# ON THE THROMBOSIS AND EMBOLIA OF LYING-IN WOMEN.

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The condition of the blood in pregnant and lying-in women, if thoroughly understood, would furnish the key to much of the pathology of child-bed diseases. That fevers, phlegmasia dolens, and eclampsia, are connected with certain departures from the normal conditions of the circulating fluids, will not now, I believe, be contested. But there is one puerperal affection in which the changes wrought in the blood are invested with a peculiarly striking interest. At a period more or less closely approaching delivery, a woman may be seized with fainting, intense pain in one or more limbs, followed by swelling, arrest of pulsation, loss of heat, gangrene, and perhaps death. What are the antecedent conditions that can lead to this sudden catastrophe? A complete answer to this question would, there cannot be a doubt, indicate the means whereby this catastrophe might, in some cases at least, be averted. In all the cases in which the series of events above enumerated have been observed, and which were subjected to post-mortem examination, clots have been found in the main arteries of the limbs affected.

In another class of cases we witness sudden faintness, irregular action of the heart, distressed breathing, quickly increasing collapse, and rapid death. In these cases it is

convenient. Dr. Graily Hewitt's instrument, it was evident, was not open to these objections. The caution was necessary that abortion might be produced by the use of the douche in the early months of pregnancy; the patient being not always aware of her pregnant condition, this circumstance should be borne in mind.

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In another class of cases we witness sudden faintness, irregular action of the heart, distressed breathing, quickly increasing collapse, and rapid death. In these cases it is

found that the pulmonic circulation is almost exclusively concerned, and clot-obstructions are discovered in the right heart and pulmonary arteries.

What are the causes which can give rise to coagulation of the blood in the living body? Here is a case in which the physician might, perhaps, be entitled to call upon the chemist for assistance. That organic chemistry has of late years made enough of progress to raise the hope of more effective aid to medicine than has hitherto been acquired, may be freely admitted; but in regard to the particular problem now submitted, we must, I fear, be content for a while to rely mainly upon medical observations. In our search for a solution we must steadily accumulate all apposite observations, in order to multiply the elements of comparison. The cases actually on record are not numerous; but it can hardly be doubted that if cases of sudden death in child-bed had been more closely investigated by dissection, the list might have been greatly extended. It is also certain that if attention be steadily directed, under the light of the few recorded cases, to clinical obstetrics, future experience will be less barren than the past.

The following case is of value as a contribution to the slender mass of facts bearing upon the subject.

CASE.—*Swelling of right leg after labour; gangrene; death.*

Mrs. C—, the wife of a surgeon, was thirty-one years of age when she was delivered, on the 23rd Febuary, 1854, of her fourth child. She was attended by Dr. Abraham, who described the labour as easy; the placenta came away entire, and the uterus contracted well. She appeared to be going on favorably, suffering, however, much more from after-pains than on previous occasions, until the 2nd March. The lochial discharge and the secretion of milk continued as usual. She took little nourishment. On March 2nd she was much irritated and excited by the nurse, who did not manage the child properly. She got up in the bed (perhaps was chilled), and was violently agitated. I was sent for late

at night, and found her restless, agitated, hysterical, complaining of spasmodic pains in the abdomen. She could bear pressure; it even seemed to relieve her. Pulse 120. She took ten minims of compound spirits of ammonia, twenty minims of sedative liquor of opium, and twenty minims of ether. She complained that this caused a burning pain in the stomach. On the morning of the 3rd Mrs. C— seemed calmer; the pulse was more subdued, having fallen to 100; the pain was relieved; the tongue was red at the tip and round the margin, the papillæ in the centre raised, covered with white fur, and moist. She had taken a saline aperient, which acted fairly. On the morning of the 4th she still appeared to be improving; the pulse ranged from 90 to 110 and back again during the day; the pains in the abdomen were less, but still reappeared spasmodically. On the 5th I was sent for hastily at 9 a.m.; the pains had increased; there was great tenderness all over the abdomen, especially in the region of the uterus; considerable tympanitis; pulse 120, feeble; skin moist, warm; tongue as reported on the 3rd; countenance anxious; she felt as if a tight cord were drawn round the abdomen; dyspnœa. At 1 p.m. Dr. Oldham shared with me the anxieties of the case. He agreed that the uterus was enlarged, and that there was probably phlebitic mischief. The patient could still move and extend her legs freely; there was no tenderness in the legs, or in the groins in the neighbourhood of the large vessels; the uterus was inclined towards the left side; there was marked depression. She took a gentle saline aperient, which acted, and Liquor Cinchonæ, with Liquor Opii Sedativus, every four hours. Nourishment and wine were freely administered.

6th, 9 a.m.—The pain in the abdomen was better. She bore pressure well everywhere, except over the uterus; great tympanitis; some dyspnœa; does not seem to have lost ground.

7th.—Still tympanitis and dyspnœa; free from pain on pressure over abdomen, but there is soreness over the uterus, which, however, seems diminished in bulk; some

discharge per vaginam to-day; tenderness in right groin, pain as if after cramp in the right calf; can, however, move the leg freely, and there is no swelling. The tympanitis was relieved by an asafœtida enema, which brought away some fæces as well as wind. No pulsation in right posterior tibial artery. At night she had taken some nourishment.

On the 8th, at 9 a.m., there was pain in the region of the uterus, in the calf and ankle of the right leg; there was slight tumefaction in the groin, but no pain. At 10 a.m. Mrs. C— suddenly fainted. She was restored by stimulants. At noon she was seized with the most excruciating pain in the ankle and calf. I think I never beheld suffering so intense. In her agony she implored her husband to cut off her leg, or to let her die. The pulse was 160. The skin was moist and relaxed; tympanitis; Liquor Opii taken in free doses seemed to exercise no effect. Towards night the intensity of the pain subsided; there was some fulness and pain in the groin; considerable swelling of the ankle, calf, and thigh; still she could bend the knee; on the inner side of the ankle the swelling shows a red blush. At midnight the pulse was 160; there was great prostration, but the intellect was clear. She had taken, with beef tea, wine and Liquor Cinchonæ up to this time. An asafœtida enema again relieved the tympanitis and dyspnœa. The urine, which all through had been passed freely, although high coloured and depositing lithates, was still secreted. On the 9th, at 4 a.m., it was found that the leg, between the calf and ankle, was in a state of gangrene. At 9 a.m. the gangrene had plainly extended; she was now sinking, but in perfect possession of her intellect. She died at 11.

No post-mortem examination was made, but the history of this painfully interesting case can leave little doubt as to the cause of the fatal issue. A coagulum had obstructed the right external iliac or the femoral artery. Mortification had ensued as effectually and as rapidly as if the artery had been ligatured.

To avoid, at least, those fallacies which are apt to arise

from speculations upon isolated cases, I propose to range together such cognate cases as the scanty leisure at my disposal has enabled me to gather. The history of blood-coagulation in the living body is not all of such recent date as has been sometimes imagined. Drs. Richardson[1] and Cohn[2] justly remark that similar facts and arguments to those which have of late years engaged the attention of the profession were known and discussed by Vesalius, Lancisi, Morgagni, Kerkringius, Pasta, Gould, Burserius, Templeman, Quaye, Brown, Cullen, Chisholm, Huxham, and others. But, not to disparage ancestral labours, it must be admitted that contemporary authors have, by more accurate observation, given greater precision to our knowledge of the subject. Amongst the writings that more especially deserve study are those of Baron,[3] Paget,[4] Kirkes,[5] Virchow[6] (1846), Simpson,[7] Richardson, and, lastly, Cohn (1860). The greater part of these writings bear chiefly upon obstructions of the pulmonic circulation and occlusion of the cerebral arteries.

The memoir of Simpson is chiefly valuable as containing the best collection of cases of obstruction in the arteries of the limbs in connection with the puerperal state.

As a means of arriving at definite conclusions, I have abstracted a series of cases in a tabular form.

[1] 'The Cause of the Coagulations of the Blood,' 1858.
[2] 'Klinik der Embolischen Gefässkrankheiten,' 1860.
[3] 'Archives Générales de Méd.,' 1838.
[4] 'Medico-Chir. Trans.,' 1844.
[5] 'Med.-Chir. Trans.,' 1852.
[6] See also 'Cellular Pathology,' 1859.
[7] Collected works, 1856.

TABLE I.—*Cases of Systemic Arterial Thrombosis or Embolia.*

| No. | Reference. | History. | Post-mortem appearances and remarks. |
|---|---|---|---|
| 1 | Dr. Simpson (obstetric works, 1856) | A lady, one year before pregnancy, had rheumatic endocarditis. At eighth month of pregnancy hæmorrhage (plac. prev.). Delivered by forceps. Second week after labour no pulse in right arm, which had been cold, stiff, benumbed; in a few days return of pulsation; then legs affected; at last erratic phlebitis; death five weeks after labour from phlegmasia dolens of left arm and left side of face. | Vena innominata of left side, with its affluent trunks quite obliterated by coagulable lymph. Humeral artery at bend of arm closed by a coagulum. Valves of left side of heart covered with small, wart-like excrescences. |
| 2 | Dr. Simpson (obstetric works, 1856) | Patient prematurely delivered of first child; did well for three weeks; fever, diarrhœa, lochia slightly hæmorrhagic. Soon after pains like neuralgia in right leg, then in left, fixed and "occasionally very violent." In seven weeks sudden pain in left groin; a loud systolic bruit in heart. Pulse in right arm suddenly arrested; next day no pulsation in left femoral; then pulse stopped in right femoral; gangrene of left toes; death. | Aortic aperture blocked up by valvular excrescences, friable, granular; on margin of mitral valve small, red excrescences; aorta at bifurcation obstructed by a large, irregular mass, like vegetations in heart; coagula extended down common iliacs. The coats of the vessels were thickened. Right humeral artery obstructed. |

TABLE I (*continued*).

| No. | Reference. | History. | Post-mortem appearances and remarks. |
|---|---|---|---|
| 3 | Dr. Macfarlane (Simpson's obstetric works, 1856) | Lady delivered naturally of fifth child. Ten days afterwards acute pain and numbness in right arm, which continued till death at end of three weeks. From first no pulsation below middle of brachial artery; seventeen days from labour, pain in right thigh; gangrene extending to knee; death. | Aortic valves covered with vegetations; aorta dilated and studded with atheroma; middle of brachial, and commencement of lower third of femoral arteries closed by fibrous clots. Cardiac end of clots contained *a small, hard body*, exactly like the aortic excrescences. |
| 4 | Dr. Lever (Simpson's works, 1856) | Acute rheumatism during pregnancy; after labour no pulsation in left arm, and subsequently none in left leg; distressing pain in both extremities; hand and foot livid, symptoms of gangrene in both; death in a few days. | Mushroom-like vegetations on valves of heart; in arteries of both affected extremities obstructing vegetations; in veins of both were phlebolithes. |
| 5 | Dr. Burrows (Simpson's works) | A lady, six weeks after labour, had rheumatic-like pains in limbs and pain in one calf; remission of symptoms; after exertion sudden hemiplegia of right side. Loud, rasping, systolic murmur over valves; death. | Vegetations on mitral and aortic valves; left corpus striatum a diffluent pulp; artery supplying it obliterated with mass of fibrin. Arteries of limbs not examined. |
| 6 | Dr. Risdon Bennett ('Prov. Med. and Sur. Journ.,' 1854) | Patient, æt. 33, had difficult labour; had, before labour, dyspnœa, œdema, occasional palpitations, never rheumatism; seven weeks after labour, pain across chest, and down left arm; a week later apparent syncope, with frothy, bloody expectoration; tumultuous, feeble, irregular action of heart; puffiness of ankles, tenderness of legs, left leg as if | Vegetations under mitral valve; at apex of left ventricle a partially adherent polypus; another in right ventricle. Aorta at bifurcation obstructed by firm clot. Iliac and femoral arteries blocked up. Femoral veins at groins contained a short, recent clot. In kidneys fibrinous or purulent deposits. |

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| | | attacked by phlegmasia dolens, then right leg taken; toes of both feet became shrivelled, parchment-like; no pulsation in femoral arteries; gangrene. | |
| 7 | Dr. Macfarlane (Simpson's works) | A lady, æt. 38, seven or eight years before, had rheumatism. Three or four years later endocarditis was observed. First labour severe; forceps; six hours before labour violent pain in right arm; no pulse below subclavian; pain violent and incessant for six weeks; collateral circulation partially effected; died of dropsy three months after labour. | Subclavian artery only examined; between clavicle and axilla plugged up by firm, fibrinous clot, consisting of several layers. |
| 8 | Dr. James Duncan (Simpson's works) | A primipara; had a protracted labour; two weeks afterwards admitted at Edinburgh Infirmary with pain and acute gangrene of both legs; death in three or four days. | No disease of heart. An inch and a half above bifurcation of aorta, a fibrinous clot completely occluded artery. It was prolonged along common iliacs and left internal iliac. Mass firmly adhered to walls of aorta, which were thickened. Inferior extremities of both plugs in external iliacs did not terminate abruptly, but were continued as a lymphy layer over arterial wall for an inch. Below, the arteries were healthy. Veins healthy. |
| 9 | Dr. Cowan (Simpson's works) | A patient, æt. 36, delivered of fourth child; did well for three days; had rigor in night; anxiety, pallor; excruciating pain in left leg and foot, which were cold; pulse small, rapid; lochia arrested; in evening mitigation of pain; foot was gangrenous. | No post-mortem. |
| 10 | Dr. Cowan (Simpson's works) | A primipara; had gangrene of a leg ten days after labour. The leg was amputated; not a drop of blood flowed; death next day. | No post-mortem. Amputated limb—some soft clots in artery. (Thrombus probably in iliac; that it was above site of amputation is proved by absence of bleeding.—R. B.) |

TABLE I (*continued*).

| No. | Reference. | History. | Post-mortem appearances and remarks. |
|---|---|---|---|
| 11 | Mr. Bottomley ('Lancet,' 1845) | Patient delivered 8th February, 1845; did well for ten days, when pleurisy appeared: this subsided; then pain ("excruciating") in heel, great toe, and ankle; then loss of temperature; gangrene; line of demarcation two inches above ankle. On 3rd May amputation above knee. Both femoral artery and vein were plugged with transparent semi-cartilaginous substance. | Patient survived. |
| 12 | Dr. Oke (Simpson's works) | A patient, æt. 24, during tenth week of pregnancy had hæmorrhage and abortion; next day severe headache, giddiness, dimness of sight, vomiting; fingers of left hand felt as though scorched, very painful; next day intense pain and numbness in left arm, which at length became cold and insensible; no pulsation; no disturbance of heart or respiration; had gangrene of skin of thumb and fingers of left hand. | Recovered, but pulsation did not return in the arm. |
| 13 | Dr. Barnes | A pluripara, æt. 31, had an ordinary labour; suffered much from after pains. Seven days after labour, after violent mental agitation, had febrile symptoms, and in three days more dyspnœa and swelling of right leg, quickly attended by excruciating pain, which, on subsiding, was followed by gangrene and death on the fourteenth day after delivery. | No post-mortem. |

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| 14 | J. Baart de la Faille ('Niderl. Tijdschr.,' 1859) | A healthy woman, æt. 36, was delivered 18th August, 1858, of her ninth child. The puerperal week passed favorably; milk copious. On 24th the left leg was very painful; white œdematous swelling of calf, without increase of heat or fever. On 3rd September a third attack of violent quotidian. On the 6th the right leg was seized. On 9th fever, pains in umbilical region, diarrhœa; no distension of abdomen. V.S. ad ʒviij. On 17th diarrhœa ceased; fever still. On 6th October died. | A few pseudo-polypi in the left heart. Liver enlarged, hyperæmic; kidneys, cortical structure hyperæmic. Uterine venous plexuses and pampiniform plexus contained thin, coagulated blood. Common iliac, hypogastric, crural veins filled with black, coagulated blood. Inferior cava in same state. The veins showed no change; no suppuration. |
| 15 | Cohn | Patient, æt. 30, had suffered from rheumatism at fifteen; palpitation ever since. Five weeks after labour, whilst walking, suddenly seized with cold of left leg from foot to knee, acute pain in sole; compelled to stop, taken to hospital; in a few hours blue spots observed on leg, which was very cold; motion and feeling quite lost. Gangrenous vesications of leg ensued. Pains in foot often disappeared in day, and returned at night; pulse felt in popliteal space. Right leg natural, but with very weak pulsation. Urine had now become albuminous. Gradual collapse set in. She became somnolent, and sank at end of ten weeks (?) from delivery. | Lungs—numerous infarctions, general œdema, secondary arterial thrombi. Heart enlarged in transverse diameter; at left ostium venosum firm deposits contracting aperture; old, firm clots in vestibule; in left auricle recent clot, containing fatty detritus. In spleen hæmorrhagic infarctus; liver thick, very œdematous; kidneys, hæmorrhagic infarction. Abdominal aorta—a brown-red, fast-adhering clot, quite filling calibre; on right a clot extended into common iliac, on left to Poupart's ligament, there being no clot in femoral or tibial arteries. Veins of both legs contained thin fluid blood. |
| | | (Dr. Cohn concludes that the essential primary embolus came suddenly from the heart and lodged in the external iliac of the left side whilst the patient was walking, being previously in apparent fair health, excepting the endocarditic sequelæ. The original embolus extended by subsequent accretions to aorta. The right leg was not affected, because obstruction had not reached aorta and right iliac till shortly before death.) | |

The cases, it will be observed, present several features of similitude, as well as of apparent variation. Cases 1, 4, 5, 7, and 14, are distinguished by a prior complication with rheumatism, a disease which in non-puerperal cases has been frequently found associated with embolia.

The earliest period of attack after labour was observed in Case 12, in which the symptoms were noticed on the second day. The latest period was seven weeks. In eight cases the indications of gangrene arose in less than fourteen days. In twelve fatal cases death ensued in from eleven days to three months. In two instances recovery took place.

It is clear, from the history of these two cases, and from what is known of the history of aneurism and other forms of arterial obliteration, partial or complete, that a collateral circulation may, under favorable circumstances, be established; or that if gangrene be not averted, the necrosed portion may be thrown off, life being preserved by the sacrifice of a part of the body.

Indeed, it has been observed that the arteries are not always completely obstructed by the clot or embolus. A space sufficient to permit the passage of a limited stream of blood may remain open. In this circumstance and the simultaneous extension of the collateral streams is a ground for the hope of recovery.

It must also be borne in mind that death may take place in the primary stage under the commotion attending the coagulation of the blood in the left heart, or so early in the second stage after the transport or formation of coagula in the arteries as to anticipate the development of mortification. Thus, a limb may be only a little swollen, and the persistence or arrest of pulsation in the related arteries may not have been determined. Such a case may pass for one of ordinary puerperal fever with "pyæmia," whilst more perfect observation would have shown it to be one of thrombosis and embolia.

In two cases amputation was resorted to, in one instance (Mr. Bottomley's) successfully, a line of demarcation having been established. In one case, complicated with

rheumatism, the symptoms were manifested six hours before labour.

In those cases which are related most circumstantially there appear to be certain premonitory symptoms, whether of the formation of coagula in the heart or of their transport into the arteries. Dyspnœa, syncope, and irregular action of the heart, are mentioned. But in some cases these symptoms have either not occurred or have escaped attention. The earliest condition recorded is pain in the limbs that have been subsequently more overtly attacked. It is especially worthy of recollection for diagnostic purposes that this pain has generally been of the most excruciating kind.

In nine cases special words are used to denote intensity of pain. The same symptom has been observed in non-puerperal cases; and Gaspard and Cruveilhier record that violent pain constantly attended the injections of foreign substances into the arteries, whilst injections into the veins were painless. The pain generally has remitted, and the signs of mortification have appeared. Pulsation has ceased in the arterial trunks leading to the affected limbs; loss of heat and some degree of swelling have followed, then loss of sensation, then gangrene. In cases complicated with rheumatism signs of cardiac disease have been diagnosed.

In all the cases in the preceding table one or more of the limbs were affected.

In three cases the right arm and both legs were involved. In one case the right arm and right leg were affected. In one case the left arm and both legs were affected. In one case the left arm and left leg; in one case the right leg; and in two cases the left leg was the seat of obstruction.

But there can be no doubt that the embolus may be carried to the brain, either in the form of a single clot or of minute particles which may penetrate the finest cerebral arteries or capillaries. Such cases, not, indeed, of a puerperal character, are related by Mr. Paget and others.

Cohn and others give examples, either drawn from human pathology or from experiments upon animals, of embolia of

other organs, as of the liver, kidneys, spleen, substance of the heart, and the eye.

The cases may be divided, as to their post-mortem appearances, into two classes:

1. In those in which rheumatism was an antecedent condition there have been found the effects of endocarditis; the valves of the left side of the heart have presented wart-like excrescences. In these cases it has been presumed that the accidents of local arterial obstruction were not always, or, at least, not exclusively, due to the sudden formation of fresh coagula in the heart, but chiefly to the detachment and washing away into the arterial system of portions of the valvular vegetations. Indeed, in some cases portions of matter exactly resembling vegetations attached to the cardiac valves have been found in the arteries at the points of obstruction.

2. In cases not complicated with rheumatism or previous disease of the heart there is evidence to show that blood has suddenly clotted in the cavities of the heart, that the commencement of the mischief was in the heart, and that the local obstructions were the result of the detachment and washing away into the arteries of portions of the heart-clot. It has also been conjectured—and, indeed, before the date of Virchow's researches, this was the favorite idea—that clots or thrombi formed in the arteries at the seat of obstruction, as the consequence of inflammation of these vessels. This question I will not discuss, but refer those who may desire information concerning it to the works of Virchow and Cohn. I will simply observe that the history of the cases seems to support the opinion that the formation of clots is generally of cardiac origin. In those cases where symptoms of cardiac distress have preceded the signs of local obstruction this inference seems clear. In those where pain in a limb or other local distress has been the first thing observed the conclusion that the coagulation did not commence in the heart would be far from certain. At the same time analogy points out that the formation of obstructing coagula in the large arteries is

not impossible. I do not know that there is any evidence to show that the phenomena of senile gangrene, or of gangrene from frost-bite, are produced otherwise than by causes operating *in loco*. So there may be local causes to produce coagulation of blood in the arteries in lying-in women.

It would be unwise to attempt to study the subject of thrombosis or embolia of the systemic arterial system apart from that of the similar affections of the pulmonic circulating system.

In some cases the two systems are simultaneously affected. In contrasting or comparing the phenomena that characterise the disorder as occurring in the pulmonic and the general vascular systems, one circumstance is particularly striking. The left or systemic heart is well known to be especially prone to disease, whilst the right or pulmonic heart is more rarely affected.

Now, in the case of the general system the disease takes its origin in the heart; in the case of the pulmonic system the disease takes its origin mostly in the peripheral veins or larger trunks, whence clots, being carried to the right ventricle, are next transmitted to the pulmonary arterial branches. In certain conditions, as pneumonia, however, there is reason to believe that primary coagulation takes place in the pulmonary arteries.

If we adopt the language of Virchow, we should say that in the system of which the left heart is the centre we have primary central thrombosis and secondary peripheral embolia, and in the system of which the right heart is the centre there is generally primary peripheral thrombosis, secondary cardiac implication, and tertiary embolia of the pulmonary arteries.

Pulmonary embolia is better known and is probably more frequent than systemic embolia.

I have arranged some cases occurring in puerperal women in a tabular form.

TABLE II.—*Cases of Pulmonary Thrombosis or Embolia.*

| No. | Reference. | History. | Post-mortem appearances and remarks. |
|---|---|---|---|
| 1 | Cruveilhier ('Anat. Pathol.') | A woman recently delivered, seized 12th July, 1830, with uterine phlebitis, recovered and suckled; on 3rd August oppression, cough, anxiety, extreme frequency of pulse; died on 9th, twenty-eight days after delivery. | Uterine, ovarian, hypogastric veins like hard cords; they were filled with compact, adherent clots. External iliac veins and left crural veins contained clots less compact and adherent, and evidently recent. At base of left lung several portions of lobular pneumonia; œdema of both lungs behind. Some hard concretions filled divisions of pulmonary artery. The lesser branches were filled with red and scarcely adherent clots. In centre of principal clot was a collection of pus. |
| 2 | Cruveilhier ('Anat. Pathol.') | A woman after labour presented typhoid symptoms during latter days of life, dying two weeks after labour. | Iliac vein and divisions filled with adherent sanguineous concretions of different dates; they were pale and contained pus; red and less coherent in smaller vessels; diffuse and lobular pneumonia of right side. Lung, divided, presented sections of vessels full of fibrinous concretions. The right pulmonary artery was obstructed. The concretions in the smaller pulmonary vessels only existed in neighbourhood of lobular pneumonia. |
| 3 | Professor Levy, of Copenhagen | A primipara; had an easy labour; next day pain over uterus, relieved by leeches; returned on fourth | Right auricle, ventricle, pulmonary artery, even to small divisions, filled with blood-clots, some fresh; |

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| | ('Deutsche Clinik,' 1855) | day with fever and tympanitis; sixth evening, violent dyspnœa, with painful constriction of epigastrium, dry cough, quick pulse, moist rhonchus; bled; improved; on twelfth day, after supper, acute pain in epigastrium, oppression, breathing anxious, laborious; death in a few minutes. | nothing in left heart. Veins of uterus contained concrete pus. |
| 4 | Dr. Hoogeeveg ('Preuss. Vereinzeitung,' 1852, and Simpson's works) | A young woman, primipara; three days after labour had phlebitis of left leg, which got better. During convalescence she suddenly *screamed, fell, and died.* | Left crural vein and branches obstructed with coagula. Pulmonary artery filled with similar coagula. These traced into smaller ramifications of pulmonary artery. |
| 5 | Dr. Hecker ('Deutsche Clinik') | A primipara, æt. 31; on third day after natural labour seized with phlebitis of left crural vein and œdema of leg; got better; on twenty-ninth day suddenly sank; intellect clear, great anxiety, pallor, gasping, quick respiration, depressed pulse, cold extremities; died in forty-five minutes. | Left crural vein closed by fibrinous clots, extending along iliac to vena cava; hypogastric vein also plugged. Two primary branches of pulmonary arteries filled with fibrinous coagula, reaching to final ramifications. No disease in heart. |
| 6 | Dr. Hecker ('Deutsche Clinik') | A woman, æt. 30; had an easy labour, but severe hæmorrhage from adherent placenta; thirty-six hours after had rigor, followed by fever. Uterus tender, pulse 120; anxiety, headache; fever, pulse rose to 140. On sixth day improvement, but still quick pulse. On the eighth she got up, fell immediately, and rose with difficulty; collapse, death in a few hours. | Small portions of placenta adherent; uterine lymphatics filled with pus, veins with fibrinous coagula. Left hypogastric vein obstructed with clots. Heart normal; trunk of pulmonary artery plugged by thrombus, extending into branches, and traced far into ramifications. |
| 7 | Mr. Havers ('Med. Times and Gaz.,' 1852) | A woman, æt. 34, delivered of second child; easy labour; did well till twelfth day; while dressing fell on her bed, frothed at mouth, slight convulsion, spoke feebly, lay back and died. | Muscular structure of heart pale, thin. Pulmonary arteries contained clots. Clots were traced to ramifications of pulmonary arteries. |
| 8 | Mr. J. H. Hewer (Simpson's works) | Patient delivered of third child; did well for eight days, then complained of slight pain in hip; on lying down she turned suddenly pale, and said "Oh nurse, I am dying!" Pulseless, breathing with difficulty, sensible; death in thirty-five minutes. | Pulmonary arteries filled with hard, cylindrical coagula (attested by Mr. Paget). |

TABLE II (*continued*).

| No. | Reference. | History. | Post-mortem appearances and remarks. |
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| 9 | Dr. Meigs 'Phil. Med. Exam.,' 1849, and Simpson's works) | A lady, delivered of fifth child, had some hæmorrhage; next day, sitting up, became suddenly ill; pulse soon 164, breathing violent, irregular; lived forty-eight hours, suffering "inexpressible respiratory distress." | Right auricle and ventricle closed with clot quite free from red globules. Pulmonary artery obstructed with clot, extending into principal branches. |
| 10 | Cohn ('Klinik der Embolischen Gefässkrankheiten,' Berlin, 1860) | Patient, æt. 31, delivered of twins (the second child by forceps) on 13th March, 1858; considerable flooding. On 15th shivering, pains in left inguinal region, diarrhœa; general tenderness and swelling of the abdomen followed, with enlargement of uterus; pulse 116; purulent vaginal discharge, collapse; death on 24th. | Serous exudations under arachnoid. In periphery of lungs small pyæmic foci; parenchyma œdematous, full of blood. In pulmonary artery, near hilus of the lung and immediately before division into branches of second order, complete obstruction by a pale-red, firm clot. Ventricular blood loosely coagulated. In spleen, a peripheral focus of mortification (Brandheerd). Uterus recently glued to abdominal wall and left ovary. |
| 11 | Cohn (opus citatum) | Patient, æt. 27, delivered of third child after ordinary labour on 31st March, 1859. Lochia ceased second day, but she got up cheerful on ninth day. Rigor, heat and sweat, seized her, then prostration, diarrhœa; no uterine pain, no dyspnœa. Rigors recurred daily; attacks of dyspnœa then appeared. After ten days stabbing pains in right chest; pleurisy; pneumonia of right lung; œdema of both feet; gradual collapse; rigors till last day; death on thirty-first day after delivery. | Lower lobe of right lung compressed by purulent pleuritic effusion; upper lobes of both sides œdematous; pulmonary artery of right, middle, and lower lobes shows numerous obstructed places; the thrombi are mostly purulent, white; the vessel thickened; parenchyma in neighbourhood in state of suppuration, with many foci in stage of hæmorrhagic infarction. Heart—blood scanty, firmly coagulated. Uterus contracted to normal size; veins of placental spot closed with firm, not suppurating, thrombi; parenchyma sound. Veins of pampiniform plexus dilated, containing fluid blood. Thrombosis of vena |

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| | | | cava from crural vein to hepatic vein and left renal vein of old date. |
| 12 | Cohn (opus citatum) | Patient, æt. 42, had floodings three weeks before normal term of gestation from placenta prævia; delivered by forceps; an extremely fetid fluid followed removal of placenta; fever followed; slight icterus; uterus tender; neither cough nor pain in chest, but shortness of breath; repeated rigors, diarrhœa, delirium, death (time after delivery not specified). | Lungs externally very anæmic, in lower lobes œdematous, the branches of the pulmonary artery leading to lower lobes filled with old, firm clots. Heart healthy. |
| 13 | G. M. Humphry ('On the Coagulation of the Blood in the Venous System during Life,' 1859) | Patient, æt. 35, had a quick, easy labour (the third); did well till fourteenth day, when, after nursing her child, she walked into an adjoining room, and suddenly fell back upon the sofa, as if faint, and died. | The pulmonary arteries on both sides, where they enter the lungs, were plugged with dark clots of moderately firm consistence; these did not appear to have been formed long before death; they extended into the second divisions of the arteries, and were only slightly adherent to the walls. Vessels quite healthy. Lungs, heart, &c., presented nothing remarkable. |
| 14 | Dr. Edward Smith | A lady in latter months of pregnancy suddenly uttered a shriek, flung her arms about, and cried, "Oh my head! I cannot breathe! I am going mad!" She died in five minutes. | Blood black and fluid universally, except in the pulmonary veins, where the whole tube was filled by a cylinder of coagulum, having a central clot of blood, enclosed by two layers of condensed fibrin, the outer of which was colourless, and the whole so firm it could be pressed with impunity. The heart was flaccid, and rather enlarged on the right side; the tissue on this side was in the first stage of fatty degeneration; the left side was empty, the right contained fluid black blood; the aorta was preternaturally small; the veins were universally distended. |

The following case, although not made clear by dissection, I concluded to be one of pulmonary embolia.

On the 6th May, 1861, I saw, in consultation, a lady who had been delivered of her fourth child, after an easy labour, on the 20th April. Two days after her labour her three children were all ill with scarlatina; one, the most severely affected, lay on a couch near the mother. They were speedily removed by direction of her medical attendant, but next day the patient had shivering; fever followed, but no rash; she had pains in her limbs, but no distinct swelling of the joints or œdema of the extremities. On the tenth day the heart was affected. When I saw her, on the sixteenth day, she was very prostrate; pulse 120, jerking; breathing very hurried and short; she complained of no pain beyond the distress of breathing; she lay inclined to the left side, the head only moderately raised; the countenance was sallow, expression anxious; had suckled till yesterday; the bowels had been purged a week ago, and disposition to loose stools had recurred two or three times since. There was a distinct systolic murmur. The apices of the lungs were free. She died a day or two after my visit. There was a history of primary blood dyscrasia; of secondary endocarditis; of tertiary pulmonic distress, ending in rapid death.

On the following day I saw, in consultation with Mr. Orton, of Stepney, a case similar in almost every circumstance excepting in the suspicion of scarlatinal infection.

The comparison of the foregoing histories will bring out many interesting points in the pathology of the affection.

1. It is especially noted in six cases that there were clots in the peripheral veins, as the crural, iliac, hypogastric, or uterine; and also that signs of phlebitis or of uterine inflammation preceded, often by long intervals, the symptoms of pulmonary distress.

2. The first or peripheral symptoms arose in from twenty-four hours to three days after labour; the secondary or pulmonic symptoms occurred at various periods, from

four days to more than twenty after labour; death occurred in from four to twenty-eight days after labour.

3. In eight cases the death was more or less sudden; in these cases there was great precordial distress, syncope, and dyspnœa.

4. In the cases suddenly fatal it was generally found that not only were the main branches of the pulmonary artery filled with coagula, as well as the smaller ramifications obstructed, but that clots existed in the right heart.

5. In the cases where death was more gradual the symptoms of pneumonia had time to develop themselves.

6. In the gradually fatal cases it was found that the smaller ramifications of the pulmonary artery were obstructed.

It seems reasonable to conclude that the sequence of events in pulmonic embolia is as follows:

1. There is a dyscrasia of the blood immediately proceeding from the puerperal process, which is favorable to the production of clots in the uterine veins and veins of the lower extremities. Imperfect contraction of the uterus, the formation of putrilage in the uterine cavity from the admission of air, which acts upon the blood and serum squeezed out of the vessels and the remains of adherent placenta or of decidua, are often the immediate antecedent conditions of peripheral thrombosis. This process is also favoured by the retardation of the circulation in the veins of the uterus and lower extremities, resulting from pressure. We are, indeed, familiar with tortuosity and thrombosis of the crural veins in pregnant women.

2. The next step is that of embolia. Portions of the peripheral thrombi, attended, no doubt, in many cases by septic matter derived from the uterus, are carried to the right heart. If the solid matters be large enough, or the septic or ichorous matters be irritating enough, to cause a violent perturbation of the heart's action, and to act chemically upon the blood-mass, rapid coagulation of blood in the right cavities may ensue, followed by a similar process in the larger pulmonary arteries. In such cases sudden death occurs.

3. But in those cases in which either minute portions of thrombi are taken up from the peripheral veins or where the septic or ichorous matter is less virulent no clot may form in the right heart, but minute emboli may be carried into the finer divisions of the pulmonary artery, causing lobular pneumonia, ending in slower death, or possibly in recovery.

Pure thrombosis of the venous system, that is, uncomplicated with blood-dyscrasia or fever, is not often fatal. It can only become dangerous when, from some accident, portions of peripheral clots are carried to the heart.

It would, however, be unsafe in the actual state of our clinical experience in this subject, to adopt without reserve, as explaining all cases, the doctrine of Virchow, that arterial-clot obstructions are the result of emboli brought from a distance by the circulating current. As far as careful dissection can show, there seems good reason to conclude that obstruction of the pulmonary arteries may arise from primary, sudden, or gradual formation of clots in those vessels themselves.

4. It has been noticed that in many of these cases some mental emotion or sudden exertion has immediately preceded (and has seemed to be the exciting cause of) the cardiac and pulmonic distress. It seems to me that this association may be explained by the temporary retardation of the blood-current which is occasioned, and which offers a momentary facility for the chemical action of the septic or ichorous matter upon the blood. Possibly, also, sudden exertion may favour the detachment of portions of thrombi from the systemic veins.

But whatever be the explanation adopted, it is difficult to avoid the conclusion that in some of the cases known the fatal catastrophe might not have occurred had the patient been kept in a condition of mental and bodily repose.

It would be an unjustifiable trespass upon the time of the Society were I to enter upon speculations concerning the causes of the coagulation of the blood in the order of cases which form the subject of this paper. The question

is one still keenly debated by physiological experimentalists and pathologists. I refer to the works of Virchow, Richardson, and Cohn, for information respecting this matter.

The important question of treatment is obviously closely dependent upon that of etiology. Upon this question want of leisure compels me to touch very lightly. Although there are cases to prove that neither the pulmonic nor the systemic forms of thrombosis and embolia are necessarily fatal, yet it must be acknowledged that our main attention should be directed to prophylactic measures. These should begin with the utmost care for securing a healthy condition of the blood during pregnancy. Exercise in the open air, and thorough cleanliness of the whole skin—too much neglected—good diet, and occasional doses of aperient medicine, are the chief measures. During labour care should be taken to ensure the due and regular contraction of the womb, avoiding as much as possible what is called "kneading," which is another name for bruising, the uterus, and the violent and irregular contraction apt to be produced by ergot. I have certainly seen uterine inflammation caused by the action of ergot.

During the puerperal state the point of first importance is to encourage lactation. There is no agent of equal efficacy in maintaining healthy contraction of the uterus, of promoting its regular involution, and thus of averting many puerperal disorders. The next points are to enforce the recumbent position, to remove all causes of mental or bodily disturbance; not to starve the patient, and thus to give activity to the absorption of foul matters, but to supply the circulating fluid with generous materials.

When prophylaxis is at an end, when we have to deal with the present disease, we must continue the same general treatment, adding bark, stimuli, and the mineral acids. Regarding the alkaline character of the blood in most puerperal diseases, and especially the happy results I have long been accustomed to witness from the administration of nitro-hydrochloric acid in typhoid fever and in puerperal fevers, I insist warmly upon this remedy.

If we adopt Dr. Richardson's theory, that ammonia is the agent which keeps the blood in the living body in a fluid state, we should naturally be led to administer ammonia freely, with the view of dissolving the clots in the heart and the obstructing clots in the arteries. But, without entering upon the general argument, I must state that I do not anticipate any advantage from ammonia given for any length of time. Blood contaminated by the puerperal process, and especially when affected, as it commonly is in these cases, is already prone enough to acquire the alkaline condition which attends the action of septic matter. I may also add that direct clinical observation leads me to reject the use of ammonia in these and in analogous puerperal maladies. Ammonia in the blood may be taken as a constant exponent of exhaustion and of the action of poisonous and depressing agents. It seems contrary to all sound therapeutical reasoning to administer more when there is already too much. Besides, I am not aware that we have any satisfactory evidence to show that we possess in ammonia, or in any other substance, the means of exerting a solvent action upon clotted fibrine in the living body.

The successful issue of Mr. Bottomley's case may suggest the expediency of amputation in certain cases of embolia of the extremities. The course, however, of that case appears to have been exceptional. The strictly puerperal affection is primarily and essentially of cardiac origin; the entire mass of circulating blood is empoisoned or degraded; clots are obstructing the main arteries leading to the limbs, at a point, perhaps, much above the seat of gangrene; in most cases no line of demarcation forms. The uselessness of amputating under these conditions has been long recognised. These conditions differ widely from those of senile or inflammatory gangrene, where the obstructions are capillary and strictly local. The case of Dr. Cowan (No. 10, Table I) is an apt clinical illustration. Not a drop of blood followed amputation. The patient died next day. There was, in all probability, obstruction of the external or common iliac artery, quite beyond reach of relief by the knife. In

Mr. Bottomley's case the general or constitutional symptoms remitted; the patient having survived the first impetus of the disorder, the affection became entirely localized in the leg; a line of demarcation formed, and although there was obstruction of the arterial trunk high up, a sufficient amount of collateral circulation had become established to nourish the stump. So gradual was all this that the amputation was not performed until some months had elapsed.

In post-rheumatic cases, however, the gangrene may be the result of pure embolia, uncomplicated with dangerous blood dyscrasia. Here it is possible that amputation may occasionally be resorted to.

To compass a complete view of the wide subject of thrombosis and embolia, it would be necessary to include the study of those not infrequent cases in which the blood coagulates in the veins of the leg after pregnancy, without giving rise to all that train of symptoms which constitute phlegmasia dolens. These cases are rarely very serious, although important in illustration of the graver varieties of blood-coagulation during life. At some future time I hope to lay before the Society a collection of observations upon this subject. It has been well discussed by Dr. G. M. Humphry, of Cambridge.

It is also of the utmost importance that this subject should not be studied from an exclusively obstetric point of view, but that we should draw illustrations from the domain of general pathology.