Further observations on the histology and function of the mammalian sympathetic ganglia / by W. Hale White.

17 a

In mammalian sympathetic
Ganglia.

[*From the Journal of Physiology. Vol. X. No. 5.*]

FURTHER OBSERVATIONS ON THE HISTOLOGY AND FUNCTION OF THE MAMMALIAN SYMPATHETIC GANGLIA.

By W. HALE WHITE, M.D.

(From the Laboratory at Guy's Hospital.)

In this *Journal*, Vol. VIII. No. 2, I tried to show, Firstly:—that human adult superior cervical ganglia vary as much in size as the largest and smallest of other mammals, and that the size of the ganglion in other mammals varies directly as the size of the animal. Secondly:—that human superior cervical ganglia exhibit granular pigmented atrophic cells much more frequently than those of other mammals; that this condition though present to some degree in monkeys, diminishes regularly as we descend in the mammalian scale, till at last it is not seen. Thirdly:—that human fœtal superior cervical ganglia do not show any of these changes in their nerve cells. These facts seemed to me to demonstrate that the superior cervical ganglion is becoming less and less important functionally the higher we ascend in the animal scale, till in the human adult its minimum of importance is reached. It is in fact an atrophied degenerate organ like the coccyx or appendix caeci.

Since the publication of that paper I have made some further observations on this subject.

In order to make sure that the pigmented, granular, atrophic, degenerate appearance of the cells could not be due to the method of preparation of the specimen, I examined in the fresh state the superior cervical ganglion of ten persons dying of various diseases, and found that the nerve cells showed exactly the same appearances as those which I have described as being present in the nerve cells of ganglia which have been hardened in Müller's fluid. This condition of nerve cell in the human subject has been found by many observers, such as Foa (*Rivista Clinica di Bologna*, 1874), Giovanni (*Patologia del*

Simpatico, Milano, 1876), Luminoff (*Virchow's Archiv*, Bd. 61, § 145), Da Costa and Longstreath (*American Journal of Medical Sciences*, July, 1880), Long Fox (*Influence of the Sympathetic on Disease*), and Saundby (*British Medical Journal*, Jan. 13, 1883). It is extremely unlikely that all these observers prepared their specimens in the same way, and yet they found exactly the same changes as I have done both in prepared and fresh specimens. Therefore we must I think admit that this condition of cells is present during life.

Wishing to find out whether the age of the subject bore any relationship to the condition of the superior cervical ganglion, I examined this organ taken from twenty-two different people dying of different diseases, wrote a description of each specimen without knowing the age or cause of death of the patient, and then arranged the descriptions according to the ages of the patients. The result of this is shown in table A at the end of this paper. It will be observed that four children of 10 years of age and under were examined, and in all of them the nerve cells were well formed, neither shrunken, granular nor pigmented, and in every respect looked like ordinary nerve cells. In the remaining eighteen patients, all of them adults over twenty-one, the nerve cells were not like those of children save in a single case; they were in all others either granular, shrunken, non-nucleated, or very few in number, and had not by any means the usual appearance of nerve cells. It will also be noticed that the cells are furthest removed from the normal type in the oldest people, for example, the nerve cells from the superior cervical ganglion of the three people who were seventy or over, were very scanty, and were nothing more than small granular masses of pigment. In my last paper in this *Journal* I described one superior cervical ganglion from a child, and its nerve cells were quite normal. Out of the 41 specimens there described, all but nine were taken from persons who died of diseases which very rarely occur in children. If we take out these nine we have thirty-two specimens left, one of which was a child with normal nerve cells, but in all the remaining thirty-one the cells were unlike the normal type. Thus, putting the lists from each of the papers together we have forty-nine adults examined, among whom only one showed entirely normal nerve cells in the superior cervical ganglion, and five children examined, all of whom showed entirely normal nerve cells. In my last paper I demonstrated that in each of ten human fœtuses the cells of the superior cervical ganglia looked exactly like normal nerve cells, except that they were rather small, which was probably due to their not being fully grown. Schenk and

Birdsall[1] have shown that the sympathetic ganglia are developed, both in man and other mammals, by an outgrowth from the central nervous system, and that the cells of the sympathetic ganglia are at first indistinguishable from those of the central nervous system, which however grow more rapidly than the sympathetic cells, so that soon the sympathetic cells may be distinguished by their being smaller.

I also proved that the superior cervical ganglion varied more in size in adult man than any other organ (except perhaps other ganglia) in the body. Although there are a few cases on record in which the cervical sympathetic ganglia have been implicated in a tumour, in none were there any symptoms save those which could be referred to the destruction of the nerve fibres passing through the ganglion, and no disease has ever been shown to be due to a lesion, either intrinsic or extrinsic of the cells of these ganglia.

All these facts seem to me to afford additional proof of my contention that the superior cervical ganglion is in the human fœtus an organ having some function, but that soon after birth the ganglion begins to degenerate, and this degeneration continues till, towards the end of life, the nerve cells are atrophied and functionless.

It will be noticed, that in fœtuses and children none of the cells are pigmented, but that at the age at which other signs of degeneration such as the appearance of a granular condition, shrinking, absence of nucleus &c., begin to appear, pigmentation is first seen. This may perhaps mean that we ought to regard the pigmentation as evidence of degeneration. The cause of death has no influence on the condition of the nerve cells.

In 21 out of the 22 patients whose superior cervical ganglia are described at the end of this paper, I examined the cervical sympathetic nerve between the superior and middle ganglia, and in every case it was perfectly healthy, being composed of grey fibres with a few small white ones mixed with them. It is noteworthy that if the sections showed among the nerve fibres a few nerve cells these were pigmented, granular, and degenerate. That the human sympathetic nerve in the neck is functionally active is well known from the experiments of Prof. R. Wagner upon the head of a decapitated criminal, whose pupil was made to dilate by stimulation of the cut distal end of the cervical sympathetic nerve. Also there are numerous cases on record in which the nerve has been destroyed by aneurisms, or growths, or cut by

[1] *Mittheilungen aus dem Embryologischen Institute*, Bd. 1, Wien, 1880.

injuries, and there is even one recorded by Israel (*Berl. Klin. Woch.* 1888, § 120) in which a piece of the nerve was excised during a surgical operation. All these cases show that the sympathetic nerve in the neck in man possesses exactly the same function as it does in animals. Möebius (*Berl. Klin. Woch.* 1884, § 234, u. folg.) has published an important collection of such cases.

I therefore submit the conclusion that although in adult man the superior cervical ganglion is functionless, the cervical sympathetic nerve has the same functions as in the lower animals.

In my previous paper I gave a list showing the results of the examination of the superior cervical ganglia taken from forty-six mammals lower in the scale than man.

I have in addition examined twenty-three more. The results will be seen in table B at the end of this paper. It will be noticed that in all the lower animals the nerve cells are of the normal type save in one of the Catarrhine apes. This confirms the result previously arrived at, namely, that whilst adult man presents a very large proportion of granular degenerate cells, in monkeys there are very few and in the mammals below them hardly any.

The sections of this ganglion from the lower animals also show that the size of the ganglion varies directly as the size of the animal.

All these additional facts confirm my previous contention that the superior cervical ganglion in the lower mammals has some function; in monkeys it has begun to lose this function, and in adult man it is entirely functionless.

The spotted hyæna, the spectacled bear, the crab-eating raccoon, Michies' tufted deer and the white lipped peccary were all described as aged, and the bear was very old, yet all these animals showed well-developed non-degenerate nerve cells. This is in striking contrast to the minute, non-nucleated masses of granular pigment, which we have seen represent the nerve cells in the superior cervical ganglia of elderly human beings, and is further evidence that, in adult man, these ganglia have lost whatever function they may have had in the lower animals.

In my second series of sections as in my first I have sometimes found a large number of leucocytes; I cannot say what their significance may be.

In 19 out of the 23 animals examined, sections of the cervical sympathetic nerve between middle and superior cervical ganglion were cut, and they were always found to be perfectly healthy and quite indistinguishable from the corresponding human nerve.

There will be found tabulated in Table C at the end of this paper, the result of an examination of 33 human semilunar ganglia, taken indiscriminately from persons dying of various diseases. Of the 33, three came from children, and in all of them the ganglion cells were excellent examples of normal nerve cells, some of them showing processes as distinct as those of the cells of the spinal cord. In six only of the remaining 30 were all the nerve cells normal; all the other ganglia showed more or less degeneration of their cells which in many sections were reduced to minute masses of non-nucleated, granular pigment, free in the middle of the capsule.

Often it is particularly mentioned that there was a large amount of fibrous tissue. In a few instances the section was crowded with leucocytes but no cause for this could be made out. No constant arrangement of the numerous small vessels could be discovered. The appearance of the section never bore any relationship to the cause of death.

I carefully examined all these ganglia with regard to their size, and found it varied as much as does that of the superior cervical, and that these variations were quite independent of the cause of death.

Sections were made of nine splanchnic nerves, and although some of them were attached to semilunar ganglia whose nerve-cells were degenerate, these nerves were always healthy.

Table D shows the appearances of the semilunar ganglia taken from eighteen mammals lower than man; the nerve-cells of all were examples of the normal type.

These results so agree with those arrived at on examination of the superior cervical ganglion, that we may probably conclude that, although the semilunar ganglia in the lower mammals and in young human beings are functionally active, in human adults their nerve-cells have degenerated and become functionally inactive, but the nerve fibres always retain their structure and function.

The superior cervical and semilunar are the two largest collateral ganglia in the body, therefore I suspect that the conclusions concerning them to which we have arrived, may be applied to all the collateral ganglia. As supporting evidence I would urge that degenerate nervous structures are known to exist in the human adult, for Gaskell (*Med. Chir. Trans.* Vol. LXXI. p. 361) has described a degenerate ganglion on the root of the third cranial nerve, and probably the medullary portion of the suprarenal organ should be regarded as an instance of degeneration, for it is of considerable size in the fœtus, but in the human adult is very small indeed in proportion to the whole body.

In order to see whether the lateral ganglia resemble the collateral I prepared the thoracic ganglia taken from twenty-four patients. Many sections of each were examined, and in most cases the ganglia were taken from both sides of the body. The results will be found in Table E, which consists of two parts, the first containing a description of the first thoracic ganglia, the second an account of thoracic ganglia below the first. The first thoracic ganglia were examined in 15 persons dying of various diseases. Those from the three youngest, viz. a child of five months, and two men aged respectively nineteen and twenty-three, showed perfectly normal nerve cells, which were large, distinct, nucleated, neither granular, nor pigmented, and the nerve cells were similar to these in sections taken from patients aged 27, 35, 36, 41, and 58. The nerve cells were slightly granular and pigmented, and therefore might probably be considered as showing some evidence of degeneration in patients whose ages at death were 24, 41, 57, 59, 60, 62, 63, but in none of these did the cells ever show the extremely granular and pigmented condition associated with atrophy, which is common in the superior cervical and semilunar ganglia of human adults. On comparison of the ages of the two sets of patients, it will be seen that those in whom the cells showed neither granular nor pigmentary change, were much younger than those in whom this condition was present. The average age of the former is 30, of the latter 52. As the inferior cervical ganglion is often blended with the first thoracic, the sections were always taken from the lower half.

Thoracic ganglia below the first were examined in nine persons. In six the nerve cells were large, well formed, and showed neither granular nor pigmentary change. In three this condition was present, but it never existed in the extreme degree so common in the superior cervical and semilunar ganglia. Unfortunately the ages of these three patients are not stated, but they died of maladies much more common in adults of middle or later life, than in younger persons.

I think this examination of lateral ganglia is sufficient to enable us to assert that they do not resemble collateral in the extreme degree of degeneration which these always present in human adults, but that in old age they show slight evidence of degeneration. This is supported by the fact that thoracic ganglia are much more constant in their size than are the superior cervical and semilunar.

In the same person similar thoracic ganglia from opposite sides of the body exactly resemble each other. The nerve fibres are always healthy in appearance. There is nothing noteworthy about the fibrous

stroma. The capsule of the cells is usually beautifully nucleated. The arrangement of the vessels is that there are a number of small ones which run parallel to the long axis of the ganglion. Occasionally some leucocytes may be seen in the meshes of the fibrous tissue. The sex and cause of death do not influence the appearance of the ganglion.

The conclusions which I would draw from these two papers are:—

Firstly; that in lower mammals and young human beings the collateral ganglia (if we may judge from the superior cervical and semilunar) are functionally active, but that in monkeys there are evidences of the commencing loss of their function which has completely disappeared in the human adult.

Secondly; that in man the function of the lateral ganglia is maintained well into adult life, and only begins to disappear in old age.

In the following tables the nerve cells are frequently described very briefly, but in those cases the description of sympathetic cells which I have given in the previous number of this *Journal* may be taken to apply.

TABLE A.

A list of Human Superior Cervical Ganglia, arranged according to the age at death, showing cause of death, and histological appearance.

1. Disease of knee. Age 2.
   Cells well formed and look healthy.
2. Diphtheria. Age 2½.
   Cells small but healthy looking, much connective tissue.
3. Diphtheria. Age 4.
   Cells large, numerous, distinct, and healthy looking.
4. Typhlitis. Age 10.
   Many of the cells are small but they look healthy.
5. Fractured skull. Age 21.
   Nerve cells are very small and shrunken, much connective tissue.
6. Suppurating kidney. Age 21.
   Some of the nerve cells are small, others are granular and pigmented.
7. Phthisis. Age 26.
   The cells are mostly granular, some are pigmented and some are shrunken, there is much connective tissue.

8. Phthisis. Age 27.
   The few cells that can be seen are small and degenerate.
9. Cystitis. Age 31.
   The cells are healthy looking.
10. Typhoid. Age 42.
    Some of the cells are granular, some are pigmented, there is much fibrous tissue.
11. Acute pneumonia. Age 41.
    Many of the cells are granular and shrunken.
12. Gangrene of the foot. Age 42.
    A few cells, and they are small, granular, and pigmented.
13. Phthisis. Age 42.
    The cells are small and indistinct, and there is much connective tissue.
14. Amputation of thigh. Age 42.
    Nothing but connective tissue, with a few small cells in the interstices.
15. Abdominal cancer. Age 48.
    Cells small, shrunken, granular, and pigmented.
16. Acute dermatitis. Age 50.
    There are very few cells, and they are small and degenerate.
17. Strangulated hernia. Age 55.
    There are but few cells, and they are small, atrophic, and granular, with much connective tissue.
18. Malignant disease of the pleura. Age 61.
    Only a few cells and they are degenerate, there is much connective tissue.
19. Acute pericarditis. Age 65.
    Some cells are granular, very few show any nucleus; there is much connective tissue.
20. Disease not stated. Age 70.
    A very few cells, and what there are present are granular and shrunken, there is much connective tissue.
21. Strangulated hernia. Age 70.
    Cells nothing but masses of pigment, there is much fibrous tissue.
22. Granular kidneys. Age 71.
    The cells are very small and nearly all of them are granular and pigmented.

TABLE B.

A list of Mammalian Superior Cervical Ganglia with histological appearances, probable age and cause of death.

A. Catarrhina.

1. Rhesus Monkey (Macacus rhesus).
   About 8 years old; cause of death doubtful.
   Cells large, neither granular nor pigmented.
2. Bonnet Monkey (Macacus sinicus).
   Juvenile; cause of death rickets.
   Large well-formed nerve cells and fibres.
3. Large white nosed Monkey (Cercopithecus petaurista).
   About 3 years old; cause of death ascites.
   Plenty of large well formed nerve cells.
4. Anubis Baboon (Cynocephalus anubis).
   About 5 years old: cause of death periostitis.
   Several of the cells are granular and pigmented, the others are normal, the section is crowded with leucocytes.

B. Carnivora.

5. Lion (Felis leo).
   Still born.
   Cells very well formed and healthy looking.
6. Spotted Hyæna (Hyæna crocuta).
   Aged; cause of death doubtful.
   Cells large, distinct, and well formed.
7. Polar Bear (Ursus maritimus).
   Young, 9 months in Gardens; cause of death doubtful.
   The nerve cells are all healthy.
8. Polar Bear (Ursus maritimus).
   Young; cause of death abscess of jaw.
   All the nerve cells are distinct and healthy looking.
9. Polecat (Mustela putorius).
   Adult, 2 years in Gardens; body not examined.
   Cells typically normal.
10. Spectacled Bear (Ursus ornatus).
    Very old; cause of death renal calculus.
    Cells perfectly normal.
11. Otter (Lutra vulgaris).
    Juvenile; no cause for death found.
    Large distinct cells, well formed, healthy.

12. Crab-eating Raccoon (Procyon cancrivorus).
Aged; cause of death goitre.
Nerve cells perfectly normal.

C. UNGULATA.

13. Thar Goat (Capra jemlaica).
7 years in Gardens; cause of death abscess of cheek.
Section crowded with leucocytes, but the nerve cells are perfectly healthy.

14. Axis Deer (Cervus axis).
Still born.
Nerve cells perfectly normal.

15. Michies Tufted Deer (Elophodus Michianus).
Aged; cause of death bronchitis.
All the cells that are to be seen are perfectly normal.

16. Bosch Bok (Tragelaphus sylvaticus).
6 years in the Gardens; no cause of death found.
Cells perfectly normal.

17. White Collared Peccary (Dicotyles tajaçu).
8 years old; cause of death not found.
Cells normal.

18. White Lipped Peccary (Dicotyles labiatus).
Aged; cause of death peritonitis.
Large normal nerve cells.

19. Indian Muntjae (Cervulus muntjae).
Adult, 5 years in Gardens; cause of death not found.
Healthy nerve cells.

20. Moose (Alces machlis).
Adult; cause of death tuberculosis of liver.

D. RODENTIA.

21. Hairy Rumped Agouti (Dasyprocta prymnolopha).
Adult, $4\frac{1}{2}$ years in Gardens; cause of death not found.
Cells well formed, normal looking.

E. MARSUPIALIA.

22. Great Kangaroo (Macropus giganteus).
Adult, 3 years in Gardens; body not examined.
Cells large, well formed and healthy.

TABLE C.

A list of Human Semilunar Ganglia showing the microscopical appearances and cause of death.

1. Diabetes.
   There are but few cells and they are indistinct, much connective tissue.
2. Diabetes.
   Cells very small and shrunken.
3. Diabetes.
   Cells very small, pigmented, granular and degenerate, there is a large amount of fibrous tissue.
4. Diabetes.
   Fellow ganglion to the last, the same description applies.
5. Idiopathic Anæmia.
   Cells small, pigmented, shrunken, there is a large amount of fibrous tissue.
6. Anthrax.
   Many of the cells are obscure in their outline, granular and pigmented, the others are normal.
7. Cancer of the Bladder.
   Some of the cells are pigmented, others are large and well formed.
8. Aortic Disease.
   Exactly like the last.
9. Bronchopneumonia (child, aged 3).
   Cells are beautiful examples of normal nerve cells, with well marked processes, and distinct nuclei.
10. Cancer of Bladder.
    Cells very pigmented and granular, and there is much fibrous tissue.
11. Sarcoma of Pelvis.
    Cells are reduced to minute masses of granular pigment.
12. Cirrhosis of the Liver and granular Kidney.
    A few of the cells are pigmented, the rest are large and well defined, there is much connective tissue.
13. Chronic Bright's Disease.
    Large well formed healthy looking cells.
14. Cancer of the Bladder.
    The cells are nothing but minute masses of granular pigment.
15. Aortic Aneurism.
    Exactly like the last.

16. Ruptured Intestine.
    A few of the cells are small and pigmented, the rest are healthy looking.
17. Aortic Disease.
    The cells are minute masses of granular pigment.
18. Phthisis.
    The cells are large and well formed.
19. Tumour of the Brain.
    Some of the cells are pigmented and granular.
20. Myxœdema.
    The cells are well formed and healthy looking.
21. Chronic Bright's Disease.
    Cells are indistinct and there is no nucleus.
22. Chronic Bright's Disease (another case).
    Exactly like the last.
23. Purpura Hæmorrhagica.
    The section is crowded with leucocytes, but the nerve cells appear normal.
24. Diphtheria (child).
    The cells are perfectly normal nerve cells.
25. Scald (child).
    Exactly like the last.
26. Aortic and Mitral Disease.
    The cells are small and granular.
27. Cerebral Hæmorrhage.
    Like the last.
28. Disease not stated.
    The cells are nothing but minute masses of granular pigment.
29. Diabetes.
    Cells large, but very granular and pigmented, there are many leucocytes.
30. Diabetes.
    Some of the cells are granular.
31. Diabetes.
    Many small degenerated pigmented cells, but the section is crowded with leucocytes.
32. Phthisis.
    The cells are normal, but there are many leucocytes.
33. Sarcoma of Breast.
    The cells are normal.

TABLE D.

List of Semilunar Ganglia taken from the lower animals.

A. Catarrhina.

1. Talapoin Monkey (Cercopithecus talapoin).
   The sections are almost entirely occupied by large well formed cells, each with a distinct nucleus but no processes. There is no trace of granulation, pigmentation, shrinking, or degeneration, all the cells have a distinct nucleus.
2. Bonnet Monkey (Macacus sinicus).
   The cells here are exactly like those in the last specimen. The ganglion has a rather thicker fibrous sheath than is usual.
3. Arabian Baboon (Cynocephalus hamadryas).
   The description of the first specimen applies exactly to this.
4. Green Monkey (Cercopithecus callitrichus).
   The cells are very numerous and very closely packed, but the description of those in the first specimen applies to these also.
5. Rhesus Monkey (Macacus rhesus).
   The same description holds for these specimens also, save that the section is crowded with leucocytes.
6. Malbruck Monkey (Cercopithecus cynosurus).
   These cells too are well formed, well nucleated, without any trace of granular or pigmentary change.
7. Macaque Monkey (Macacus cynomologus).
   The cells here are exactly like those in the previous described specimens.

B. Carnivora.

8. Philippine Paradoxure (Paradoxurus philippensis).
   The cells are large, well formed, perfectly healthy looking, well nucleated, without any granular or pigmentary change.
9. Suricata (Suricata tetradactyla).
   Cells like those previously described.
10. Common Genet (Genetta vulgaris).
    Cells like those previously described.
11. Virginian Fox (Canis virginianus).
    Cells like those previously described.
12. Grison (Galictis vittata).
    The cells are exactly like those previously described; the sections contain many leucocytes.
13. Common Cat (Felis cattus).
    The cells are exactly like those previously described.

14. Blotched Genet (Genetta bigrina).
The cells are exactly like those previously described.

C. Rodentia.

15. Spotted Cavy (Cœlogenys paca).
The cells are exactly like those previously described.

16. Squirrel (Sciurus [sp. incert.]).
The cells are exactly like those previously described.

D. Marsupialia.

17. Vulpine Phalanger (Phalangista vulpina).
Exactly like the specimens previously described.

18. Opossum (Didelphys virginianus).
The cells are exactly like those previously described; there are several leucocytes.

In all the above specimens the nerve fibres, blood vessels and supporting tissue were normal.

TABLE E.

List of Human Thoracic Ganglia.

A. First Thoracic Ganglia, with cause of death, sex, and age.

1. Cleft Palate, Bronchopneumonia. F., 5 months.
Ganglia small, and the nerve cells also, they fill their capsules, are well formed, nucleated, neither granular nor pigmented; nerve fibres healthy; the ganglia from the two sides are precisely alike.

2. Ruptured Kidney. M., 19.
Nerve cells large, fill their capsules, no pigmentary nor granular changes, many have a distinct nucleus, some have not; nerve fibres healthy; there are many blood vessels which run parallel to one another through the length of the ganglia; those from the two sides are precisely alike.

3. Cerebral and Hepatic Abscesses. M., 23.
Nerve cells are all large, completely fill their capsules, are neither granular nor pigmented; nerve fibres healthy; this ganglion has a particularly thick investment of fibrous tissue; the two are similar.

4. Psoas Abscess, Lardaceous Disease. M., 24.
Many of the nerve cells are small, but they all fill their capsules and several of them are a fair size; some have nuclei, some have not; several are granular and a few are pigmented, but I cannot make out that these changes bear any relationship to their size and none are smaller than their capsules; the section is full of small leucocyte-like cells; both ganglia are alike.

5. Puerperal Peritonitis. F., 27.
   Nerve cells large, rounded, fill their capsules, neither granular nor pigmented, in most the nucleus is very distinct; the nuclei of the capsule show very well; the nerve fibres are healthy, and the two ganglia are alike.
6. Phthisis. F., 35.
   Many nerve cells are rounded, and distinct without any granular or pigmentary change, in some the nucleus is not very evident; there are no processes; the two ganglia are quite alike.
7. Aneurism of the Aorta. M., 36.
   These ganglia are exactly like the last, and the two ganglia are quite similar.
8. Phthisis and Bronchitis. F., 41.
   The cells are well formed, distinctly nucleated, some have well marked processes, they fill their capsules, the nuclei of which are very evident; a few of the nerve cells show some granular pigment, but this never implicates the nucleus which always stands out prominently; there are no small atrophic cells; the nerve fibres are healthy; the two ganglia are quite alike.
9. Bronchitis and Emphysema. F., 41.
   Most of the cells are beautiful examples of the rounded type, but a few have processes; the nucleus is distinct, and there is no granular change or pigmentation, they completely fill their capsules, which are well nucleated; the ganglion is very vascular, being pervaded by numbers of small vessels running parallel through its length; the two ganglia are alike.
10. Fractured Ribs, œdema of the Lungs. M., 57.
    Most of the cells are granular and slightly pigmented, and a very few are abnormally small, but all fill their capsules, and none are without a distinct nucleus, nor are there any so pigmented, granular and shrunken as one often sees them in other ganglia; the fibres are healthy, and the two ganglia are alike.
11. Fractured femur, Bronchitis. M., 58.
    The cells are large, rounded, and distinct, without any pigmentation, or granular degeneration; the nucleus shows well; there are many vessels all running through the ganglion parallel to its long axis; the nerve fibres are healthy; the two ganglia are alike.
12. Cancer of the Œsophagus. M., 59.
    Most of the cells are large and well formed, sending distinct processes to the edge of the capsule; some of the large ones are slightly granular, and a few are small granular masses which only half fill their capsules. Although these cells resemble those often

seen in the superior cervical ganglion, they are not nearly so degenerate as is commonly the case in this ganglion; the nerve fibres are healthy; the two ganglia are alike.

13. Cerebral Vomiting. Nothing found at the autopsy. M., 60.
Most of the cells are large, neither granular nor pigmented, but some are small, slightly granular and a little pigmented, both varieties are well nucleated; the two ganglia are alike.

14. Cirrhosis of Liver. M., 62.
Numerous large, rounded, nucleated nerve cells without any processes, they fill their capsules which are well nucleated, a few show a little granular change at the edge; the two sections are alike.

15. Cancer of Œsophagus. M., 63.
The cells are large, rounded, well formed and distinct; many are granular and pigmented, but most that are in this condition are large and well nucleated, a few are small, but even in them there are large well formed nuclei; there are none of the minute masses of granular pigment so often met with in the superior cervical ganglia; the two ganglia are similar. In this as in all the preceding specimens the nerve fibres are healthy.

B. Thoracic Ganglia, below the first.

16. Acute Tuberculosis. Æt. 19.
Cells typically normal, large, well formed, neither granular nor pigmented, fill their capsules; there are many vessels and a few leucocytes.

17. Fractured Skull. Æt. 45.
This specimen is exactly like the last.

18. Cirrhosis of the Liver. Æt. 47.
The cells are large, well formed, and perfectly healthy; there are many leucocytes.

19. Diabetes.
Cells large, nucleated, neither granular nor pigmented.

20. Cause of death not stated.
Cells exactly as in the last specimen.

21. Diabetes.
Many of the nerve cells are small and granular with a good deal of pigmentation; there are several leucocytes; the ganglia on both sides are alike.

22. Fractured Thigh.
Nearly all the cells are large, well developed, fill their capsules and look like healthy nerve cells, but a few are faintly granular,

and some of these are rather smaller than the rest; the corresponding ganglia on opposite sides are similar.

23. Diabetes.

The cells are perfectly healthy looking, there are a great many vessels in the sections and many leucocytes; the ganglia on the two sides are alike.

24. Diabetes.

Most of the cells are large and distinctly nucleated, many are granular and slightly pigmented, but the nucleus always remains distinct; a few of the cells are small; there are many leucocytes; the ganglia from the two sides are similar.

SOCIÉTÉ MÉDICALE DES HOPITAUX.

Séance du 23 février 1894. — PRÉSIDENCE DE M. FERRAND.

M. PIERRE MARIE. — *Nature de la maladie de Basedow.* — Les effets du traitement thyroïdien rappellent quelques-uns des traits de la maladie de Basedow, tachycardie, élévation de température, insomnie et agitation, polyurie, albuminurie, paraplégie incomplète, sudation exagérée. Cela vient à l'appui de l'opinion émise en France par Gauthier de Charolles puis par Mœbius et reprise par les Pr Renaut et Joffroy que les troubles nerveux ne seraient que symptomatiques de l'affection thyroïdienne, sans que la maladie soit forcément d'origine thyroïdienne. Certains phénomènes doivent être attribués à un trouble du fonctionnement de la glande. Le *primum movens* de la maladie devrait être cherché dans une affection ou un trouble du système nerveux (grand sympathique) engendrant une suractivité fonctionnelle de la glande amenant les symptômes de la maladie. En effet dans aucun cas du myxœdème traité par le traitement thyroïdien on n'a vu survenir l'exophtalmie ni le signe de Graëfe. Dans plusieurs cas de maladie de Basedow traités par la ligature des carotides ou l'ablation du corps thyroïde on a vu l'exophtalmie persister. Ce symptôme est donc dans une certaine mesure indépendant de l'action du corps thyroïde. La théorie de l'origine thyroïdienne de la maladie s'accorde mal avec les débuts brusques de cette affection à la suite d'une émotion vive. Il est en outre singulier que cette affection s'observe fréquemment dans le tabes et dans des maladies où le système nerveux est pris presque tout entier.

THE TREATMENT OF BASEDOW'S DISEASE.—From an experience in upward of seventy cases, and fortified by the unanimous observations of Von Dusch, Eulenburg, Meyer, Erb, and others, Dr. Chvostek is led to regard the rational employment of galvanism as the most important part of the treatment of Basedow's disease. He recommends the following method to be pursued: 1, the ascending constant current applied to the cervical sympathetic, on each side, for at the most one minute; 2, the same to the spinal cord (the anode at about the fifth dorsal spine, the cathode high up in the cervical region); 3, through the occiput (one pole at each mastoid process), and in certain cases also through the temples, a constant current, for at the longest one minute, and so weak that the patient can feel but the slightest sensation of burning. Sometimes also local galvanization of the thyroid gland with a weak constant current for about four minutes, the current to be reversed at the end of each minute. The applications should be made every day if possible. As a rule very good results were obtained, even in the most severe cases a cure or marked improvement being recorded. In three cases death resulted from excessive anæmia or complications.—*Centralbl. für Klin. Med.*, June 23, 1883.

REINHOLD (*Münch. med. Woch.*, June 5th, 1894) relates the following case in a woman, aged 35. The patient had previously been under treatment for hæmatemesis, and at that time no signs of Graves's disease were present. She was admitted with influenza, Pfeiffer's bacillus being found in the sputum. On the third day the temperature again rose, and there was painful swelling of the thyroid gland. She was discharged well a month afterwards. Three months later she was readmitted with all the symptoms of Graves's disease. Here the connection between the strumitis and the latter disease must suggest itself. The same parts of the gland were enlarged as after the influenza. The inflammatory affection had given rise to a permanent alteration in the gland. The occurrence of Graves's disease after influenza has frequently been observed. Thus after an acute infective involvement of the thyroid gland, Graves's disease may appear. The author refers to the different views as regards the nature of this affection—whether it is due to a disease of the sympathetic or to a lesion in the medulla (Mendel), or whether it is a functional neurosis (Charcot). Moebius has advanced the view that it is a a disease of the thyroid gland itself. He points out that occasionally some or all of the symptoms of Graves's disease may exist in ordinary goître, and that Graves's disease is in many ways the opposite of myxœdema, etc. It has been suggested that the former is due to hypertrophy, the latter to atrophy of the gland; myxœdema has been known to follow upon Graves's disease. If the local theory is accepted, many clinical difficulties still remain. The specific treatment with thyroid gland has been without effect and opinions on the value of removal of the thyroid are divided. The author refers to another case in which Graves's disease followed upon scarlet fever. Here the gland was already enlarged, but no symptoms existed previously.

PARALYSIS OF MOTOR BULBAR NERVES IN EXOPHTHALMIC GOITER.—G. Ballet (*Gazette Hebdomadaire*, No. 9, 1888) states that a man thirty-four years old developed all the symptoms of Graves' disease as the result of violent excitement caused by a fall into the sea. At the same time occurred hysterical symptoms—left-sided anæsthesia, diminution of the sensibility of the right half of the body, globus hystericus, etc. Subsequently the patient developed a complete exterior ophthalmoplegia and a bilateral facial palsy. Ballet thinks it is more than probable that the symptoms in this and also in other cases of Graves' disease are to be referred to a bulbar origin.—*Medical and Surgical Reporter.*

M. PONCET (de Lyon) lit, en son nom et au nom de M. Jaboulay, une note sur le manuel opératoire de l'exothyropexie. L'incision médiane des plans musculo-aponévrotiques, du cricoïde à la fourchette sternale, en faisant saillir la veine jugulaire antérieure, mène dans le tissu cellulaire périthyroïdien. Avec le doigt on dilate la plaie et va à la recherche des lobes qu'on énuclée. Au besoin on fait une incision cruciale. On doit luxer successivement chacun des bords en évitant de se rapprocher des extrémités, pour ne pas déchirer les vaisseaux et spécialement les veines. On procède de même par la voie latérale pour les goitres plongeants. En résumé, le manuel consiste à découvrir le corps thyroïde sans inciser la capsule et à luxer les lobes ; l'opération doit se faire à sec. Le pansement est fait avec de la gaze stérilisée. L'exothyropexie convient surtout aux goitres charnus non encapsulés ; elle est parfois une opération d'urgence.

M. TILLAUX rappelle que, depuis longtemps, il a divisé les tumeurs thyroïdiennes en capsulées et non encapsulées ; les premières sont faciles à enlever sans danger et leur ablation ne produit pas de myxœdème.

M. DELORME présente un malade atteint de spasme musculaire à la suite d'une entorse du genou datant de deux ans.

March 1894.

(Semaine Médicale)

Surgical Operations and the Lay Press.

Your readers may remember that in my letter of March 3rd relating to exophthalmic goitre I spoke of the death of a young girl who had succumbed after the operation of exothyropexia performed in Dr. Brissaud's wards at the Salpêtrière. Some days ago there appeared in a certain evening sheet the following sensational heading in large type: "Un Meurtre Médical," which, as it turned out, referred to the above-mentioned occurrence. The writer of this romance made out that the surgeon incriminated had been actuated by vivisectional sentiments in performing an unnecessary and cruel operation on the poor unwilling victim. The said scribbler had evinced his ignorance of the hospital of which this barbarous proceeding had been the scene, and he had even applied at the wrong establishment for information. The cry was, however, taken up by other journals, and "*l'incident de la Salpêtrière*" became town talk. From a letter addressed by Dr. Brissaud to Professor Brouardel, Dean of the Faculty—a letter in which the dean is asked to lay the case before the Director of the Assistance Publique—it transpires that Professor Poucet of Lyons, the inventor of the operation, was the operator. Dr. Brissaud had in his wards two young women with exophthalmic goitre, unamenable to ordinary medical treatment. One was, at her own request, operated on with complete success. The other, the deceased, was a minor, and the consent both of herself and of her parents was obtained before operative measures were taken. The affair came in due course before the Municipal Council, and a resolution was carried urging the authorities to exercise more vigilance and discouraging operations in Paris hospitals by provincial surgeons. It is probable that nothing more will be heard of a subject which should never have found its way into the columns of political papers.

Professor Charcot's Successor.

Lancet March 1894

Nature of Exophthalmic Goitre.—Dr. P. Marie said that the phenomena observed while applying the thyroid treatment for myxœdema, had led him to believe that the view advocated by Gauthier and Möbius, who state that the thyroid gland is the direct cause of Basedow's disease, is untenable. He said that, although some of the pathognomonic symptoms of Basedow's disease may be caused by a functional disturbance of the thyroid gland, he did not believe that the origin of the disease could be found in that gland. He based his conclusions on the fact, 1, that in no case of myxœdema in which the thyroid had been administered had exophthalmia or Von Graefe's symptom developed; 2, that the theory of the thyroid origin of Basedow's disease does not accord with our present knowledge concerning the etiology of the disease.

It is impossible to reconcile the sudden advent of the symptoms in Basedow's disease, such as frequently occur after fright, with any explanation other than causative factors arising through the intervention of the nervous system, particularly the sympathetic system. From this disorder of the nervous system results exaggerated activity of the thyroid gland, which in turn causes hyperthyroidation of the system, and as a consequence symptoms develop which are common to thyroid feeding and Basedow's disease.

Regarding treatment, the speaker is heartily in favor of the operative in preference to the medical. The results of thyroidectomy, he thinks, are indisputable; and likewise he is inclined to look with favor on the method known as esothyropexia recently described by Poncet.[1]

March 1894.

Lancet. March 3. 1894

The toxic symptoms observed in some cases of myxœdema treated by the ingestion of thyroid gland tissue recall so forcibly certain troubles present in exophthalmic goitre, that one is led to ask if hyperthyroidisation is not the true cause of Basedow's disease. Tachycardia, rise of temperature, insomnia, agitation, polyuria, albuminuria, incomplete paraplegia, heat sensations, diaphoresis, and diarrhœa—these complications of the thyroid treatment are very suggestive of symptoms complained of by subjects of exophthalmic goitre. While accepting the validity of this theory (therein agreeing with Professor Greenfield, whose recent Bradshaw lecture must be fresh in the minds of your readers) of excess of function of the thyroid body as explaining these phenomena in the latter disease, M. Marie[1] throws the onus of their production on derangement of the nervous system (? the sympathetic). This nervous perturbation occasions an exaggerated secretion of thyroid juice and the clinical phenomena above mentioned declare themselves. For be it noted that an overdose of thyroid gland has never yet provoked the appearance of exophthalmos or of von Graefe's symptom. Moreover, in several cases of Basedow's disease treated by the removal of the thyroid body or by the ligature of the carotid arteries, the exophthalmos has persisted (three cases recorded by Dreesman, one case by Sprengel). On the other hand, thyroidectomy has brought about in other instances a disappearance of the protuberance of the globes of the eye. The nervous origin of exophthalmic goitre is further proved by its sudden onset after a strong moral shock. Barié and Joffroy have furthermore called attention to the remarkable frequency of Graves' disease in individuals suffering from locomotor ataxia. What seems certain is that some of the symptoms of Graves' disease are due to hypersecretion of thyroid juice, and that consequently the administration of thyroid extract, as recommended by some physicians in that disease, is contraindicated. Horsley has already established the inutility of such treatment, and quite recently Canter of Liège, in relating a case of myxœdema cured by thyroid tissue, states that he has observed an aggravation of several symptoms when the same method was applied in

[1] Société Médicale des Hôpitaux, Feb. 23rd.

Basedow's disease. On the other hand, M. Marie pronounces strongly in favour of thyroidectomy. Professor Tillaux was the first to cure two exophthalmic cases by this means. Putnam has recently published statistics of forty-one cases treated by thyroidectomy; in thirty-four of these recovery or considerable improvement ensued, four ended fatally, one remained *in statu quo*, and two patients had tetany. Such figures encourage the belief that the treatment of exophthalmic goitre should henceforth be conducted, not by the physician, but by the surgeon. I may mention, in conclusion, that in the *Médecine Moderne* of Feb. 24th, Dr. Brissaud publishes the details of a case treated by "exothyropexia" which ended fatally, the girl (aged twenty years) sinking rapidly in a state of coma. Professor Poncet of Lyons is the author of this new operation. In it the thyroid gland is exposed by a longitudinal (or crucial, if the volume be very large) incision. The extruded gland is fixed between the lips of the wound and allowed to mummify. MM. Poncet and Jaboulay have successfully performed the operation in fourteen cases of goitre, four of which presented the *tableau clinique* of Graves' disease.

Feb. 20th.