1858
Dubuque
THESIS

On anaemic convulsions with special reference to the use of chloroform.

Presented to the Medical faculty
of the University of Edinburgh
by Emilie William Dubuc L.R.C.S.E.

1858
Before we can fully understand the actions and uses of any remedy in the case of any special disease, it is of the greatest importance that we should have the chief features of that affection fresh in our minds. Therefore, in the present instance, we must first consider the pathology of puerperal uremic convulsions, along with their leading symptoms, and then the rational of the action of chloroform in subduing them. I have said, "puerperal uremic convulsions," for there are some grounds for believing that something analogous to them may be occasionally met with in women, quite independent of pregnancy, and even in men, when circumstances are favorable for their production. Accordingly the word puerperal will be omitted in the following pages, it being born in mind that the designation uremic convulsions or eclampsia refers to a disease of the pregnant or parturient human female. These convulsions are met with at any period of pregnancy, (not before the thirty-fourth month according to Dr. Simpson) and during parturition, or even after delivery.
They exhibit themselves in the form of fits rapidly succeeding one another. The patient is frequently forewarned of their approach by headache, giddiness, mental hallucinations, and sensations of sight, also by nausea, vomiting, and languor. The fits themselves are attended with complete insensibility which is persistent sometimes even in the intervals between the attacks. The face is livid and swollen, the conjunctivae are injected, and the eyes roll about or stare fixedly. The mouth is at first open but it is afterwards strongly closed, so much so, as to constitute a trismus. The facial muscles exhibit strange contractions, and those of the extremities, alternate contractions and relaxations constituting clonic spasms. The breathing is stertorous and the muscles of respiration affected with spasm. The pulse is either quick or slow, full or small. When the fit has subsided the patient lies stiff and motionless, and perfectly unconscious; the breathing still continues stertorous and there is less unconsciousness generally
Uranic Convulsions.
In Dubuc.

5. Bright's disease is brought on by the presence of stones on kidneys.

10. Vents: Assume all the statements about areas, ammonia, urea, stone, etc., are favorable to French's doctrine.

17. Are the angina in some of chloroformed people due to increased action of hearts?
Still remains. The duration of the attacks, (including both the convulsive stage and that of torpor and unconsciousness) is for the most part from half an hour to a whole hour or even two hours. Such seizures may terminate either in death or in gradual recovery.

In the latter case, the breathing becomes easier, the muscles relax and the pulse regains somewhat of its normal character and frequency. Consciousness slowly resumes its sway, though at times insensibility is prolonged till the advent of a fresh fit of convulsions, which are ushered in by spasmodic twitchings of the muscles of the face and of the upper extremities, and by flushing of the countenance.

Among the concomitant symptoms most commonly observed, are edema of various parts of the body and an albuminous condition of the urine.

Dr Simpson (in his lectures on Midwifery) expressed his opinion to the effect that vomiting occurring late in pregnancy was a most suspicious symptom.
and often a prelude to an attack of
uremic convulsions.

The albuminous condition of the
urine can be readily demonstrated by the
aid of the appropriate tests. viz. boiling and
the addition of nitric acid. The urine and
uric acid are observed to be deficient.

When examined microscopically, the
urine is found to contain those curious
casts of the mucous tubes, so charac-
teristic of the various forms of Bright's
disease. The kidneys are tender when
pressure is made on them. In fatal
cases, when a post-mortem examination is
made, we frequently find softening of the
brain with bleeding and focus condemnation,
consisting with hyperaemia of the membranes.

The lungs are usually found to be
edematous and occasionally they are empty-
emaciated. The heart is usually empty and
flaccid. The spleen is distended, as it is
about to be during pregnancy.

The kidneys are, for the most part,
greatly congested as the tubes are choked
up and in a state of fatty degeneration.
Sometimes, but rarely, they are atrophied. Such then are the main features of a well-marked case of diabetic convulsions. What then do the above phenomena and lesions indicate? In the opinion of the most competent observers they point to Knight's disease in one or other of its forms, and this Knight's disease is, in most cases at least, supposed to be brought on by the pressure exercised by the gravel stones upon the kidneys. The proper functions of the kidneys are prevented and impaired. Urea and uric acid, especially the former, are retained and albumen is excreted. The urea is decomposed along with the elements of urine, by the influence of some ferment existing in the blood, and Carbonate of ammonia is produced, this circulates in the blood and seems to be the predisposing cause of the convulsions. In this instance, we have convulsions, not coma, as is so often seen in cases of non-ocularal Knight's disease.

In the present case the Carbonate
of ammonia is notably in smaller quantity and the nervous system is more irritable, since the different nature of the phenomenon in the two cases.

However if circumstances be favourable so that the condition of nervous system comes to resemble that of the puerperal, true eclampsia from carbonate of ammonia may be observed in the Brights Disease of men as well as of non-pregnant women.

Urine convulsions are rare before the seventh month because the gravid uterus does not till then begin to press injuriously upon the kidneys and to cause a form of Bright's disease, and consequently uraemic intoxication long retention of ammoniacal urine in the bladder and consequent absorption of carbonate of ammonia, if of repeated occurrence, might produce uraemic convulsions without any renal disease being present.

A woman might become pregnant while labouring under ordinary Brights.
disease and perhaps might, in consequence, labour under debility of urea and formation of carbonates of ammonia in the blood. That these would hinder such an individual from inhabiting the urinary convulsions, if the condition of the nervous system were to be favourable for their production. Dr. thinks Dr. Simpson thinks that convulsions before the seventh month are almost invariably hysterical. Surely this is not from supposing them to have any special connection with advanced utero-puerperium, beyond that of causing a form of Bright's disease and consequently anaemia from the pressure of the distended uterus.

It can be only because anaemia is rare before the seventh month, that convulsions are rare before that period. Along with the urea other matters are retained. The most important of these is ureic acid. This doubtless has but little, if anything, to do with the convulsions. Because, in this case, it is retained but in small amount and we
know in addition, that it is even in tolerable large quantities by no means a very energetic agent. This is well seen in the case of gout. Unlike urea it is more readily converted into a potent and deleterious agent, like carbonate of ammonia.

It has been asserted and assumed all along that it is the decomposition of the urea which causes the disastrous effects resulting from its retention. This is almost universally to be the true explanation for the following reasons. Urea is sometimes accumulated in the blood in cases of Bright's disease to a very great extent, without causing either renal coma or any other bad symptom. Such curious cases are readily explained on the supposition that a proper ferment was wanting which is needed in order that the urea may undergo decomposition. The ferment in the case of wine (when it turns ammoniacal after being allowed to stand for some time) consists of Mucous from the urinary.
Passages. If the urine be carefully filtered so as to separate this mixus, it may be kept for a lengthened period without turning stale. The urine is decomposed in company with the elements of water, thus: \( \text{Urea} \cdot \text{H}_2 \text{N}_2 \text{H}_4 \text{O}_2 + \text{four equivalents of water} \cdot \text{H}_2 \text{O} \) yield two equivalents of carbonate of ammonia \( \text{NH}_4 \cdot \text{CO}_2 \). Urea has been injected, to a large amount, into the veins of animal without evil results.

Urea has been recommended and used as a diuretic, in tolerably large doses, without producing uraemia. Indeed it seems to be, even in large quantities, a harmless substance, providing always it does not undergo the changes above represented.

In the next place, carbonate of ammonia, when injected into the veins of an animal speedily produces phenomena identical in kind with those of death, coma. The carbonate is said to be present in the blood of the insomniac in large quantity and it is stated to...
be exhaled from the lungs as well as present in other secretions, while ammonia is absent from normal human blood, though it is by many supposed, that a small proportion is actually always present and serves to maintain the fluidity of the blood. This however is by no means an universally received doctrine.

It is a curious circumstance that one (which by no means invalidates the above conclusions) that the ferri-carbonate (so nearly allied in properties to the carbonate of ammonia) has actually been recommended and said to be used with success in the treatment of uraemic convulsions. For we must always bear in mind this: that medicinal preparations do not in all cases reach the circulation in such chemical condition in which they were received into the alimentary channels. Therefore, it is not impossible that the small doses of ferri-carbonate of ammonia, given in medicine, do not enter the circulation as such.
On the whole, we are fully entitled to conclude that carbonate of ammonia resulting from the decomposition of urea and water is the principal materies morbi, both in uramic convulsions and in venal coma.

We now arrive at a most important subject for consideration — namely, the diagnosis of uramic eclampsia from other nervous affections.

Many text books on Midwifery confound epilepsy and the affection at present under consideration, though their causes and prognosis as well as treatment are very different. Hysteria, asphyxia, and the effects of various narcotic poisons are liable to be confounded with uramic eclampsia. Such fallacies are obviously extremely dangerous and disastrous for the patient. Measures suitable in one case would be either uncalled for and totally inadequate or absolutely injurious in the case of another.

Since Dr. Simpson, Professor Kraus, and many others have led the way in these interesting and important investigations.
Hysteria differs widely in its character from eclampsia, and apart from that, the condition of the urine would guide us with great certainty towards a proper diagnosis. The first care of the practitioner, when called to a case of postpartum convulsions, should be to observe accurately the phenomena of the fit, and vividly to compare them in his own mind with all that he knows regarding hysteria, aetiology, epilepsy, and the effects of various narcotics. Having satisfied himself that neither narcotics nor aetiology nor hysteria are to blame, his choice lies almost solely between epilepsy and uraemic eclampsia. The genito-urinary system should next engage his attention. The urine should be examined for albumen; if it be present, uraemic eclampsia may be diagnosed with tolerable certainty. All facts connected with the patient's past history are important, and
Particular inquiries should be made concerning
dehiscence affecting the face and vomiting.
Time is precious and must not be
unwarrantedly wasted, for every moment adds
to the danger.

As regards epilepsy, it seldom makes
its appearance for the first time during
pregnancy, and the accidental coexistence
of epilepsy along with albuminuria must
be very rare. Epilepsy is, for the most
part, a chronic affection, recurring at in-
tervals independent of pregnancy.
The above remarks apply to those cases
in which the patient is seen for the
first time by the Medical Man during the
fit. In most cases the practitioner has
been forewarned and anxiously on the
look out for some time previously.

Doubtful cases will occur, even to
the most skilled, but in such circumstances,
the major evil should be always presumed
and acted on by the practitioner in
attendance.
The important subject of treatment must<br>next engage our attention and especially<br>the employment of chloroform.<br><br>In the first months of intra-uteration, if<br>mæsmic eclampsia occur, it will be most<br>probably, in consequence of Bright's disease<br>not depending upon the pressure of the<br>uterus upon the kidneys. Therefore emptying<br>that organ of its contents by producing<br>abortion would not be indicated and<br>if effected, would add to the risks of<br>the case. The disease is analogous to<br>renal come as ordinarily being, and the<br>prognosis is very unfavourable. In the<br>last month or during labour, the oc-<br>urrence of mæsmic eclampsia demands<br>speedy delivery as one of the most<br>urgent indications, for the sooner the<br>weight is removed from the kidneys the<br>better, and the life of the child as well<br>as that of the mother will be lost<br>if this be not soon effected. For<br>this purpose, the forceps, the operation<br>of tying turning and even resuscitá-<br>tion measures may be necessary. If labour
has not yet begun, it's premature induction must be accomplished as soon as possible. The convulsions are very to come on, for the first time, a few days before the normal time for delivery in each individual case. At that period the uterus everts some way down into the pelvis, and so relieved the cardiac and respiratory system but of presses still more the urinary and other abdominal organs, producing difficult micturition and of course aggravating greatly any urinary disease.

The urine must not be allowed to accumulate in the bladder, and the evacuations from the bowels attended to. When delivery has taken place, the kidneys relieved of the load which compressed them, regain their functions and the further production of the Materis Morbi is just a step to. This is not observed in all cases, and the kidneys often do not recover their functions in time to save the patient's life.
However important the above indication may be, yet we require to do something in order to ward off the immediate danger and to arrest the convulsions. For this purpose we have a potent and useful agent in chloroform, which may be given with due regard to these rules and precautions observed when it is administered in other cases generally. When trismus is present we must be careful lest the tongue should fall back before the jaws are relaxed, and so threaten asphyxiation.

Much of the beneficial influence of chloroform in the present instance is unquestionably owing to the sedative influence exerted upon the nervous system, especially upon the spinal cord, whose irritability (or susceptibility to impressions and readiness to transmit them in a reflex manner) has been materially excited by the carbonate of ammonia circulating in the blood. Such an action of chloroform is well exemplified in the case of strychnia, tetanus, and in various diseases and in the effects of such poisons as act
upon the spinal cord in the way of producing tetanic spams.

Professor Simpson, with great ingenuity, has thrown out hints as to these being something more than this in its action; to which question let us now direct our attention.

Now it is a curious circumstance that the urine of patients placed under the influence of chloroform has been observed to be remarkably saccharine.

Nor is this beyond the reach of explanation. Sugar is normally produced, according to the observations of Bernard, by the liver, and we have to suppose that this function is heightened in those placed fully under the above agent, either by direct irritation or through the agency of the nervous system.

Sugar, whether as glucose, lactose, or cane sugar, has a remarkable power of preventing a\textsuperscript{a} from undergoing its normal transformation, even in presence of a ferment.

This action seems to be similar in kind to that whereby the saccharine
carbonate of iron of the pharmacopoeia is kept from absorbing oxygen, or converses from decay. As a result of this, the urine of those who labour under diabetes Mellitus, which is in consequence very much loaded with grape sugar, is bit little prone to putrefy, and may be kept long without becoming ammoniacal.

This curious fact, namely, that sugar can preserve urine sweet, is said to be known and turned to practical account by housemaids in Germany.

Hence Dr. Simpson thinks it quite possible that the sugar produced in such quantity in the system, while under the influence of chloroform, may act beneficially (in cases of uraeemic convulsions) by preventing the great excess of urea from becoming further decomposed.

The further production of the Matères Morbi being suspended and time thus gained till the patient is delivered and the kidneys have resumed their functions. The relative action of the chloroform, counteracting the effects of that amount
of carbonate of ammonia already formed and circulating throughout the system.

This may and doubtless is the case in some measure, but we must assume that the active agent at present is the carbonate already formed. The sugar could only present itself further for formation and cannot recall that already formed. As a supplement to this very ingenious proposition of Dr. Simpson, might we not suppose that part at least of the sugar produced may act directly by undergoing the lactic fermentation. Lactic acid could thus be produced and might instantly neutralise a more or less considerable portion of the carbonate of ammonia.

Now the neutral salts of ammonia are comparatively harmless (i.e. neutral to litmus paper). The sugar produced normally by the liver is supposed to undergo the lactic fermentation prior to its final combustion into carbonic acid and water. There is therefore nothing extravagant or out of the way in this.
If sugar then be so useful, might not a weak solution of grape sugar, or (if we could procure it in sufficient quantity) of that more unstable form of sugar - hepatic sugar - be injected into the veins in the more hopeless cases? Sugar is tolerably harmless when circulating, even in large quantities, within the blood. This is well in the case of the diabetic.

Vinegar and other vegetable acids are strongly recommended in the work of Braun, in the hope that they might enter the circulation and neutralise the poison. If a state of ammonia could be so formed, its diaphoretic properties might prove highly advantageous as an auxiliary to the best of the treatment. Unfortunately the delicacy of the human organism - and especially of the blood and venous system - almost prohibit us from seeking to inject acid solutions, however weak, directly into the veins. Such experiments might be tried on the lower animals.
The normal and adventitious products circulating in the blood seem to in many respects exempt from the operation of ordinary chemical laws. Therefore any attempts to react upon them, undertaken in accordance with those principles which rule combinations and decompositions in the laboratory of the chemist, must in many cases prove abortive and end but in failure and disappointment.

The rules to be observed in the administration of the chloroform, do not materially differ from those regulating its employment for other purposes. As usual, lays down the following rules in his work. The anaesthesia is to be induced wherever the premonitory symptoms of the convulsions appear, such as great restlessness, increasing rigidity of the muscles of the arms, facility of expression, or tonic titter and shudder, or ending of the interval subsisting between the paroxysms. The narcosis is to be kept up until the premonitory symptoms of the paroxysm disappear and quiet sleep ensue.
a result generally attained in one minute. But if it be not possible to cut
short the paroxysm, then the chloroform inhalation is not to be kept up during
the convulsive attacks and comatose condi-
tion, in order that an abundant supply of fresh air may reach the lungs.

Dr. Simpson prefers giving a toler-
able full dose at once, in preference to
repeated small doses one after another, as
recommended by some others. The former
method though it may obviate the incon-
veniences arising from a prolonged stage
of excitement yet it is somewhat more hazar-
drous than the latter.

There are other auxiliaries to the
use of chloroform besides vegetable acids.
General blood letting cannot be of
much service, considering the pathology of
the disease. NARCOTICS (especially the
various preparations of opium) are justly
condemned by Dr. Simpson. The sedative
action of opium is apt to be attended by
a reactive condition of the secretory and
excretory systems, and besides opium is
very apt to engender a certain tendency to cerebral congestion. Cold to the head (if judiciously employed) might prove useful.

After the uterus has been emptied of its contents, and if the fits have subsided, we must endeavour as speedily as possible to restore the functions of the kidney. To effect this all important indication we must treat the case as we would one of ordinary Bright's disease. Cupping over the loin, diaphoretics, and the cautious employment of diuretics, are the remedies most to be trusted to.

In order to exemplify the good results which have actually been arrived at in practice from the employment of chloroform, I have quoted in the following pages a case from a thesis presented last year to the Medical faculty of Paris. The various phenomena seem to have been observed and registered with great care, and hence the case seems one peculiar adapted for being brought forward for the above purpose.
The case is as follows.

M. ... Aged 13 years and a half, of a lymphatic temperament, who began to menstruate at the early age of 11 years. The menses occurred regularly every month, very abundantly during 8 days. It was her first confinement, and the past history of her pregnancy presented nothing remarkable; the patient could give no information regarding the precise time that she was last menstruated.

On the 18th of November 1855, at 5 o'clock in the afternoon, she complained of having some infra-orbital headache, her temper has altered, she has been lying the whole day and she has been much agitated. She has several attacks of dizziness in her head ..., and she feels a slight uneasy sensation in the epigastrium.

The urine, when tested with the aid of heat and nitric acid, is found to be albuminuric. She was placed in a ward in the Hôpital de la Maternité. The following was ordered viz a draught containing 10 centigrammes of powder of digitals. She also partook of febrilité water.
The patient fell asleep about the time she took the laetic acid mixture, and slept a quarter of an hour (from ½ past 6 to half past 6). She then awoke much troubled in her speech, after which her eyes became fixed; she was afterwards seized with a fit of eclampsia, which lasted one minute; her head was turned towards the left; her eyes rolled about from right to left; there was considerable blueness of the countenance; the breathing became stertorous and was then complete insensitivity which lasted for five minutes, after which she fell asleep.

After twenty minutes had elapsed, consciousness and sensibility returned, and she spoke distinctly. There was no pain in the abdomen. On examination the uterine was found open and of normal consistence.

At 7 o'clock P.M. a saline enema was administered, and then the following emetic—Powder of the cæcum 1 Gramme, 50 centigrammes, Tartarized antimony Grammes 0.05 centigrammes. This caused free vomiting, the patient brought up contained portions of food. She also went to stool.
The patient can articulate very distinctly; all her mental faculties are restored.

At 7 and three quarters P.M. There was a fresh attack. Without premonitory symptoms, the limbs exhibited jerking movements, and the lividity of the face was extreme; sensibility returned at the end of 10 minutes;

At 8 P.M. There were slight movements of the eyes and agitation of the limbs.

From the minute past 8 to 5 minutes past 8, Chloroform was inhaled by her; the fit was resolved; the breathing became regular and easy.

At 20 minutes past 8. There were fresh premonitory symptoms and Chloroform was again inhaled; the fit was in consequence aborted, and then was subsequently vitiated breathing which lasted half a minute; after which there was tranquil sleep. The inhalation was kept up till a quarter before 9 P.M.

At 9 P.M. There was a fresh fit, which lasted one minute, with a quarter of an hour of Coma, and Consciousness did not return.
At a quarter past 10. The fourth attack has occurred which lasted the same time as the last. The pressure has diminished, the head is movable and small. The foetal heart is heard beating to the left side and in front. No urine obtainable.

At a quarter before 11 p.m. there was another attack similar to the last.

At 10 minutes past 11. There was a 5th attack. Chloroform was inhaled soon after the limbs began to tremble. The fit was cut short. The was starter which lasted two minutes. The breathing was then calm and the then enjoyed tranquil sleep. The pulse rose, it was regular and beat 80.

At 45 minutes past 11. A 7th attack again asserted.

November 19th at 20 Minutes past 12. The same as at last report.

At 20 Minutes to 1 a.m. 8th attack, and the was again put under chloroform. Consciousness returned. The beats of the foetal heart were now noticed to be irregular.

At a quarter before 2 A.M. 10th attack which was again arrested by the use of chloroform.

At 2 A.M. 11th attack, again arrested as before.
At a quarter past 2 A.M., she had her 12th attack; this was again arrested by chloroform.

At half past 2. Her 13th attack, which was again stopped by chloroform.

At 10 minutes to 3. Her 14th attack, which was again arrested.

At a quarter to 4 again another attack.

Her 15th. Her uterus is somewhat dilated, and the head is low. The sounds of the foetal heart are no longer heard. This attack was also cut short as before.

At a quarter past 4, the membranes were ruptured artificially, and the amniotic came away tinged with meconium; the labour is advancing.

At half past 4. The cervix having become fully dilated, the child's head was finally through.

There now came on, a 16th attack, which occurred while the attendants were seeking for more chloroform. It lasted one minute, and there was coma subsequently for 10 minutes.

The agitation of the patient was afterwards extreme. There were some expulsive efforts. The forceps were then applied, as the head was at the vertex.

At 5 P.M. the 17th attack occurred, which was cut short.
at a quarter past 6 A.M. There was an 18th attack which was again cut short.

At a quarter to 7 A.M. Same as last report.

The patient was still kept under the influence of chloroform. The pulse is regular. The urine is still albuminous.

At 8 minutes before 8 o'clock, another attack, again cut short.

At 8 o'clock, there occurred the 21st attack.

Urine still albuminous. The attack was again arrested by chloroform; the inhalation of which was suspended for 10 minutes in consequence of a fall in the state of the pulse, which however soon rose and beat regularly, 90 per minute.

At 6 minutes to 1 P.M. There now occurred rapid movements of the extremities, and a 22nd attack which was again cut short by chloroform. There was some congestion of the face. Sinapisms were applied to the arms and to the epigastrium and ice to the head.

At 4 P.M. The patient is tolerably quiet. There are some movements of the head. She was again chloroformed and the
attack arrested. Her sensibility returned through the mind is absent. The pulse beats 80 and continues good. Urine still albuminous.

At 10 minutes to 5, 23rd attack, again arrested.

At 10 minutes to 5, 24th attack. She was again chloroformed. The body generally has a bluish tincture. She was ordered frictions over the body, every two hours.

November 20th. At 8 a.m. The urine now contains comparatively little albumen.

At 3 o'clock P.M. The skin is hot. Pulse 130. She was ordered cool frictions every hour.

At 11 P.M. The patient seems to awake, and she tries to turn herself in bed, and opens her eyes when spoken to, but makes no reply.

November 21st. At 7 a.m. She can both hear and understand. Pulse 100. The cold frictions are still continued. She was able to take some fluid nourishment.

November 22nd. She is quite conscious. Her ophthalmic affection has greatly diminished, though the eyelids are still swollen and the face is pale.

At 10 she fell asleep. Pulse 100.
November 23rd. To day she was ordered a warm bath which was unfortunately given too hot; the patient complained of headache and ringing in the ears; she was put to bed and had an attack of eclampsia which lasted half a minute and she was subsequently comatose for five minutes. The urine was found to be albuminous. She recovered her speech twenty minutes afterwards. Some purgative medicine was given.

November 24th. At 10 o'clock this morning the urine was examined and found to be free from albumen.

The patient from this time onwards, grew gradually better and left the hospital in excellent health, on the 10th of December 1855. From first to last 220 grammes of chloroform were used. The above case speaks for itself and requires no comments. We shall confine ourselves to but few remarks. A case could not have been selected more fit than the one recently described, to exemplify the good effects of chloroform. The patient was very young to be a mother, the fits were both numerous and severe, and yet the...
the patient was safely delivered and ultimately recovered perfectly. To what then did she owe her preservation? - Doubtless to the inhalation of chloroform, which most potent and useful agent (when given at the first approach of an attack) scarcely ever failed to arrest the fits. What would have been the issue of the case, "if treated with blood-letting, full doses of opium, or with powerful doses of tartar emetic," is but easy to guess. The patient's case would never have been quoted in any medical work or essay to show the utter inefficiency of such treatment.