Chorea in Pregnancy

A Thesis

written by

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Chorea in Pregnancy.

The peculiar spasmodic affection of the nervous system
known to us as Chorea Minor was first described, indeed,
by Sydenham in 1686, and yet, in spite of a wealth
of clinical material, and in spite, too, of close observation
and research on the part of many careful and brilliant
investigators, its morbid anatomy is still shrouded in
obscenity, its etiology and pathology are still the subject
of much diversity of opinion, and its treatment has not,
as yet, freed itself from the trammels of empiricism.
Fortunately, with comparatively few exceptions, the duration
of the disease is short, and its termination, especially in
children up to the age of puberty, is usually favorable.
This in their report on chorea in general, the Collective
Investigating Committee of the British Medical
Association give a mortality of 2 per cent., death
having resulted in 9 out of 439 cases reported upon.
After puberty the prognosis becomes more serious,
and in certain conditions, notably in pregnancy,
the percentage of deaths has hitherto been very high.
This condition, indeed, accounts for a large proportion of
the cases of chorea occurring in young women between
the ages of 17 and 20; and it is of the greatest
moment, therefore, to enquire into the causes of the
high mortality among them, to discover, if possible,
a satisfactory solution to some of the etiological
a pathological problem suggested by the study of such cases, and, above all, to formulate a treatment that shall ameliorate the condition and lessen the death rate.

Until ten years ago the record of cases of chorea occurring in pregnancy was small, and many of the reports were lacking in precision and detail. Recent collectors and observers have, as a rule, shown more care and exactitude, although, at times, even the information they supply is measure unsatisfactory. Barnes in 1869 collected 56 cases, and described them in a paper which was published in the Transactions of the Obstetrical Society, vol. 5.

Fehling in 1874 (Archiv.f. Gynaeol. 3 vi. 1874) added 12 cases to the number. Schenck in 1876 (Ueber Chorea Gravidarum. Dissertation Halle 1876) added 12 more, whilst Spiegelberg in 1877 (Text-Book of Midwifery) with 4 new cases brought the total up to 84. In 1887 the already mentioned Report of the Investigating Committee of the British Medical Association (vide B.M.J. vol. 1887) described 7 cases occurring in pregnancy, and in 1889, Benington (Proceedings of the Northumberland and Durham Medical Society, 1889) also added 7, four of them occurring in his own practice.

Thus up to the year 1890 some 98, or (if that reported in the Lancet Vol. 1886 p. 686 be included) 99 cases had been described. Since that date descriptions
of 15 or 16 isolated cases have appeared at one time or another in the Medical Journals, but the most notable contributions to the subject within the last decade & a half have been a paper by Dr. Buist of Dundee, published in 1894 in the Transactions of the Edinburgh Obstetrical Society, (a resume of it appearing in the Lancet 1895, Vol. 1), and a paper by Dr. W. Cann, published in the Transactions of the Obstetrical Society of London, Vol. XXXIII, the former giving an account of 255 cases collected, the latter of 37. These, no doubt, include some, or perhaps, many cases previously reported & described. To, therefore, it is impossible to say what is the total number so far collected. Many cases too, must have escaped record for there must have been a certain number of which no notes were taken by the medical attendant, no official description given. Also, indeed, is exemplified by the first two cases described below. Both of them, though occurring in the practice of a colleague, came under my own observation at one stage of their treatment, but neither of them, up to the present time, has been added to the literature of the subject. Of the others which follow, I to VII are from the Collective Investigation Committee’s Report, VIII to XXIII are from various Medical Journals, the Reports of Medical & Obstetrical Societies, XXIV to XXVIII are Buist’s, and XXIX to XXXIV are W. Cann’s. Some of these are in the direction of brevity & indefiniteness already referred.
to, but from a general survey of the whole period it is possible to make valuable deductions as to the true nature of the condition, and to obtain some useful hints toward the proper treatment of it should it arise in general practice.

Case I. Mary S. — 23, unmarried; admitted to small.

Collected hospital in neighborhood, suffering from severe chorea. The movements being almost continuous, the patient showing marked signs of mental agitation.

**Family History**
- Father had rheumatic fever twice and died at 42 of heart disease.
- Mother had chorea as a child.

**Personal History**
- No previous attack; vague history of rheumatic at age of 15. Menstruation regular till 3 months ago, but amenorrhea since then.

On examination, found to be pregnant. The chorea apparently commencing in the first weeks of pregnancy. Treated at first with Arsonic, later with Bromides, but the condition got worse, till 3 weeks after admission she aborted. It immediately began to improve. The choreic movements gradually abated, and at the end of 22 days she was discharged cured.

Case II. Matilda J. — 25, married; developed chorea in 3rd month of her second pregnancy. She was sent to Hospital for treatment. No history of rheumatic, but two previous attacks of chorea. On admission was found to be five months pregnant, the chorea was of a severe type, the patient shouting and throwing herself about, exhibiting extreme...

Age 19. Rheumatic Fever one year before; her first attack of Chorea.
One month pregnant; aborted at 6 weeks (that is, after one fortnight of Chorea): exciting cause: fright: Result: Cure.


Age 23. No rheumatism; heart normal; her 3rd attack of Chorea;
Lasted through eight months of pregnancy; aggravated by worry due to loss of wedding ring; ended, presumably, by delivery at full term.


Age 21. Previous Scars. Fever & Rheumatism; heart normal; 5 months pregnant; Cause: Shock (death of father).
Treated with Chloro hydrate for 10 to 20, with no effect; but 40 to 50 produced sleep. Labour then induced: death from exhaustion.


Age 19. Rheumatic Fever 1 year before; Anaemia & medical syphilitic stain; had her 5th attack of Chorea, occurred at 5th month.

Case VII. Op. Cit.

Age 20. Rheumatic Fever 4 years before; 4 months pregnant; Aborted: Cure.

Age 19: unmarried: no Rheumatic or: Causa: or, only of fellow servants (?) perhaps reprimanding her for her condition.

Treatment: Ointment diluted by spirits.

Result: a foetal 4 months' fetus passed during the night: immediate improvement: movements entirely ceased in 10 days.

Patient afterwards in good health, but "dull and stupid."

Case IX. R. C. Benington. Proceedings of Durham Med. Soc. 1887 (Dec)

Age 18: married: no Rheumatic Fever, but Chorea at age of 7 for six months, attributed to fright.

Three attacks of Chorea in three successive pregnancies:

1st Attack (1881) when 3 months pregnant: movements affected right side chiefly, continued till full term, when child born naturally but dead. During the latter months of the pregnancy she had not been able to get about at all but had not consulted the Doctor. After delivery the movements quickly subsided, but by the end of the puerperium had quite gone.

2nd Attack (1883), in 2nd pregnancy at 4th month. Consulted Dr. Benington at the 7th month: Valerianate of zinc prescribed got worse: listless and depressed, sleepless, mental processes blurred, movements violent, especially on right side: Bromides & Cinch. Conic tried but of no avail: Premature labour then induced by passage of a foal: (child lived 12 hours): Chorionic movements gradually ceased.

3rd Attack (1884) in 3rd pregnancy at 4th month. Consulted Dr. Benington.
Dr. Bennet in whose examination found "great cavity of vagina, a slight tendency to cystocele, & the whole pelvic contents squatted". He inserted a ring迳vaginale, the result being such an alleviation of symptoms (the movements persisting but only in a mild degree) that she went to full term, had a natural labour, and gave birth to a living child.


Primipara; unmarried; Rheumatic Fever 2 years before.

Onset at 6th month; affected right hand, arm & leg.

Treatment: cervix dilated 2½ inches by forceps.

Result: case went to full term.


Age 23; 3rd pregnancy; onset at 7th month; no previous Rheumatism, or Chorea; right arm chiefly affected; complicated by insomnia.

Result: went to full term; Mania on 6th day after delivery, but at end of 2nd week both Chorea & mental disturbance ceased. Temper on 2nd day 103.7.


Age 19; primipara; onset at 15th day of pregnancy:

no previous Rheumatism or Chorea; affected chiefly face, hands & legs; complicated with delirium & delusions.

Treatment: liberal diet & tonics.

Result: movements ceased in 3 months, but paralysis of left arm came on as Chorea ceased, & continued till labour.


Age 25; primipara; 4th month; no Rheumatism or Chorea.

Age 25, 2nd pregnancy; 4 months pregnant; no family history of rheumatism or chorea; had rheumatism for 3 or 4 days 3 years before her first pregnancy. Normal except for excessive vomiting.

Choreic movements began at end of 2nd month, not severe generally. Had slight pyrexia, chill and double vision at night, repeated pulmonary bronchitis.

Treatment - 10 days. Chloral and bromide (90 grm in 24 hours) varied by trional and para-adrenaline, but no improvement; delirium, restlessness, fainting occasionally; then a pulse increased to 140, respiration to 32, T. Temperature 101.2. Abortion was induced by careful passage of a bougie, the foetus and placenta being expelled 15 hours later. No improvement for 3 days. T. 102. P. 150. Then put on chloralamine, 30 grm every 4 hours, for 15 days. Gradual improvement. 20 days later was discharged cured with no choreic movements.


Principal - onset of chorea soon after marriage & beginning of pregnancy. History of pain in micturition (probably on corium). Examination showed vascular changes in membra.

This remitted, chorea subsided. After pregnancy not the same as chorea.


Age 24; onset at 7th month. Rheumatism & two attacks of chorea previously. Heart and urine normal.

Treatment by bromides, arsenic, belladonna - of no avail.
became delirious financially. It was removed to infirmary. Great improvement on first day in hospital, owing to this induction of labour was postponed. Patient died suddenly next day.


Age 28: primipara: 3 months pregnant: child born at 5th month.
Of a neurotic family, had had chorea rheumatica previously.
Treatment: by arsenic, bromides, chloral, opium, morphia—In vain.
Membranes ruptured to lessen pressure, thus giving relief for a few hours. Morphia again, but no relief. On 3rd day child delivered by a leg—excessive haemorrhage—no improvement.
Morphia again, without benefit—next day patient collapsed & died in an hour.


Age 27: married 14 months: 9 month's pregnant: child born at 8th month.
No previous Rheumatic or Chorea. Symptoms grew rapidly worse.
Treatment: Induction of labour by forceps—several attempts made during 3 days, finally successful—delivery with forceps.
Patient died four hours later from exhaustion.


Age 21: primipara: 7 months pregnant: No Rheumatic or:
Anaemic: Severe hemorrh (2 haemie). Chorea continued till full term.
Delivery with forceps—Chorea left her next day—recovery.


Mr. Hardwicke reported a case ending in delivery by forceps, followed by complete recovery.


Case XXII. Barry Hart. op. cit.

Age 19 : pregnancy at mid term; puerperal convulsions under Bromide and Phosphide.


Case XXV. Buist. op. cit.

Age 29 : married : 4-para : 5 months pregnant. No Rheumatism, Scares few or Choreo previously; always easily frightened. Previous pregnancies : 1st miscarried at 5th month. 2nd premature birth at 7th month. 3rd full term - but in all these some slight winking of hands & arms, & facial contractions were noticed.

In 4th pregnancy movements were greatly intensified on hearing of the death of a fellow patient.
Treatment: Sulphonal, Paraldehyde, Bromide: Several bath extracts.

There premature labour at 7th month; then movements ceased.

Since then a 5th pregnancy, with return of the Chorea; patient aborted at the 3rd month & the movements ceased at once.

Case XXVI. Burs - op. cit.

Age 24: married; 3rd pregnancy: no rheumatism, but at age of 17 Chorea, lasting a year, & following a fright.

1st pregnancy - Chorea for first 3 months - then cleared up.

2nd - no history.

3rd successive case - recovered in a month - no particular.

Case XXVII. Burs - op. cit.

Age 26: married 6 years; 2nd para; first pregnancy normal.

Now 5 months pregnant; no rheumatism or scarlet fever.

Cervix middle cystic since present.

Treatment - Chloral & Bromide.

Result - pregnancy went to full term, & choreic movements continued for 3 months after it.

Case XXVIII. Burs - op. cit.

Age 20: 3rd para; no rheumatism, scarlet fever, or chorea present.

Had Chorea during 2nd pregnancy, & aborted at 6th month, the movements lasting six weeks longer.

Now 5 months pregnant.

Treatment - Cervix dilated by fingers; membranes ruptured.

Result - vomiting, diarrhoea & death.


Age 26: married; 3rd para; no rheumatism, scarlet fever or Chorea.
1st pregnancy normal. In 2nd pregnancy had repeated fainting attacks before quickening, 4th slight twitchings occurred after first faint.

After quickening there was increase of choreic movements with unsteady gait & dimness of vision. Admitted 8 months pregnant. Treatment – labour induced by gradual dilatation of os; forceps;

Next day choreic movements were rapidly losing violence; gradual subsidence till 10th day. Discharged, cured.

Case XXX. McCann. Op. cite.

Age 21; married. 1st para. Family history of rheumatism – no Chorea.

Personal history – no Rheumatism, but Chorea at 18 after fright.

1st pregnancy – Chorea at quickening, getting very severe, then slightly better – went to full term, Chorea disappearing.

2nd pregnancy – presented between 6th & 8th month, & on receiving Chorea perceptible; increased of choreic movements when foetus moved; Haemic murmur.

Pressure, so as to cause foetus to move, increased the choreic movements; ditto on pricking & tickling different parts of the trunk & extremities. Whilst greatest effect was produced by pressure over the uterus; similar result on vaginal exam.

This patient, therefore, was specially susceptible to external stimuli.

Movements increased during labour; diminished after birth; child increased during birth of placenta and on making efforts to take cognizance.

On same day choreic movements much diminished; 2 days later they were increased by suckling, & also by each after pain. Discharged on 14th day, slight movements continuing for 5 months.
Case XXXI. McCann. op.cit.

Age 17; unmarried; Family History - Rheumatism.

Personal History - Chorea at 13; Cerebrospinal at 13-14; regular till 15 months ago, since then Anæmica; Ulcers now size of 7 months frequency.

Treatment - Menstrue separated round 12 by fingers, next day very ill; delivered in evening & kept under Chloroform for 2 hours afterward, then given large dose of Chloral; movements ceased.

Next day movements returned but less severe; Chloroform + Chloral given as before; on 4th day movements as bad as ever, in spite of Belladonna + Morphine. 50 grains of Chloral gave 3 or 4 hours sleep, & dose was then repeated; but patient got worse. On 7th day Temperature rose, & abscess formed over scarven. This opened, and Temperature fell, rapid improvement setting in. By the 13th day only slight irregular movements remained, & she pretended the tongue steady & with ease. Discharged cured.

Case XXXII. McCann. op.cit.

Age 26; unmarried; primipara; Family History of Rheumatism & Chorea; Personal History of neither.

Puerperal 4th month; symptoms mild; functional haemorrhage;

Labour at full term. Movements increased by pressure over uterus & on child sucking.

Discharged on 13th day - Slight twitching of lips still observable.

Case XXXIII. McCann. op.cit.

Age 23; married; primipara; full term. Father had "fits".

Personal History of Epilepsy at 16, + 3 attacks of Rheumatic Fever.
First attack followed by Chorea, from which never really free since. Movements always increased a week before menstruation, & most severe when flow at its height. Very anemic.
During labour movements increased with each pain.
Fits & Chorea continued for a year after this pregnancy ended.

Case XXXIV  McCann, of c.t.

Age 17, married—primipara—full term. Father had Rheumatic Fever.

Personal History—Rheumatic Fever at 10; Chorea as follows:
1st attack of Chorea at 12—cause overstudy.
2nd...after Scarlet Fever.
3rd...fright.
4th...fracture of arm due to a fall.
5th...when pregnant 4 months; quickened at 4½ months & movements increased. Chorea better towards end of pregnancy. Movements increased during labour pains.
Slight movements remained on discharge from hospital.

An analysis of 214 cases furnishes the following facts. In a few instances the Chorea occurred between the ages of 20 and 26, but in the majority its incidence lies between 17 and 20, thus falling within the upward limit for cases of Chorea in general. Of 214 cases (presumably those only of the total number collected concerning which definite information was obtainable), 127 were primiparae, a fact partly accounted for by the age incidence. In 108 the Chorea began in the first three months, in 70 in the second...
three months, in 25 in the third three months. Thus the
cardinal months of pregnancy were responsible for the greater
number. Of possible causal relations, 45 (that is 18 per cent)
are said to have had a rheumatic history, 25 (or 10 per cent)
had had acute rheumatism, 66 had suffered from previous
attacks of chorea, in 6 chorea was already present at
the beginning of pregnancy, in 24 chorea and acute
rheumatism were coincident. Of 12 chorea, epilepsy, eclampsia
were mentioned in connection with other members of the family,
whilst in 23 there was a definite history of fright or shock
closely preceding the attack. Two-thirds of the cases
went to full term, and were relieved by delivery; 63 cases
recovered before full term, and 45 cases were fatal (dying
undelivered) — a mortality of 17½ per cent.

Mc-Cann's statistics differ little from the above.
24 out of his 31 cases occurred between the ages of 17 and 20:
In 17 the chorea had its onset during the first 3½ months of
pregnancy, in 24 during the first four months. Of precedent
conditions he found chorea in 11, rheumatic fever + scarlet fever
in 2, rheumatic fever alone in 2, chorea + fright in 6,
rheumatic fever + fright in 1, rheumatic fever + chorea in 7,
rheumatic fever, scarlet fever + chorea in 1, rheumatic family
history in 2, fright alone in 2, mental distress in pregnancy in
6 cases aborted at from the 4th to the 6th month, 26 were delivered
at full term. Delusion + mania occurred in 8, of whom 3 died, 9 were cured,
— the total mortality being 5, or 13½ per cent.
What light do these statistics and other facts gleaned from the cases quoted above throw upon the Etiology & Pathology of Chorea in general? Is it a purely functional disorder of the nervous system? Is it local in origin—the result of a specific poison circulating in the blood, or of an infective microbic agent introduced from without? Is it due to some definite lesion in brain or spinal cord—the result of embolism, or thrombosis or other vascular change? Or, do all these views fail at certain points to explain the condition? If so, does the limited field of Chorea in Pregnancy offer anything in elucidation of the problem?

In a recent number of the Lancet (1901, vol. xi, p. 1629), Dr. W. Howship Dickinson combats the idea that chorea is a purely functional disease without a pathology and draws a comparison between it and tetanus. "In tetanus," he says, "haemorrhage into the cord is common, & though from its "inconstancy, it is to be regarded as accidental rather than "essential, it is yet evidence of a morbid hyperaemia "which plays a part though only a secondary part "in the disease. In chorea the evidence of disturbed "vascularity is as great as in tetanus & of the same "kind—namely, evidences & results of hyperaemia "in corporeal effusions, effusions of liquor sanguinns "& extravasations of blood in bulk & entirety, and in "an extreme case the breaking up of the substance "of the cord by an explosive haemorrhage." He
sees in this proof of "a morbid attitude of the blood vessels which we hypothetically attribute to their own motor nerves", but admits the obscurity of the cause of this attitude. "How fright and rheumatism are connected in causal relationship with what seems to be a local vaso-motor paralysis we know not." The fact he seeks to emphasize, however, is that, to his mind, there is sufficient pathological evidence to remove chorea from the category of the purely functional to that of the organic.

Many observers have noted the occasional occurrence of similar lesions. Indeed, they have mentioned others in addition, and have not confined their observations to the region of the spinal cord. Thus Virchow in Allbutt's System of Medicine, vol vii p.837, summarizing the work of Raymond, Dana, Beveridge &c. mentions "brain lesions, "hyperaemia, softening due to embolic plugging, & chronic encephalitis, with some changes (swelling & cloudiness) in the large pyramidal cells of the cortex", and as spinal & medullary lesions, "hyperaemia, punctiform haemorrhages, & perivascular round cell exudation."

But in the majority of cases no such conditions are found, and none of these lesions occur with sufficient constancy to warrant their being looked upon as accounting for the disease. None are peculiar to chorea, and
Dr. Howship Dickinson himself admits (op. cit.) that the hyperaemic cord of tabes, & the hyperaemic cord of chorea are indistinguishable. It must be remembered also that cases that are seen in the post-mortem room are usually those of the gravest character or of longest duration, and that they often show signs of some intercurrent disease to which death has been really due. Moreover, in cases with the most marked morbid appearances (such as cerebral congestion) the clinical symptoms (mania, delirium &c.) that may be presumed to correspond to them, have developed late in the course of the disease, and are to be looked upon, therefore, as the effect rather than the cause of the nervous disturbance.

In this connection Burs's analysis of his fatal cases is interesting. Thus 14 died undelivered (presumably from exhaustion), 1 of morphine poisoning, 1 of Tuberculosis & Aluminuria, 1 of oedema of lungs (with clot under the dura mater & effusion into the cerebellar fossa), 1 of intestinal obstruction, 1 of bronchitis, 1 of oedema, 1 of post-partum haemorrhage, &c., 1 Placenta Praevia, 1 of pneumonia, 1 of pneumonia, 1 of meningitis, 1 of miliary meningitis, and 14 were "more or less septic." Without doubt the morbid changes, both macroscopic & microscopic, occurring in these cases would be numerous & varied, but they could not be taken as explaining the cause of the presence of chorea. Moreover, the fact that
of cases of chorea in general 98 percent recover, that
most do so within three or four months of the onset;
that many recover rapidly after the removal of some
apparently irritating cause (such as pregnancy), so
further that many choreic attacks are induced by
some sudden fright, or shock, or strong emotion—
these facts exclude the occurrence of any anatomical
change as a necessary antecedent, and one is forced
to conclude not that a morbid anatomy is non-existent, but
simply that present methods of research have so far failed
to find it.

There is one morbid condition, however, which
appears with some constancy in association with chorea,
namely, pericarditis. According to Richard Russell (Allot's
System of Medicine, 3rd ed.) Page found it in 17 out of 18
necropsies of chorea at Guy's Hospital; and Frederick
Taylor (in Gibson's Text Book of Medicine vol ii p.812) states
that it occurs in more than half the cases, and that it has
been found even when no cardiac murmur has been heard during
life. The frequency of its occurrence has suggested the
possibility of embolic processes as the prime cause of
the choreic manifestations and this theory was strongly
advocated by Hulke in 1863, & by Hughlings Jackson
in 1874; but, although embolism has been found at
times, it is too rare to have any importance in this relation.

A more probable theory arising from the frequency
with which endocarditis is associated with it, is that there is the result of a poison or toxin circulating in the blood, and the fact that rheumatic fever appears so often as an etiological factor seems, at first sight, to add confirmatory evidence. Rivet Russell refers to this in the article already quoted in Albutt's System of Medicine, and considers that "there is much that suggests that chorea is generated by some toxic agent, either the result of an altered blood state, or some infective agent introduced into the system from without," and in support of this contention cites its relationship to rheumatism, the prevalence of endocarditis, the similarity of chorea to other infective diseases in its relation to age and season, and in its clinical manifestations.

Even in cases occurring in pregnancy, as exemplified by those outlined above, there is frequently a personal or family history of rheumatism, or a record of an antecedent anaemia or scarlet fever, or evidence of an accompanying endocarditis. But when statistics are examined, the proportion of such cases is not large. Thus of Bristow's 225 cases, only 45, or 18 per cent, had a rheumatic history, and only 25, or 10 per cent, had had acute rheumatism previously. W. C. N. gives a higher proportion, namely 40 per cent. H. T. D. gives 50 per cent. The C. I. C. Report 26 per cent. Smellie 25 per cent. Thomsen 21 per cent. Allen Mack 18 per cent, and Osler 15.8 per cent. (vide Albutt, loc. cit.). The fact must be
taken into consideration that other infective conditions than
pneumonia will produce endocarditis — pyaemia, &c.
Scarlet fever, for example — and also that in many instances
the endocarditis has developed after the onset of the
chorea. Admitting, however, that in perhaps 10
per cent a history of a precedent infective condition
is of an associated endocarditis is obtainable, of what
significance is the occurrence of the remaining
50 per cent with absolutely no such history? And
what of the cases that occur during pregnancy? If the
disease is due to a condition of the blood, or to a
circulating virus, or to an infective process, how is it
that in by far the larger proportion of cases complicating
the pregnant state, it ceases abruptly with the ceasing of
pregnancy, or quickly subsides during the puerperium?
Again, what explanation is to be given of cases of
undoubted authenticity where it has been induced by
fright, or shock, or violent motion, or of yet others
where apparently the sole cause, the removal of which
has effected a cure, has been some local condition of
irritation such as the presence of worms in the intestines
(vide infra), or of a carbuncle at the meatus urinarius as in
Case XV quoted above? In view of facts such as those,
a toxic theory falls to the ground, and one must look
elsewhere for an explanation of the disease.

What help, in this connection, is to be got from a—
survey of cases of chorea occurring in pregnancy. The following points are based upon analyses of the cases given on pages 5 to 15 of this Thesis.

1. In many cases chorea had appeared in childhood or adolescence, and in many it recurred in subsequent pregnancy. Dpras mentions G6, FMCane II as having had chorea previously. These patients, therefore, given an exciting cause, had a tendency to develop chorea—or, in other words, they possessed that instability of the nervous system which is peculiar to choreic subjects.

2. The age incidence is practically the same as in pregnancy as in chorea in general, and it does not tend to exceed the upward limit of age, namely 30. Cases occurring in pregnancy, therefore, occur amongst those who, from the point of view of age limit, are most likely to develop chorea.

3. Most of the cases occur in primiparae, and in the early months of pregnancy—i.e. a time when the new generation, and the vascular and metabolic changes occurring within the uterus would be most apt to disturb the already unstable nervous system.

4. The majority of the cases are quickly and more abruptly relieved of all choreic symptoms by termination of the pregnancy, whether by abortion, or by premature delivery, or by the natural process of a full-term labour.

5. In many cases the exhibition of new sedatives,
such as chloral hydrate & potassium bromide, is soon to have
the effect of ameliorating the condition sufficiently to allow
the pregnancy to go on to completion.

Nine two-thirds of Bäsiö's cases, and almost the same
proportion of McCamie's went to full term, and the chorea ceased
soon after delivery. An illustration of this the following:
selected from the cases quoted above, may be cited:

Case IX. First pregnancy—child born naturally at full term. The
movements rapidly subsiding.
Second pregnancy—premature labour induced, & chorea
gradually ceased.

Case XIX. After delivery with forceps, "chorea left her next day."

Case XXV. First pregnancy—premature labour at 7th month, when
movements ceased.
5th pregnancy—aborted at 3 1/2 month, & movements ceased
at once.

Case XXIX. Labour induced by gradual dilatation of cervix: forceps
next day choreic movements rapidly losing intensity.

In many cases, therefore, the chorea begins with the
pregnancy and ends with it, and the only discoverable
condition to account for the choreic manifestations is
the pregnancy with which it is connected. What the
exact relationship may be that exists between the two
conditions it is difficult to determine, but it resembles
more nearly than anything else that which holds
in cases where the chorea is undoubtedly caused
by some local condition, such as worms, phimosis, caruncle &c, acting upon the nervous system as an irritant. Numerous examples of the effect of such a localized focus of irritation are on record, and the following are worth quoting.

1. Scipio Russell (Allbutt, loc. cit) mentions a case recorded by Demme where chorea appeared after the use of iodofurin in a fistula connected with a cavity of the cervical vertebrae; it ceased when the iodofurin was suspended, & returned on resumption of the treatment.

2. In the Lancet, 1903, vol. p. 824, Dr. Pereria refers to a child who developed chorea at 6, was found to have tape-worm, was treated with Tinea maris, was quite well in a month.

3. In the Lancet 1904, vol. p. 1348, Dr. Galbraith, of Natal cites the case of a boy with bilateral chorea who also suffered from tape-worm, on the expulsion of which by means of extract of pomegranate, the chorea rapidly subsided; and he gives it as his opinion, that the worms acted by maintaining a continued peripheral irritation of the intestinal mucosa, which acted on the motor centres & produced the functional excitement.

4. Dr. Benington's case (vide p. 7, case IX) is an instance where the source of peripheral irritation was apparently the "general dropping of the pelvic contents", the insertion of a jejunum relieving this condition and the chorea at the same time.
5. In case XII (Handfield Jones) chorea ceased at the end of the 3rd month, the pressure of the gravid uterus acting as a strong irritant until it rose above the brim of the pelvis.

6. In case X (Wade) the principal irritant was a tight unyielding cervix, partial dilatation of which relieved the symptoms and enabled the patient to go to full term.

7. In case XV, the source of peripheral irritation was apparently not the pregnancy but a myoma carunculae, when this was cauterized the chorea subsided.

8. A case of chorea always stopped by rectifying a retroflexion of the uterus, reported by Bergel in Krankhaleit der Weib. Gesch. 8, p. 228, offers confirmatory evidence of the same point.

Any irritation associated with the genito-urinary system seems to be particularly potent in this respect, a fact which probably accounts for the large proportion of choreic cases amongst boys and girls at or about the age of puberty and for the larger incidence among girls than among boys. Thus the condition is especially apt to occur in young girls in whom there is some delay or other disturbance of the menstrual function, due perhaps to their being poorly nourished and anaemic. Thus in the C.I.C. Report already quoted, of choreic patients 16 years old and over, 44 are stated to have shown disorder of delayed or very active menstruation.
A case in point occurred in my own practice recently.
Six months ago a girl of 13 with slight choreic symptoms was brought to me by her mother, who, on enquiry, stated that the child had menstruated for the first time six weeks previously but had now gone a fortnight over her time, and had become "restless & fidgety & stupid." Rest in bed, with light nourishing diet, & gradually increasing doses of arsenic had no appreciable effect, and so at the end of a month, in view of the continued amenorrhoea & some attendant anaemia & constipation, she was put on a course of iron & alkalies. A fortnight later the menstrual flow returned, & forthwith the choreic movements began to abate. Menstruation is now regular, and there is not the slightest trace of chorea.

In view of such cases as this (and they are probably common enough), is it to be wondered at that a pregnancy, & especially a first pregnancy, should act as a powerful peripheral irritant in susceptible subjects, and induce an attack of chorea? For, as the summarised cases given on previous pages have already shown, the onset of chorea occurs most commonly in the first three months, when the enlarging uterus acts as a foreign body in the pelvis, and in addition there is present that profound disturbance in rearrangement of the pelvic circulation together with that mysterious readjustment of metabolic processes.
rendered necessary for the development & nourishment of the growing embryo.

If other causal conditions of choreic attacks are closely examined they are seen to fall into line with those already given. One and all, be they toxico circulating in the blood stream, or infective microbes inducing a fever or a toxemia, or be they some merely local condition (a taenia, a caruncle, a constipated cervix) they are simply variants of a condition of “peripheral irritation.”

But this is not all; for in the majority of individuals (presumably those with normal or well-balanced nervous systems) the presence of exactly the same sources of peripheral irritation does not result in chorea. What is the reason of this? One is driven to the central nervous system for an answer, and many considerations point to the fact that the main causal condition is one which especially involves the motor centres of the cerebral cortex. Thus Frederick Taylor (Gibbon’s 3rd Book of Medicine 1911, p. 132) in support of his contention that the brain is the principal seat of the trouble refers to “the frequent origin of chorea in fright or other strong emotion, the effect which efforts of the will have in aggravating the movement, & still more the influence which attention has upon them; the fact that the movements cease during sleep, the phenomena of hemichorea with the important
fact that the muscles of the trunk and face on both sides
are associated in the movements with the arm and leg of
one side only; the implication of the mental faculties
to a slight degree, if at all, in mild cases, but seriously
in the form of delusions and maniacal delirium
in some cases of "chorea gravis."

It is then to some underlying abnormality of the
cortical centres that the choreic manifestations are ultimately
due, but the exact nature of that abnormality is
still a mystery— a field for speculation. Is it a
condition of imperfect or delayed development on the part
of the pyramidal cells of the cerebral cortex rendering
them hypersensitive to certain kinds of external stimuli,
(a possibility in view of the fact that the majority of
choreic patients apparently outgrow at a fairly
constant age, the tendency to develop the condition)?
Or is it a condition of malnutrition of the whole motor-
sensory apparatus, the result, in part, of a congenital
deficiency of tone, in part, of the unhygienic
surroundings and insufficient feeding of a large
proportion of young people at an age when they are
not only subjected to much mental strain in their
school work, but are also undergoing those mysterious
changes, mental, physical and physiological, that
mark the period of adolescence?

What it is is yet to be discovered; but, given the two
factors—this hypersensitiveness of the motosensory system, this "neuropathic inheritance" as it has been called, and a suitable "peripheral irritation" acting either suddenly or with violence, as in fright, shock, or in a milder degree but with persistency as in toxic conditions or in pregnancy—and the result is that inco-ordination of voluntary movement and that exhibition of involuntary movement, jerky, spasmodic, and irregular, known as chorea.

Upon the twofold nature of the choreic attacks are based two lines of treatment: (1) the discovery and elimination of the cause of peripheral irritation. (2) the toning up of the nervous elements and the re-establishment of the normal nervous equilibrium.

Of cases of chorea in general it need only be said here that local irritants such as worms, pneumonia, adenoids should be removed without delay, that toxic irritants such as rheumatism, scarlet fever, should be combated by suitable drugs, and that conditions of anaemia & general malnutrition should be remedied by wholesome dieting, fresh air & tonics.

Above all complete rest must be secured for mind and body for a longer or shorter time according to the severity of the case—rest in bed, if need be, and absolute prohibition of occupation & amusement; this should be accompanied or followed by a course
of daily massage, & later by regular specially planned drill & exercise.

Of drugs, arsenic has had, & still has great prominence, and in many cases (perhaps because it improves the nutrition of the neuron) when given in rapidly increasing doses, its use is attended with good results. Sodium salicylate has its advocates, notably Dr. Coe (vide B.M.J. Aug. 29, 1913) who regards chorea as a cerebral rheumatism, and of late a substitute for this drug, namely Aspirin (Acetyl salicylic acid) has been successfully employed. Antipyrine, Epsom, Paraldehyde have all been tried & in certain cases favourably reported upon, whilst in many instances, especially in the severer forms of the disease, sedatives & hypnotics such as chloral & the bromides are found of great value, and indeed, if the movements become exceptionally violent & uncontrollable, a general anaesthetic such as chloroform may be necessary.

As the chorea of pregnancy however that makes the greatest demands upon the practitioner's skill & knowledge & readiness of resource. For at any moment he may be suddenly confronted with a case, and owing to their rarity & the scarcity of information as to the proper treatment of these, he may have nothing to help him in dealing with it but his own wits. Many of the milder cases,
it is true, by the judicious use of sedatives, or by tempering some melancholy condition that apparently aggravates the movements, may (as in Cases V, X, X + XV) be tide over the latter months of pregnancy and may have a natural delivery at full time. But many of the cases are, unfortunately, of the most serious nature, the choreic movements increasing in violence as the pregnancy continues, the patient rapidly succumbing to insensibility to take sufficient nourishment, or, perhaps, becoming delirious and maniacal. Moreover, some fatalities have been due, no doubt, to too long temporizing, as, for example, in Cases V, XVI, XVII, + XVIII, where, in view of the numerous recoveries following abortion or induction of labour, one justly wonders that bolder measures would have had happier results.

Each case, whether mild or severe, must be dealt with on its own merits; many considerations must be passed rapidly in review before a line of treatment is decided upon. Are the movements violent and continuous, preventing the patient from following her daily avocation and threatening her with accident or self-injury? Is she likely to be able to carry the child, if not to full term, at least to such a time as would give it a fair chance of life? Is she in a position to obtain proper attention during her pregnancy? Does she sleep well and is she able to...
take plenty of food, or is she losing weight and being worn out by want of rest? Are there any mental symptoms? Is there pyrexia? Is the pulse getting weaker and more rapid? Will a continuance of the pregnancy cause permanent injury to her health or increase the risk of a fatal issue?

The desire to save the child should in every case be subordinated to the possibility of saving the mother. For even if it is still doubtful whether so-called hereditary or Huntington's Chorea (a chronic condition occurring in adults and usually ending in dementia) is, as some authorities hold, a variety of ordinary Chorea, nevertheless the fact remains that the offspring of a choreic mother is as likely as not to inherit a tendency to nervous instability in one or other of its various manifestations, and this fact should be looked upon as a powerful argument for rather than against the adoption of radical measures. Even in cases of moderate severity, where the immediate risk to the mother is not great, a rapid exacerbation of symptoms may occur at any time or a sudden complication may arise, rendering operative interference imperative, but making it for that very reason more difficult and more dangerous to the patient. Delay is often fatal here as elsewhere, for, to quote Williers's dictum, "in Chorea gravidarum the cases which require
interference require it in good time."

When radical measures have been decided upon the method adopted is of the utmost importance. It has been found, for example, as in Cases XVIII & XXVIII, that a too rapid & forcible dilatation of the os uteri is liable to cause such an exaggeration of the uterine movements as to exhaust the patient and result in a fatal issue. Hence gradual, easy dilatation should be aimed at and whatever will facilitate this should find a place in the routine selected for any particular case. Thus, from its well-known action upon the circular fibres of the os uteri - an action generally recognised in obstetrical practice in the treatment of excessive rigidity of the os during labour - chloral hydrate forms a valuable adjunct to the mechanical means adopted (such as Tapelo tents or bougies) for the stimulation of the physiological action of the uterus.

In regard to mechanical interference, every detail should be carried out with the strictest aseptic precautions. The patient should be anaesthetised, the genitalia should be shaved & disinfected, a sterilised bougie should be passed, with the utmost care, between the uterine wall & the membrane, the vagina should be packed with iodophor gauge. Failing natural expulsion of the foetus in 24 hours, further dilatation, if necessary, may be performed by graduated
bougies, the uterus removed by hand or by forceps according to the stage of the pregnancy, and the uterus (completely amputated of its contents) irrigated with antiseptic fluid. Operation conducted in these lines so attended by the minimum of risk to the mother, and should secure for her an uninterrupted convalescence, and a speedy recovery from all choicer manifestations.

The treatment shall not end here, however. The cessation of the pregnancy means, as has been seen, the removal of the exciting cause — the source of "peripheral irritation" — or the cure of the attack of chorea, but it does not alter the condition of the body or of the nervous system which constitute a "locus minoris resistentiae." In such a patient, any circumstance — a fright, a shock, or another pregnancy — may cause a recurrence of the trouble. It is the duty, therefore, of the medical attendant to advise a course of living that done up the nervous system & strengthen its power of resistance — fresh air, change of venue, rest, suitable nourishment, tonics — any means that will aid healthy circulation & healthy evacuation of waste products of digestion — and in addition, avoidance for a prolonged period of any possible exciting cause. By these means we might gladly entertain the hope of successfully combating & of ultimately overcoming the tendency to this strange disease.
Bibliography.

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