A case of General Dropsy of the Foetus with notes on Obstetrical Significance, Morbid Anatomy and Theories concerning Etiology

A Thesis presented to the University of Edinburgh for the Degree of M.D

by

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Crepitations and increased vocal resonance. Slight dulness on per-
cussion over both apices. Physical exa-
mination over rest of lungs revealed nothing abnormal.

Heart & vessels: Right side of
heart slightly dilated. Haemic
murmurs were heard on auscult-
ation at base of heart and also
at root of neck. The 2nd Pulmo-
ary sound was accentuated.

The Urine contained a little
albumen. No casts were observed.

Labour: Patient did not
send for help until the mem-
branes had ruptured and the
"waters" came away. According
to the patient's statement labour
had been in progress for at least
36 hours. The liquor amni was
have been greatly in excess of
the normal amount as the
in his experimental observations on the formation of monsters, found that when the vascular spaces were arrested in their development, the blood corpuscles remained in the cavities where they were formed and general dropsy followed. Franck has observed hydrodrops in bovine animals which he considered was due to absence of the Thoracic Duct and mesenteric glands.

Since the case of Smith Birmingh

ham above alluded to, three more cases of General Dropsy of the Foetus of a somewhat similar character have come under the notice of Ballantyne. In all three cases no trace of a Thoracic Duct could be found in the thorax or abdomen, though minutely searched for. The mesenteric glands however were present. Ballantyne seems to incline to the view that absence of the Thoracic Duct is accountable for at least some of the cases of General Dropsy of the Foetus.
B. Causes in the Placenta.

Morbid conditions of the Placenta giving rise to Foetal Dropsy.

The placental tissue in several cases where it has been particularly studied has been found to be abnormal. In most cases of General dropsy of the Fetus the Placenta has been enlarged and in some an oedematous condition has been described. In two cases of twins - monochorionic - only that part of the placentae belonging to the dropsical foetuses was oedematous whilst that portion belonging to the healthy foetuses in each case was normal. The oedema of the placenta in case (65) however was looked upon as having been caused by an abnormal cardiac condition - Stenosed Ductus Arteriosus and not as an etiological factor in producing the dropsy.

Struth thought that the obstruction to the foetal circulation
was due to an oedematous condition of the placenta. He supported the mechanical theory of the dropsy. The oedematous state of the placenta he ascribed to maternal nephritis—contracted kidney & not merely a pregnancy nephritis. Strauch was of opinion that the kidney trouble of the mother gave rise to increase of blood pressure followed by effusion of serum into the maternal portion of the placenta. The pressure exerted by the effused serum on the foetal portion, lead to obstruction of the circulation in that part; this obstruction told back on, first the funic, then the intra-foetal circulation and a general dropsical condition of the foetus resulted from this backward pressure. Strauch's theory has been disputed. He did not make a microscopic examination of the placenta & secondly, if nephritis was the cause of foetal
dropsy we should expect to see more instances of this foetal malady as nephritis of the gravid mother is comparatively common. Thirdly, in Ballantyne's second case where a microscopic examination of the placenta was made, it was found that is was the foetal part—the villi—that was oedematous and not the maternal.

(In Gottschalk's case the portion of the placenta belonging to the dropsical foetus (case of twins both female, mother 1 para) only occupied 1/3 of the whole placenta. It was simply an oedematous hyperplastic mass with necrotic areas scattered among its villi were few and almost without vascularity. There was an anastomosis between the vessels of the cords. Gottschalk seems to have been of opinion that the differences between the two foetuses—the healthy and dropsical—resulted from the differences in structure belong of the
portions of placenta belonging to each. But whether he supported the mechanical theory, that the dropsy resulted from obstruction to the circulation in the placenta or the nonmechanical, that the dropsy was due to malnutrition, too little blood reaching it, he does not say.

Führ thought that in a case he investigated the cause was to be looked for in an overfilled phtoritic circulatory system. This was due to there having been an increase of chorionic villi and a large placenta, the result probably of endometritis. The mother also suffered from nephritis which rendered her blood hydreaemic. The large placenta absorbed too much of this hydreaemic blood. The foetal heart did not become hypertrophied to compensate for this increase in volume of blood and dropsy with oedema was the result.

In one of Hönck's cases the mother
suffered from malaria with an enlarged spleen. He considered the foetal dropsy to be brought about by oedema of the placenta, which in its turn was caused by the mechanical obstruction to the maternal circulation, produced by the enlarged spleen.

II. Non-mechanical Theories concerning the etiology of General Dropsy of the Fetus:

In this group of causes we have those cases of General Dropsy attributable to changes in the vessels or blood-quality or diminished quantity. The bloodvessels of the foetus are in some cases described as having thinner walls than normal (Virchow, Flebs, Sänger). Mattersdorf suggested some structural change in the foetal vessels as a causal factor. The mother of his case suffered from
nephritis. The maternal nephritis he thought produced anhydramic condition of both the mother's and the foetus's blood, and the foetal blood vessels, altered in structure allowed of an easy transudation of serum. Hönek considered that the cause of one of his cases might have been due to the foetal blood becoming affected in some way by malaria of the mother. It is possible that, in the case of General Dropsy of the Foetus described by Osler where the mother died from Typhoid, the blood of the foetus became affected in some way analogous to Hönek's case. Possibly by some toxins circulating in the blood. In Osler's case there was probably some change as well in the blood vessels as evidenced by the presence of an (Intrauterine) Intracranial Haemorrhage.

According to Sir J. Williams the blood of the foetus may become like
that in Bright's disease, if the renal function of the placenta is interfered with. He thought that, as the placenta acted as a respiratory organ and also in all probability as an hepatic organ (as Bernard had found glycogen in the cells) so it was not unreasonable to suppose that it had a renal function as well, as the kidneys are almost inactive during foetal life. He seems to have thought that diseased placenta may give rise to foetal dropsy, analogous to renal dropsy in the post-natal state.

Ballantyne suggests that the changes in the placenta may act in a biochemical way upon the foetus inducing in it diseased conditions which are the causes of the dropsy.

Leukaemic Theory — Helv. and Sänger both attributed the General Dropsy of their cases to a Leukaemoid
state of the foetus. The mother of Sänger’s case suffered from nephritis. He was of opinion that the leukaemia of the foetus was induced by absorption from the deteriorated hydramnic blood of the mother. The foetal blood contained an immense number of leucocytes. The walls of the vessels were described as thinner than usual allowing of an easier escape of leucocytes which accumulated in various viscera. Serum transudated along with the leucocytes and gave rise to general oedema. All the organs of the body were infiltrated with leucocytes and the bone marrow of Sänger’s case consisted almost entirely of these. The placental tissue was also oedematous, the serum being present in the villous connective tissue according to Sänger but according to Kles in inter villous lymph spaces.
Malnutrition theory: — In the debate which followed the reading of Tait's case (due to occlusion of the Foramen Ovale) at the London Obstetrical Society, Sir W. Priestley said that as it was not uncommon to find that the tissues become edematous after birth where children suffer from depressed conditions of health, he thought that malnutrition of the foetus might be the result of imperfect nutrition in utero. I am inclined to think that the general dropsy in my case must be attributed to malnutrition. Lowering of the mother's health by such diseases as Phthisis, anaemia, syphilis or diseased conditions of the Placenta, thrombosis in umbilical vein, will all tend to lead to malnutrition of the foetus, either by supplying it with nourishment poor in quality or deficient in quantity. In cases where the foetal heart has been found to contain some abnormality
mattress and bedclothes were almost saturated with it. She was seen two hours after the liquor amnii had escaped. There had been a little haemorrhage during the first stage.

**Physical Examination:**

**Chest:** Mammmæ were small; glandular tissue scanty; secretion present; superficial veins of chest distended; areolæ marked; few fresh striae. Respiration was much embarrassed on account of the size of abdominal tumour.

**Abdomen:** On Inspection the abdomen appeared to be very much distended, notwithstanding the fact that the waters had come away. Fresh striae gravidarum were very large and scattered all over the surface of the abdomen, up to the thorax, round in the flanks and also the upper part of the thighs. Dark lines
producing obstruction to the circulation, the malnutrition element may also come into play besides the mechanical. Taking for example a case in which the Foramen Ovale is prematurely occluded, in such a case the food-carrying blood from the umbilical vein will not pass as it should do, through the left side of the heart and aorta to the nervous centres, but will go through the right side, along the pulmonary artery & ductus arteriosus to the aorta, beyond the origin of the great vessels going to the head & will pass from the circulation of the lower part of the body to the hypogastric arteries without having ever reached the nervous centres.

Now, if the central nervous system is imperfectly nourished there will be a lowering of the innervation of the tissues of the body & dropsy will be more prone to occur. This dulling of the innervation of the tissues of
the body, by imperfect nourishment going to the brain, may also account for the foetal movements becoming less marked. Lazarus Barlow in some interesting experiments concerning the Pathology of oedema, has shown that mechanical obstruction to the circulation pure and simple does not produce oedema, there must first of all be a change in the tissues. The tissues, in order that oedema may take place, must be in a state of starvation. That starvation may be caused by anaemia (by anaemia he meant diminish ed blood supply of oedema sometimes occurring after ligation of the main artery to a part) or by the products of metabolism. If Barlow's starvation theory of the causation of dropsy is correct, then it is possible to conceive how diseased conditions of the mother may bring about a dropsical condition of the foetus. In my case the mother was poorly

* Brit. med. jour p 635. 1895.
fled. Phthisical, anaemic it had a severe shock to her nervous system by an accident at mid-term. All these would tend to deteriorate her blood. The foetus suffered in consequence; its tissues, deriving their nourishment from a blood deteriorated by disease, became starved and dropsy resulted. This is practically the same as a cachectic dropsy.

III. The Rôle played by Parental disease in producing a general dropsical foetus:

We have seen that the mothers of a considerable number of cases of general dropsy of the foetus have suffered from some morbid state of health, and when we find records of instances where mothers have borne several dropsical foetuses in succession, we naturally endeavour to explain the effect of these morbid
conditions of the mother on the foetus.

We have already spoken, in a general way, of how these morbid states of a mother may cause intrauterine malnutrition, but will now take up separately the maternal diseases which have been supposed to be causal factors in producing the foetal malady. The more important of these diseases are:

- Nephritis,
- Endometritis,
- Anaemia,
- Syphilis,
- General hyperaemia,
- Malaria.

The ancient view that dropsy of the foetus is a disease transmitted from mother to infant we may dismiss without comment.

**Intranatal Nephritis:** In a number of cases the mothers have suffered from albuminuria. In some, including my own case, this albuminuria seems to have been due merely to pregnancy nephritis; transient in nature and possibly produced by excrencephalous material.
from the focus, circulating in the blood & irritating the kidneys or from pressure on the abdominal veins or by autointoxication; in Strauch's case, however, the kidneys were the seat of a more permanent form of nephritis. The mother of his case had granular kidneys. Nephritis of the mother may be a causal factor. 1st. By producing increased arterial tension. Flowing of the venous circulation followed by oedema into the maternal portion of the placenta, embarrassment of the circulation in the foetal part of the placenta tending back on the vessels of the cord & the general intra-foetal circulation resulting in dropsy produced in a mechanical way (Strauch).

2nd. By producing an hydraulic state of the mother's blood. The fluid absorbed by the placenta is, on account of this hydraulic condition, deteriorated & might give rise...
to Leukaemia in the foetus (Sänges) or 5th. The foetal blood may become Hydraemic like the mother’s blood and dropsy may result from Hydraemia along with a thinning of the vessel walls. (Mattersdorf) One may here observe that according to Schütz renal dropsy is not due to Hydraemia as generally supposed but to some structural change in the vessel walls by reason of which they become more permeable. Is it not possible that a change in the foetal vessels may occur similar to that in the mother who is the subject of renal disease, induced by the character of the blood circulating in them?

Endometritis: According to Führ Endometritis would appear to have a causal relation to General Dropsy of the Foetus. He supposed owing to the Endometritis in his case there was an increase of Rhionic Villi and hence an extra-large placenta.

was formed. This large placenta absorbed too much fluid for the capacity of the foetal circulatory system, a plethoric state resulted. The foetal heart did not hypertrophy and dropsy resulted in consequence.

Anaemia:— anaemia of the mother with an increase in the number of leucocytes was thought by Ahlfeld to be the cause of the general dropsy in a case he recorded. Anaemia was also present in the mother of one of Ballantyne's cases & it is interesting to note that this woman's sister-in-law also gave birth to a dropsical foetus & its father suffered from anaemia. This case shows a possible paternal influence in the etiology of General Dropsy of the Foetus. In my case the mother was extremely anaemic which no doubt would tend to lower the nutritive qualities of her blood.

Syphilis:— Sir James Simpson and
brueelhier appear to have regarded specific disease as an important etiological factor, but the majority of cases seem to be specially characterized by the absence of syphilitic lesions and history. Virchow thought that the foetal Endocarditis of his case might have been caused by Syphilis or Rheumatism of the mother. The opinions of later authorities as to etiology seem to disfavour the syphilitic origin of General Dropsy of the Foeetus.

General Hyperaemia: - In Brother Smith's case of General dropsy of the foetus (6½ month) the mother and her family suffered much from Hepatic derangements. The mother was 35 a 9 para, had albumen and bile in urine till 5 days after confinement. Had always been delicate. The liver of the foetus was soft and friable, about usual size. No well-formed liver cells were observed under the microscope, there were many nuclei.
but the cells were broken up. The other organs were apparently normal. The placental tufts under the microscope were thin and badly developed. Smith considered that the mother suffered from General Hyperaemia, which Hyperaemia he thought was the cause of the albuminuria and bile in urine and it was conceivable that an analogous Hyperaemia occurred in the foetus and accounted for the dropy.

Malaria:— Hönck, in one of his cases, was of opinion that malaria of the mother might have been the causal factor in producing the dropy of the foetus. The placenta became oedematous on account of obstruction to the circulation by an enlarged spleen; but he also suggested that the blood of the foetus might have become affected in some way by the malaria of the mother.

We may also cite here Osler's case.
where the mother had Typhoid.
Possibly in this case some poison passed from the maternal to the fœtal blood through the placenta, which had an etiological significance in producing the General Dropsy of the Fœtus.

Conclusion

From the foregoing remarks we have come to the following conclusions:

I. General Dropsy of the Fœtus must be looked upon as an anomalous condition produced by some abnormality which may exist in the Fœtus itself, the secundines, or mother, or a combination of these.

II. The cause may be mechanical or non-mechanical; or partly one and partly the other.

III. The mechanical causes may be in the Fœtus itself, from obstruction...
migræ umbilicus prominent.
Superficial veins distended
Palpation:—There was some oedema present over the lower part of the abdominal parietes. The foetus could be palpated, but one failed to differentiate the foetal parts. Movements could not be made out.
Percussion:—Full note was elicited all over the abdomen except well round on the sides.
 Auscultation:—Uterine souffle heard distinctly. No foetal heart sound could be found.
Exsternâ:—External genitals were large. Labia were oedematous especially the left labium majus. There was marked dark pigmentation.
Per Vaginam:—Vagina was large and roomy, walls soft and moist. Child's head was well engaged. There was what felt like a very large caput succedent.
in the circulatory or lymphatic systems or (3) Extrafoetal obstruction in Placenta due to effusion of serum into the foetal or maternal portion.

IV. The non-mechanical causes are to be looked for in morbid states of the mother inducing morbid conditions in her fetus by malnutrition, absorption from a deteriorated blood or by the absorption of a poison of some kind or the non-mechanical cause may be found in the secondaries, diseased or abnormal conditions in these producing malnutrition of the fetus or acting in a bio-chemical way (Ballantyne)
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IV. The non-mechanical causes are to be looked for in morbid states of the mother inducing morbid conditions in her foetus by malnutrition, absorption from a deteriorated blood or by the absorption of a poison of some kind.

V. That the cause of the dropsy in my case was due to malnutrition in utero.
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To Cases and Literature of General Dropsy of the Fetus

(2) Archives of Pediatrics, xi, p. 137, 1894.
(4) Ribemont-Dessaignes: Annales de Gynécologie, xxxii, p. 8, 1889. (Contribution a l'étude de la macération chez le fœtus vivant) 5 cases.


(9) Ahlfeld:—Berichte und Arbeiten aus dem geburt. gyn. klin. zu Giessen 1881-82.

(20) Erimsdale:—Liverpool medical chirurgical journal p. 225. 1895.


(29) Ritter: -- Wurttemberg med. corres. pondenzblatt. no. 6, 1869.
(35) Sangalli: -- La Scienza e la pratica dell'Anat. patol. p. 70. Pavia, 1878.
(41) Schurig: - Embryologia Historia Medica Sect. III cap. p. 203 Dresdae et Lipsiae 1732.
(47) Osler: - (1) Base of Cerebral Haemorrhage in a Foetus (this was an example also of General Dropsy). Gradatologia Vol. p. 13. also (3) Congenital affections of the Heart. Heathings Cyclopedia of Diseases of
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(58) Martin:—ibid p. 278.
(59) Smith:—Dublin Medical Journ.
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(60) Bitschel:—Konstatts Medizin.
sert. Konigsberg. 1897.
(61) Dammann:—Ein Fall von
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schr. Nos. 45.—46. 1878.
(63) Behn:—Zeitschrift für Ge.
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(64) Betschler:—Klin. Beiträge
für Gynäk. Bd. I. p. 260 Breslau
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(65) Rieberding:—Archiv. f. Gynäk.


68. Darseste:—La Production artificielle des Monstrosités. Paris 1891.


70. Index Catalogue of Library of Surgeon Generals Office, U.S. Army. (Billing)


72. Galabin:—London Obstet. Soc. Trans. Vol. XIX. p. 120.

73. Hermanz:—Medical Times & Gazette 1881 p. 731.


aneurism, but afterwards this was ascertained to be greatly due to oedema of the scalp. The position could not be diagnosed from the sutures and fontanelles as these could not be clearly felt. It was with some hesitation that one at first diagnosed the presentation to be vertex, as the oedema of the scalp rendered it no easy matter to feel the underlying bones. (The position was L.H. as ascertained afterwards from the situation of the caput.)

Progress of Labour. — The uterine contractions felt fairly powerful, but the head only advanced a short distance on the perineum, then receded again when the pains passed off. The cause of delay was apparently not in the passages as they were spacious and the soft parts easily dilatable. As the patient was becoming exhausted forceps were
(77) Williams (Sir J.) - London Obstet. Soc.
(78) Lessner: - Centrallb. f. Gynäkologie
    No. 10 p. 279. 1896.
(80) Bruceilhier: - Anatomie Pathologique
    Tom. i. liv. 15: plate ii. Paris. 1829
applied to the head and traction made upon it, whilst at the same time external downward pressure was applied to the fundus of the uterus through the abdominal parietes during the pains. It was with some difficulty that the head was delivered, considerable traction being required. The cause of the delay was now recognized definitely not to be due to the size of the head but to the aftercoming body. The face was markedly cyanosed and swollen; the caput was large. The skin on the side of the head was abraded where one of the blades of the forceps had been applied. The child made no attempts at respiration. The cord was not round its neck, a condition which if present might have been supposed to be the cause of the dystocia.
The following uterine contractions though palpably powerful made no impression on the body of the child which remained stationary. The fingers were introduced round the axillae and steady traction made upon the trunk both during the pains and also at intervals between the contractions. During traction by this method the right humerus gave way at its upper part. The patient being anaesthetised, the fingers were passed along the anterior aspect of the child's body and the abdominal cavity was felt to be greatly distended with what one rightly judged to be fluid. It was with considerable difficulty that one managed to deliver the rest of the child without having recourse to paracentesis.
of the abdomen. By combined traction, at the same time levering the body from side to side, and external abdominal pressure in the axis of the canals, the dystocia was eventually overcome. The umbilical cord was pulseless, nor could the beats of the foetal be detected. The maternal passages, though it was the first child were not much injured. The cervix was more deeply torn than usual but did not give rise to excessive haemorrhage. The perineum was only slightly torn.

The placenta, cord, and membranes were expelled about ten minutes after the birth of the child. On a cursory examination of the placenta it appeared larger and thicker than normal and very friable.
The membranes and cord did not appear to be abnormal. Unfortunately the Secundines were destroyed by one of the attendants before a minute and microscopic examination could be made.

The uterus did not contract well after the third stage with the result that there was rather copious haemorrhage from the uterus. This was checked by a hot corrosive douche. Ergot was given & the uterus then contracted satisfactorily.

Examination of the mother's abdomen after labour revealed hepatic & splenic dulness quite distinctly. Neither of these organs were enlarged. There was no maternal ascites.
Puerperium:

1st day:—Patient had a restless night. Cough troubled her. Discharge copious, several clots passed. Temperature 99; pulse 70. Slight afterpains. Belladonna plasters applied to breasts.

2nd day:—Temp. 98.6; pulse 72. Discharge copious but sweet.

3rd day:—Temp. 100. Pulse 98. Bowels constipated; no pain. Given belladonna grs 1/2 mixture for cough.

4th day:—Temp. 98.6. Pulse 84. Discharge normal. All trace of albumin disappeared from urine.

Patient continued to make satisfactory progress and got up on the 10th day. All the oedema of her legs and of the abdominal walls had disappeared. When last seen by me which was 3 wks. after her confinement she looked fairly well, though pale, and had
still crepitations over the right apex of her lung.

On March 27 I heard concerning the mother that she has not been again pregnant since the pregnancy which resulted in the birth of this Dropsical Foetus.

Before summarizing and remarking on the various points of interest in the foregoing case I must in the first instance give my grounds for believing this Foetus to be an example of General Dropsy. There was general subcutaneous oedema and the body cavities were found at the sectio to be filled with serous fluid.
Introductory Remarks

The subject of this thesis, General Dropsy of the Fœtus, is an anomaly which, on account of its extreme rarity, the pathologist or obstetrician has not often an opportunity of studying. Having had the good fortune of seeing a case of the kind whilst acting as assistant to Dr. Lawson of Banwell, Somerset, I thought it would be an interesting subject to study and present to the University as my Thesis for the degree of M.D. I have to thank Dr. Lawson for allowing me to make use of the case. I must mention that the microscopic sections and microphotographs were prepared at the College of Physicians Laboratory, Edinburgh, and I take this opportunity of acknowledging...
One has to diagnose such a case from: - I a case in which effusions have occurred as the result of intrauterine post-mortem changes.

II. Elephantiasis bongenita bispica.

III. Peritonitis, simple ascites, enlargement of abdomen due to tumour e.g. distended bladder or cystic kidney.

From post-mortem changes:
The foetus in the case I have recorded was dead when born; the heart could not be heard during the 2nd stage of labour; (it was not until labour had advanced to this stage that the mother sent for assistance) The skin on the side of the scalp just above the ear was abraded.

The question arises could the general dropsical condition in this case be due simply to post-mortem changes? The
above facts might appear a first sight to be not incompatible with this view. However one is of opinion that the case recorded was not due to post-mortem changes. The foetus could not have been dead long before birth; the skin appeared quite healthy except at one small spot on the side of the scalp, where it was abraded. The gradually increasing cyanotic condition of the face when the head was born during labour showed that there was obstruction to a still active circulation. It is possible I think, that the heart was not heard on account of the fluid in the thorax interfering with the conduction of the foetal heart sound. The cord when it was born was pulseless, but by that time the child was killed by interference with the circulation. The abrasion on the side
of the scalp was of interest; it in all probability was due to the fact,
the skin in these cases of General Dropsy being much more easily
injured than in the normal state. One may here note that
cases of antemortem peeling of
the skin (Foetal Keratolysis) have been
recorded, a condition which ac-
cording to Ribemont-Dessaix is closely connected with general
dropsy. No less than 5 cases came
under this observers notice.

It may be especially difficult
in some cases of stillborn foetuses
affected with general dropsy, to dia-
gnose them from dead-born syph
ilitic foetuses which are affected
with Hydrops sanquinoventus. It
is important in these cases to
look for syphilitic lesions in the
tissues & particularly at the ends
of the long bones (when the organs
are too macerated to show lesions)
for Osteochondritis syphilitica.
according to Ballantyne the organs of the generally dropsical foetus are usually anaemic, whilst those of the macerated foetus are most often sanguinolent. This fact may help us in diagnosing a case.

II. From Elephantiasis Longeva, Lymphatica, my case was diagnosed by the absence of hyperplasia of the subcutaneous tissue and also by the absence of subcutaneous cystic swellings supposed to be due to the dilatation of lymph spaces.

III. From Peritonitis, simple ascites, or tumour in the abdomen by the localized character of these conditions and the absence in them of general subcutaneous oedema.

No. III only, as a rule, should give rise to difficulty in diagnosis during the 2nd stage of labour. When the whole body is born the diagnosis from General Dropsy will be apparent.
It must however be remembered that Peritonitis, distended bladder and cystic kidneys have each been found in cases of General Dropsy of the Fetus, complicating, if not indeed having an etiological significance in that anomaly.

With these details to guide one, I think I am justified in diagnosing my case as one of General Dropsy of the Fetus.

**Summary of facts of interest in the case recorded with notes on the Obstetrical Significance of General Dropsy of the Fetus**:

- **Maternal History**: age 23
  - Although a woman may give birth to a fetus affected with general dropsy at nearly any age during the child-bearing period, it will be seen from the following...
table of the ages of the mothers of recorded cases that the anomaly is more commonly met with in women who are well advanced in the child bearing period. The ages of the mothers run from 20 to 45.

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The numbers in brackets refer to the Index at the end of my Thesis.

Number of Pregnancy: The mother had had no other children. She had one miscarriage at 9th week and became pregnant again.
before menstruation was reestablished. It is possible that the miscarriage may have left some abnormality of the endometrium which would be of etiological significance in producing the anomalous condition of the ovum.

The following table shows how frequently the condition is met with in multiparae than in primiparae:

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mother is of interest, as one authority has looked to anaemia of the parent for an explanation of the foetal malady.

Phthisical: The presence of Pulmonary Tuberculosis in the mother would tend to deteriorate her blood and may be of some etiological importance. The presence of Pulmonary Tuberculosis in both parents and an anaemic state of the mother were thought by Pinkus to be causal factors in his case.

The mother had a severe accident at midterm. She did not feel well from that date and attributed the cause of the condition of her child to this accident.

Hydramnios: This is of common occurrence in cases of General Dropsy of the foetus. The presence of an excess of liquor amnii by thinning out the uterine wall would predispose to inertia and may possibly by
stretching the placenta embarrass its circulation. The cause of the Hydramnios in these cases of foetal dropsy is uncertain. There are those who suppose it to be due to the same cause as produces the dropsy in the child. Another view one might take is that the dropsy of the child is primary and that the larger child necessitates a larger amnion than usual.

If the amnion is the source of the amniotic fluid, then the larger the amniotic surface the more will be the fluid. Hydramnios however is not always present. Oligohydramnios has been noted in cases recorded by Mattersdorf, Gottschalk & Martin.

Albuminuria. There was a trace of albumen in the mother's urine when examined two days before labour set in, no casts were detected. There was no diminution in the amount of urine passed, but
rather an increase. The albuminuria was transient and had quite disappeared by the 4th day of the puerperium. Some authorities are of opinion that maternal nephritis is one of the causes of general dropsy of the foetus; but one is of opinion that the transient albuminuria in this case was too insignificant to have a causal relation to the foetal condition.

Obstetrical Significance:
During labour the points of greatest interest from a clinical standpoint are:—I. The Dystocia which the dropsical condition of the foetus produces. II. The Diagnosis of the cause of the obstruction to delivery. III. The Management of a case.

I. The Dystocia:—The amount
my indebtedness to the President and Fellows of the College for granting me permission to carry out my work in their Laboratory. My thanks is also due to Drs. J. W. Ballantyne and S. L. Sulland of Edinburgh, the former of whom was kind enough to give me some references to the literature on the subject & the latter gave me his valuable advice concerning some of the microscopic sections.

The First part of my Thesis contains a detailed record of the case which came under my notice in March 1898. With parental history, notes concerning labour etc and the obstetrical significance. pages 4 to 55.

The Second part contains the Morbid Anatomy of my case (with photographs) pages 56 to
of dystocia varies considerably. It will depend on (a) the amount of dropsical fluid in the foetus, (b) the age of the foetus, (c) the strength of the powers and (d) the dilatability of the maternal passages. Fortunately for the obstetrician the foetus is in a great many instances born prematurely and the mother is, in the majority of cases a multipara whose passages are capacious having given birth to children before.

The expulsive powers will be apt to give in early on account of the stretching of the wall of the uterus by the large body of the foetus and in many cases to a greater extent by the accompanying hydramnios. This will of course help to increase the dystocia.

The most marked dystocia is seen in cases from the 7th month.
to full term. In none of the recorded cases where gestation had not advanced beyond the end of the 6th mth. was it necessary to perforate or eviscerate to overcome the obstruction. Even after the 6th mth. the abdominal walls are so yielding, accommodating themselves to the shape of the canals through which they pass, that many cases have been delivered without having required paracentesis. The amount of the dropsical fluid within the serous cavities varies greatly. The following are the amounts in a few of the recorded cases:

1800 grms. (4 no.); 60 grms (6); 3½ pints (53); 2 or 3 pints (20); 430 Cub. Cms (3 no.); 375 Cub. Cms (3 no.); 164 Cub. Cms; 958 Cub. Cms in the case recorded.

The oedema of the scalp in cases of general dropsy seems to be seldom the cause of much obstruction.
to delivery. The oedema, apart from increasing the size of the head, by obscuring the wedges of the foetal head may interfere with the production of flexion and internal rotation in this way delay labour. But it is the distension of the serous cavities of the trunk of the foetus with fluid and more especially the abdomen that gives rise to the chief obstruction to delivery. In cases where dystocia is present, the head in a cephalic and the legs in a breech presentation may have been born without much difficulty but the body of the foetus remains wedged in the pelvis. This wedge contains fluid; its apex will be at that portion of the foetal trunk which has met with the resistance of the bony and the resiliency of the soft passages, the base of the
wedge will be towards the fundus uteri. If this fluid wedge, as we have designated the body of the dropsical foetus, remains with its base above towards the fundus and its apex in the vagina, the dystocia will be great but if the passages are dilatable, the fluid not excessive and the vis à tergo is sufficient to force the fluid towards the fluid towards the apex of the wedge in the vagina below the brim of the pelvis, then gradually the apex will expand, the wedge will become a cylinder & finally when part of the trunk is born more fluid is squeezed into that part by the vis à tergo, it is able to expand more than when passing along the vagina, so that that portion of the foetal trunk, which was formerly the apex of a wedge, becomes the base and vice versa.
The above will be the mechanism of labour in those cases where the dystocia is overcome without artificial interference.

II. The Diagnosis of the Cause of the Dystocia:— We have already discussed the diagnosis of general dropsy after birth. Before labour has set in, it is impossible with our present knowledge of the etiology of the dropsy or from physical examination of the mother, to prophecy with any degree of certainty dystocia from adropsical condition of the fetus. There have been a few cases recorded, where the same mother has given birth to several drop-sical infants in succession. In such cases, if the mother presents the same symptoms and physical signs, (e.g. marked distension, Hydramnios, albuminuria) as she did in a previous
pregnancy when she bore a dropsical infant, then we might venture on a provisional diagnosis of a dropsical foetus, but there is no single definite symptom or physical sign to guide us in our diagnosis of the condition before labour is well advanced. Before the birth of the child the point of practical importance is that the cause of delay lies in the distension of the foetus with fluid and that we should be able to ascertain this fact during labour, but this will be well nigh impossible until labour has been in progress for some time. If when part of the foetus is born, it is recognized to be oedematous, then we may feel pretty sure of the cause of delay in the aftercoming part, but in some cases it may be extremely difficult to recognize the presence of oedema, especially
on the head where, unless well marked, a large caput succedaneum may obscure it. During the first stage of labour in a head case it will be almost impossible to diagnose general drop of the foetus. Before the head has descended to the vulvar orifice it may be difficult to recognize it as a head. The oedema of the scalp may be so great that the head may be mistaken for the nates, as in a case recorded by Brotherton Smith. In a breech case we can reach the limbs of the abdomen earlier and we may recognize the condition from the oedema of the legs and fluctuation in abdomen. In a transverse presentation during the operation of turning we would feel the distended body and swollen limbs of the foetus, also fluctuation in the abdomen might be elicited.
We may conveniently divide the cases as regards diagnosis into:—
(i) Those in which we do not at first suspect the cause of delay to be the distension of the body of the foetus. (ii) Those in which we suspect the cause to lie in the foetal trunk. (We are supposing, of course, that the mother's pelvis is normal in size.)

(i). In the first group of cases the presentation will usually be cephalic. In breech and transverse cases as we have already pointed out, the foetal limbs and abdomen can be earlier and more readily reached. Hence in both these latter presentations we are able to tell better if the size of the foetal trunk is to be a source of delay in delivery.

The usual course of events in a head case will be as follows.
The head may be born without much difficulty but the aftercoming part remains fixed and resists traction. We may suspect the cause of delay to be due to multiple pregnancy e.g. locked or united twins. We should endeavour to exclude this possibility by examining for two or more foetal heart sounds with different points of maximum intensity, also by palpating for the presence of parts belonging to more than one foetus.

Accidental shortening of the cord may be suspected, but if the dystocia were due to this, on releasing the cord from the neck of the child, the obstruction to delivery would be overcome. If the neck of the child could not be readily reached we might be able to detect an irregularity...
in the contour of the uterus from the cord pulling on the placenta. There may be haemorrhage on account of separation of part of the placenta.

Actual shortening of the funiculus may give rise to the two latter symptoms, but to diagnose actual shortening we should have to pass the hand along the child's abdomen and feel the cord pulled tightly. The presence however of an abnormally large body would have in all probability been detected before we reached the umbilicus. (In some cases of general dropsy the umbilicus is situated nearer the pubis than normally; it was opposite the 1st sacral instead of last lumbar vertebra in one of Ballantyne cases.)

Malposition of an arm of arm must be excluded by making
The third part contains the theories regarding the etiology of general dropsy of the fœtus. Pages to

At the end of my Theses I have appended an Index to the literature of the subject, most of which I have been able to consult at the London Medical Libraries, but in some cases I have found it impossible to consult the original articles; I have had in these cases to be content with quoting the references to them by other authors.
a careful examination, insinuating the fingers between the foetal head and the maternal passages when the malplaced arm would be felt round the neck.

Maternal Tumour of the uterus or Tumour outside of the uterus as fibroid or ovarian tumour may be thought of as causing the delay, but with such conditions there would probably be an antecedent history to aid our diagnosis and the tumour may be differentiated by our methods of physical examination.

(II). If we rightly judge the cause of delay to be due to the size of the Foetal Trunk, we may think we are dealing with a healthy child with an extra large body. Dystocia from this cause alone is not often met with. Playfair in his Midwifery
quotes a remarkable case of Hinchliffe where evisceration was necessary to deliver the body of a large healthy child. Spencer also mentions a case where he had to mutilate a healthy child on account of the size of the body. The head shoulders and limbs in such a case would be correspondingly large. There would be no oedema of the heart sounds strong and powerful whereas in a dropsical child the heart sounds would only be faintly heard or perhaps inaudible. In a large healthy child when the shoulders are born the dystocia is overcome but this may not be the case when the foetus is affected with dropsy as the distension of the abdomen may be so great as to still be a hindrance to delivery from distension of the foetal abdomen with gases due to obstetric changes.

* Playfair's Manual of Midwifery Vol. 1 p.48 1876
putrefactive changes, general drop-
sy is recognized by the absence
in the latter of maceration. The
skin in the former may be em-
physematous and give rise to a
clackling feeling on pressure
with the finger. Sympathetic
percussion of the uterine tumour
has mentioned as being of dia-
gnostic value. There would also
be a history of absence of foetal
movements for some time previous
to labour.

Other
causes
producing
abdominal
distension
produce the 2nd stage of labour on ac-
count of the child's body
it may be extremely difficult
to diagnose general dropsy dur-
ing labour unless general oed-
ema is recognizable and fluctu-
ation in the abdomen elicited.
Distended bladder, vagina or
uterus, Peritonitis, accumulation
of meconium distending the colon
cystic kidneys, enlarged liver, or spleen may all be thought of as causes of delay and it may be exceedingly difficult during labour to form a correct diagnosis without having recourse to paracentesis or in some cases evisceration, these measures not however being adopted for diagnostic purposes but to overcome the dystocia. The location of the distension & the absence of general oedema being the only signs to guide us.

It must, however, always be borne in mind that Peritonitis, distended bladder & cystic kidneys have each been found as complicating, if not indeed having an aetiological significance in cases of general dropsy of the foetus.

In all cases where we are in doubt as to the cause of the dystocia, the mother should be thoroughly anaesthetised, the
hand passed along the surface of the child's body and a most careful examination made.

III. Having discussed the Dystocia and Diagnosis we shall now proceed to discuss the third item of Obstetrical importance viz. The Management or Treatment of a case of General dropy of the foetus.

(1) Prophylactic Treatment. In as much as cases have been recorded where mothers have borne several dropsical foetuses in succession and since the mothers have in many instances given a history of indisposition of some sort before or during the pregnancy which has resulted in the birth of the anomalous child—she may have suffered from chlorosis, Albuminuria, endometritis—it is therefore our duty to treat any abnormal conditions we find, with
appropriate remedies, before she again becomes pregnant. The only instance I can find in which treatment was adopted during pregnancy is one recorded by Dr. Ballantyne in his book on Foetal Diseases Vol. 1 p. 159. The placenta of the mother's previous pregnancy was found to be extensively diseased; accordingly potassium bichromate were administered, but although the mother carried her child for a longer period than in the previous pregnancy, she nevertheless gave birth to a drop-sical infant.

Possibly as our knowledge concerning the etiology of foetal diseases extends we shall be better able to prevent these anomalous conditions occurring. For the present our prophylactic treatment must be largely empirical.

II. Management during labour. As in all cases of dystocia so in where the presentation is
favourable and the maternal passages capacious, so in that from general fatal dropsy, artificial delivery should not be had recourse to until the natural powers show evidence of being insufficient to overcome the obstruction or the state of the mother is such as to demand a speedy termination of the labour, or the child may make attempts to breathe, in which case we should try to deliver as quickly as possible. It is seldom however that the child survives birth. Most of the cases are still-born; this may be due to: I. The Fetus not attaining a viable age. II. Pressure on the fons during birth. III. Effusions interfering with the expansion of the lungs or action of the heart. IV. The cause of the dropsy may be incompatible with life.

Apart from the overcoming of the dystocia due to the size of the
If an acephalic dropsical fetus is born before its twin we must remember the importance of putting a double ligature on the cord to prevent the possibility of the healthy twin bleeding through the dropsical infant's cord. A free anastomosis of the vessels of the cords seems to be invariably present in these cases.
child's body we must keep in mind that there is apt to be Inertia uteri from the overstretching of the uterine wall by the commonly associated condition of Hydramnios or the inertia may follow a rapid escape of the liquor amnii. The placenta is very often described as much larger and more friable than normal. This fact may also give rise to trouble and more especially if there is Inertia uteri. The placenta may require artificial delivery. The dangers of these conditions must be kept in view when we are dealing with a case of General Dropsy of the Fetus and treated as they arise "secundum artis regulas.

Many of the recorded cases of General Dropsy have required no artificial interference to effect delivery; these, as we have seen in discussing the Dystocia, are cases for the most part of premature birth, where the maternal
passages were roomy & the dropsy not excessive. When these conditions are unfavorable, artificial interference is generally necessary. This interference may be by: I. *Traction* - manual, hooks, forceps. II. *Abdominal pressure* - expressio foetus. III. *Mutilation of child to reduce its size*.

I. *Traction*: By insinuating one's fingers into the axillae in a head case or into the groins of a breech if legs are extended or if the legs are down, by pulling on them in the axis of the canals. If we have a blunt hook it may be substituted for the fingers. In some cases it may be necessary to apply forceps. These may require to be applied on account of the *Inertia luteri* or large size of the oedematous head.

In all cases where traction is used we must remember the tendency for the foetal tissues in cases of General Dropsy, to present a remarkable
Part I

A Case of General Dropsy of the Fetus:

History of the Mother, previous to labour: -- Mrs. B. -- age 23


Family History: -- markedly tubercular. She belonged to a family of four. One brother died of phthisis; one sister far advanced in phthisis; one brother alive & healthy. Patient's mother had seven sisters and three brothers all of whom died of consumption. None of patients or of her husband's relations ever had a child affected with a similar malady. As far as she knew. Her husband was a farm labourer and was alcoholic. All his organs apparently healthy. No specific history could be elicited from either the patient or her husband.
degree of friability. Cases on record where the head has come off during traction with forceps, in another case the neck gave way and the head was hanging to the trunk by only a "tag" of skin. It is therefore important that undue force should not be used in these cases of General Droopy. Much traction on the head should be avoided when the head is not large and the trunk remains wedged at the brim because if this were the case we would run the risk of pulling the head from the trunk. In all cases it is important to follow down the uterus during traction with someone's hand applied to the fundus through the abdominal parietes.

II. Abdominal pressure = Expressio foetus. This manipulation is of much importance as it promotes the mechanism of labour in these dropsical cases. Ashburton Thompson was the first, I think, to draw part.
icular attention to the danger of traction in these cases, and the importance of "vis à tergo." He was led to see the danger of applying much traction by a case of which the following are the important facts: He applied forceps to the head and pulled on it; the head however separated from the trunk so he pulled down the arms intending to exert traction on them, but these felt as though they would give way too. He went for other assistance leaving a midwife in charge. On returning he found that what he had failed to accomplish by traction, the natural efforts of the uterus had been successful in accomplishing. The dropsical child had been expelled. The explanation is as follows: By pulling on the presenting part the fluid in the trunk of the child is drawn up above the pelvic brim where it meets with resistance. The body is wedge-shaped, apex at brim, base
at fundus uteri. Now when the uterine efforts are strong or when they are supplemented by external abdominal pressure of the uterus, then the fluid will be forced down past the pelvic brim, so that the lower part will expand more and more while the part that is towards the fundus uteri will gradually become less voluminous and able to pass the brim.

III. Mutilation of child to reduce its size:—After a judicious trial of the above methods of traction and expression, if the child still remains impacted in the pelvis we must have recourse to some means of reducing its bulk. If it is a cephalic case and the head will not descend, then we may use a basilyst, as suggested by Ballantyne, perforate the cranial vault, break up the base, and if the body still forms an obstacle to delivery thrust the instrument.*

on through the thorax into the abdomen. Such cases though will be quite the exception, as it is the rule for the bulk of the trunk of the child, in these cases of General Dropsy, to form the chief obstacle to delivery, and not the size of the head. If the shoulders cannot be delivered we may snip through the clavicles with scissors in the hope of reducing the width of the child. If still the body remains stationary we must pass a perforator, carefully guiding & guarding the point with the fingers to escape wounding the maternal passages, along the anterior wall of the thorax, enter the point at the base of the thorax & thrust it through the diaphragm to the peritoneal cavity. Let the fluid escape. The opening in the thorax should not be large as the broken ribs may prove trouble some. Galabin recommends that

* manual of midwifery p. 503
the medulla of the child should first be destroyed before perforation of the trunk is resorted to, unless there were legal importance in the child living, even for only the shortest time.

Spenser suggests, in speaking of the delivery in certain cases of impaction of the foetus, that it may be necessary to remove the head to gain room for further manipulation, but before decapitating it is advisable to seize the neck with a strong volsella furnished with interlocking teeth which will prevent the trunk receding out of reach.

One cannot see that such a procedure would be advantageous in cases of General Dropsy as the tissue may be so friable that it might be difficult to get a firm and sure grasp of the neck with a volsella.

Scissors may be employed instead of a perforator, the same precautions being taken to avoid lacerating...
the maternal passages. The point of one of the blades of the scissor should enter the base of the thorax & cut right through to the abdominal cavity when the fluid will escape & in most cases the dystocia overcome. In some cases, however, the General Dropsy may be complicated with or perhaps caused by some tumour e.g. distended bladder or cystic kidneys, in which case these may require puncturing, but before this measure can be adopted it may be necessary to enlarge the opening in the abdomen, introduce the hand & eviscerate, then the tumour will be felt & can be better dealt with.

In breech cases the abdomen is more easily reached than in head. Dystocia from distension of the body of the foetus with fluid will be earlier diagnosable. Ballantyne in a recent most interesting lecture

*Brit. med. jour. april 15th 1879 p. 890
on antenatal Therapeutics suggests that "in cases of fluid accumulations in the fetus such as hydrocephalus, ascites or distended bladder, it may be well to aspirate instead of widely incising the affected region of the infant, in the hope of there being a possibility of saving its life. It seems to one that this procedure will be of importance in cases of General Dropsy too, the chances of the fetus living for any length of time being much less than in the examples alluded to by Ballantyne, whether the fetus can breathe or not depending on the amount of fluid in the thorax. After birth if the heart is still beating, there may come up the question of the possibility of allowing the lungs to expand by aspirating the pleural cavity as well as the peritoneal cavity. Aspiration will be more practicable in breech cases than head as the abdomen is so much more
easily reached. The aspirating needle should be inserted just above the symphysis pubis in order that any possibility of the dystocia proceeding from a distended bladder, vagina or uterus may be excluded.

In transverse cases the foetus should be turned then dealt with as described under breech cases. If turning is found to be impossible on account of the bulk of the child's body or if fluctuation in the abdomen is felt, the abdomen should also be aspirated or possibly incised and the viscera had recourse to the milder method of treatment always being tried before the graver. Then turning will be found practicable.
Part II

The Morbid Anatomy of my case of General Dropsy of the Foetus.

It is only my purpose here to relate the morbid anatomy of my own case, concerning the salient points of interest in the morbid anatomy of other's cases. I shall delay writing until dealing with the Theories of the Etiology of General Dropsy of the Foetus.

The Sectio was made 23 hours after birth.

External appearances...
The skin over the scalp, eyelids, upper lip, thorax, abdomen & penis, was markedly oedematous. The skin over the rest of the body was not so noticeably oedematous as in the regions mentioned. The skin over the ankles & dorsal aspects of the feet seemed thick
and indurated to the feel and did not pit on pressure.

Above and behind the left ear there was a small abrasion about the size of a shilling with irregular edges. Skin over abdomen was of a pinkish colour. Yellowish blue tinge about flanks. The superficial veins were distended & distinctly visible both over the surface of the abdomen and thorax. Vernix caseosa moderate in amount.

Abdomen was very greatly distended. On palpation fluctuation was easily elicited. The left lobe of the liver felt dislocated downwards & to the right, with fluid between it and the parietes.

Percussion gave a dull note all over the thorax & abdomen except over a small area just above the umbilicus.

Neither of the testicles had descend ed into the scrotum.
Menstrual History: Menstruation began at sixteen, has always been irregular, often used to miss a month, lasted 2-3 days. Quantity moderate. Has always suffered more or less from Leucorrhoea.

Previous Reproductive History: Patient had one miscarriage 9 months previous at 9th week. She was feeling in quite good health at the time and thought the abortion was brought on as the result of a fright she had by a bull while crossing a field. She was treated for this miscarriage by a medical man who told her that everything had come away satisfactorily.

Present Pregnancy: After the miscarriage above referred to, patient again became pregnant before menstruation had been reestablished. Pregnancy progressed favorably till about
External measurements were as follows:

Length = 44 cms.
Umbilical Birth = 43 cms.
Ensiform Birth = 41 cms.
Axillary Birth = 25 cms.

To show how the fluid could be displaced, these measurements were also taken with the measuring tape pulled tightly:

Limb of umbilical Birth = 35.5 cms.
Ensiform Birth = 32 cms.
Axillary Birth = 23 cms.

Length of the surface of abdomen from tip of ensiform cartilage to symphysis pubis = 21 cms.

The skin was cut through by a median incision from top of sternum to symphysis pubis. Serum exuded from the sides of the incision. The abdominal cavity was opened into first.

The Peritoneal cavity contained a large quantity of clear, straw-coloured fluid. There were no flakes.
floating in it. The quantity was 795 cc.

A sample of the fluid was sent to the Clinical Research Laboratory, London to be analysed and the following was the report:

Ascitic fluid - Specific gravity 1.013
Total solids = 3.58%
Organic solids = 2.75%
Salts = 0.83%

The organic matters were almost wholly composed of serum albumin and serum globulin in the proportion of six of the former to one of the latter. No nucleo albumen or mucoid was present, and of organic matters other than protein only traces were present.

(To compare with this we may here refer to the analyses of the fluid from three of Ballantyne's cases, to show how the constituents of the fluid may vary. Other authorities have not given a full analysis of the fluid:—
Specific gravity = 1.017
Total Proteids = 2.46%

 Serieu Albumen = 1.36%
Serrum globulin = 1.10%

Specific gravity = 1.017
Total Proteids = 1.69%
Serieu Albumen = 1.28%
Serrum globulin = .41%

See I p. 119. Total Proteids = 0.087
chiefly serum albumen, small amount of globulin. Biliverdin present. Under microscope, some endothelial cells & acicular crystals of Bilirubin. )

The Peritoneum appeared normal.

The Liver was not enlarged. Left lobe tilted downwards and to the right.

On section, not so much blood exuded from the cut surface as from that of a normal liver. (I compared the viscera with a normal 8th month
fetus which was killed in a labour complicated by a contracted pelvis. (see photos).

Microscopically: at first sight, one was almost inclined to believe that there was a condition of diffuse hepatitis present, but on closer examination it will be seen that the cells between the rows of hepatic epithelium are nucleated and do not form fibres or any kind of tissue. The cells vary in size. The blood spaces contain a good many leucocytes and nucleated red blood corpuscles.

On comparing with the normal specimen, this condition does not appear to be pathological.

Spleen: about normal size. Under the microscope it was found to be apparently normal. Malpighian bodies fairly well formed. Active blood formation appears to be taking place in the pulp containing many nucleated red corpuscles both normoblasts and
megaloblasts.

Kidneys - slightly larger and more lobulated than normal. On microscopic examination the tubules & glomeruli are normal for that time of life.

The Bladder was empty.

Stomach & Intestines appeared healthy.

Thorax: On opening into the Thorax the Pleural cavities & Pericardium were found to contain apparently the same kind of fluid as the abdomen, but a separate analysis was not made.

Pericardium contained about 800 fluid.

Heart about normal in size. apex displaced was pushed towards the right. bring
opposite left edge of sternum. Heart muscle paler than normal. Valvular orifices + ductus apparently normal.

 Pleural sacs each contained fluid.
 Right = 42 cc. Left = 115 cc. The left contained more than the right probably on account of the presence of the liver on the right side, the left lobe being dislocated downwards to the right.

 Lungs were very small + unexpanded, but appeared normal under the microscope.

 Thymus normal

 The following are some photographs of the foetus affected with General Dropy. The microphotographs were kindly prepared for me by Mr. J. Hume Patterson of the College of Physicians Laboratory.

 All the viscera appear to be normal for that time of foetal life.
Photographs of my case of General Dropsy of the Fetus
Liver from Fetus affected with General Dropsy

Low Power x 50

High Power x 250

Portal Spaces i blood
Livers from a normal Fetus

Low Power x 50

Portul spaces & blood

High Power x 250
Spleen of Foetus affected with General Dropsey

Malpighian tuft

Low Power x 50

Malpighian tuft

High Power x 200

Malpighian tuft
mid-term, at which time she met with an accident. She was drawing water from a well when the handle of the wheel round which the well-chain wound slipped from her hand and hit her on the abdomen with such violence that she was knocked down on the ground, falling on her back. It took about a fortnight for her to get over the effects of the shock to her system which this accident caused.

From this date she began to suffer from slight pain situated in the lower part of the abdomen anteriorly in the hypogastric region and also at times in the right and left inguinal regions, worse in the right. She also became much depressed in spirits. There was a leucorrhoea discharge during the whole period of pregnancy, but at no time was
Spleen of Normal Foetus

Malpighian tufts

Low Power x 50

Malpighian tuft

High Power x 250
Kidney of Foetus affected with General Dropsy

Low Power \( \times 50 \)

Tubule

Glomeruli

High Power \( \times 250 \)
Kidney of normal fetus

Low Power x 50

Tubules

Glomeruli

High Power x 250
Lung of Fetus the subject of General Dropsy

Low Power  x 5.0

High Power  x 25.0
Lung from a Normal Fetus

Low Power  x 50

High Power  x 250
Thymus Gland of Fetus affected with General Dropsy

Low Power $\times 50$

High Power $\times 250$
Thymus Island of Normal Fetus

Low Power × 50

High Power × 250
Part III:

Theories concerning the Etiology of General Dropsy of the Fetus.

Our knowledge of the etiologic factors of Fetal Diseases is still exceedingly limited, especially is this the case with the malady under consideration. Many theories have been brought forward concerning the etiology of General Dropsy of the Fetus. A consensus of opinion is still wanting. In some cases observers have found abnormal conditions in the fetus itself which they have thought were quite sufficient to account for the dropsy, but this has by no means been invariably the case. There are others who have sought for the cause in the secondaries: the umbilical cord or placenta, others have looked for a maternal cause and yet others have even suggested a paternal
morbid condition as giving rise to the abnormal foetus.

I purpose in the following remarks to discuss the Theories regarding the Etiology of General Dropsy of the Foetus under the headings: 1st Mechanical Theories 2nd non-mechanical due to change in the vessels or blood 3rd The role played by parental diseases in producing a Ddropsical Foetus.

1 Mechanical Theories or causes due to obstruction to the flow of blood or lymph in the circulatory or lymphatic systems.

A. Fatal Causes within the body of the foetus itself. "Idiopathic Foetal"

B) Due to anomalous conditions in the Heart: There are a considerable number of cases recorded in the literature of General Foetal Ddropsy where the Cardiac organ contained abnormalities which.
the discharge sanguineous in nature. She began to feel foetal movements at the fifth month, these she continued to feel actively till within ten days of her confinement, during which period she only felt movements three or four times and on these occasions they were much softer than they had been previously. She did not suffer much from morning sickness. During the last month of her pregnancy she felt tremendously distended about the abdomen and often experienced a feeling as if she would burst asunder since mid-term there had been a considerable amount of oedema of her legs. The superficial veins on both legs were distended and there was a slight amount of Phlebitis in those of the calves. Two days before labour set in there was slight puffi
to those who investigated the cases appeared quite capable of producing sufficient obstruction in the circulatory system to give rise to serous exudations. The most important of these anomalous conditions have been found in the Foramen Ovale, Ductus Arteriosus & Pulmonary orifice.

(i) Foramen Ovale: Too early occlusion of this Interauricular foramen has been cited as a cause by Lawson Tait. The condition was also present in the second of Ballantynes cases, though not so marked as in the case recorded by Tait. Osler also gives this as a cause & Rebecmont. Dessaignes in a dissertation on the maceration of the living foetus relates a case of General Foetal Dropsy which he seems to have regarded as being due to extreme narrowness of this foramen. In none of these
cases was the closure quite complete.
The following are the chief points of interest in Taits + Rebemont-Dessaingnes's cases:

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Tait's case:-- Mother age 36. 6 para
Hydramnios. Child born at 7th month. Its heart was beating when born & it made several attempts to breathe, but could not be brought round. No albuminurca in mother. Skin of child was so oedematous & tense over the limbs that they could not be bent without risk of bursting the skin. The oedema was so marked over the head that the bones of the cranium could not be felt. Albuminous fluid was present in the serous cavities. Double Hydrocele, both sides separate from peritoneal cavity. Serous membranes not inflamed. Bladder contained a little nonalbuminous
urine. Liver and kidneys apparently normal. In the heart there was no direct opening between the auricles through the foramen ovale. The opening was only one-twelfth of an inch in its largest measurement and crescentic in shape. The septum ventriculorum was completely formed. The ductus arteriosus was extremely patent, being almost as large as the aorta. The placenta was described as large and oedematous. Microscopic examination of its tissues revealed nothing more than this oedematous condition.

Ribemont-Dessaignes' case. Mother age 21. Foetal heart heard before labour. Hydramnios present. Head presented. Child was still-born. Skin in several parts was peeling. There was marked lateral
curvature of the spinal column. There was general oedema & the abdomen was tremendously distended with fluid - 1800 grammes. The placenta & membranes friable and infiltrated.

In the heart, the foramen ovale was extremely narrow and nearly obliterated. There was nothing worthy of note in the vessels. To the narrowing of the foramen Ribemont-Dessaigne seems to have attributed the dropsy.

The mode in which premature occlusion of the foramen ovale produces the dropsy is as follows: - The blood in the normal foetal heart is directed from the Inferior Vena cava by the Eustachian valve across the right auricle through the foramen ovale to the left auricle. If this foramen is smaller than usual, the flow...
of blood will be obstructed, dilatation of the right auricle will result and then engorgement of all the vessels before the right auricle in both the placental and foetal parts of the circulation. The placenta containing the part of the circulation most distant from the heart is the first to become oedematous. The oedema of the placenta still further embarrasses the circulation & the passive obstruction in that structure would produce general venous engorgement leading to anasarca. Extreme patency of the foramen ovale: - Besides the theory that constriction of the foramen ovale may give rise to General Dropsy, Ribemont-Dessaignes recorded a case of Foetal Keratolysis in which a widely patent "Trou de Botal" was supposed to be of etiological importance in producing the General
dropsical condition which was also present.
Case: - Mother was aged 40. a 9-pare, child 7th month had to be delivered with forceps and abdominal puncture. The most interesting abnormalities found in internal organs were in the heart and liver. The latter was congested. In the heart the foramen ovale was widely patent, having a diameter of 7 mm.

(II) Ductus Arteriosus: - In some of the cases where the foramen ovale was less patent than normal, the ductus arteriosus is described as being dilated. The explanation given for this dilatation of the ductus is the increase in the amount of blood which flows through it. This increase is due to the foramen ovale being almost occluded therefore not allowing the usual amount of
Blood to pass in that direction. In these cases the ductus arteriosus conveys both the blood that would naturally pass by it to the aorta plus the blood that if the foetal heart were normal would pass through the foramen ovale. To allow of this increase in volume of blood the ductus becomes dilated to compensate as it were for the obstruction at the foramen ovale.

Premature Closure of the Ductus Arteriosus:—This anomalous condition of the ductus was noted by Pieberding in a case of General Dropsy in a twin. To the occlusion of the ductus he attributed the cause of the dropsy and also the Hydramnios.

Each foetus had a separate amniotic sac and it was only in the one which contained the dropsical foetus that hydramnios
was present. There was a single chorion. The closure of the ductus was due to hypertrophy of the muscular and inner layers of its wall. The occlusion of the duct would give rise to obstruction, hypertrophy and dilatation of the right side of the heart, engorgement of the double circulation, fetal and placental, and subsequently a condition of general anasarca.

The Hydramnios Nieberding thought was due to a rise in the arterial blood pressure brought about by an increase in the amount of blood passing through the foramen ovale leading to hypertrophy of the left side of the heart. Increased activity of the kidneys resulted from the rise of arterial pressure, followed by distension of the bladder and hydramnios.
(III) Pulmonary Artery. A stenosed condition of the pulmonary orifice was supposed by Virchow to be the chief causal factor in a case which he investigated. This narrowing of the pulmonary orifice would lead to obstruction in the circulatory system in an almost exactly similar way as the narrowing of the Duodenum Arteriosus. Along with this constriction of the pulmonary artery there was transposition of the cardiac vessels; also a cirrhotic condition of the Liver, granular degeneration of the Kidneys and thrombosis of Placental sinuses. These latter conditions Virchow thought helped to increase the dropsy. He was of opinion that the narrowing of the Pulmonary orifice had an inflammatory origin, as there was evidence of inflammation in the Peritoneum, Liver, Kidneys and Spleen.
The cause of the inflammation in the fetus he could not explain definitely but suggested as an explanation that it might be due to maternal rheumatism or syphilis.

(iv). Truncus Arteriosus. This was persistent and stenosed in a case of General Dropsy of the Fetus recorded by Potts. The heart was three-chambered having two auricles and a single ventricle, there being a deficiency in the Interventricular septum. The obstruction in the circulatory system was caused by the stenosed condition of the common arterial trunk. There was insufficient compensatory hypertrophy of the ventricle and right auricle, this gave rise to venous engorgement resulting in ascites and general oedema.
ness of the lower eyelids. There was also a small amount of albumen in patient's urine. The urine did not seem to be diminished in quantity. She complained of frequency of micturition and at times of the urine dribbling away without her being able to control the bladder. She suffered much from distressing dyspnoea and during the last week of pregnancy from diarrhea. A hacking cough troubled her during the whole of her pregnancy, it was accompanied by very little expectoration, never any haemoptysis. She perspired profusely at night and on the slightest exertion during the day.

Physical examination of the lungs revealed at right apex, prolonged expiration with a considerable number of medium moist
Pitschel also described a case of persistent Truncus communis Arteriosus in which the child survived birth 32 hours. It was an 8th month child, when born it was markedly cyanosed and suffered from oedema.

(v). Tumour of the cardiac wall. Woeiz has recorded a case of General Dropsy of the Foetus in which there was a Rhabdomyoma in the right side of the heart. This tumour lead to embarrassment of the circulation. The chief points of interest in this case are as follows:- Mother age 32. Primipara. 8th month. She suffered from chlorosis. There was marked Hydramnios. (Bystic tumour had been diagnosed by a doctor whom she had consulted, and accordingly she was sent to hospital to have it extirpated).
The child weighed 1700 g. was 41 cms long. Body markedly oedematous. There was 2 litre fluid in abdomen and plural cavities. The organs of the abdomen appeared normal. The lungs congested. The heart was about double the normal size especially the right half.

In the right auricle was a tumour larger than a hazel nut with smooth surface. The cavity of the right auricle was much reduced in size, about the size of a hemp seed, it communicated with the two Venae Savae. Wesy was surprized that the child survived as long as it did (8th mth). considering the great obstruction in the heart.

(II). Arrest of Development of the heart as a whole or complete absence as acardiacs. Ribemont Dessaignes described a case of General dropsy of
the foetus in which there was arrest of development of the thoracic organs. They occupied the middle line of the thoracic cavity and were very small as if they belonged to a 4th month foetus. Zottschälk also describes a case of twins one of which was dropsical. The heart of the dropsical foetus was small and weak compared with the healthy one. The acardiac dropsical foetuses are found in twin cases, the one foetus that one without a heart or with a functionally inactive heart acting practically as a parasite on its stronger twin. The heart of the stronger foetus has to do the work for both. The vessels of the cords inosculate and the heart of the healthy foetus propels the blood not only through its own circulatory system but that also of its weaker twin whose development has become arrested. Many
of these cases of acardiacs are otherwise greatly malformed.

Prof A.R. Simpson and Routh have recorded typical examples of this kind of case. The former accepted Blaundus' theory concerning the disappearance of the heart and the resulting oedema. The foetuses are developed from a single ovum and the bloodvessels of the cords unite at an early date. In the one foetus development is arrested while the other continues to develop. The blood streams from the two hearts meet and the blood from the stronger of the two overcomes that of the weaker, causing a reflux of blood towards the heart. The blood in the heart stagnates and coagulates. The weaker heart undergoes atrophic changes and may disappear altogether. The heart of the stronger foetus continues to propel the blood to the other foetus against the resistance
brought about by the useless, inactive or atrophied heart and a general dropsical condition is the result of this obstruction.

(3) Mechanical obstruction to the circulation outside of heart.

A sclerosed condition of the subcutaneous vessels and also of those of the liver and kidneys has been described by Schütz. The arterial walls were greatly thickened.

Diaphragmatic Hernia: by compressing the Inferior Vena Cava has been supposed by two observers, Behm and Dammann, to have been the cause of obstruction leading to dropsy in 2 cases that came under their observation. A diaphragmatic hernia was present also in a case recorded by Löhlein, but was regarded by that authority, as being produced by the dropsy and not as a
cause of it.

Cystic degeneration of the kidneys was considered by Honig to be the cause of the General Drossy in one of his cases. The cysts, he thought, pressed upon and obliterated the vessels of the kidneys. This obstruction told back on the general circulation and drossy resulted. Guiniot, Gesner & Ballantyne have also recorded cases of apparently a like condition of General Drossy of the Fetus with cystic kidneys. Ballantyne has suggested that it is more by pressure of the cysts on the larger vessels of the abdomen than on the small vessels of the kidneys that obstruction to the general circulation is caused, as there are many cases of cystic kidneys on record which did not exhibit general
dropsy.

Linking of the right Hypogastric artery was supposed by Stevens to be the cause of the dropsy in a case which came under his notice. This case is also interesting on account of the abnormalities which existed in the urinary system. Chief points in Stevens case are the following:— 7th month child, delivered by forceps & embryotomy. There was absence of urethra and corpus spongiosum. Bladder contained about 6oz of fluid. Left ureter was distended and tortuous; kidney and pelvis normal. Right kidney atrophied with a cyst; ureter small. Right Hypogastric artery much larger than left. Portal cir. culation and Heart normal. Whole foetus oedematous, serous
fluid in serous cavities = about 3½ pints. Proximal end of cord distended with fluid. Stevens was of opinion that the general dropsy could not have been caused by a consecutive nephritis from the obstruction in the urethra as the kidneys play such an insignificant part in eliminating waste products at the 7th month. He thought the edema and ascites were produced by kinking of the right hypogastric artery in its course over the bladder & cord. He likened it to the kinking of the ureter producing Hydronephrosis.

Leucocytic Infiltration of the Liver and Kidneys was found by Raineri in a case of General Dropsy of the Fetus, and was thought by him to give rise to sufficient obstruction to the
circulation to account for the general dropsy and also the oedema of the placenta. He described the condition of the Liverds like that found in syphilitic cases.

(r). Due to deficiency in development of part of the lymphatic system with resulting accumulation of lymph in the tissues. Absence of thoracic duct and apparently also of the lymphatic glands was thought by Smith and Birmingham to be the cause of the general oedema and dropsy in their case.

The case was one of a twin, both were males, born at the 20th week. The mother was quite healthy. Its twin was normal. The diseased foetus was about thrice as large as the healthy one. The skin was markedly oedematous and on puncturing
it a glistening fluid like white of egg escaped. The thoracic duct was searched for both in the thorax and abdomen, but in neither situation was a trace of it found, nor could the receptaculum chyli or the mesenteric glands be discovered. Microscopic examination of the skin revealed large spaces, some of which contained coagulated lymph whilst others were empty.

Normally some liquor sanguinis exudes through the minute vessels into the lymph spaces and is absorbed by the lymphatics to pass by them into the veins. If this link between the lymph spaces and veins is absent there would be accumulation of fluid in these spaces. Such was Smith's and Birmingham's theory regarding the etiology of their case. They supported their theory by alluding to observations of Dareste & Franck, the former of whom