Chorea & Rheumatism

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Chorea and Rheumatism.

As long ago as 1802 it was recognized that a close relation existed between two diseases. In a syllabus of lectures on Practice of Physic for that year Rheumatism is distinctly stated to be a cause of Chorea, and in a later edition of the same syllabus 1820 the two diseases are said to alternate though no conjecture is made as to the agency by which this is brought about. (1) Copland observed the connection in 1819 and thought that the Chorea was caused by metastasis of the acute Rheumatic affection to the thirca of the spinal cord. Pritchard, Roosin shortly afterwards reported similar cases. (3) Bright and Burrow investigated the point. The former says he had many cases and states that his attention had been directed to it by the teaching of Babington, Curry and Cholmley. He considered that the former was influenced in cases of peri-carditis through it irritation was conveyed to the spinal cord. Biggai and Watson (1835) discussed the subject and in their opinion

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The state of the blood in Rheumatism was the common source of the articular, cardiac, and nervous symptoms. Babington in 1846 drew attention to the frequent association of the heart complication and assigns the credit of first pointing out this fact to S.-Addison. Babington says "Rheumatism also where it affects the heart & pericardium may give rise to the disease through the irritation of the plexus and ganglia which so entirely surround that organ and the origin of its great vessels." In 1846 Hughes published a list of cases which led him to the conclusion that among those he had investigated 46 had their origin more or less in Rheumatism.  Hughes showed that contrary to the opinion of Bright & others chronic was associated rather with endo- than peri-carditis. See and others about 1850 continued the investigations which have been followed up and extended by many distinguished physicians since that time.

Though all agree that there are grounds for believing that there is some connexion between the diseases yet there are great discrep.

(1) Contributions to Pract. Med. p 68.
Watson. Vol. VI. 1672. 4 Ed.
(2) Enyo Hospital Reports. Vol. 6. 1841. p 418. x 415.
(3) Enyo Hospital Reports. 1846.
(4) Med. Gazette 1850. Decs
(5) Mem. de l'Acad. 1850. p 373.
nancies between the results of the various observations. Doubtless these differences were to a great extent due to the fact that the object of their investigations was not definitely settled and evidence which was deemed satisfactory by one man was rejected by another. Perhaps also the unconscious bias exercised its unperceived but potent influence in some cases.

Originally the conception was supposed to lie between Chorea and acute articular Rheumatism: the two diseases occurring in such a sequence as to suggest some actual causative relation. One section of observers appear to have had this view of the subject before them when making their inquiries. Another and a larger section, division, believing that the Rheumatic Diathesis had something to do with the causation of the nervous disorder, looked for any evidence of this taint either in the individuals affected or in their near relatives. When we remember the undoubtedly hereditary character of Rheumatism, this last evidence is certainly admissible.

(1) Keating's Cyclopædia of Diseases of Children Vol. 1, 1889.
25% - 60% of all Hereditary.
Cicard 30% - 40%
Goodhart 60%

in support of their position. The differences between the statistics of those who took this last view of the question would be explained by the various degrees in which they recognized the rheumatic nature of many cases of tonsillitis, rheuma nodosum, some inflammatory affections of serous membranes, and the presence of subcutaneous nodules described by Negretti. It may be safely said that there is some evidence in support of the causal relation between Chorea and Rheumatism, and that many are satisfied that besides this there is an intimate connection between the Rheumatic Diathesis and that affection of the nervous system.

It is interesting to note that Rheumatism and Chorea are alike in their incidence upon sex and age. Chorea is essentially an affection of childhood, while the frequency of Rheumatism at that age is remarkable. Chorea is more prevalent among girls than boys; and, contrary to what is the case in adults, Rheumatism is also found affecting females more frequently than males.

(2) Brit. Med. Jour. Nov. 1874. Statistic 34 cases between 6 - 16
(3) Kents Cyclopædia Vol. I. p. 791
As pointed out by Sturges consideration must be given to the age incidence of Rheumatism, but in his statistics Stephen Mackenzie thought that 1 in 2% were taken off this pellagra would be done away with. (1)

No good purpose would be served by giving long lists of names or statistics on one side or the other so that a few may suffice. Romberg thought the relation was rarely traceable. Nieurige held much the same view. Oelhast and Stumpf thought the connection was but an occasional one. The views of those who oppose the Pan-Rheumatic theory may be expressed in the words of Dr. Sturges who, after showing that he had made out that 132 cases of Rheumatism had nothing to do with 3% of them says: "No one in this country has succeeded in finding out any large proportion of cases immediately connected with Rheumatism, and until we agree upon the particular signs & symptoms which are to be accepted as valid evidences of Rheumatism we have no common factor to deal with and may expect the remarkable discrepancies which

(4) Oelhast.
appear. He thinks that acute Rheumatism, though rare, occurs in such association as to justify the assumption of some direct relationship, but denies that chronic Rheumatism has any thing to do with Chorea.

On the other hand see: (1) Rogers, (2) the Brit. Med. Coll. J., (3) & Gowers agree that there is a connection in 1/4 of the cases reported. Broadbent admits there is a relationship, Lewis Smith says the question was investigated by himself and his brother physicians at the Bureau for the relief of the poor, New York, and it is fully accepted by them that there is a frequent causative relation. Sachs says that though interpretations may differ the fact is indubitable. (4) Roos speaks of Rheumatism as one of the most frequent and important causes of Chorea. (5) Stephen Mackenzie made out that 44% of his cases had distinct Rheumatic History. (6) The Investigation made by the Brit. Med. J. into the Geographical Distribution of Disease.

(1) Mem. de l'Acad. 1850. XV, p 373
(2) Arch. gén. de Med. 1866. XV
(4) MacKenzie Cyclopaedia Vol. 4 p 343
(6) Diseases of Children. 5th. p 486
(8) Diseases of the Nervous System. Vol ii p 814
pointed out that the distribution of chorea was affected by that of acute and subacute Rheumatism: its prevalence diminishing as the latter disease became rare. Many other results might be cited but these in the words of his Harveian address(1) may be allowed to sum up the case for the substituents of the Rheumatic theory in its entirety. After pointing out how necessarily incomplete all statistics are was much as they have been based chiefly on records of acute articular Rheumatism without noting other important manifestations of the Rheumatic Diathesis, he goes on to say: 'The statistics of the Collect. Investigation Committee based upon the simple Rheumatic event of articular affection before, during, or immediately after the event gave a 32% of chorea positively rheumatic. If to these be added the cases of vague backache the percentage is 46.2. The estimate of two of the most sagacious clinical observers of our time come near to this. S. Stephen MacLennan found 44.76% almost certainly rheumatic, and for reasons similar to those I have just pointed he regards this

as representing very imperfectly the connection of Chorea. Dr. Barlow finds in 44 out of 73 or 68% sufficient evidence of Rheumatism and points out the existence of progressive heart disease and the inadequacy of the record renders it probable that many other cases should be included. In 84 cases minutely recorded and specially investigated by myself I find satisfactory evidence of acute Rheumatism in the patient or immediate relatives in 62. i.e. 73%. Learning out the family history the estimate would coincide very closely with that of Dr. Barlow. It may then I think be concluded that in the majority of cases at least Chorea is a Phase of Rheumatism.

Chorea may appear before, during, or after an attack of acute Rheumatism. YOUNGMAN says it rarely precedes but follows the Rheumatic attack in the proportion of 1/3 of the cases. ARIDGE found that Rheumatism preceded Chorea in 1/3 of the cases and SCUDDERT as frequently as Rheumatism. The relation of Scrofula to Rheumatism must be borne in mind. STEINER reports but few cases which developed during Acute Rheumatism. CHENREDLE (4) says Chorea

(2) Hilfuiris Medemie Vol. 2. p. 112. 72nd
is associated with acute rheumatoid arthritis and with no other acute disease except scarlatina which is also closely associated with rheumatism. However, quotes statistics which show that of 70 cases of chorea associated with febrile disorders rheumatic fever was present 25 times and exanthema 17 times of which 10 were cases of scarlatina. Bourgin holds to the opinion expressed in the Syllabus of 1820 and also mentioned by Griesinger with regard to rheumatic insanity that there is an alternation between the nervous and the articular affection. Radcliffe holds that chorea is essentially a feverless malady and says the symptoms are suspended before or during the fever but may occur before or after it. This may be the case with ordinary chorea in a but cranioform movements due undoubtedly take place during some cases of rheumatism. It is also stated by one author that these movements are more likely to occur if the heart be affected. The patient

(1) clinical lectures vol 1. p. 395.
(2) klin. wochenschr. Berlin. 1886. 10. LeBes.
(3) mental diseases. p. 189.
(4) Reynolds' system of med. vol 2. p 128. watson vol 1. p 666 4 ed. tagg the cm. 643.
(x) tagg's medicine vol 2 p 535.
xx. Quain's med. 3 ed. p 1361.
be suffering from mental depression. In children it is not always possible to say whether they have had a previous rheumatic attack or not and this makes one change to the number of cases which occur before the Rheumatic Suture. The conclusion is that Chorea frequently follows acute Rheumatism; occasionally accompanies it and sometimes appears to precede it. Indeed in the words of Credé it is often "a phase of Rheumatism.

Now why should children who have a Rheumatic Diathesis be so much more liable to attacks of Chorea than are those whose constitutions are free from the Rheumatic Taint? Why should mental causes act more frequently on the Rheumatic than on the non-Rheumatic child? Macleod again tried to explain it by saying that Rheumatism was a disease of the motor system and that Chorea affected the nervous motor mechanism. Sturges has pointed out that it was an affection not so much of the general muscular system as of the muscles whose movements were

(1) Lancet Nov. 30, 1889.
most intricate and specialized. To this it
might be rejoined that Rheumatism attacks
the joints which are most used.

From the consideration of pathological records
it would appear that Chorea may denote
either a purely functional disorder or it
may be caused by various pathological con-
ditions of the brain and possibly even of
the spinal cord. In this country it is gen-
erally believed to be due to affections of
the Basal ganglia and motor areas of
the cortex. (x)


(3) Lancet May 30, 1885.


arrangements and irregularities of the vascular supply of the highest nerve centres. In many cases no lesion of the nervous system has been found. Watson (1) has since then considered that in some instances it might be due to a blood condition. Sachs remarks that if there be any such toxic agent it must be a debilitating one. Dickinson (2) thinks it arises from hyperemia with slight hemorrhages & pericardial oedema & sclerosis in the course of the middle cerebral artery. It is important to note the pericardial position of these lesions. Hult (3) started the embolic theory which was supported by Weltz (4). It has been said that the hemorrhages and hyperemia observed by Dickinson might really have been secondary to the emboli (Currost). Dickinson, Weltz & Moisan however did not find emboli though other investigators have done so. Hugheleys' Jackson in the strong supporter of the embolic theory which is also received by Broadbent (5) though he acknowledges that Chorea may arise from other

(2) See collected P.M.'s. With a p. 16 there were no changes in nervous system. Leriche's Gelseo. Vol. 1. p. 44.
(3) Weltz. p. 44. 1872.
(5) Beth. p. 1. 1874.
causes. Some observers have found evidence of
thromboses (Crichton & Bastian). Copleand and
Pritchard at the beginning of the century
thought it was associated with meningitis,
and their lesion a severe effusion into the
meninges have been found occasionally.
Rothamsted and Golgi describe increase of
the connective tissue of the nerve centres while
von Manger mentions cases of severe form
movements associated with peripheral affect
ions of the nerves. In the one P.M. however
which he gives (Gliessner) there were central
lesions found as well though he speaks of
other cases which recovered.

In the words of Sachs every thing and
every thing from a blood disease to a cerebral
tumour has at one time or another been
put forward as the cause of clonic.

From this it may be fairly argued that
Clonia is a symptom which depends upon
functional or nutritive disorder of the nerve
centres and which may arise from various
pathological conditions. I would lay stress
upon the anaemic condition & weakness of cir-
ulation which is so frequently found as.
antecedent conditions to the onset of chorea. It has been at different times ascribed to:

1. So-called functional causes. in anxious individuals.
2. To alterations in the vascular supply of nervous centres.
4. Thrombosis or embolism.
5. Meningitis: severe effusion into meninges; changes in connective tissue of central organs.
6. To changes in peripheral nerves [1].

There is however an underlying element in the production of chorea which is of vast importance and that is the "mobility" of the nervous system, spoken of by Cullen and referred to by Marshall Hall [2]. The latter looked upon chorea as an affection of the emotional centers. The children liable to attacks of chorea are light and hyper-sensitive. Dickinson remarks that every period of life has its region of nervous excitability and in childhood this is the motor region [3]. That there is this nervous excitability in choreic children is shown by the fact that they are twice more liable to whooping cough than are non-choreic children. The influence of their "mobility" is further displayed by the great

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(1) Materia Medica Vol. 2. p. 112.
rarity or absence of chance proper amongst idiot children. Graham had never seen a case in
Idiots. S. Shuttleworth (Royal Albert Asylum). Hutton
Ewen (Dawson's Idiot Asylum). Jones (Earlswood)
agree in informing me that it is very rare. I myself have never seen an instance though
attentions and post-paralytic choreiform move-
ments are found. This is the more astonishing
because in every other respect the idiot shows
the most favourable material for the production
of chorea. The majority of them have certainly
the rheumatic inheritance and many of them
also the Rheumatic and Tubercular affections.
The want of this mobility in the German char-
acter may also explain the statistics of Ramb.
Grunwick who stated that out of 40723 chil-
dren treated there were only 19 cases of chorea
and of these only 2 followed greatly. The pro-
portion in New York was 1 in 207: in London
1 in 322; in Paris 1 in 681 (in females). Sturge's
has said that the affection is practically
unknown among the Indians. The 4th action
of pain or shock in its prodromies is admitted

6. Lewis Smith Diseases of Child. p. 82.
generally. Dr. Sturge made out that more than half his cases were due to mental causes and in his opinion psychical disturbance far outweighs all other causes of the disease put together. I myself saw a case of chorea which followed immediately upon the use of the Suturetveri catheter. These causes will undoubtedly exercise a greater effect upon debilitated individuals of a "noble" nervous temperament.

I shall now endeavour to show

1. That the Rheumatic Diathesis carries with it the mobility of the nervous organisation and entails a liability to certain nervous states.

2. That the anaemia due to Rheumatism or to the Heart Disease arising from it plays an important part in bringing about that malnutrition of the nerve centres which renders the already unstable nervous system still more liable to be upset by shock, fright or mental causes.

The Heart Disease in itself will produce abnormal changes in the Blood supply of the nerve centres.

3. The Rheumatic Endocarditis by causing vascular vegetations furnishes the materials for emboli which have been shown to be the cause of choreiform movements.

4. The state of the Blood in acute Rheumatism.
The rheumatic poison attacks serous and fibrinous membranes, especially the serous effusion into the meninges do occur in that disease and either from irritation or from extension of the affection to the perivascular spaces in the nerve centers may lead to chronic movements.

Rheumatism occasionally leads to changes in the sheaths of nerves. Aections of sympathetic nerves have been said to play a part in the production of chorea. (3)

7. The Nervous Element in the Rheumatic Diathesis.

Acute Rheumatism itself is believed by some to be due to nervous influence. This was the view held by Fuller Todd and Addison and Hutchinson supports it in his paper on the connection between Eust and Rheumatism. Latham attempted to combine the chemical and nervous theories.

(2) Taylor's Med. 20 Ed. 1809.
Theories. The relationship of Rheumatism to Chorea may be considered established, at least to some extent, and its possible connection with migraine is interesting. (1) Zetler in 

speaking of the subcutaneous nodules found in Rheumatism remarks upon their occurrence along with migraine in an individual of asthenic diathesis. I have made enquiries into 10 cases of migraine and in every one I find evidence of the Rheumatic Diathesis well marked either in the individual themselves or in their near relatives. (2) Hauy has said that migraine is due to uric acid. If this be so, which is not by any means clear, then my cases may go to support Hauy's view of the intimate connection relationship between Rheumatism and gout which latter disease has been held by Duckworth to have a nervous origin. Testimony in favour of the nervous tendency of Rheumatic epilepsia is given by Austin who affirms that Hereditary tenders of Rheumatism is associated with Hereditary tendencies to nervous diseases of various kinds. When we remember the large percentage of Chorvas in which some late observers have

(2) "Uric Acid." Hauy.
(4) Brashwen's, Report. 74 2/74.
detected Rheumatic Pains; it is significant that Sykes found that out of 1,456 cases of chorea, 32% had Rheumatic and 33.56% had neurasthenic inheritance. Radcliffe found that 27 out of 48 cases of chorea had a near relative who either had been or was a sufferer from nervous affections. Roas and Maundy urged the indirect inheritance of chorea in nervous subjects. Dyce Duttworth suggests the transmission of nervous instability in Rheumatic subjects and dreaded states definitely that the Rheumatic diathesis carries with it nervous instability. Such while agreeing that that Rheumatism is related to chorea remarks that the latter is one of several nervous states which may be developed in children of parents affected with epilepsy, migraine or chorea. Wirtz in insanity allude to a Rheumatic form of that complaint. Stiehen argues on his side of the question and endeavours to show that the various diatheses are degenerate conditions and are transmutable. My conclusion is that Rheumatism appears to enter a mobile nervous organism with

(1) Lancet 21 Dec. 399.
(4) Pathology of mind. p 158
(6) Lancet May 4. 1889.
(7) Keating: Cyclopædia of Sci. of Chil'd Vol. I. p 305.
(8) Gowers. Mental Disease. 2nd Ed. p 189.
(9) Maundy. Pathology of mind. p 201.
a liability to chorea and possibly to migraine.

7. Anemia and diseases of the heart.

"Anemia plays a very important part in the production of a number of other diseases and we see that even within the limits of physiology a bodily condition in which the nutrition is lowered renders more easy a state of irritation in the functions of the nervous system — of all purely physical causes might almost attribute to these variously modified anemia states the greatest weight in the production of insanity." So wrote Griesinger, and other writers on insanity speak on the same topic. Anemia is one of the most common antecedent conditions to chorea and we find in Rheumatism a most potent agency in its production. I have alluded to the frequency with which Rheumatism attacks young children. Indeed, in childhood the joints may be spared altogether and the attack of Rheumatism be overlooked until anemia, debility or a permanent heart lesion point to its having been present. The younger

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1) Mental Diseases 23. Ed. 1891.
2) Blood. 4th Ed. p. 53.
the patient the more likely is the heart to be affected and the joints left untouched. Radcliffe holds that chorea is associated with want of vigour and with inactivity of circulation and others have ascribed it to irregularities in the vascular supply of the nerve centres. The great number of the cases of chronic minor are due to psychical causes operating upon a unstable nervous organization which has been debilitated by anaemia etc. Rheumatism besides supplying exactly the stamp of child which is needed produces itself the very conditions which reduce the already unstable nervous system to such a state of instability as to respond readily to psychical influences. The attacks of Rheumatism also in childhood is so insidious that the chronic movements after many days may be the first evidence of it, and lead us to look for and often find other traces of it, having been present.

Endocarditis.

The credit of first noting the frequency with which heart murmurs were associated with chorea belongs to B. Addison. They have been generally recognized since his time. At first

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It was thought that pericarditis was the form of heart affection which most commonly excited but Shakes made out that it was eutic candiditis. Hughes showed that out of 104 cases only 15 were free from cardiac murmurs and in 11 out of 14 deaths from chorea there were found actual vegetations on the valves. Kellier took note in 37 cases and there was probably organic disease in 25 and functional affection in 4: in 8 only was there no sign of cardiac disturbance. Romberg rarely discovered a murmur. Insinville found in fatal cases a constant lesion affecting the auricular surface of the initial valve. Broadbent says eutic candiditis is present in almost all fatal cases whether there was a murmur during life or not. Dickinson found eutic-candiditis in 17 out of 22 fatal cases and states that the stethoscope showed it in 40 out of 70. He did not believe that the eutic candiditis stood in any causal relation to the chorea. Steffen also while admitting the presence of the eutic candiditis denies that it has anything to do with producing the nervous symp-

Kunigis says that the heart is affected in 1/3 of the cases and that the valvar lesion is persistent in certainly 60% and possibly 80% of these. (2) Byers points out the prevalence of endocarditis in chorea and shows that it may be found after death even when there was no evidence of its existence in life. (3) Wilks states that he has never seen a fatal case without this complication.

The frequency with which it is found after death as well as diagnosed during life is a proof that it is often though not invariably present. The important questions are: 1. Is the endocarditis due to Chorea?

- atis. 2. Did it cause the Chorea?

(4) Cheddale, Roger and Cooshart agree that 50 to 80% of all cases of endocarditis can be traced to Rheumatism. When we recall the number of cases of Chorea in which Rheumatism might have produced the Chorea and the partiality of Rheumatism for the heart in childhood we must admit the probability of Rheumatism being the cause of the great majority of the heart lesions. The COLL. HEART. STATISTICS give 72% of heart affections in child Rheumatism

(2) p 115.
(3) Diseases of Nervous System. 2nd Ed. p 427.
as compared with 46.7% in adults. The vegetations in Chorea are similar in structure to those in Rheumatism, though "coincidence of structural change does not imply identity of process." Sturge holds that the heart complication in Chorea is due to muscular process, but S. MacKenzie maintains that nearly all the cases of heart murmur which are found are caused by Rheumatism. This position is supported by Sarnod and B. Bramwell, who states that vegetations are present during the attack of Chorea and subsequently disappear. He believes that the Chorea endocarditis is undoubtedly Rheumatic. The conclusion is that the vast majority of cases of Chorea endocarditis found in Rheumatic subjects are caused by the Rheumatism and not by the Chorea itself.

In some cases at least Chorea movements may be caused by emboli consisting of particles from the valvular vegetations as advocated by Herbert, Hughes, Jackson, Broadbent, and others; but it does not follow that because vegetations are found on the valves, the nervous symptoms were due to emboli. Chorea is not caused by emboli solely and individuals with endocarditis are as liable or even more liable
to the causes which operate upon subjects not so affected. Therefore though in some cases chorea may depend upon the endocarditis measured as it is caused by the irritation or malnutrition produced by embo- 
obi. There are others in whom the endo-
carditis plays a part in producing a 
general weakening of the body and cause 
severely of the nervous system which, owing to the patient's inherited temperament, 
purposes severely. Whether the nervous symptoms 
depend upon emboli or not, the presence of 
some endocarditis appears to be a frequent 
accompaniment of chorea in fatal cases.

IV. Condition of the Blood in Ac. Rheumatism

The chronic form movements observed 
in some cases of Ac. Rheumatism was es 
duced by Bigbie & Watson to the same 
condition which causes the arthritis 
and by this to a tonic agent which acted 
the nerve centres. The tendency of the blood 
Ac. Rheumatism to coagulate and form 
Thrombosis must not be overlooked. Thus 
comes, partly from the reduction of its 
alkalinity (due to the presence of Rastic Acid or 
Bacteria) or from the hyperinos in which exists.

3) Pathologie und Therapie der Nervenkrankheiten p. 397.
It is interesting to compare the state of the blood in frequency, in which it shows the same liability to form thromboses, when we recall the fact that severe chorea is sometimes a dangerous complication of that condition. The formation of capillary or small arterial thromboses would lead to chorial movements. We know that thromboses do occur in ac. rheumaticum and we have it on the authority of Arthur & Bastian that they have been found in chorea. Viral meningitis & serous effusions into the meninges.

Copland and Postland thought the choreiform movements they had noticed in cases of ac. rheumaticum was due to the spinal meningitis they found after death and they supposed that it was due to a metastasis from the joints to the them of the spine. Hughes also thought that in the cases where inflammatory affections of the meninges existed the nervous disorder must have been due to them. Bright pointed out that one of Copland's cases was complicated by the presence of meningitis which he thought was the cause by affecting the phrenic

(2) Phil. Med. Vol. II p. 207. 7 Ed.
In 1835 Watson called attention to head complications attending acute rheumatism which he said were due to disturbance of the cerebral circulation from heart disease and which he styled to denote inflammatory conditions of the brain. Rheumatic related cases which only showed increased vascularity without inflammation. Roosevelt also spoke of cerebral rheumatism. It is now however recognized that most of these cases were really examples of hypertensive pericarditis or even due to salicylic acid.

Meningitis however occasionally found in acute rheumatism & serious permanent also occur. The affinity which rheumatism has for various membranes is great. Out of 24 cases of acute rheumatism quoted to the Clinical Society meningitis was present in 2. Simons and others say it is occasionally found. In the opinion of Jacobs it occurs more frequently than some authors believe. D'Espine in 1873 reports 75 cases. Similar lesions have been described in fatal cases of chorea. Out of 84 ½ in's 72 found that 34 showed inflammation of various membranes and

changes in the heart. (There were 16 Rheumat.
card. + endocard. = 6 meningitis. + 3 Brain in.
duration of meningitis = 6 pleural exudation.
6 Peritonitis.) Steinhe looks cases with severe effusion into meninges. These chorei-
form movements are not a symptom of
ordinary meningitis but do occur in cases
of acute Rheumatism with head complications.
This may be due to the effect of the Rheuma-
tic poison upon the meninges or the peri-
vascular spaces causing irritation + malnutrition of
the nervous tissue.

Rokitansky, Edgi and Steinhe have
found increase of the connective tissue in
the brain + spinal cord in cases of chronic
and dural." following a suggestion by
Cheyne has put forward the theory that
soon as there are temporary nodules found
in subcutaneous tissue in Rheumatics in
individuals similar formations might occur
on the nerve centers. This is inadmissible.

Nottingham in his paper on peripheral
rheumatic meningitis mentions cases of choreiform move-
ments which he believed were caused by

(1) Thebainis Cyclopaedia vol. XIV. p. 1450.
(2) Lancet Nov. 23. 1887.
changes in the nerves themselves. In the P.M. he gave (I think) there were at the same time lesions in the central nervous system though he mentions other cases in which apparently there were affections of the nerve bundles but who recovered. It is however interesting in this connection to remember the influence of Rheumatism in causing neuralgias owing to the growth of the circumjacent fibrous tissue.

Conclusions

1. A "mobility" of the nervous system is an important element in the causation of many diseases.

2. Rheumatic inheritance entails this "mobility".

3. Chorea is a symptom which denotes "irritation and malnutrition" of the nerve centres and this may be brought about in various ways.

4. The anemias and heart disease which so frequently follow acute Rheumatism are powerful agents in producing this state of irritation and malnutrition. Acute Rheumatism is frequently over-

(i) Reynolds System of Medicine Vol 2, p. 746 (Ward, Beazie)
looked in young children.

V. Rheumatic children are as liable as others to be attacked by "psychical" causes of chorea and are more likely to be overtaken by them.

VI. For the production of the graver forms of choreiform movement depending upon organic changes in the nerve centres as Rheumatism or its results provide the following causes:

a. Thrombosis
b. Embolism.
c. Nervous affection etc.