine vessel. Personally, I am far from willing to deny the possibility of Playfair's hypothesis. I only wish to state that so far as the evidence goes it lacks the positiveness of a scientific demonstration. Savage, in his reply to a paper on "Puerperal Thrombosis and Embolism," read by Playfair before the London Obstetrical Society (Trans., vol. xvi), while questioning the doctrine of primary thrombosis of the pulmonary artery, gives Virchow as his authority that "any of the few minor cardiac veins opening into the right auricle may be the seat of the primary thrombus, and give rise to a large secondary thrombus within the auricle," a fact which, if admitted, furnishes standing-ground for Playfair, and answers the objection that, excepting in the death agony, the force of the current in the pulmonary artery is such as to prevent spontaneous coagulation from taking place.

NERVE EXHAUSTION AND SHOCK.

Twenty years ago these two pathological states played a conspicuous part in the etiology of sudden death in childbirth. Now the fashion has changed. Such terms as "nervous apoplexy," or "idiopathic asphyxia," belong to an almost forgotten nomenclature. And yet none the less the necessity remains to account for a class of cases in which death takes place without recognizable organic lesions.

Instances of death attributed to heart-paralysis are to be found in the collections of McClintock¹ and Mordret², but to these objections have been made either that the post-mortem confirmation of the diagnosis was lacking, or that the examinations were wanting in the completeness necessary to shut out other possible causes of death. Baart de la Faille,³ however, has more recently collected thirteen cases of collapse in which the occurrence of embolism and the entrance of air could with every probability be excluded. Cases similar to my own, where the absence of all symptoms of pulmonary obstruction furnished certain evidence that the fatal ending was due neither to embolism nor to air, may be found scat-

¹McClintock. Dublin Med. Press, 1852.

²Mordret. Mem. Acad. Med., 1858.

³Baart de la Faille. I have only had access to the synopsis of these cases to be found in the Mon. Schr. f. Geb. Kunde. Vol. XXV, p. 318.

tered through journal literature. As I write I find in the April number of the *American Practitioner* an account by Dr. O. T. Schultz in which an enfeebled patient was seized with deadly pallor and other signs of shock immediately after a precipitate labor occurring while the patient was at stool, the patient dying two hours later without dyspnoea.

Certainly in the absence of the visible lesions, or the characteristic symptoms of the conditions to which death in childbed is usually referred, we have the right to attribute the melancholy issue to the same causes which outside of childbed produce identical phenomena. It would be impossible to find in the annals of surgery a more striking example of the features of shock than those presented by my patient. The pinched features, the eyes sunken and surrounded by dark rings, the marble pallor of the skin, the hands and lips blue, the extremities cold, the sweat upon the brow, the thready, scarcely perceptible pulse, the shallow but not anxious breathing, with the closed sphincters, and with consciousness and sensibility preserved, present a complete picture of the torpid form of shock. As time passed by the erythemic symptoms followed; the face, with the exception of the mucous membranes, became reddened, beguiling me with false hopes; the eyes brightened, the patient became restless, bade her friends good-by in anticipation of death, and complained of constant thirst, while at the same time the pulse was too rapid to be counted, and the skin, in spite of artificial heat, never regained its normal temperature.

Modern pathological investigation refers the phenomena of shock to a reflex paralysis of the vasomotor, and especially of the splanchnic nerves, whereby the great mass of the blood is withdrawn from the surface, and collects in the large trunks of the celiac, the mesenteric and the renal veins. Hence the skin becomes cold and is devoid of color, save at the points where a bluish hue is imparted by the stagnant blood still lingering in the veins; the muscles deprived of blood became enfeebled; and the empty vessels of the brain explain the sluggish intelligence, the nausea, the vomiting and the indifference of the patient; finally, during the diastole, the heart, pale and contracted, receives but little blood, and the radial pulse fades to nothingness, because a corresponding small amount of fluid is propelled during the systole into the arterial vessels.

From works on military surgery we learn that it is in the defeated army among homesick soldiers, at the close of a wearisome war after great exertions and deprivations, that shock is developed in its severest forms; that the finer the organization, the more readily the manifestations occur; that they are promoted by sudden losses of blood, and are in a special degree evoked by abdominal injuries.

It certainly would be singular if similar conditions in childbed were not followed by similar results. After prolonged labor, the woman has her nervous system depressed by pain, starvation, and deprivation of sleep. The sudden emptying of the uterus is followed by a recession of blood to the venous trunks of the abdomen. Hæmorrhage subsequent to parturition is followed by syncope, and the wonder is, not

that the circulation should occasionally show the evidences of marked, and even fatal disturbance, but that the nervous system attacked from so many directions, should, as a rule, triumph over the adverse forces. In the old days of torture, shock often mercifully put an end to the victim's anguish. Women in childbirth are at times subjected to pain exceeding that of the rack and the thumb-screw. Now it is not sound pathology to ignore these facts, and to banish as unworthy of consideration a well established pathological condition, simply because in the days of ignorance the terms exhaustion and shock were indiscriminately employed to explain a multitude of cases, which, with our present enlightenment, we know are due to the entrance of air into the circulation and to pulmonary embolism. As the nervous organization of women loses in powers of resistance as the penalty of a higher civilization and of artificial refinement, it becomes imperatively necessary for the physician to guard her from the dangers of excessive and too prolonged suffering. Especially I would raise my voice in warning against the current opinion that the length of the first stage of labor before the rupture of the membranes is a matter of indifference, a teaching which I believe has cost the lives of many women; in a few, death resulting from shock; in more, the exhausted condition in which the woman is left after childbirth rendering her an easy prey to the perils of the puerperal state.