The Etiology and Treatment of Albuminuria and Eclampsia Gravidarum.

being thesis as candidate for the degree of Doctor of Medicine.

by

J. Ernest Moorhouse

M.A., B.Sc.,(H. and) M.R.C.M., (Edin.)

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1 Windsor Place

Stirling.
Case 1.

Eclampsia and Death.

Mary Chalmers, 21. unmarried.

Primipara. Admitted 12:30 pm. 13th Sep. 1872.

History. Last unwell 26th Nov. 1871. In February, May & June, she had a slight red-coloured discharge from the vagina. There was a recurrence of this in July.

At the beginning of August great swelling of the legs appeared and a fortnight before admission there was swelling also of the hands and feet especially during the night.

At the same time she began gradually to have diminished vision until on admission she could not recognize friends nor read nor count fingers 15 feet away. She suffered from a severe head & face-ache chiefly on the right side of the face and across the forehead. Three days ago while speaking to a friend her eyes became for a few seconds fixed & staring.

Examination. The legs were very drooping. Face & hands puffed and swollen. Eyes suffused & somewhat injected. Pupils widely dilated but responding to the stimulus of light. Severe headache. Memory of dates & various things in connexion with the pregnancy much impaired. She had a few pains
the day before admission.

Abdominally - uterine tumour tense, head low down.

Per vaginam - condition of colitis gravidarum. Vulva small, so not dilated. Labia majora somewhat swollen.

Ht. qr. 100. Albumen 5-3 gr. ad 3.

Treatment - An enema was immediately administered which produced 3 motions. Strictly milk diet. Calomel p. t. 3.

Pelapipe p. t. produced 1 motion.

At 8 p.m. Potass. Acet. p. t. 5 & Am. Brom. p. t. was administered but immediately omitted.

The loss of sight and headache were worse. She was put into a hot vapour bath for an hour which produced profuse perspiration. Chloride of sodium & Am. Brom. ad p. t. was rectified.

A mustard and linseed poultice was then applied to the loins and this was continued alternating every hour with fomentations of Inf. Digitalis all night. Between 10 p.m. & midnight Cotone Oil p. t. and Puls.

Flaterii & p. t. were exhibited but had no further effect than to produce the most violent vomiting. 28 oz. of urine were passed during the first 12 hours she was in hospital. At midnight the membranes ruptured during an attack of severe vomiting.

September 12th, from 1:30 to 1:30 a.m.
the patient was kept under chloroform. Chloral hydrate & Am. Brom. ad & frequent administration per rectum but often rejected.
At 3 a.m. the os was fully dilated and the head quickly descended on to the perineum. The application of forceps was attempted but the head was lying obliquely & the forceps rotated backwards so they were taken off.
At 4.30 a.m. the child was born, followed in 10 minutes by the placenta. At 9.30 8 oz. of urine were drawn off by the catheter. She was very restless, turning her head from side to side and throwing her arms about.
12 a.m. An eclamptic fit lasting nearly 3 minutes. Chloral & Bromide ad. & administered by mouth.
Hypodermic injection of Pitocinone nit. & litre. Hot air followed by hot vapor bath for two hours. Digitalis fomentations to the loins.
4.40. 6 oz. urine drawn off and Ph. Acet. & 50 administered. During the afternoon she was very restless & sometimes kept in bed with difficulty. She drank considerable quantities of milk. Comatose but answered when spoken to. Pulse very rapid and feeble. Temperature 105.7 to 107.7.
5 p.m. Venusæction of the median basilic vein was performed. 3/8 of blood being drawn off. This was followed by collapsed the pulse going up to 172 + very feeble. 3½ brandy given by sips and a hypotonic injection of ether. She continued somnorous + very restless. The face was not so puffed—œdema of the legs entirely disappeared. Fed every hour alternately with milk + Valentine's Extract.

8.45. 9½ oz of urine drawn off.


September 15th. 2 a.m. very restless + excited.


4.0. Vapors bath + pilocarpine ft. hypodermically. Collapsed + brought out of both. Breathing became very noisy and pulse extremely weak and rapid. There was no evidence of any perspiration induced by the various applications she had after the fit. The breathing gradually became laborious and the patient sank and died at 5.15 a.m.
Post Mortem Report by Dr. Robert Muir.

There was very marked hydro-pericardium. The heart, beyond showing a slight hypertrophy of the left ventricle - thickness of wall in some places being fully 5/8” - was quite normal. The intima of the aorta & the endocardium were not blood-stained.

Lungs greatly congested, especially posteriorly & slightly edematous, otherwise normal.

Liver somewhat enlarged & soft, of a somewhat bright yellow colour, with lines of congestion & a number of minute scattered hemorrhages. Micro. exam. showed extensive fatty & granular disintegration of the liver cells, with small hemorrhages here & there.

Spleen, slightly enlarged, of a dark colour & somewhat soft, but not at all different.

Kidneys. Both swollen & tense. Capsule stripped with great readiness. The cortex was greatly swollen & aequinie, almost white, whilst the medulla was congested.

Micro. exam. showed very marked cloudy swelling & Early Catarhal changes. The tubules were very markedly swollen & the cortex was very aequinie. Malpighian bodies fairly normal.

The condition was extremely acute & intense & quite sufficient to cause death. No signs of previous disease. No micro-organisms could be detected in any of the organs.
Case II

Eclampsia and Death.

Mrs. Naiming, aged 35, primipara, admitted 3rd October 1892 at 12.140 p.m.

Said to be pregnant between 7 1/2 months history. Morning sickness all through pregnancy accompanied by sickness in the evening for last few weeks headache, frontal and occipital - swelling of feet and face - some loss of memory & stupidity. Eyesight not affected. Not sick than usual on the previous night. Went to bed and awoke at 1.45 r.m. in a fit. Became unconscious. Doctor called at 3 am. Bromide & chloral were given by mouth. She was vomiting and repeated again. She never recovered consciousness and from 2 a.m. to 12.40 p.m. she had 12 fits in all.

On admission - Face swollen & edematous. Conjunctivitis & blue. Pupils contracted. Legs swollen. Unconscious with stertorous breathing. 3/4 urine was drawn off - on heating it became solid.

Uterus reached 2 fingers breadth above the umbilicus. Do not dilated. Head presenting. An enema was given which produced 2 big motions. Also Coton Oil 11/12

Fit at 1.10 p.m. At 1.30 mustard and linseed poultices applied to the loins. Hot bottles in wet flannel placed
all round the patient blood drawn off by venesection. Began to
dilate the os by fingers.

fits at 2.10 & 2.30. At 3 digitalis
fomentations replaced purgatives on glass.
The os was very rigid & dilated slowly by
means of the fingers. At 5.20 the os
was deemed large enough for delivery.
The child was delivered by bipolar version.
The head was delayed but was extracted
by the combined Paque Hamblin siezures.
At 6.30 it was discovered that the hot
water bottles had caused considerable
burns on the skin of the legs & buttocks.
The fomentations had produced the same
effect on the loins.
The patient remained comatose and
though she had no fits after delivery she
never regained consciousness. Nutrient
suraeata were given at 7 & 8 p.m. & a
hypodermic injection of ether at 9.15.

The breathing became more stertorous. The
pulse flickering feeble & vicissant.
The rapidly sank & died at midnight.
The child was a female - dead.

Post mortem the temperature rose to
107.7° at 12.30 a.m. and fell to 102.4°
at 1.15.

There was no post mortem examination.
Case III.

Albuminuria with subsequent Pyelitis and Cystitis.

Della Walker, at 22, unmarried, primipara. Admitted 19th October 1892 at 11 a.m.

Patient was last unwell in January. For the last few weeks before admission she had great swelling of the legs and feet. For about a month she had suffered from severe frontal headache, I had noticed that her hands were often stiff. She had no loss of sight and her memory was perfectly clear.

On admission, legs very oedematous extending right up the thigh of the abdomen also. Abdominal tumours large. Fetal heart heard half way between umbilicus & left anterior superior spine of ilium. She had had pains since 9 a.m.

Per vaginam — as admitted 2 fingers daily. A large enema was administered. At 3.20 p.m. she passed 6 oz. of urine of gr. 1034. alb. 13 oz. acid 37

area 55 ps 53 7. Both serum albumen & globulin were present.

At this time the os uteri had a diameter of 2 inches.

Cotton oil 7 oz. followed by Calomel 1/8.
was administered to the patient put into the hot air bath for an hour. Profuse perspiration & small motion followed. At 5 pm the cervix was fully dilated & the head well down in the pelvic cavity as the membranes were artificially ruptured. Child delivered by forceps at 6:16 pm. In the evening she had 2 doses of a mixture of P. Digitalis, S. Aeth. Nitrici, with Decoet. Opoparii. She had a large watery stool passing urine at the same time. Strictly milk diet was prescribed.

At midnight 703 of urine were drawn off by Catheter & found to contain a large quantity of albumen.

PERFORMANCE.

1 day. 12:15 a.m. hot air bath for an hour.
1:30, 3g. Amin. Aeth. Jod 3f + Digitalis fomentations to the abdomen.
9 a.m. 3g. Amin. Aeth. Jod 3f + Digitalis fomentations to the loins.
At midday 203 of urine were drawn off. Sp. fr. 1020. area 53/4 53f. albumen less than fr. 6 43f.
2:45 p.m. passed 153 urine
6 p.m. 353 of urine drawn off by Catheter. Sp. fr. 1010. area fr. 6 43f. albumen only traces.
Altogether in 6 hours she passed 703.
The temperature was 99.7°F. The edema was disappearing from the hands & face & she was sweating profusely. Five watery motions.

2 day. Improving favourably. Edema entirely disappeared from hands & eyelids. She passed 118 oz of urine which contained only traces of albumen.

3 day. Urine passed during the day amounted to 92 oz - albumen 1/8 ad 3½.

At 6 p.m. she had a rigor & complained of headache. Temperature 101°F. The breasts were hard & tense. They were rubbed with olive oil, some milk drawn off, flint smeared with belladonna & glycerine applied.

Edema disappeared from the legs.

4 day. Breasts still hard & tense.

Temperature never above 100.7°F. Urine 68 oz. S.p. 1627. Albumen traces.

8 p.m. Sig: Amin. Acet. fort. 3½.

6 day. Temperature rose to 101.8°F and patient complained of pain in right flank & right iliac region. Insipid urine stopped. Urine 42 oz.

S.p. 1630. Albumen 1/8 ad 3½.

Large doses of Tyroso's solution were given.

7 day. morning temperature 101.8.
Severe pain in right flank iliac region. Urine contained large quantities of pus with tailed cylindrical epithelial cells. Sp. gr. 1.030, albumen fp 57.5 37. A large fomentation was applied and Leg. Americ. 4oz 37. The temperature fell rapidly & at 6pm was 98.4 - the pain being very much less.

6th day. Urine 24oz containing albumen, pus & urates & epithelial cells. Sp. gr. 1.037. Right pleurisy in right side.


10th day. Discovered that patient had scarletina when a child followed by inflammation of the kidneys. Chronic Bright's disease since.


14th day. Temperature rose to 100.2 37 & pulse 96. Patient was conveyed in an ambulance wagon to the Royal Infirmary where she was received in Ward XXV under the charge of Professor Garanger Stewart.
Case IV.

Eclampsia with Post-Operative Section

Mrs. Bowie, age 20, primipara of Papalgar Lane, Leigh, admitted 9.35 pm 21st October 1892.

Had always been strong & healthy. At no time during the latter months of gestation were there any indications to raise suspicion in the minds of the patient or her relatives. On the day of admission she suffered from slight headache & a feeling of dullness but there was no appearance of oedema. She was attended by a midwife.

At 8 a.m. on the 21st she commenced to vomit & this continued for some time during the day.

At 5 p.m. Convulsive fits set in & O. Tod of Leigh was called in - his advice being that the patient should be taken to hospital at once.

Prior to removal from her home, there had been 6 convulsive seizures, on the way to hospital there had been 3 in the cab & she was found in one by the resident on her arrival.

Condition on admission. She appeared a strong, well-built woman. Her face was cyanosed, the fit just passing off. There was no appearance of any
edema either of Eylisha hands or lower limbs; she was perfectly insensible to touch, light or sound & remained comatose throughout. The abdominal tumors did not appear to be more than usually tense or prominent. It seemed to contain a fetus of 8½ or 9 months size & this corresponded with the statements of the relatives.

Immediately on admission Coctan Oil was placed on the back of the tongue, a hypodermic injection of Pilocarpine nitrate ½ was given & the hot air bath administered.

Meanwhile O'Halliday soon was informed. The pilocarpine & hot air bath induced an immediate & copious perspiration & the air bath was continued for 20 minutes the temperature of the patient being carefully watched. As the patient remained cyanosed & there were indications of further impending convulsions she was put under the influence of an anaesthetic & this was continued without intermission but the dose was increased on any indication of an approaching fit.

At 10.10 p.m. she had another convulsion - the temperature was now 101° & the pulse 130. Urine 3½ muddy
highly-coloured was drawn off by the catheter, and this on examination indicated the presence of a very large amount of albumen—the precipitate being as much as 2/3 the bulk of the urine.

A vaginal Examination was now made. The vagina was very short & narrow its capacity extremely small. The foetal head appeared well down in the pelvis. The cervix was not drawn up and the os was closed only admitting the tip of one finger and with difficulty allowing the passage of the fingers to the internal os. The cervix was hard & firm & had little of the soft character one expects in a porous cervix.

The os did not appear capable of admitting the fingers for the purpose of inducing dilatation.

Halliday then arrived & examined the patient. Up to this time the cotton oil had produced no effect & an enema was administered but was not followed by any evacuation. (This has been the experience in all these cases, although the oil was freshly ordered, it seems to have been the unexceptional result in previous cases.)

On a further vaginal examination the condition of the parts was found to be unchanged. It was impossible to do more than with difficulty insert one finger into the os. The patient remaining comatose, the fits succeeding each other at intervals of 5 minutes & the patient being evidently in antepartum mortis the advisability of performing Caesarian section was considered with the hope of saving mother & child, rather than merely waiting passively till the patient was dead & then extracting the foetus.

At 11:30 Dr. Goon again attempted to dilate the cervix with the fingers but found this impossible.

Dr. Milne Murray who was present then repeated the experiment but failed to get more than one finger in. He then inserted Hegar’s dilator variatus but this failed in producing any result other than rupturing the membranes.

At midnight the patient’s temperature was 102°F. The only hope for her evidently lay in active measures.
adopted instantaneously she was prepared for operation. This was performed with the assistance of Dr. Murray and Boulton. Every antiseptic precaution was observed and the patient was fully anaesthetised. The abdomen was opened in the middle line and the surface of the uterus exposed. The placenta was recognised as being attached to the anterior wall so that it lay in the line of the incision. This was cut through and the placenta and child rapidly extracted, of the walls of the uterus grasped and drawn out of the abdominal wound. The child was soon reanimated and continued to do well until removal from Hospital. It was a healthy male of about 83 months. The uterus was firmly grasped and a piece of elastic tubing applied to its neck preventing any further hemorrhage. The amount of bleeding had been very little more than in a case of normal labour. It had been intended to perform the Dimple Cesarian section to replace the uterus but this was deemed inadvisable and the Porro operation was completed. The peritoneal surface was carefully stitched to the stump of the
intra- v & this was held in position by
the abdominal needles & the abdominal
wound was carefully closed. During
the course of the operation whilst the
patient was fully anæsthetised there
had been no recurrence of fits & the
patient now appeared rather less spastic
& the pulse, although rapid, seemed better.
The patient was replaced in bed at
1 a.m., 22nd October. Dr. Doon & Dr.
Murray shortly thereafter left.
At 1.30 the Eyes were noticed to be
fixed in divergent strabismus & the
breathing was somewhat noisy.
1.55. Pulse 100, temperature 102°.6 F
2.40. Fit much worse than any of
the preceding. Chloroform was
again administered. The patient's
face became exceedingly edematous &
purplish & remained so.
A rectal injection of Chloral Hydromide
â€” 5 cc, Valentyn's meat juice &
Brandy â€” 3 F was given but
rejected immediately. Hypodermic
injections of chloral & bromide
were given at short intervals.
3. Hot air bath for a short time but
produced no effect in paralysation.
3.10. Pilocarpine 1/50 hypodermically
was injected & was again followed
by copious perspiration which continued
to flow freely.
3:46. Rectal injection similar to the
preceding was retained.
4. Temperature 104°6. pulse 150.
3/4 wine drawn off by catheter.
4:30. Enema of 8q disrespect. Aq.
5. Temperature 105°2. pulse 156 irregular.
5:30 a copious frothy saliva was exuded from the mouth.
6. Temperature 105°2
6:15 patient expired. About 3/4 of
thick discoloured urine was drawn off.

Twelve hours afterwards the abdominal
wound was opened. The surfaces had
become adherent throughout the entire
extent & depth. There was a slight
amount of serosa exudation tingeed
with blood into the peritoneal cavity.
The kidneys were extracted & sent to
be examined but no further post-
mortem examination was performed.

Pathological Report by Dr. Robert Muir.

Naked Eye examination.
Organ is somewhat swollen. Stomach
capsule strips with peal readiness.
Cortex regular & slightly swollen.
The interlobular arteries are greatly congested whilst the parenchyma between is aseptic, of a pale yellow colour. Nuclei swollen.

The medulla is congested.

Micro. Exam.:

The tubules are much swollen pressing upon the capillaries between. The epithelium is in a condition of extreme cloudy swelling going on to catarrh. The Malpighian bodies are much swollen distending their capsule but show no other change.

The four cases detailed above occurred during my quarter's residence as House-Physician at the Edinburgh Royal Maternity and Simpson Memorial Hospital and the accounts are copied from the records of the Hospital by the kind permission of Dr. Haldiday Groom. They will serve as an introduction to a discussion on the Etiology and Treatment of Albuminuria & Eclampsia Gravidarum. The question of Albuminuria will be first separately taken up and Eclampsia discussed in the second half of the paper.
Albuminuria Gravidarum.
Albuminuria Gravidarum.

The urine in normal pregnancy undergoes notable changes. The quantity secreted is increased in amount. This is chiefly due to the excessive excretion of water. At the commencement of gestation the quantity of solids found in the urine is diminished and consequently with this increase of water we get a diminution of the specific gravity. The diminution of the amount of solids is due to lessened quantities of phosphates, sulphates, urea & uric acid, but the diminution is relative rather than absolute.

Most probably the total amount of these substances excreted in the 24 hours is equal to that in the non-gravid state & may be even greater. The only normal substance which seems to be relatively increased in quantity is chloride. The acidity is well-marked. The urine rarely having an alkaline reaction.

The most notable fact however is that in the urine of pregnancy there is often found albumen. About this question of the albuminuria of pregnancy much discussion has taken place and chiefly in its connection with eclampsia gravidarum.
Looking to the various results of examinations that have been published there cannot be any doubt that in a considerable proportion of women who pass through pregnancy and labour there is albuminuria. The frequency of this condition is given in very varying numbers by different authors. Several writers on the Continent estimate the frequency as 20 per cent. and some even at 50 per cent. but the former figure is the one more usually given. Thus Blot, Litman, Petit & Stypolitze regard the frequency as being over 20 per cent. of women during or just after labour and during the 9th month before the onset of labour about 14 per cent. 2nd citizen of Buda-Pesth gives the frequency as 60 per cent. in 600 pregnancies and 18 per cent. of 70 pregnant women. He considers it to be a valuable diagnostic sign of pregnancy. On the other hand most British & American observers put the frequency at a much lower rate than this - 2 or 4 per cent. being numbers much more frequently found.

Possibly the Continental observers have used more delicate tests and they consequently discovered the presence of albumen which was in insufficient quantity to give a reaction with heat & Nitric Acid - the test most frequently used in this Country.

But whatever the proportion be it must be granted that albuminuria does occur frequently in pregnancy and it is a usual accompaniment of eclampsia.

Since the discovery of the association of albuminuria with eclampsia by Dr. of Guy's Hospital in 1842 the origin of the albuminuria of pregnancy has been a much debated question. Many theories have been brought forward to account for it and we propose to examine some of them.

1. The first to be brought forward - by Dr. Dever himself - was the theory that the presence of albumen was due to mechanical causes and this still finds many supporters. It is stated that the gravid uterus exerts pressure on the renal arteries and veins. This supposition is supported by several facts. In the first place albuminuria is more frequent in primiparae and in them it is explained by the
greater resistance offered by the tense abdominal walls causing increased tension in the abdominal cavity.

Similarly in cases of twins + hydranuria where there is a proportional increase of the frequency of albuminuria we have this increased pressure. And we have still further an example of venous stasis produced by pressure in the case of edema and varicosities of the lower extremities.

Others, notably Halleréma + Döhleis, have argued that the pressure is exerted not so much on the renal vessels as on the ureters + the neck of the bladder. Döhleis made post-mortem examinations in 32 cases of eclampsia and found in 8, or 25 per cent, dilatation of one or both ureters.

The arguments brought forward in support of the mechanical theory are strong but are considerably weakened by the following considerations.

1. We often have albuminuria by the 3rd or 4th month or even earlier + in these cases it cannot be due to pressure on the renal vessels.

2. The albuminuria often disappears

under treatment by general—not local—means whilst the mechanical conditions remain the same or are even exaggerated.

3. Albuminuria occasionally occurs in multiparae who have escaped the condition during their first pregnancy.

4. The kidneys and their vessels are peculiarly protected by their position from the effects of pressure exerted by the growing uterus. They lie in the recesses of the lumbo-dorsal region, protected by the spinal column, and the uterus grows forwards instead of exerting its pressure backwards.

5. In a few cases it has been shown that with the intra-uterine death of the foetus the albuminuria disappears although the mechanical conditions remain the same.

6. And lastly, women who have large ovarian cysts very seldom suffer from albuminuria if their only when the tension is much greater than is usual in pregnancy.

These considerations considerably lessen the importance of mechanical pressure in pregnancy as a cause of albuminuria but they do not altogether abolish it. The facts concerning primiparity, twins...
Hydramnios still require explanation and we may accept the fact of increased pressure acting as an accessory cause of albuminuria.

2. Vescical catarrh which is occasionally present in pregnancy, must be held to account for a certain number of cases. In this connection Barnes' view of the cause of many cases of albuminuria may be noted. He points out that in pregnancy it is easy to observe that there is hyperemia & a catarrhal condition of the mucous membrane of the vagina & cervix. This leads to the shedding of epithelial scales and an exudation of mucous-albuminous fluid. From this he infers that we have the same condition of things present in the tubes of the kidney for they are under the same condition of hyperemia. Further their functional activity is much greater than that of the cells lining the mucous membrane of the cervix & any increased blood supply would lead to larger results. But there seems to be no reason why the same reasoning should not apply to every mucous membrane in the body and an intestinal or bronchial catarrh would arise under similar circumstances.

0. Barnes, op. cit. p. 400
Conditions. Although ingenious we think this theory is insufficient to account for more than a very few cases of albuminuria.

3. Reflex nerve mechanism has been called on to account for this condition. Tyler Smith suggested that albuminuria "may depend upon sympathetic irritation of the kidneys of the kidneys by the gravid uterus, similar with the irritation of the salivary glands, the mammae, the thyroid." Undoubtedly there is a close nervous connection between the kidneys & the pelvic organs as shown by the sudden copious secretions of urine by hysterical women but there seems to be no explanation in this theory of the presence in the urine of the abnormal constituent albumen, which is the point at issue.

Having cleared the ground a little by these examinations it would be well to inquire into the nature of albuminuria in general. Albuminuria is most frequently found associated with Bright's disease & in this connection it has been studied most.

C. Barnes, op. cit. p. 403.
At the present day it is recognised that albumen may be found in the urine arising in one of three different ways. These are called

The Parenchymatous theory ascribes the albuminuria to inflammatory changes in the epithelium of the tubes, which must give rise to albuminous products in the urine. In addition to more particularly by the shedding of epithelium the basement membrane is laid bare and permits the direct transudation of albumen from the blood vessels into the tubes. When albuminuria is produced in this way then there is necessarily an accompanying nephritis.

The Vascular theory is to the effect that when albuminuria occurs the seat of transudation is in the Malpighian tuft of the kidney. Nassenbaum's experiments on frogs practically settle this question in the affirmative and in the majority of cases, except in acute tubal nephritis, we may hold that albumen finds its way into the tubes by means

of the glomerular tuft. In cases of venous obstruction due to pressure on renal veins, kidneys or ureters, or due to backward pressure in cardiac lung & liver disease, there occurs oedema of the whole organ & we get a direct transmission of albumen from the blood vessels & lymph spaces into the tubules but we have seen that it is unlikely that this is able to account for more than a few of the cases of albuminuria gravidarum.

If the albumen then generally transmitted by means of the glomerular tuft, what is the cause of this condition whereby the foreign substance albumen is permitted to pass? Are we to suppose that in all cases of albuminuria & eclampsia gravidarum there is present a nephritis?

An inflammation of the kidney structure by affecting either the tubules or glomeruli would immediately account for the presence of albumen, and this explanation has been and still is accepted by many as the correct one. For many years after the discovery of the association of albuminuria by Seaver, the majority of obstetricians held this opinion.
and the condition was spoken of as Bright's disease occurring in pregnancy. It is of course quite natural that a patient suffering from chronic Bright's disease who becomes pregnant should still continue to excrete albumen in the urine, but we are dealing with cases in which no previous disease of the kidneys has been present. Are we to suppose that in all these cases of albuminuria + Eclampsia we are dealing with an actual nephritis arising during the course of pregnancy? Some writers answer unhesitatingly in the affirmative. Galabin's says "there is abundant evidence that in the albuminuria of pregnancy, when notable in degree, there is generally actual nephritis." In a discussion on Peripheral Eclampsia in the Obstetric Section of the British Medical Association at Bournemouth in 1891 he leaves no doubt that in his opinion in albuminuria + Eclampsia there is an actual nephritis. He says "those who suffer from Convulsions are commonly not known to have Bright's disease until either premonitory

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Signs of eclampsia or actual convulsions appear to therefore may be presumed to suffer from a recent attack of kidney disorder. Further on he describes the character of the "form of nephritis associated with eclampsia" as being especially severe in the diminution of the excretion of solids.

Dr. Sondhey in a clinical lecture reported in the Lancet describes the condition as "pregnancy nephritis."

This theory then of an actual nephritis has not been wanting in able advocates and still has many adherents but we think the facts of the case are very much against them. The arguments in its support are that during life there is albuminuria often after death various conditions are found in the kidneys. If it be claimed that a patient who passed albumen in the urine has necessarily got nephritis there is no further discussion but we shall attempt to show immediately that the two are not conclusive.

As regards the conditions found post-mortem in fatal cases of eclampsia we shall have more to say later on but in the meantime

it may be said that the post-mortem changes in the kidneys are very trivial in a large majority of cases and there is no evidence that the patients who recover suffer from the same changes. The complete recovery which takes place in the great majority of cases is an argument strongly opposed to this doctrine. Quite a number of women who suffer from eclampsia in their first pregnancy have no further trouble in subsequent pregnancies and are not subject to nephritis in any form.

In connection with vascular theories of the origin of albuminuria the researches of Mahomed may be studied and they throw important light on the subject. His paper is entitled "The Etiology of Bright's Disease and the Prealbuminuric Stage," but it is really an investigation into some of the conditions which precede and accompany albuminuria. The experiments were conducted on cases of convalescents from the exanthemata, gouty subjects, parturient and periparal women. He discovered that the pulse of acute Bright's disease like that of chronic was a pulse of high tension. There—
is a similar condition of pulse in the exanthems, erysipelas & pregnancy and this led him to suspect that the vascular condition caused the albuminuria & not vice versa. In Scarlet fever albuminuria is almost always preceded by constipation and less frequently chill. This leads to some effete material being retained in the blood which by disturbing the relation between the blood & the tissues interferes with capillary circulation & produces high tension. The albuminuria which occurs is not inflammatory. It is a general blood poisoning in which the kidneys are affected along with other organs, notably those of excretion. There is a similar condition to the kidneys in the stomach & duodenum & probably through the whole intestinal tract. By analogy the sweat glands are probably affected in the same way. In convalescence from the exanthems the patient is excreting as rapidly as possible a quantity of effete matter & one of the three excretory functions is suddenly arrested - by constipation or chill to the skin. Coincidently there is a rise in tension - the poisoned blood cannot take
up more effete matters, therefore, it loses its affinity for the tissues, and
the two remaining organs of excretion have to do extra work. The kidney
receives extra blood supply under high pressure. This is not inflammation.
The first indication is the presence of crystalloids in the urine - then albumen.
It seems that only under a certain degree of pressure do crystalloids pass - if
the pressure is increased they cease of the colloid albumen appears. If the
pressure be still greater the minute vessels rupture and blood appears.
The quantity of urine is invariably diminished.

He says that in the large proportion of pregnant women there is high
tension - in none is there low tension or dirotonia. During the first stage
of labour there is invariably high tension. It decreases gradually, after
labour it requires from 7 to 21 days to get normal. There is high blood
tension because the mother's blood is charged with effete materials for
she has to discharge the excretory matters of the foetus. Her blood is
thus in a manner poisoned and does not bear a normal relation to the tissues
while the organs of excretion have to do increased work under increased pressure. Therefore if constipation or chill occurs albuminuria is a very probable result.

Mahomaed's conclusions were:

1. Before any kidney change or albuminuria there is high tension due to noxious materials in the blood such as lead, alcohol, uric acid, scarlet fever poison &c. or else to sudden chill.

2. If sufficiently severe haemoglobin & other blood crystalloids appear in the urine before albumen.

3. If allowed to continue albumen is subsequently found in Bright's disease occurs.

4. If checked before albumen appears or immediately after it, purge or otherwise the high tension & crystalloids disappear.

These observations of Mahomed are of great value & require careful consideration as applied to the pregnant condition. The changes produced by normal pregnancy on the state of blood pressure, the heart & vessels are well marked. The increased quantity of blood & its

(1) op. cit. p. 198.

(2) see infra under "Eclampsia".
hydramnic condition necessarily tax
t the heart to greater exertion. Thus it
is found that the number of beats
per minute is increased by 5 or 10
over the non-pregnant condition and in
addition the left ventricle soon becomes
hypertrophied from the extra strain
thrown upon it. The vessels show the
effect of the strain by the peripheral
capillaries becoming engorged and the
stellite veins in the thighs increase
in number and size. Many women
suffer from varicose veins and hemorrhoids
early during pregnancy, and this often
occurs in the early months. It cannot
be accounted for by the pressure of
the enlarged organ but is due to the
increased blood tension. Observations
with the ophthalmograph show that
from a very early period in pregnancy
the blood pressure is increased.

Sir W. H. Broadbent in his book on
The Pulse quotes pregnancy as one of
the causes of high tension.

These facts all strongly support
Mahomed's thesis but before coming
to any conclusion regarding the
albuminuria of pregnancy it is
necessary to take into consideration

P. Barnes, op. cit. p. 209.
the 3rd group of causes which are nowadays regarded as causing albuminuria in general.

Once the days of Bright himself there have always been some who maintained that albuminuria is due to changes in the blood that the only part which the kidney plays is the elimination of this constituent as a deleterious substance. Thus, according to the hematogenous doctrine, albuminuria is on all fours with a glycosuria. Any excess of sugar in the blood passes off at once by means of the kidney if in doing so sometimes gives rise to a nephritis. In the same manner any foreign or useless albumen present in the blood is eliminated by the kidney if in the process the irritating qualities of the albumen give rise more frequently to a nephritis that to a more severe degree. Thus the albumen is not a consequence of the nephritis but the nephritis is caused by the elimination of the foreign urinary constituent albumen.

The chief supporter of this theory at the present day is Professor Semmole of Naples and as we think it may throw considerable light on the
questio vexata of the origin of the albuminuria of pregnancy and as it has received so little support in this country we propose to give a short outline of Remondola's views.

An account of his experimental and clinical work from 1860 to 1883 is found in a paper entitled "Nouvelles Recherches Experimentales et Cliniques Sur la Maladie de Bright" which was presented to the Academie de Medecine of Paris and published in the "Archives de Physiologie" in 1884. Shortly after this paper have since appeared in the Bulletin de l'Academie de Medecine down to 1892. From the title of the paper it will be seen that he deals exclusively with the question of Bright's disease but his remarks as to the etiology of albuminuria have a wider application and are of great importance relative to the albuminuria of pregnancy.

His first paper was published in Naples in 1860. At this time, as indeed, since then, the theory that albuminuria in Bright's disease were due strictly to renal lesions was hardly called in question. By experimenting clinically with various diets Remondola found that...
1. The quantity of albumen eliminated by the urine in Bright's disease in 24 hours has a constant relation to the quality of the food. Other things being equal the quantity of albumen secreted was four times greater on an exclusively meat diet than on a diet completely non-aëtiolated.

2. The quantity of albumen eliminated under the influence of food, is greatest during digestion.

This led him to think that there ought to be a relation between albuminuria and the composition of the blood, as he could not suppose that the morbid condition of the kidneys varied with such facility and in the different hours of the day. He then arrived at the following conclusions from clinical work:

1. That the albuminuria can take place without a renal lesion, and that in Bright's disease it precedes the lesions of the kidneys.

2. That the albumen eliminated by the urine is in a certain relation with the composition of the blood which consists in the fact that certain albuminoids not being destroyed (brûlés)

D. op. cit. p. 288.
Transformed into urine water + carbonic acid are eliminated by the kidneys as being useless material.

Further researches led to a paper before the Académie de Médecine at Paris in 1861 when he laid the following results before the body:

1. The albumen of different cases of albuminuria is not the same, either as regards coagulability or its reaction to acids, magnesium sulphate or other salts.

2. The albumen in cases of Symptomatice albuminuria - i.e. albumen passed in cases of heart or liver disease - is allied to caseiniform albumen while that of true Bright's disease is more like white of egg.

3. That the alteration of the blood in the albuminuria of Bright's disease consists in the presence of a non-assimilable albumen unable by its molecular composition to contribute to the maintenance & repair of the tissues & consequently leads to its elimination as a substance foreign to the body.

Further he showed that diet which has such a profound influence over...
the albumen passed by a patient suffering from Bright's disease has little or no influence on the quantity passed by those suffering from symptomatic albuminuria. Thus it will be seen that Pennwola had come to the conclusion that the essential factor of Bright's disease is an alteration in the albuminoids of the blood. Since then he has constantly directed experimental and clinical work to investigate what are the differential characters of the urine of origin of these albuminoids. To show that this hyperprotein condition is the cause of the renal process for a long time he tried to devise a chemical test whereby the albumen found in the urine of Bright's disease could be differentiated from all others but though some general ideas were formed according to the density and reactivity of the precipitate he could get no definite guide. He considers that the chemical changes undergone by the albuminoids supplied by the food form an endless chain constantly changing by hydration, molecular transformation and combination with other constituents.
of the blood-stream and that when we speak of the albuminoids globulins and sytonicated these are only links in the chain bound together by an indefinite series of intermediate forms. Consequently Semmola turned his attention to the consideration of other characters of the albuminoids of the blood chiefly to the question of their diffusibility. By 1881 he had formulated by experiment the conclusion that

1. the albuminoids of the blood in the albuminuria of Bright's disease are more or less completely diffusible according to the more or less advanced stage of the disease to the smaller or greater quantity of albumen eliminated by the urine.

2. that in the serum of healthy people or of patients suffering from Symptomatic albuminuria the albuminoids are diffusible only to a very slight degree and this small proportion of diffusibility has no relation with the quantity of albumen passed by the kidneys.

We come now to his most important contribution which was made, as

D. of cit. p. 299
stated above, to the Académie in 1883.

He aimed to prove that

1. In healthy individuals who present
   transitory ("physiological" or "cyclical")
   albuminuria, the blood serum always
   contains a greater quantity of diffusible
   albumen than that of healthy
   individuals who are not albuminuric.

   If the quantity is always in
   proportion to the quantity eliminated
   by the kidneys.

2. In all the cases of albuminuria which
   occur in the course of dyspeptic diseases
   the serum contains a greater quantity
   of diffusible albumen than in
   health.

3. In the cases of albuminuria due to
   changes in pressure on the renal
   circulation, the albuminoids of the blood
   which diffuse do not vary from the
   proportion in health.

4. The blood serum of patients attacked
   by albuminuria in convalescence from
   scarlet fever contains a great quantity
   of diffusible albumen.

He gives two interesting clinical cases
showing the various changes in the
blood serum in albuminuric before,
during, & after treatment of these

O. op. cit. p. 300
agree with his propositions.
The presence of an excess of diffusible albuminoids in the blood is called by
Renault—hyperalbuminemia. This
may arise in the first place by an
excessive introduction of albumen into
the body by means of the food. If
more be introduced than can possibly
be dealt with by the various appropriate
agencies of the body, there necessarily,
arises a condition of hyperalbuminemia
absolute." But the class of cases
called "hyperalbuminemia relative" is
more to be studied in connection with
our subject.
One is carried naturally to the
consideration of how the albumen
are dealt with in the body. What it
is which affects these chemico-molecular
changes in their constitution which
enables them to fulfill their function
of administering to the various tissues.
What it is that leads "à l'accomplissement
de son voyage biologique."
In clinical investigation one is immediately
struck by the frequency with which
albuminuria is produced by the
influence of causes which affect
the cutaneous surface as above all
by the action of wet and cold and this
leads to the supposition that the cutaneous functions constitute one of the most important organic functions in the elaboration of the albuminoids. Several other well-known facts support this theory strongly. Many patients suffering from cutaneous diseases such as eczema & psoriasis when cured of this condition by local remedies become attacked with albuminuria. Demmola has records of 55 such cases. Further by covering the skin of animals with an impermeable coating albuminuria is almost always produced. Again atmospheric influences such as moisture & cold affect in a notable degree the condition of patients suffering from albuminuria & very often the results of this influence can be seen in the daily amount of albumen passed. In these patients also at an advanced stage there can be noted an atrophy of the skin in all its elements and a smoothness & palor which show its implication in a striking degree. From these facts from experiments on coating dogs Demmola concludes that there is a constant relation between the 3 terms
1. the degree of activity of the cutaneous functions,
2. the quantity of dialysable albuminoids in the blood-stream and
3. the appearance of albumen in the urine.

Another most important point is made in showing the non-dependence of albuminuria on a kidney lesion by the fact that in those cases albumen is also excreted by other excretories. Albumen is constantly present in the bile of patients suffering from Bright's disease. Paracelsus in a note to his translation of Erasmi's lectures states that it is found in the feces. The sweat and saliva contain it also.

These facts strongly bear out the suggestion of Semmola that the primary cause of albuminuria is the presence of diffusible albumen in the blood. Along with the other considerations mentioned, they suggest that albuminuria is very comparable to glycosuria. 

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O. op. cit. p. 317. @ p. 321
alteration épithéliale pour réaliser cette élimination d’albumine." Thus Deenuola considers that failure in the metabolism of the skin is the first link in the chain of the causation of albuminuria. Along with this there are probably altered functions of the liver & nervous system but the skin supplies the predominating factor.

Next we come to consider the causation of the renal lesions in cases of Bright’s disease. Deenuola regards them as being "un fait secondaire et même la conséquence nécessaire de l’irritation fonctionnelle que l’appareil rénal doit subir pour éliminer l’albumine devenue nuisible et en conséquence inutile au maintien des fonctions de l’économie vivante." The albumen is a foreign entance to the kidney - as much as, though in a different degree, uric acid, caustharides or turpentine - its passage must cause deleterious results. To test the truth of this supposition Deenuola conducted 6 experiments on dogs - injecting a solution of white of egg to reproduce the condition of the presence of an...
unassimilable albumen in the blood stream. This method is chosen in preference to any other method of producing albuminuria such as ligature of vessels or section of nerves as these procedures introduce other elements. In this he followed Claude Bernard who had previously made similar experiments. The animals were bled to the extent of the proposed quantity to be injected & the injections were subcutaneous to ensure their slow absorption. The general results of his carefully carried out experiments & autopsies are as follows:

1. Albumen can cross the renal filters without any previous alteration in the histological elements of the kidneys and without causing during its passage any consequence.

2. If the passage persist the first effect is hyperemia with intraglomerular hemorrhage & hemorrhage into & between the tubules - the capsule is distended by a mass after boiling and sometimes it is simply lifted up & seems separated from the glomerule by an

D. British Medical Journal. 1891. Epitome Jan. 3
D. op. cit. p. 460.
empty space. There is considerable migration of leukocytes without any alteration of the epithelium. Hyaline casts are present in the urine. These are the first steps of an inflammatory process (inflammation) in connection with the functional effort.

3. If the functional effort persists more than 6 or 8 days - above all with quantities of albumen injected of a gramme for each 1000 grammes of animal - the slow inflammatory process increases with cloudy swelling of the tubular epithelium, fatty degeneration, epithelial necrosis, thickening of the intertubular connective tissue.

4. The histological alterations of the kidney persist for some time after the injections have ceased without causing the continuation of the albuminuria.

5. With the elimination of albumen by the kidneys there is always albuminocoeholia - i.e. the elimination of a certain quantity of albumen with the bile.

This rapid resume will serve to give a general idea of Semmola's theory of the production of albuminuria and Bright's disease. The steps of the
process are 1. some interference
with the metabolic activity of the
skin & other glands. 2. the
consequent presence of unassimilable
albumens in the blood. 3 the
elimination of these by the kidney
and 4 the production of nephritis.

In connection with the presence of
these albumens in the blood,
Pernona proves it to be correct by
bleeding his patients & finding that
their blood does contain an excess
of albumens which diffuse and
further by injecting these albumens
into the veins of dogs he produces
in them an albuminuria proportionate
to the amount of albumen injected.

Further, seeing that this loss of
albumen to the economy shone of
necessity lead to a diminished
excretion of urea he experimented
& found that the diminution in
the excretion of urea by patients
suffering from Bright's disease is
very marked in the earliest stages
this proportionate to the loss of
albumen. If this loss is not compensated
by the presence of other nitrogenous
products such as creatin.
In like manner all his propositions are supported by a wealth of clinical and experimental work which is very convincing to an unbiased reader.

In this discussion of the question of albuminuria in general it will be seen that we have paid most attention to the researches of Mahomed and Bennnola because we believe that it is to them we shall have to look for the most plausible explanation of the albuminuria of pregnancy. It is to be regretted that we have no published examinations of the condition of the blood in albuminuria gravidarum qui the presence of diffusible albumens but the great frequency of complete recovery, the condition of the kidney found post-mortem varying from quite normal to conditions of considerable change lead us to study Bennnola's views very particularly in relation to our subject. And the recognized high blood tension of pregnancy with the increased work thrown on the kidney of eliminating the excrementitious matters of 2 organisms
give the data on which Mahomed bases an albuminuria in general. In the first place if accepted they permit us to dispense with the idea that in every case of albuminuria gravidarum there is necessarily present a nephritis. This will be the more acceptable because the presence of albumen in the urine is otherwise hardly to be satisfactorily accounted for. Further there would explain how it is that in a certain number of cases the disease is followed by chronic albuminuria and the presence on post-mortem examination of various changes in the kidney structure.

The most important post-mortem examinations have been made by Braun. Here were in cases of Eclampsia and in the great majority of them we may presume albuminuria to have been present, & that to a considerable extent. The results of his examinations of these cases in which the kidney was affected are summarized by Barnes. "Braun distinguishes 3 degrees of disease of the kidney. First stage: hyperæmia, capsule easily removed, plexus of veins on—  

*Barnes, op. cit. p. 395.*
Surface dilated and full of blood. The cortical substance is brownish red; the pyramidal masses are also hyperemic, injection striped. The epithelium of the tubuli is not essentially altered but is easily separable. The tubuli filled with coagulated or fluid exudation sometimes contain blood corpuscles.

In the second stage, that of exudation + commencing fatty metamorphosis, the cortical substance is of a dull yellow, the striped vascular ramifications + red spots in it disappear. Between glomeruli + capsule lies a thick stratum of firm exudation of granular structure, showing fat droplets. The interior of the epithelial cells of the tubuli is, in extreme cases filled with fat droplets, becomes turbid + at last the cells themselves are decomposed into aggregations of granules.

The third stage, that of retrogression + dissolution of the glandular substance (atrophy), the kidney becomes smaller, the surface is uneven and tuberculated.

Some observers such as De Paul state that in the autopsies they have made
the kidneys were perfectly healthy or simply congested. Braun only found the above conditions in one out of every 7 cases. These results agree remarkably with Professor Semmola's views.

We have in the majority of cases albuminuria without any Evidence of nephritis & in those cases in which nephritis occurs the steps are almost identical with those produced experimentally by him by the injection of white of egg into dogs.

The part which atmospheric influences play in the production of albuminuria gravidarum has long been recognised but has received no adequate explanation. Duck says "Conclusions may occur epidemically in consequence of atmospheric Conditions which probably interfere with the functions of the skin & thus indirectly increase the labour thrown upon the kidneys. Johnye Parker refers to this in discussing Eclampsia. He saw 3 cases in one day & 3 on another day of the same week. It is supported to a certain extent by the records of cases in the Edinburgh Maternity.

2. The Feverish Diseases. Johnye Parker. 1874. p. 112
Hospital. During the quarter of my residence, and the succeeding quarter 8 cases of albuminuria or scleranoia are given, of 3 of whom no record of the residence has been kept. Of the other 5, 3 came from Leith and 2 from Drumbridge Road.

By accepting Penicola's view these cases are easily explained by the supposition that under the influence of various winds damp and cold the metabolism of the skin is interfered with, and we have the consequent hyperalbuminuria and albuminuria.

With regard to Mahomed's theory of a toxæma and increased blood pressure there is the curious fact that Continental observers, who have found albumen in the urine of 20 per cent of women during or just after labour, only found the percentage to be 14 during the 9th month of pregnancy. This is explained by Galabin by the presence of contractions of the uterus which cause an increase in the blood pressure. During a pain the flow of blood through the uterus is greatly limited - the arterial blood fails to find

admission & a large quantity of venous blood is squeezed out of the
intestines - the 2 factors causing a considerable rise in pressure.

How far we may reconcile the two
theories of Mahomed & Semmola
and construct a single one out of
them is a matter of no great moment.

D'Alexander Haaq supplies a very
thoughtful & suggestive study in his
paper "On the connecting link between
the High Tension pulse & albuminuria" in the British Medical Journal (see
1890, vol. 1, p 65). He believes that
the presence of urie acid in the blood
causes arterial contraction & this by
lessening the supply of the skin & the
liver brings about the changes which
Semmola reports. In another paper
he says "It is easy to see in the large
& active nitro-genuous metabolism of this
period a condition corresponding to
gouty hypernutrition & entailing some
retention of urie acid which must
from time to time find its way into
the blood." This theory is extremely
interesting & may lead to considerable
results but the chemistry & pathology
of urie acid in the blood is insufficiently

O. British Medical Journal 1890, vol. 1, p 290
advanced to permit of any conclusions being drawn as yet. Beyond accepting Naege's suggestion that the high blood tension of pregnancy must cause an interference with the cutaneous circulation & thus increase the effect of any cause acting on the skin, hands, we prefer to take the two theories as they stand as being capable of explaining a great deal in the causation of albuminuria gravidarum & to leave the question of their interdependence for the time.

Without having any knowledge of Scemmola's work Gübler had suggested a theory of superalbuminuria to explain the albuminuria of pregnancy. He held that the mother produced more albumen than ordinarily & that the foetus could not consume it, consequently the excess must accumulate in the blood & be eliminated by the kidneys causing as it passes imitation of the kidney structure. This hypothesis must give place to Scemmola's more scientific theory but it is interesting as having run on somewhat the same lines.

Within recent years it has been suggested that the albuminuria and eclampsia of pregnancy have a bacterial origin. Dr. E. Blane of Lyons in the Archiv de Pharmacie of March 4th, 1879, stated that he had discovered micrococci in the kidneys of urine of women suffering from this condition. He failed to find the organisms in the blood. Cultures of these micrococci were made injected into pregnant rabbits causing albuminuria, convulsions and death. Blane thinks that the presence of the microbes and their products constitutes a zymotic disease and that the albuminuria is merely a symptom of this. This theory has received the support of Doleis, Joane and the partial assent of Galabin. They trace the entry of the organism to an endometritis. It is not to be denied that these microbes may be found in the urine bodies of patients who have died from albuminuria and eclampsia, but control experiments have succeeded in

demonstrating them to be present also in the urine of perfectly healthy pregnant women. The occasional epidemic character of the disease lends some support to the hypothesis but many other facts are directly opposed to its acceptance. The greater frequency of albuminuria and eclampsia in primiparae and plural births is inexplicable on it and endometritis is a comparatively rare disease in primiparae. The good effects of simple treatment, the cessation of albuminuria or the intrauterine death of the fetus are alike facts that cannot be explained by it. Altogether, in the meantime at least, the theory has very few supporters and little to fall back on in the way of facts and data.

Recapitulating what has been said as to the causation of albuminuria in pregnancy we think the following may be regarded as the chief causes of its occurrence.

1. By the pressure of the growing uterus upon the neck of the bladder, the ureters, the kidneys, vessels or the kidneys themselves. This theory will undoubtedly account for a certain
Small proportion of cases though not for so many as its advocates suppose. It probably acts chiefly however in the cases of primiparæ having Rhodanemia as accessory to the other factors following.

2. Vesical catarrh will explain the occurrence in a few cases.

3. Anything affecting the maternal organism which leads to an exaggeration of the normally increased pulse tension or leads to an increase of Excremenations substances in the blood may give rise to albuminuria. Such circumstances arise from interference with the digestive processes especially constipation or any interference with the excretory functions of the skin by chill or otherwise. This subject will be more fully entered into in discussing edema. The condition of multiple pregnancy, by increasing the amount of excremenations substances in the mother's blood will favour the development of albuminuria under slighter causes than in a single pregnancy.

4. Any interference with the metabolism of the skin & liver will bring about albuminuria by interfering with the normal changes undergone by the
albuminoids. This theory is not as yet accepted by the great majority of medical writers but we believe that much more attention will be paid to it in the future than it has hitherto enjoyed.

The skin has always been looked upon as a purely excretory organ but to us it is more than probable that this is only a small part of the important function it plays in the economy of the body. In this connection we may refer to the recent Harveyian Oration on "Modern Developments of Harvey's work" by Dr. Lauder Brunton. He says "We do not yet know whether the secretion of sweat which is usually looked upon as the sole function of the skin bears really, really the relationship to cutaneous activity which the secretion of bile bears to the functions of the liver." Much work in this direction has been done of recent years. The treatment of myxœdema by the injection of thyroid juice or extraction of the gland opened the way by showing that a gland with no excretory duct may have important relations to the blood stream & the general economy.

Similarly the slippolytic function of the
pancreas which takes place independently
of the product of its activity secreted
by the pancreatic duct show in its-
case an important function which has
hitherto been overlooked. Interference
with this function is now considered
one of the chief causes of glycosuria
in the same way as we regard
interference with the internal
metabolism of the skin as causing
albuminuria. Brunton further
says: 'It is obvious that if this
idea be at all correct a complete
revolution will be required in the
views we have been accustomed to
entertain regarding the action of
many medicines. In the case of
purges & diaphoretics, for example,
we have looked mainly at the
secretions poured out after their
administration, whereas it may be
that the main part of the benefit
they produce is not by the substances
liberated through the secretions they
cause, but returned from the
intestine & skin into the circulating
blood'. Now that more attention
is being paid to this aspect of
disease & therapies Semmelka's
view of the functions of the cutaneous
Fluctuating will gain in importance to
the great gain we believe of the
treatment of albuminuria as usual
of that of pregnancy in particular.
They give very precise indications of
the directions for treatment and it
will be seen that the empirical
methods which have been useful
lead themselves readily to an
explanation if these hypotheses be
accepted.

The treatment of albuminuria gravidarum
becomes of considerable importance when the
complications which may supervene are
considered. The loss of albumen of
in any considerable amount is in itself
a source of danger to the maternal
organism but other more serious
dangers may arise. The chief of these
of the one which always presents itself to the
mind on finding albumen in the urine
of a pregnant woman is eclampsia.
Periperal convulsions may arise in
pregnancy or labour without any,
preceding albuminuria but in the
majority of cases - 81% per cent - this

O. A Text-book of Obstetrics by Dr. J. Quickel,
translated by J. Clifton Edgar. 1870. p. 698
Condition precedes the development of the convulsive seizures. On the other hand in the majority of cases of albuminuria eclampsia does not supervene. Various authors put the frequency at proportions varying from 10 to 50 per cent. Fifty years ago when the association between the two conditions was first discovered it was held that they were invariably present together. Fuller knowledge has led to considerable alteration in this opinion. The discovery of cases in which eclampsia occurs without a trace of preceding albuminuria or any premonitory symptoms settles the question of albuminuria being the sole cause of the convulsions. What the precise connection between the two is we shall discuss later on—in the meantime we shall regard albuminuria as a distinct disease which may or may not be accompanied by eclampsia. However, the ever-present possibility of its coming on gives to the treatment of the albuminuria considerable importance.

Abortion or premature labour is an accident to which albuminuria frequently tends. Possibly the insufficiency of nutrition in the mother's blood or the excess of
poisonous elements in it may lead to this condition. The exact frequency with which it occurs is difficult to ascertain but it is recognized by all obstetricians as a complication which is much to be dreaded. Similarly, intrauterine death of the foetus may occur under the same circumstances.

Serous effusions are among the commonest symptoms of albuminuria. These when in any considerable amount are a source of considerable danger. The swelling of the vulva introduces a serious element at the time of delivery. Hydropericardium, hydrothorax, ascites, effusions into the lungs or brain are all to be dreaded and when they occur they become sources of grave trouble.

The possibility of permanent disease of the kidneys can never be looked upon as a safe state. We have seen that the constant passage of albumen causes an irritation which may be trifling but if continued is apt to give rise to structural changes which become permanent. A chronic nephritis may arise in this way or if such a condition does not supervene many patients are liable at each successive pregnancy to the dangers of a fresh
attacks of albuminuria. In time a chronic disease may be set up.

Paralyses of various kinds arise in connection with albuminuria gravidarum. Cerebral apoplexy may occur during pregnancy but more probably during labour it may cause death. On the patient may have one or several smaller bleedings which leave her more or less paralysed for life. A case of this kind occurred in my own practice in April 1893. The patient suffered from albuminuria + oedema during her 11th pregnancy. The labour occurred without any complication but on the 2nd + 3rd days of the puerperium she had slight attacks of right hemiplegia which left her with permanent weakness in the affected parts. Paraplegia is a not uncommon accompaniment of labour in such cases. Similarly aphasia + aphonia occasionally happen.

Among the most notable changes which may complicate albuminuria are those affecting the eye. Fear. The eye frequently shows hemorrhages of white spots - a condition known as albuminurie retinitis: atrophy of the optic disc, paralysis of accommodation +. A favourable
prognosis can be given in the majority of cases but some lead to permanent impairment of vision.
Deafness due to swelling of the Eustachian tubes or local haemorrhages not infrequently occurs. This condition, though partly recovered from, is likely to be increased with each successive pregnancy.
Add to these the various serious haemorrhages which occasionally happen such as epistaxis, pulmonary apoplexy, post-partum haemorrhage and it will be seen that the complications which may arise in cases of albuminuria are very serious. It causes us to take up the question of its treatment as a most important subject.
Treatment of Albuminuric Graevitaeum.

When any notable amount of albuminuria is present during pregnancy, the first thing to be done is to place the patient on a strictly milk diet. This was prominently emphasized first by Fauve in 1875 and in 1880 he published a paper "De l'efficacité du régime lacté dans l'albuminurie des femmes enceintes" still further insisting on its great importance.

The substitution of milk for a mixed diet benefits the patient in many ways. Demmeola has shown that the albumen of milk is the form that requires least elaboration by the skin and if the metabolism of its glands be at fault, this defect is to a certain extent counterbalanced. D'Haig has ingeniously suggested that this is due to the fact that milk is really the product of a skin gland. Milk diminishes as much as possible the formation of toxic products. It contains nothing which may be toxic. The toxemia in this way is not being constantly increased as is possible on a mixed diet. The blood is further

D. British Medical Journal 1889, vol. 1, p. 390
diluted & its toxicic condition rendered less intense by the dilution which is a necessary consequence of the ingestion of a sufficient quantity of milk to maintain good nourishment. Tannier & Even gives milk by means of a stomach tube in severe cases with threatened eclampsia to attain this dilution. The large quantity of water contained in it also acts as a diuretic & leads to the excretion of some of the toxic substances present in the blood. For all these reasons milk diet is to be strongly recommended whether our theories of its action be correct or not. It is of undoubtedly service in the treatment of this condition. In very severe cases the food should consist exclusively of milk but in less serious conditions it may be combined with starchy materials such as corn flour, sago, arrowroot etc.

Another line of treatment, directed to act on the skin should always be combined with this. Following the suggestion that the condition was due to kidney disease the attempts to bring the skin into action as an alternative excretory organ have
long been used. Dr. Wiener 2 says that the best method is to give daily a hot bath at 100°F. To wrap the patient afterwards in a hot blanket, this will cause diaphoresis for 2 hours. He says: "This treatment enables the granda to go to term without injury to the child." Or the use of the hot air bath for 20 minutes—daily in severe cases, twice a week in milder ones—will do equally well. These measures are better than Turkish baths taken away from home which are never quite free from danger.

The diaphoresis produced in this way undoubtedly does service by the elimination of excretory products from the blood by relieving the overtaxed kidneys of some of their work. But remembering what we have said in discussing Semnola's views of albuminuria it would seem that it is more than probable that a considerable

—if not the main—part of the utility of this method is to cause an increased action in the metabolic activity of the skin whereby the albuminoids are enabled to undergo their normal changes. Done 2

2. Bernheim, op. cit. p. 68
writers have objected to the production of diaphoresis on the ground that the blood serum is in this way concentrated of the relative toxicity of the blood, increased. But it is more probable that the action of the batho fully compensates for this by the increase of what we may call the interval metabolism of the skin and if milk diet is being given the fluidity of the blood will be fully kept up. The importance of these two measures - milk & batho - cannot be too much insisted upon. By their means alone, many cases of albuminuria in the early stage can be completely relieved and the pregnancy go on to term without any further complication. Many other measures however are to be taken as accessory & often necessary in the management of such cases. The impoverished condition of the blood in many cases requires the use of iron to maintain its proper functions. The albumia hydrenia of normal pregnancy are considerably increased. Almost all cases are benefited by its administration to a certain extent. The use of diaphorotics such as Acetate of Ammonia has been advocated
It is distinctly of benefit but the baths supply the same action in a much more satisfactory and efficient way. The use of pilocarpine from its depressing action on the heart and liability to produce pulmonary congestion cannot be recommended.

A copious daily evacuation of the bowels by means of saline laxatives must be produced. Waste products from the blood can be carried off in this way and the blood tension is markedly relieved. In severe cases this channel of elimination can be still further utilised by the exhibition of cathartics.

The practice of giving diuretics such as Acetate of Potassium which may be irritating is hardly to be recommended. Water is the best diuretic in albuminuric cases if the patient is on a milk diet a sufficient quantity of this will be absorbed to flush the kidneys without any additional drug.

So far then we have recommended milk diet, baths, iron and laxatives. With these must be enjoined a strictly physiological life on the part of the patient. The body should be
enclosed in flannel from head to toe to avoid any possibility of chill to the surface of the skin. There must be no exposure to cold or dampness, no fatigue from household duties or otherwise on the part of the patient. All sources of emotional excitement should be as far as possible removed. Absolute rest for a time is very beneficial and no long period of fasting must be allowed. All the rules for the management of a normal pregnancy must be followed carefully. Moderate exercise—not to the point of fatigue—will be very useful if not otherwise contraindicated.

The use of digitalis is recommended by Barnes® in cases where there is excess of blood tension but if it is used it must be in small doses and careful watch kept for any slowing of the heart’s action. We think its use can be omitted in the great majority of cases.

These measures are applied to ordinary cases of a considerable proportion of albumen in the urine. Other measures must be applied in very severe cases where there are premonitory signs of
serious complications. These consist
of venesection & cupping and as a
last resort the induction of
premature labour.

Venesection in albuminuria & eclampsia
is undoubtedly a question vexata of
modern obstetrics. Weickel² says he
has long given up its use in both
conditions. Fordyce Barker & Barnes
of many others however consider it of
great value in extreme cases more
especially as a prophylactic against
the occurrence of Convulsions. This
question we shall consider later for
the meantime we shall discuss its
relations to the albuminuric state.

Obviously a venesection will rehile the
blood of a certain amount of toxic
matters but the proportion of blood
withdrawn being so small compared
with the rest of the blood we cannot
assume that this is its chief action.
More probably, the undoubted benefit
which follows in some cases is due
to its effect in lowering the blood pressure
which according to Mahomed is the

² Weickel. Of. cit. p. 576
³ Fordyce Barker. Of. cit. p. 80
⁴ Barnes. Of. cit. p. 409
chief cause of the passage of albumen. In this connection a most interesting case has been recently published by Sir John Williams. The patient had suffered from albuminuria & eclampsia in her first pregnancy & albuminuria in her second and premature labour was induced in each case with the death of the child. In her 3rd pregnancy she again became albuminuric in the 7th month. The albumen amounted to one fourth. She was bled this time to cure. "Relief followed immediately. The distress ceased, the turgescence of the face vanished & in 24 hours albumen had entirely disappeared from the urine." This was repeated 3 times at intervals of a week & in each case was followed by a like gratifying result.

Venesection we may conclude is beneficial in a certain - not large - proportion of cases where the indications are high tension & heart failure but it would be unwise to use this measure in the case of weak women & it should always be done with caution.

Along with it Cupping of the loins may be tried in cases of a great

quantity of albumen. In this way the longest state of the kidneys may be relieved - a measure which would be beneficial on any theory of albuminuria.

The last measure that calls for consideration is the induction of premature labour. The advisability of this procedure can only arise in very extreme cases. Opinion is again very much divided on this point. Werrick considers the practice "obsolete" but on the other hand several authorities strongly recommend it as giving the best chance both for mother and child. Barnes, Lush and Galabin are all in favour of it in the presence of grave symptoms such as serious damage to the eye, paralysis, heart failure etc. In these cases many patients may be saved from becoming the victims of chronic Bright's disease or permanent paralysis, blindness or deafness etc. in individual cases the operation is not only justifiable but necessary. Each case must be considered on its own merits.
Eclampsia Gravidarum.
Puerperal eclampsia is characterised by the occurrence of epileptiform convulsions. The similarity between these convulsions and the uræmic fits of Bright's disease was first pointed out by Freichs in 1861. In the former disease there is albuminuria generally present & anasarca and the idea naturally arose that eclampsia results from the association of Bright's disease with pregnancy. Puerperal convulsions came to be regarded as having the same causal connections as the convulsions met with in certain cases of Bright's disease and like these were put down as being due to the retention of urea in the blood. Freichs's words are quoted by Luck: "The eclampsia occurs only in pregnant women suffering with Bright's disease & it bears to the latter the same causal relation as convulsions & coma in Bright's disease in general; it is the result of the uræmic intoxication, with which also in its mode of manifestation it agrees."

To this theory Carl Braun gave his valuable support & for many years the two conditions were regarded as being identical.

During an attack of eclampsia there is

D. Luck. op. cit. p. 571
a lessened secretion of urea by the kidneys. This fact has been proved often
by none more conclusively than Dr. Hermann in his series of carefully recorded cases
placed before the Obstetrical Society of London. In all the 12 cases he examined
the excretion of nitrogenous matter was absolutely diminished and in most
the percentage was diminished also.
Does it necessarily follow that there
is an increased quantity of urea in the
blood? And would the condition of
uremia cause convulsions?

Dr. Winkel® expresses himself strongly to
the effect that there is no excess of
urea in the blood or important organs.
He says: "In many cases - we have
noted several in our clinic - absolutely
no retention of urea could be found
in the most important organs, especially
in the liver and the muscles; on the
contrary, these contained less urea than
ordinarily; further in those cases of
eclampsia which recovered, the amount
of nitrogen excreted in the urine was
only equal to the minimum quantity
excreted in a state of absolute hunger."
affirming that urea is found in the
blood in excessive proportion in the
albuminuria & eclampsia of gravidae.
Barnes considers the fact to be well-
attested & says that Gegenbauer and
George Harley were amongst the first to
prove it. Barnes himself found urea
uric acid in the blood of a patient
whom he had bled. Similarly, most
writers believe that during eclampsia
the quantity of urea in the blood is
increased & we may provisionally
accept this conclusion. For, as regards
the immediate point at issue, the
mere presence of urea in the blood is
of slight importance unless it can be
proved that this would bring about
conclusions. This has been long
disputed & many experimenters have
been at work in connection with it.
Claude Bernard injected large doses
of urea into the veins of animals &
failed to produce conclusions & many
experimenters following him have failed
to produce toxic phenomena either in
this way or by causing the animals to
infect quantities of urea with their
food. Gehaut & Quinquaud produced

Convolusions in dogs by injecting urea but the quantity required was from 1/100 to 1/30 of the body weight and in man this same proportion would necessitate a minimum of 12 lbs.
The largest quantity of urea recovered from the blood of a uremic person has been 3 oz. and therefore only 1/3 of the requisite minimum amount.
Apart from experiments we have the valuable evidence of patients suffering from uremic cancer, in whom the ureters are invaded and there is necessarily produced urinary suppression yet in these cases of true uremia convulsions do not occur. The theory that pre-renal convulsions are due solely to the presence of urea in the blood must be abandoned.

Another phase was given to this theory by the explanation that it was the carbonate of ammonia developed by the oxidation of urea in the blood that caused the convulsions. In this both Jernits and Carl Braun brought important evidence. Braun states

"Eclampsia parturientium is commonly the result of uremic intoxication arising from Bright's disease and produced.

Dr. John S. Barker, of cit h. 106
That was decomposed into ammonium carbonate.

Further Petroff's experiments show that the intravenous injection of ammonium carbonate, even when the ureters were tied, produced only short convulsions with no further bad effects, that the same effect was produced by carbonate of sodium.

In true cases of ammoniuria such as arise from absorption of decomposed urine from the bladder the symptoms are altogether different from those of eclampsia.

The theory then that puerperal convulsions are due either to the presence of urea or of its product ammonium carbonate in the blood falls to the ground.

At the same time the condition of the blood must be considered as a factor of primary importance in seeking for an explanation into the consideration of this we propose to enter.

Take first the condition of things we find physiologically, i.e. in this connection, in a normal pregnancy.

O. Wiedel op. cit. p. 688

The total quantity of blood in the organism is increased, more especially in the second half of pregnancy. This is a physiological necessity as the uterus, which is a very vascular organ, undergoes a great increase in size and the mother's blood has also to nourish the foetus through the placenta. This increase has been experimentally proved by Spiegelberg in the case of bitches.

Along with this increase in the total quantity, the specific gravity is notably decreased, always 3 or 4 degrees and sometimes as much as 6. This is due to the relative increase of water. In the non-gravida the proportion of water is 79% to 1000 cc. according to Pagenault 81.7% to 1000 in the two latter months but this increase is marked all through the period of gestation. This hydrenic condition is of considerable importance in the discussion of the causation of the complications.

The number of red cells in the blood notably diminishes and the average fall is approximately 25 per cent. - this is most marked at the latter end of pregnancy.

The amount of fibrin diminishes

2. Luck, op. cit. p. 89
materially during the first 6 months but after that it increases in quantity and along with the diminished amount of fibrin we have a decrease in the quantity of albumen.

As also the excrementitious matters of the foetus must be carried off by the mother's blood stream it will be seen that the blood undergoes considerable changes in a normal pregnancy. It is in greater volume, more watery, diluted, deficient in the more vital qualities, overcharged with excrementitious matters. It is a relative anaemia.

What further changes does the blood undergo in a case of eclampsia? The changes in the blood in various conditions, notably the so-called anaemia of Bright's disease and eclampsia, have been the subject in late years of various experimental researches by Jezly + Ritter, Bonhard, Defrime and Tarnier + Chambrelent.

Jezly + Ritter led the way by a series of experiments in 1851 directed to show the results of the injection of fresh urine or its various constituents into the

1. Barnes op. cit. p. 208
2. Pasqually, op. cit. p. 76
blood-stream. They proved
1. that the intravenous injection of fresh
wine causes convulsions coma & death
2. Their results are independent of the
increased pressure produced by the injection
of the organic constituents
3. The inorganic substances injected
separately produced the same symptoms
as the wine itself & that of these the
Potassium salts showed the most powerful
toxic action.
Furher they showed that while the wine
of healthy people is toxic that of certain
patients is not
Bonchard ° in 1885 dissociated seven
substances in the blood having
different physiological actions on rabbits.
These are found in the blood in health
but are not present in great proportion.
He says that these various toxic
substances in the blood have four
properties
1. The products of tissue metamorphosis.
2. Toxic materials produced by secretory
organs such as bile saliva &
absorbed by the blood.
3. Food derivatives especially salts of
potassium
4. The products of intestinal putrefaction
° Bonheur op. cit. p. 20
absorbed by the blood. Experimenting in the same way, Tarnier & Chambrecut presented to the Société de Biologie in 1892 in a "Note relative à la recherche de la toxicité du sérum sanguin dans deux cas d'éclampsie puerperale" a valuable contribution to the condition of the blood in eclampsia. They found 1. That the toxicity of the blood serum is considerably increased in the case of eclampsia.

2. This toxicity is in inverse proportion to the toxicity of the urine from the same cases. Tarnier argues from this that eclampsia represents a true poisoning of the blood. In a paper in the "Journal des Fées-Femmes" January 1st 1894 he repeats his proposition and maintains that the blood of an eclamptic is absolutely poisonous.

Doléris again in 1886 extracted a crystallloid substance from the serum of eclamptics which caused toxic effects when injected into rabbits 1 caused lesions having a close

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1. Prenbergen, op. cit. p. 18
2. British Medical Journal. 1894 vol. 86, p. 163
3. Prenbergen, op. cit. p. 17
resemblance to eclampsia.
In the face of these researches we must conclude that - whatever the cause may be - the blood of eclamptics is poisonous. We have to deal with a condition of toxemia.
This theory has been held almost from the beginning of scientific researches into the nature of eclampsia. Sir J.F. Simpson wrote in 1862 in an article in the Edinburgh Monthly Journal of Medical Science - "And it may be that the premonitory oedema, headaches &c. and the actual convulsions themselves ... and the albuminuria are simultaneous or successive effects of some one common central cause - viz., a pathological state of the blood, to the occurrence of which pregnancy in some way peculiarly predisposes, probably from various acts of secretion, nutrition &c. of the patient being vastly increased & altered by the condition of intra-uterine existence." His belief has been entertained by almost all philosophical thinkers on the subject. The above quoted researches place the theory or firmly established.
The next question that arises is—what are the substances present in the bloodstream which cause this excess of toxicity?

Several suggestions have been made that the toxemia arises from the retention in the blood of various substances normally eliminated by the urine. We have already discussed the theories that it is due to the presence of urea and of ammonium carbonate, but we have seen that neither of these is able to explain the origin of the convulsions. Schottin and Fleischer both suggested that the toxic substances present in the blood are the extractive materials of the urine. Fleischer proved that the injection of the substances into animals caused toxic symptoms but there is far less chemical evidence of their presence in excessive amount in the blood and their dangerous character if there than there is of urea which we have seen already can be discounted. Possibly further researches may show that they are of importance but in the meantime we cannot accept them as being the sole cause of the toxemia.

1. Walker-Brière, op. cit. p. 36
2. Wrinkel, op. cit. p. 689
In this connection we may mention the theory of Stumpf— that convulsions are due to the presence in the blood of acetone or some allied body. He found sugar present in the urine of many eclamptic patients. From this he suggested that by an abnormal process of decomposition some such substance as acetone may be formed in the blood, as is supposed to be the case in diabetic coma. This acetone by irritation during its excretion may produce a nephritis and from irritation of the brain produces coma & convulsions.

Very little experimental evidence is given in favour of this suggestion & the pathology of diabetic coma is not sufficiently advanced to allow us to argue from it in the case of puerperal convulsions, especially as sugar is not by any means universally present in eclampsia.

The most comprehensive of these theories of retention of urinary products is that it is the retention of the urine as a whole—urinœmia—which causes the toxœmia. This finds many supporters & many facts make strongly in its favour.

In the large majority of cases of eclampsia the amount of urine excreted is greatly diminished. The total quantity eliminated is one of the most important prognostics.
signs. If the quantity diminishes
danger is always to be feared. In all
cases that recover, the quantity of urine
excreted is on the increase. This is a
much more important point than the
quantity of albumen which is eliminated.
In this connection it may be mentioned
that in the experiments of Tassign and
Chambrelant quoted above a third
patient was afterwards examined.
The urinated more than the other two
though the toxicity of the serum
was increased over the normal it was
not so great as that of the first two
cases.

Seeing then this relation of quantity of
urine to danger to the patient it may
naturally be supposed that the
retained constituents of the urine form
a primary cause of the toxemia.

We have seen above that there is
probably an increase in the quantity of
urea in the blood. Other observers
have found uric acid present in the
blood also. Although these substances
cannot, we believe, of themselves
satisfactorily account for the conclusions
they indicate that the kidney is
overpowered that some at least of the
-
O. Bernheim, ibid., p. 18
Constituents of the urine are retained.

Urinemia is the theory of Peters in France & Barnes in England. Barnes aptly calls it the result of a kidney "strike". We have seen that in albuminuria - a condition which precedes 84 percent of cases of eclampsia - we have by the constant passage of albumen across the renal filter a more or less considerable amount of irritation set up. This may not mean an actual inflammation but the functional efforts of the kidney must be considerably handicapped - especially seeing that it is generally in the cases of severe albuminuria that eclampsia arises.

Taking all these facts into consideration we think it must be granted that the presence of some constituents of the urine in the blood must be taken as a part of the truth. What the particular substance or substances may be we are not entitled to say. But this is not the whole of the case. The quantity of urine is not greatly diminished in some cases & in the premonitory stages when headache, vertigo, dyspepsia &c are present there may be no diminution of urine at all.

Taking Benedikt's four sources of toxic products in the blood we see that the toxemia in pregnancy may develop in other ways.

The products of tissue metamorphosis which form his first group are eminently at work here. The mother's organism in all its parts undergoes extreme changes in metabolism. To provide nourishment for the foetus more food has to be elaborated giving a corresponding increase in excretory products, and in addition the mother has to eliminate the excretory products of tissue metamorphosis in the foetus.

It is interesting to note here that with the death of the child during pregnancy the danger to the mother is much lessened.

2. Various secretory organs such as the salivary glands and liver are often functionally at fault as shown by excessive salivation and occasional jaundice, along with various alterations in structure (i.e., Jaundice) and the absorption of products from these may add their quota. The deficient action of the skin, which we regard as an all-important factor in the production of albuminuria.

must lead to the retention of some of
its excretory products.

2. Similarly in the pregnant woman, as in any other, constipation will give rise
to the absorption of the products of
intestinal putrefaction; and constipation
is a not uncommon accompaniment of
pregnancy.

3. Also food is often more difficult of
digestion owing to mechanical or functional
interference.

And so it is possible that an increase
of toxic products may come from any
one of these four groups under any
departure from a physiological pregnancy.

We think therefore that even the
term uræmia is too small to supply
the true explanation of the presence of
these toxic products in the blood and we
shall be content simply to maintain
that in the majority of the cases of
 eclampsia there is a toxæmia.

Weickel, accurately sums it up by
dising, "There are not only very great
differences in the degree of intoxication,
but probably, also various poisons or, at
least, one poison arising in different
ways in the body of the pregnant woman
which may be the cause of this severe disease."

O. Weickel & cit. p 691
This toxemia then is an auto-intoxication produced by exaggerated production of toxins or their imperfect elimination or both. We may assume that it is a condition which is present in the great majority of cases of eclampsia.

Having settled this preliminary point we come now to consider some further theories that have been submitted to account for the occurrence of convulsions.

When it had been seen that the theories of urea or ammonium carbonate in the blood could not be accepted as the cause of puerperal convulsions the explanation known as the Traube-Rosenstein theory was brought forward. For long received as a more scientific and plausible explanation of the condition, Traube suggested the explanation in the uremic convulsions of Bright's disease and Rosenstein adapted it to the case of puerperal eclampsia. Rosenstein's paper "Die Pathologie und Therapie der Nieren-Krankheiten" was published in Berlin in 1863. In accordance with the theories then in vogue he admits that frequent congestion of the kidneys as a result of
mechanical pressure in pregnancy causes albuminuria & cæsh & often diminished secretion of urine. At the same time in the majority of cases the patient is hydramio & drophæical. further he states that in the majority of cases the convulsions occur during or after parturition & thus the parturition & the consequent disturbances of the circulation have great influence in their development. He discounts the theory of uremia by saying that there is no evidence of its presence in these cases & that in pregnant women suffering from nephritis no convulsions have occurred. Moreover there are frequent cases of convulsions without albuminuria. In view of these facts & the fact that the renal cortical nervous excitability of pregnant women especially primiparæ Combined with the condition of the blood & its tendency to frankulation, and further the frequent occurrence of oedema & anaemia of the brain in autopsies Rosenstein concludes in regarding eclampsia as a phenomenon attending the alteration of the circulation within the brain. "For under the influence of parturition through the action of the entire muscular system an enormous pressure is exerted on the arterial circulation which in the presence of a dilute serum
and acting upon the finest arterial vessels occasions edema secondary edema of the brain these may call forth convulsions.

Thus it will be seen that the theory is a purely mechanical one—the convulsions being due to edema of acute anemia of the brain—and that the immediate cause is the muscular contractions of labour.

It is an attractive explanation containing many elements that are true but it is insufficient and inadequate.

In the first place not all cases of puerperal convulsions occur during or after labour. General statistics tell us that the proportion of cases before during and after labour is 1:2:1 and so Rosenstein's explanation would fail to account for at least a quarter of the cases. Further in these statistics we do not get an analysis of individual cases. Probably in many of these said to occur during labour the parturient was premature & the convulsions may have been the exciting cause of the labour—not vice versa. Braxton Hicks has shown that during a convulsion the uterus participates in the general muscular

1. Jodice Barker. op. cit. p. 108
It may in some cases pass into a firm contracted condition for 10 or 15 minutes so that often labour may be immediately brought on & carried through. So we must consent to the fact that quite a number of cases occur during pregnancy in the absence of pains.

Further under these purely mechanical conditions it would be difficult to see why eclampsia is not much more common during labour than it is. And since the same cause of edema is acting all over the body we should expect to find that convulsions would be most frequent in those cases with most extensive edema / dropsy but this is not always the case.

Again the results of post mortem examinations do not corroborate the theory. We should expect to find in all cases edema anaemia + flattening of the convolutions of the brain. Löhlein only found this condition in 1 out of 19 examinations and as a general rule the brain conditions found are beyond the high degree of cerebral anaemia insignificant.

These objections are fatal to a cerebral source of origin due to purely mechanical

D. Laid op. cit. p. 675
Causes of the Rössensteins theory must be abandoned.

August Macdonald, in 1878 published an account of 2 cases with post-mortem examinations in which he brought forward a theory allied to Rössensteins but more feasible. He stated that purely toxic theories such as that of Frenichs are upset by the beneficial effect of a slight blood-letting. Purely mechanical theories give no explanation of cases occurring independently of dropsy or renal disease.

He contended that the essential pathology was irritation of the vasomotor centres in the medulla oblongata originating from impure blood circulating in the vasomotor centres or reflexly from impure blood circulating through the tissues. This causes a general contraction of arteries through the body. In the brain it leads to extreme anaemia of the central parts and engorgement of the peripheral portions. The central anaemia causes to the fit, the peripheral congestion the pain and coma. Generally, the source of irritation is excretory matters in the blood but any powerful peripheral irritation

might give rise to it. This accounts, according to Macdonald, for the cases with no renal disease or only trifling albuminuria. In his two cases he found the meninges congested & the venous sinuses filled with blood while the deeper layers of the brain were markedly anaemic & the ventricles filled with serum. These observations are very important & seem to us to come much nearer the truth than any that had preceded them.

An explanation of the peripheral convulsions of a purely reflex neurotic character was given by Faukenhauser of Jena. Seeing that eclamptic attacks follow various sources of external irritation as pressure of the foetal head on the cervix, digital examination, emotional causes &c. he maintained that the nervous & not the vascular system was the starting point of the convulsions. Further he stated that he had demonstrated a direct connection by means of the sympathetic nerve between the nerves of the uterus & the renal ganglia. In this case he regards the albuminuria as being due also to reflex irritation.

J. J. F. Barker, op. cit. p. 111
This explanation of albuminuria we have dealt with above I have not seen any reason to accept it. The other part of the theory relating to the actual occurrence of the convulsions is much more likely we believe contains a part of the truth.

Gathering together the known elements of puerperal convulsions we think it must be admitted that eclampsia has no uniform etiology any more than a uniform clinical history. We regard it as being caused by the concomitant action of three elements.

1. First of all we have the normal increased excitability of the nervous system during pregnancy. The autonemia, hydroemia which are constantly present lead to imperfect nutrition of the central nervous system. In this condition things that would otherwise have only a slight or no effect on the nervous elements are followed by serious results. Barnes well illustrates this by the analogy of the strychnized frog. If a full toxic dose of strychnia be introduced into the circulation the frog if absolutely undisturbed will lie quite
motionless. But any slight irritation such as a prick or a shake of the table will provoke fits which may prove fatal under a dose which would be innocuous if the animal were left undisturbed. So it is in puerperal eclampsia. The anaemia & hydroaemia lead to a highly irritable condition of the nervous system. Fits may be brought on by slight exciting causes such as vaginal examination, labour pains, the passage of a catheter or any manipulation of the patient which would otherwise be perfectly harmless. Any sudden emotion as joy or fear or grief may have the same effect. Pregnant women are particularly prone to diseases of a similar nature. The vomiting of pregnancy may itself be regarded as a Convolvulus Sigoor - when occurring within normal bounds an essentially conservative one but if excessive constitute a real danger.

2. The second factor at work is the abnormally increased vascular tension. A pulse of high tension is characteristic of pregnancy, & we have seen that in albuminuria which precedes 84 percent of eclampsia cases, this is considerably increased. Macdonald
suggested that this is caused by irritation of the vasomotor centres by toxic products circulating in the blood. However, produced high tension is a clinical fact in eclampsia which has been well-attested by all. Several factors may occur to increase the normally heightened tension of pregnancy. A chill by constricting the blood vessels of the skin – one of the commonest causes of albuminuria – will affect this. Similarly, constipation or any plethora will bear a part in its causation.

The high tension of arterial contraction produced are characteristic of many convulsive disorders. Passing over the uraemic convulsions of Bright’s disease we have the condition of the arteries in epilepsy – an attack of which presents close resemblances to an eclamptic fit. Sir Wm. Broadbent in speaking of epilepsy says: “I look upon convulsive attacks, when they occur in connection with an infrequent pulse, as a result of cerebral anaemia, produced in exactly the same way as the convulsions after great hemorrhage.”

Seeing that this contraction of cerebral arteries is consequent anaemia of d. “The Pulse” by Wm. Broadbent p. 120
is sufficient to cause the convulsions of epilepsy in a person of otherwise good health it is all the more likely to lead to convulsions from slight causes in a condition of the nervous system which we have just described as being present in patients suffering from eclampsia.

3. The third factor we have already discussed in detail—it is the toxæmia. This is probably, in the majority of cases, the most important factor. We have seen how it may arise from the increased production of toxic products and their retention. It greatly aggravates the heightened nervous excitability by imperfect nutrition and increases the vascular tension by irritation of the vasomotor centres.

In many cases toxæmia must be regarded as the immediate exciting cause of the convulsion. It is conceivable that the nervous system can perform its normal functions under a certain amount of strain from imperfect nourishment by an impoverished blood but an advancing toxæmia would render this more and more difficult, when the toxic condition reaches a certain extent—
no further element is needed to cause an outbreak of uncontrolled nervous energy such as a typical eclamptic fit.

But probably most often we have in addition some element acting as an exciting cause. This is borne out by the fact that half the cases, according to general statistics occur during the process of parturition. The labour pains themselves may be the immediate cause of such an increase in the already exaggerated vascular tension of excessive nervous excitability as to produce the explosion. Excessive distension of the uterus or retention of urine may act in like manner. In the same way anything that interferes with normal parturition头脑's about a laborious labour may act as the exciting cause. During pregnancy a fit of indigestion or constipation a moral shock or fatigue or excitement may have the same result. Briefly anything which will increase the action of any one of the three elements above may act as an exciting cause of the particular fit.
What is the relation of the actual conclusions to albuminuria? In discussing the latter subject we saw that eclampsia in 84 per cent of cases is preceded by albuminuria. Further, that in the majority of cases of albuminuria eclampsia does not supervene. We think the relation can best be expressed by saying that the causes of albuminuria are sometimes such as to be able to produce further effects in the way of conclusions.

If we compare what we have regarded as the causal elements of the two conditions we shall find many things in common. High vascular tension is characteristic of both. In discussing albuminuria we laid much stress on the imperfect action of the skin as regards its internal metabolism in addition to its excretory function. These two functions probably go together and when one is at fault most probably the other varies directly in the same way. So that with the production of inassimilable albumens & albuminuria on the one hand we should get the retention of excretory products on the other - one of the causes of the toxemia of eclampsia.
Similarly, the passage of albumen in the high-blood tension in the former condition lead to changes in the kidney of a temporary nature at least if carried on to a certain extent will bring about a diminished secretion of urine lead to a condition of urinemia — another element in the causation of Eclampsiae toxemia. Indigestion, defective action of the intestinal glands will act in the same way in each of the two conditions. So we see that the causes of albuminuria acting in greater degree or in excessive amount may bring about the condition of things found in eclampsia.

But we have still to explain another important group of eclampsia cases — those which are not preceded by any albuminuria. Braxton Hicks in 1866 in a paper entitled "A Contribution to the Pathology of Puerperal Eclampsia" was the first to draw attention to this class of cases. He gives four and typifies them by taking the case of a woman approaching the full period of pregnancy apparently in perfect health, without edenma, without albumen in the urine, being suddenly seized with

An epileptiform attack. After a certain time has elapsed albumen is noted in the urine, at first in small quantities, shortly in profusion; then blood flecks, casts of epithelial cells, are found in it.

At this time the urine becomes seared; of high specific gravity with very high coloured crystals of lithic acid in considerable quantity. The case is now one of acute destructive nephritis.

The theory then held was that all eclamptic fits were the result of paresia. He shows that this explanation cannot be accepted in these cases as there are no antecedent signs of paresia present. He holds that one of 3 modes of explanation must be accepted. 4.

Either 1. The convulsions themselves are the cause of the nephritis.

2. The nephritis & the convulsions are produced by the same cause. E.g. Some detrimental ingredient circulating in the blood, irritating both cerebral spinal system & other organs at the same time or

3. That highly congested state of the venous system so is produced by the spasm of the vessels in eclampsia is able to produce the kidney complication. He concluded that the
Then state of obstetric knowledge would not allow him to decide which of these was the true explanation.
Reading albuminuria for nephritis we venture to believe that the second explanation is in the majority of cases the true one. The same causes which have produced the eclampsia further act in producing the albuminuria. Looking upon high vascular tension + nerve tension + toxæmia as the causes of Eclamptic fits there is no necessity that these conditions should first have produced a condition of albuminuria. We may have any one or all of these at work without any passage of albumen in the urine and we think that now that uræmia + nephritis may be given up as the cause of every case of Eclamptic Convulsions there is no difficulty in seeing this. But when these conditions are of such intensity as to produce a convulsive outbreak + further when they are aggravated by the actual occurrence of a fit they will in all likelihood produce such changes as to occasion the passage of albumen in the urine.
There are still some cases that are neither preceded nor followed by albuminuria to account for. These are admitted to be of very rare occurrence, perhaps their frequency in statistics would be considerably lessened if a more careful and detailed examination of the urine were systematically made. But under the conditions brought about by pregnancy, in certain women we cannot be surprised that convulsions should occasionally arise. A highly neurotic individual placed under the circumstances of high vascular tension with emotional influences strongly at work as in primiparity illegitimacy, it may exhibit these symptoms without the necessity for any great amount of toxemia.

Jodryce Barker says, "I believe that we meet with convulsions developed by emotional causes unassociated with any anatomical lesion, except so far as the general system is modified by the condition of pregnancy, precisely like in all respects those associated with albuminuria toxemia."

Some writers have even classed this group by itself under the name of —

Jodryce Barker et al, 165
"Hysterical Seizures" or "Reflex Seizures." Others again, e.g. Sir John Williams, explain some cases as being the only expression during lifetime of epilepsy in the patient—the attack being brought on under the peculiar exciting conditions present.

But we prefer to bring these cases into line with the others by putting them down as due to the vascular and nervous elements alone in a patient strongly predisposed to abnormalities of the nervous system. In the treatment of these cases these elements must be remembered. Remedies directed accordingly, relying chiefly on sedatives.

2. Practitioner, January 1875, p. 6
Treatment of Eclampsia Gravidarum.

It will be admitted by all that the most important phase of the treatment of eclampsia is the prophylactic treatment. The convulsions themselves are so often attended by disastrous consequences that all efforts must be made to avoid them in cases where we have any premonitory warning.

The most important premonitory symptom is albuminuria, and the treatment of this condition detailed above forms the prophylactic treatment of eclampsia in cases where it is found. In addition other measures must be employed if signs show that the convulsions are imminent. Such are rapidly increasing anemia, sudden loss of consciousness, vertigo, severe hemianopia, flashes of light before the eyes, sounds of ringing in the ears, etc. If these occur during pregnancy, they are to be met by an increased attention to the details of the treatment of albuminuria, by the exhibition of such drugs as chloral hydrate, bromide of potassium to soothe the excitable nervous system. By means of these measures it may be possible to continue the pregnancy, until such
time as the child is viable.
The question of the induction of
premature labour may arise at this
stage. Under very grave conditions it
may become an absolute necessity.
When the patient is suffering from
severe albuminuria with oedema diphtheria
pyrexia blindness or paralysis 1 of all the
above measures of relief have proved
unavailing it becomes the duty of the
obstetrician to terminate the pregnancy
as quickly as possible. In this
way the mother's life may be preserved or
she may be saved from permanent
paralysis or injury to the eye or kidneys.
At the same time every precaution must
be taken to prevent the measures carried
on from bringing about a consumptive
outbreak 2 to this end every manipulation
must be performed with the patient deeply
under the influence of chloroform.

In cases not preceded by albuminuria
there are sometimes no premonitory
warning whatever 3 of course no
prophylactic treatment can be
undertaken. But even though there
be no albuminuria the cerebral
symptoms may supply evidence of a
warning character. Under these
circumstances the rules as to sedatives
purgatives to aid induction of premature labour as a last resort must apply.

When the premonitory symptoms are present during labour almost all authorities are agreed that everything possible must be done to expedite its progress. In the same way, all manipulations must be carried on with the patient deeply anaesthetised.

The actual treatment of the condition is a question which has evoked very different opinions from various authorities. Barnes is very decided on the principles of treatment. He states that the principles of treatment flow logically from the obvious etiology of the affection. In the whole range of medicine there is probably no case in which the disease so clearly dictates the treatment.

And yet to the measures which he — strongly advocates — bleeding induction of premature labour is not less an authority than Wickel gives a direct negative.

We propose to consider in turn the various measures that have been employed in the treatment of this condition.

© British Medical Journal. 1891 vol 2 p.988
1. Probably the most ancient of all methods is that of venesection. Before the days of chloroform anaesthesia it was almost always employed. Barnes says: "It is undoubtedly the most powerful and prompt resource at command for lowering the high vascular tension — a primary cause of the eclampsia." Duck writes: "The special advantage of venesection lies in the rapidity of its action; incidentally it favours absorption and renders the patient more susceptible to the influence of other remedies." It forms therefore naturally the first step in the treatment of eclampsia. Jospe Barker argued in favour of its use. Whilst Galabin reserves it for extreme cases where all other means have failed, or for extreme venous congestion of the lungs, Winkel has abandoned its use altogether. Examples might be multiplied in this way of authorities who have praised or condemned the practice.

It cannot be maintained that bleeding acts beneficially by extracting along with the blood a quantity of toxics.

1. Barnes. M. J. h. 410
2. Duck M. J. cit. h. 579
because the proportion of blood removed to that left behind is very small. Its supporters have advocated its use mainly on the ground that it lessens the vascular tension which is so greatly increased. Undoubtedly this is a very beneficial effect and does tend to check the consequences for a time or render them less severe. But its effect is very evanescent. The effused serum is quickly absorbed and makes the blood pressure as great as before while the quality of the blood now circulating is proportionally deteriorated in quality. And further if cerebral anemia be regarded as the cause of the consequences it would seem to be distinctly contra-indicated. In the face of these facts if other methods of treatment venesection must be relegated from the first rank and take place as a measure to be used only under extreme circumstances or when no other means are available.

2. Although bleeding as a means of lowering the blood pressure cannot be generally recommended the Employment of purgatives for the same reason receives the support of all. When the patient is conscious any
hydrosol super cathartic such as Salazopyrine may be given but if she be in an unconscious condition it is better to give elaterine in butter or 2 drops of arsphen oil. By active purgation the arterial tension is lowered without the danger of weakening the patient so much as by venesection. Further than this it may remove a local exciting cause of the convulsion by getting rid of an accumulation of faecal matter in the bowel. But possibly its most important action is the removal from the system of some of the various toxic products circulating in the blood. The relief that follows these measures is often seen in a striking degree. The sensory phenomena disappear the nervous system is calmed.

In addition to purgation other measures aimed at the elimination of poisons and the lowering of blood pressure must be used. These were described under the treatment of albuminuria. In women with eclampsia, Dr. William has declared itself— they must be carried out with renewed vigilance. Hot air or hot vapour baths to bring the skin into action should be used immediately. These can be combined with the
administration of Liquor Ammoniae Acetatis or any diaphoretic.
For a like result the hypodermic injection of pilocarpine is strongly recommended by some authors. It produces a profuse perspiration but as its use is attended by a depressing effect on the heart & tendency to pulmonary oedema its general use cannot be recommended. Further in comatose patients the profuse salivation attending it is not without danger as the secretion may asphyxiate the patient by getting into the lungs & trachea. Still, where it is impossible to give baths such as described under favourable individual circumstances pilocarpine may be used.
Besides bringing into greater action the bowels & skin to relieve the blood tension & diminish the toxemia it is advisable as soon as possible to re-establish the suspended action of the kidneys. If the patient can swallow considerable quantities of milk may be given as described under the treatment of albuminuria. Fauquier even prescribes milk by means of the stomach tube in unconscious patients to dilute the toxemic blood & act as a diuretic.
Under these circumstances weak hot tea is a most admirable and un-
irritating diuretic & the patient may be permitted to take as much as she
likes. In unconscious patients or where there is much vomiting digitalis
fomentations to the abdomen *flions*
form the best means of introducing this drug into the system.

3. By far the most useful remedy is the administration of chloroform.
Since its introduction the treatment of eclampsia has been revolutionised
and the method of bleeding has been almost entirely superceded. As soon
as possible after the first fit the patient is placed partly under its influence and
when there is any sign of another convolution coming on the anaesthetic is given to the
full surgical extent. Afterwards the patient is allowed to come partly "out",
the anaesthetist being always ready to push the drug on any sign of an approaching
paroxysm. In this way the chloroform may be given for hours without danger
of this should be done so long as the patient shows signs of the possibility of
further convulsions.

By this means the arterial tension is
lowered, the face becomes less engorged & the breathing less stertorous. The reflex excitability of the nervous system is lowered or almost abolished & the patient is unconscious & is subject to no exciting cause due to perception or emotion. It shortens the attack of each individual fit & given in the way described above it often averts a fit or certainly diminishes its intensity.

Further it permits of our carrying out any manipulation that may be necessary without running the danger of causing an outbreak. Many indications are in this way fulfilled & chloroform must be regarded as one of the most useful means at our disposal.

Acting in a manner closely allied to chloroform is the use of chloral, introduced into the treatment of hydrophobia in 1869. Wrickell seems to regard it as even more important than the former. Whenever an attack has occurred he gives 1 to 2 gm. per enema & puts the patient under chloroform until the chloral shall have had time to act. Further after each fit he again gives 1 gm. by the rectum & is not afraid of giving even 12 gm. or more.

O. Wrickell, cit. p. 676
in the course of a day. He quotes a mortality of only 7 cases out of 92 under this treatment alone. In this country chloral is usually given more cautiously and not in such large quantities. So pangs along with the same quantity of bromide of potassiac are given in one or two doses per rectum it is found that when the patient is fully under its influence the administration of chloroform can be intermitted or the quantity required lessened. If necessary the dose of chloral + bromide may be repeated in a couple of hours but any further dose would be considered unsafe.

Morphine is often exhibited for the same reasons as chloral. Joddy Barker preferred it to the latter but twice then (1874) with greater experience of the new drug the concensus of opinion seems to be in its favour. Being given hypodermically we can be sure of the action of morphia than that of chloral given per rectum. It is sometimes given in heroic doses - $\frac{1}{2}$ at a time & even as much as $\frac{3}{4}$ in the course of a day. But seeing the excellent results that

C. Joddy Barker, of "ib. p. 117"
are obtained by the chloral treatment. There seems to be no necessity to have recourse to the more dangerous drug.

Nitrite of amyl and nitroglycerine have also been given with a view of relaxing the muscular spasm of a fit. Robert Baines recommended nitrite of amyl in his Lumleian Lectures of 1873. A successful case treated by nitroglycerine was reported in the British Medical Journal for 1882.

It might be thought that by relaxing the contracted arterioles of the brain we should do away with one of the primary causes of the fit. But the high tension which it culminates in a convolution is a condition which has lasted for a long time in the majority of cases and as in nephritis and glomerular convulsions, these same remedies have not been found to have the beneficial results we might a priori have expected.

Veratrum viride is a drug which is extensively used in America. It was recommended first in the American Journal of Obstetrics in 1871 by D. J. Jeans of Brooklyn. It is claimed that

D. Barnes, op. cit. p. 411
D. Luck, op. cit. p. 579
the drug impairs the permeability of the
nerve-motor nerves & causes the blood
vessels to lose their power of contraction. 
It also causes pericardia. The drug
has been little used in this country, but
much more experience will be required
before it can replace well-tried remedies.

Of all sedatives chloroform and
chloral take rank as the best. Others
should only be used under exceptional circumstances.

4. The most recent proposal in the
treatment of eclampsia is the
hypodermic injection of salt solution.
This procedure was proposed in a paper
read before the Obstetrical Society of
France by Porak & Bernheim. Further
details of the method & its results
are given in a paper by Bernheim
entitled "Traitement de l'Ecclampsie
Puerperale et en particulier par les 
injections hypotaliques d'eau salee" (Paris 1893). He maintains that the only
sound pathological doctrine of eclampsia
is to regard it as a toxemia.

Accepting Tarnier's teaching that
treatment should be directed to dilute
the blood serum & promote diuresis
he maintains that the method of
doing this by introducing milk through a stomach tube is not only difficult but is also too slow in its action. In many cases, if these most serious, it is difficult to introduce the tube and maintain it in position. Consequently, he proposed to introduce subcutaneously a considerable quantity of salt solution for the same purpose. His method had already been employed in cases of haemorrhage, cholera, various poisoning but the object in these cases was different. To the questions as to whether the injections have a diuretic effect he answers that they increase the blood pressure and diminish the velocity of the current, so that the kidney secretion is in direct proportion to the blood pressure and in inverse proportion to the velocity of the current.

A litre of water containing 7 to 7.5 g of sodium chloride, sterilised or boiled, at a temperature of 57.5 to 58°C is introduced into the cellular tissue of the buttock by any aseptic apparatus. Twenty minutes is taken to introduce the fluid which may be all in one buttock or in the two. There is generally a swelling at the sight of injection.

O. D. cit. p. 82
which lasts for about half an hour - the
operation is accompanied by no pain
followed by no ill effects whatever.
He then gives the clinical results of
14 cases. Six of these with complications
were treated by milk alone - all
recovered, a good prognosis having been
given because the daily quantity of urine
amounted to 20 oz or more. The other
8 were 7 cases of eclampsia and 1 of
asymptomatic coma. No other treatment than
the subcutaneous injection was adopted.
In the eclampsia cases there was little
or no urine. In all 8 the injections
increased or re-established the urinary
secretion. In the 7 eclampsia cases the
attacks ceased more or less quickly
after one or two injections. Two died.
One of these was recovering but was taken
from the hospital by her friends and
brought back next day in a moribund
condition. In the second the treatment
was only commenced very late when the
patient was already moribund.
If the 6 who were treated by milk diet
had been injected it is only reasonable
to suppose that they would have recovered
as they did. To Bernheim claims that
the mortality from this treatment is only
2 out of 14 or 14.3 percent.
This treatment has also been advocated by Grassow. The results are certainly remarkable & although the number of cases in which it has been tried is very small it is sufficient to warrant a further trial of the remedy. It will be seen that Bernheim holds that the sole cause of the eclamptic convulsions is the toxæmia & that his treatment is even directed to increase the blood pressure—an element which we have considered to be a primary cause of the convulsions. But putting aside the possibility of our theory of eclampsia being incorrect or of Bernheim's theory of the action of the injections being incorrect it would seem that in severe cases with urinary suppression this method has strong claims for at least a fair trial & we shall hope to see further results of its published.

3. The Obstetric Treatment of Eclampsia.

When convulsions break out during pregnancy, the immediate induction of labour is a question which admits of some doubt but much always be taken into consideration. Winkel\(^2\) considers

\(^2\) British Medical Journal 1893. Vol 2. Epipharm 8

\(^2\) Winkel, op. cit. p 396
the practice 'obsolete' because it is irritating to the mother & dangerous to the child. But most authorities submit that in many cases it is a measure not only justifiable but absolutely necessary. Often the question is settled for us as the convulsions themselves bring on labour pains and then the case must be judged according to the rules applied to eclampsia during labour. In cases which may be considered as mild - i.e. where there are only a few fits at considerable intervals & where there is no great degree of coma between them it may be wise to trust alone to measures such as we have described, hoping to counteract the condition immediately, causing the convulsions or in the expectation that labour will supervene spontaneously. But if the case be at all severe, and especially remembering that fits before labour are those most frequently followed by serious results, such measures alone will not suffice & everything must be done to place the patient as soon as possible beyond danger. Galabin recommends the immediate puncture of the membranes. "This at
once takes off some of the reflex irritation by diminishing the tension of the uterus. In some cases I have found this suffice to stop the fit. While labour has not come on for a day or so. If the fit continue & labour does not progress, the os should be dilated by hydrostatic bags chloroform being given meanwhile. But when once it has been decided to empty the uterus it must be admitted that the quickest method compatible with the mother’s safety should be adopted. All manipulations of any kind should be performed with the patient deeply under chloroform. In this condition it is possible by introducing first one then two then three fingers into the cervix to dilate it sufficiently in 2 or 3 hours to admit of turning or forceps as may seem to be most advisable. The labour is brought to an immediate termination & the patient placed in the best condition of safety possible.

When the contractions break out during labour all authorities are agreed that everything possible compatible with the mother’s safety should be done to hasten delivery. This will include
dilatation of the os in the first stage by means of Barnes' bag or the finger—of the early use of forceps or turning.

Such measures as incisions of the cervix and accommodation force are inadmissible.

A procedure has been recommended by Löhrlein and by D. Roentgen of placing the patient in the semiprone or knee-elbow position. D. Roentgen adopted the latter means to replace the cord which had prolapsed in a case of eclampsia. The procedure not only replaced the cord, but all convulsions ceased from that moment. The object of the manoeuvre is to take away pressure from the kidneys or their vessels, thus or some other way, it seems to have been attended by success in some cases. In many the assumption of the knee-elbow position would be an impossibility, but the semiprone may be tried.

It will be seen that in the fourth case detailed above all such measures were tried without avail & the cervix refused to dilate even under the influence of Hegar’s dilators. The patient had

1. Luck oh. cit. p. 678
Convulsive seizures every 6 or 7 minutes.

Under the circumstances it was decided to perform a Cesarian section as a last resort in attempting to save the lives of the mother & child. The operation was successfully performed & the patient had no further fit for 2 hours 40 minutes. A very severe convulsion then took place & the patient had no further fit but died in 3½ hours.

In the interests of the child the operation was eminently successful as there is little doubt that under the conditions in which it was placed a delivery alive per vagum naturales was impossible. The mother was considered moribund at the time of operating.

Experience of this treatment of eclampsia is very limited. Halbertsma gave to the Berlin Congress in 1890 two cases successful both as regards mother & child. He stated that the operation had already been done under similar circumstances 6 times in Holland and in only one did the mother die— she being moribund at the time of operation. The operations failed to set up any fresh convulsions & promptly stopped.

O. British Medical Journal, 1890. Supplement Dec. 6
the eclampsia. He regards complete cessation of urine in an unfavourable case as the indication for the operation and no patient should be allowed to die undelivered. This is a measure that could only be recommended under extreme circumstances as in the case detailed above, but the success that has attended it renders it justifiable in such cases.

When convulsions first occur after delivery as in Case I the measures to be used are similar to those already spoken of but of course the absence of pregnancy or labour does away with certain complications. Milk diet, depletives, fomentations and sedatives are the measures to be employed.