Thesis

on

Cerebro-Spinal Fever.

by

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Cerebro-Spinal Fever

Cerebro-spinal fever has been recognised as a definite independent disease from the early years of the 19th Century. It has not affected the United Kingdom to any great extent: the principal outbreaks having occurred on the Continent of Europe, and in the United States of America. Widespread Epidemics have occurred in these Countries, and Ireland has been the seat of extensive outbreaks in 1845 – 1846, 1866-1867; and as recently as 1900 a small outbreak has occurred in the latter Country.

In England and Scotland cases observed have usually been isolated, and may be termed Sporadic

Briefly summarising the history of the disease we find that the first distinctly described outbreak occurred at Geneva in 1805, and in 1814-1815 Cases were observed at Paris and Metz. In 1814-1815, Corresponding to the Continental outbreak, there was a widespread Epidemic in the United States of America.

In 1837 the disease is again described as occurring in France, often limited to a single town; but at the same time widely scattered foci appeared in Southern Italy, Sicily & Denmark.

In 1846, the disease broke out in Dublin and Belfast, and as in 1837 the United States of America were again the scene of an extensive and very fatal Epidemic.

Between 1854-1874 the disease again appeared in Europe, chiefly affecting the Northern parts, Norway, Sweden Denmark and North Germany. As in the case of previous epidemics the United States of America soon became affected, and cases again appeared in Dublin and other parts of Ireland in 1866-1867.

During the latter quarter of the 19th Century the disease has never assumed very extensive or alarming proportions. Cases have frequently been seen in the United States of America, and as recently as 1900 in Dublin. In England and Scotland a few cases have from time to time appeared, but their advent has not been followed by an extensive Epidemic. In 1877-1878 cases were reported at Dundee, in 1885-1886 at Dublin, and in 1890 in Norfolk and Suffolk, 14 cases having been treated in the latter year at St Bartholomew's Hospital, London. In 1900 several cases having occurred in men of the Royal Navy, I have made the disease a subject of study.

Etiology - The disease occurs in Epidemics and in Sporadic Cases. As an Epidemic it exhibits peculiarities which differ from other Epidemic diseases - limited localities are usually attacked, whilst the area over which these are distributed may be very extensive. The foci may be confined to

. a village or even to a certain building in, a town or village, the intervening houses or districts being quite exempt from its attack.

The extension is usually quite irregular and rarely follows definite lines, though there have been exceptions to this rule. Some epidemics have lasted only a few weeks attacking many or a few people; whilst in other instances they extended over months or even a year.

The Epidemic may reach its Maximum and then decline, but more frequently consists of limited outbreaks, which appear and disappear; to be followed by others at a longer or shorter period

The cases to be reported were entirely sporadic occurring in different ships, and not spreading among other persons in these ships.

Children and young persons in the prime of life are most susceptible to attack. Isenthorth in the Lancet of October 1st 1898 says that most cases occur between the ages of 2 and 30 years, but persons beyond the latter limit may also be affected.

In the cases recorded the patients all were under 30 years of age. In the United Kingdom Early Manhood appears to be the most favourable period for an attack.

Both sexes are equally susceptible of infection; and negroes have suffered quite as severely as white men.

The disease has usually appeared in winter and Spring, and epidemics have chiefly been confined to Temperate and Subtropical latitudes. However in recent years I believe cases have also been recognised in India and China.

Sporadic cases occur at all seasons of the year, and of 85 outbreaks reported in the United States of America, 37 appeared in Winter, 18 in Winter and Spring, and 23 in Spring alone; the others appearing in the other seasons of the year.

Cold apparently contributes to an outbreak; many epidemics having arisen in cold seasons; although this is by no means an invariable rule, a smaller number having occurred in mild or even warm weather.

Dampness of the soil does not affect its occurrence, and the rôle played by bad hygienic surroundings is doubtful; both rich and poor having been frequently attacked.

Overcrowding, and bad ventilation, such as often formerly existed in barracks and workhouses, undoubtedly affected the spread of the disease, and on

the Continent it was observed that officers, and others, who were better lodged than the men, used to escape.

Soldiers in garrisons have been very frequently attacked, both on the Continent and in America. In France out of 62 Epidemics 43 were absolutely confined to soldiers, and in 6 the soldiers were chiefly affected; but occasional cases offend among the civil population. In many instances it remained strictly confined to one set of barracks or one institution. In 1846 in the outbreaks at Dublin, Bray & Belfast the workhouses were attacked.

Certain families and communities appear to have a much greater susceptibility than others

Fatigue has also been credited as a predisposing factor in this disease, & it was observed that young soldiers were particularly prone to its influence; but the evidence on this point is not very definite. In the recorded cases it could not have been a factor, as the patients had not been subjected to any unusual strain.

The Etiology of this disease may thus be described as very obscure, No Satisfactory reasons having been determined for its attacks on certain countries & communities

Contagion — That the disease is contagious from one individual to another seems to have been well established in countries where extensive outbreaks have occured, but the means by which the virus is conveyed from person to person is still very obscure. In garrisons which have been attacked, regiments have carried the disease to other places in their movements; and cases have broken out among troops stationed in barrack rooms, previously occupied by men who had suffered from the disease. Inmates of workhouses & other institutions, as well as different Members of a family, have repeatedly been attacked one after another; whilst persons in the immediate Neighbourhood, who have not been in contact with the sick, have Escaped. The disease may be transmitted from the patient to his attendants, & an instance quoted by Netter, from the Observations of Leichtenstern, on an outbreak in a hospital at Cologne seems to add most conclusive Evidence to the theory of contagion - A Sister and 3 Nurses in charge of patients suffering from cerebro-Spinal fever were attacked by the disease themselves - They had not been outside the hospital building for a long time

and so could not possibly have contracted the disease elsewhere. The Nurses in wards not having cases of the disease in them were not attacked. Richter mentions a case of a woman who visited a house where 2 children had been sick with the disease & who developed meningitis on the 4th day afterward - She was visited by a man, who 4 days afterwards himself developed the disease.

The disease was probably imported into Algeria & into Italy in 1870 by French troops

The medium by which the disease is transmitted is said to be articles of clothing, which have been in contact with the sick. Instances have occurred in which clothing has been borrowed from infected houses by persons who had not been in contact with the sick themselves, but who developed the disease subsequently. Quite recently in West Africa the diplococcus of Weichselbaum has been discovered in the sweat of patients, & this seems to throw some light on a means by which dissemination may occur.

Although the instances quoted point to the contagiousness of the disease, this is much less marked than in most of the other infectious diseases. The spreading

from patient to patient in hospital Wards, is rare. In 160 houses in Cologne where Cerebro-Spinal fever occured, a second case developed in only 10 instances, and in 3 instances there were more than 3 cases. Infact as a rule the disease has very frequently been treated in Wards with other cases, & only in the rarest instances has it been conveyed to others. The cause of this rarity is obscure. The Exact Channel by which the virus enters the body is also not ascertained. It has been found in the Nasal Mucus, pus from the Ear, the Spinal fluid & urine. The most probable portal infection seems to be the Nose. The diplococcus intracellularis may live for an uncertain period outside the body, but is apparently easily destroyed by heat.

In the recorded cases, which occured among boys and men, belonging to ships of the Royal Navy, there was no instance of the disease spreading to other persons.

In 2 instances, 2 cases came from the same ship, but were separated by long intervals of time. Owing to the close proximity in which persons live on board ship, one would Expect other persons to contract the disease, and other infectious diseases often Spread very rapidly.

General Sketch of the disease

Cerebro-Spinal fever is an acute Specific disease which has generally occurred in epidemics & has often caused a high rate of mortality of those attacked. It also occurs sporadically, and in this form has usually been met with in England and Scotland. It may be classed with other acute specific fevers, having a definite course, with periods of incubation, invasion, advance and termination.

A definite micro-organism has frequently been discovered in the lesions found after death, and pure cultures of this micro-organism have reproduced the disease when injected into the Spinal Canal of goats in a few instances. Moreover the micro-organism has also been found in the Meningeal exudate of these animals when dead. (Wentworth)

Its method of attacking human beings is unknown, but Osler remarks that No fever attacks so few individuals of a Community, & scarcely any known fever kills so large a proportion of those attacked.

In his Experience 76 out of 111 Cases died, giving a Mortality of 68%, & Hirsch estimates the Mortality as varying from 20 to 70%.

The disease nearly always commences suddenly. A person in good health and in the prime of life, after a period varying from a few hours to a few days, is seized with severe headache, often excruciating in severity, accompanied by vertigo and vomiting. The pain almost immediately or in a few hours extends to the back of the neck and to the extremities; this sudden onset + retention distinguishing the disease from other forms of Meningitis. Some degree of mental disturbance is generally noticed early in the attack, varying from apathy to complete unconsciousness.

Delirium, which is sometimes violent, may supervene, or coma rapidly follows.

In adults there are often preliminary rigors; in children convulsions are more common at the onset

Sometimes there are some prodromal symptoms eg chills, headache, vague pain in the back and limbs, vertigo or vomiting - a point observed in 2 of the recorded cases was the presence of obscure abdominal pain + tenderness with vomiting and diarrhoea before definite symptoms appeared

The headache is usually frontal at first, but may be occipital - sometimes

it is localised, but more often it is felt all over the head.

In all the cases observed from the commencement it was a marked symptom. As a rule it was very acute, patients boring their heads into the pillows, & in nearly all cases it persisted longer than any other symptom.

Vomiting is most intractable, appearing early in the disease, and being uninfluenced by therapeutic measures. The vomited matter seen was usually scanty in amount & consisted of mucus, often bile stained.

The face may be pale or flushed, the features wearing an expression of extreme anxiety or being drawn with pain.

The pain along the spinal column, and at the back of the neck, which closely follows the headache, is often very severe, chiefly affecting the cervical and lumbar regions, and often radiating to the limbs and abdomen; accompanied by stiffness of the muscles of the neck & spine

The stiffness of the cervical muscles is a marked feature of the disease, the muscles are firmly contracted, all efforts made to flex the head being strongly resisted & causing pain. The head is often retracted, & the retraction

may be so marked in the spinal Muscles as to produce opisthotonos.

Movements of the limbs cause pain, & the patients groans or cries out when these are attempted.

The rigidity of the neck muscles varies in severity, and sometimes is not observed at the first onset of the disease, often persists after the painful condition has subsided. This feature is particularly marked in Case VI

Pains in the limbs are not so marked as pain in the spinal Muscles - Sometimes the limbs are rigid and there may be twitchings, contractions or Cramps

Kernigs Sign - In 1882 a Russian, Kernig, noted a condition of contraction of the Muscles of the leg in Cases of Spinal Meningitis, and his observations have been repeatedly confirmed by many other observers.

This condition is as follows — When the patient is propped up in bed there is a certain amount of flexion of the knees, & on attempting to Extend the leg there is contraction of the flexor Muscles of the thighs, preventing this movement being fully carried out.

If the patient be lying on his back and the thighs flexed on the abdomen & the legs on the thighs, attempts to Extend

the leg are strongly resisted.

This sign occurs in other forms of meningitis, and so in itself is not a conclusive proof that the disease is of specific origin, but it only occurs in cases where meningitis is present. Kernig himself found it in 15 cases, in 8 of which the ~~disease~~ diagnosis was confirmed after death, and Netter found it in 45 out of 50 cases. The latter observer explains the production of the contraction as follows: "In consequence of the inflammation of the meninges, the roots of the nerves become irritable; and flexion of the thigh upon the pelvis, when the patient is in the sitting posture, elongates and consequently stretches the lumbar and sacral root. Thus increases their irritability. The attempt to extend the knee is insufficient to provoke reflex contraction be in on his back with the thighs extended upon the pelvis, but does so when he assumes a sitting posture."

This sign is noted in several of the recorded cases.

Trismus has occasionally be observed, also nystagmus and facial paralysis.

The patients whether conscious or unconscious are restless, often utter short cries.

Cutaneous hyperesthesia commonly appears

, early in the disease. It may affect the skin of the entire trunk and limbs, or be limited to the trunk. It is not always present in mild cases, but in severe cases maybe so marked that the patient cries out when touched or moved.

Mental Conditions. Delirium occurs early in many cases, and may be muttering in character or violent. It is not constant or persistent often disappearing suddenly, & in many cases the patients answer questions rationally.

The mental reflex may be dulled or stupor may supervene, and shouting or gentle shaking may be necessary in order to obtain a reply.

Coma may appear very early in the attack, especially in severe cases, & markedly so in those described as fulminant, & may persist till the advent of death.

Sometimes it appears gradually, the patient who may have been delirious, gradually lapsing into a comatose condition.

Coma may pass off, and this is always a hopeful sign in the prognosis of the case. Insomnia is often a troublesome complication, but is not a constant condition

Affections of the Organs of Special Sense.

These affections are sometimes a marked feature in this disease, the meningeal inflammation spreading along the optic & auditory nerves and involving the organs which they are in connection with

The Eye. Numerous lesions of this organ have been observed, but none are constant, and in the cases described they have been insignificant

The pupils may be normal, dilated or contracted. The first condition is perhaps commonest at the commencement of an attack - Sometimes they are unequal in size and react sluggishly to light Photophobia is often present -

On External examination, conjunctivitis is nearly a constant feature in the disease & chemosis may be noticed Ptosis and strabismus have also be recorded. General cerebral & spinal symptoms are much more common than local ones

Among the conditions which have been observed by others may be mentioned, Iritis, Keratitis, purulent inflammation of the choroid, leading to detachment of the retina. Optic neuritis is not uncommon, & atrophy

may follow, producing permanent blindness.

The other conditions are not necessarily permanent, & may be recovered from.

The Ear - The auditory apparatus is more frequently affected than the visual. Tinnitus and deafness are often noted early from extension of the inflammation along the sheath of the auditory nerve, as in Case V were marked. Suppurative otitis may follow with destruction of the inner & middle ears, producing permanent loss of hearing.

Anosmia has been noted by some observers.

The Temperature - Unlike many of the acute specific fevers, the temperature of this disease is most irregular & indefinite. Fever is sometimes absent or very slight at the commencement of an attack, but in the first few days suddenly rises to 102°, 103° or 104°. However it is most usual for an attack to be ushered in by a sudden rise of temperature. There is no definite and constant ratio between the amount of fever, and the other symptoms of the disease, and this is a marked feature in this disorder.

The temperature may remain elevated for several days, & then fall nearly to normal, or throughout an attack may be extremely irregular. In cases lasting over a week remittent and intermittent types are not uncommon. Sometime the fever ends in lysis, and this is always a favorable factor in prognosis - Reversed temperature are occasionally recorded

The complete absence of uniformity of the temperature charts of this disease is a notable feature

Tendon reactions - The knee jerks may be absent or lessened - Strümpell found this to be so in 5 out of 32 cases

Abdominal Symptoms - Abdominal pain is noted in several of the recorded case. This is most indefinite, & occurs on the first day or two of an attack, & sometime precedes other symptoms. It has been felt in the epigastric region, & also in the right iliac fossa, but apparently does not remain long marked in any particular region - Diarrhoea may be present - Sometimes the abdominal muscles are rigid -

Nasal Catarrh occurs in some cases -

In protracted cases hemiplegia & paraplegia have occurred.

Skin Rashes. are often a marked feature in this disease, and are of the greatest assistance in diagnosis.
Several varieties have been described, viz Erythematous, Vesicular, bullous. rose spots like typhoid, herpes & petechiae.
Herpes, petechiae, & erythematous rashes were all observed in the recorded case.
Herpes. is very common. It appears on the face & lips, and in some instances has been observed on the face & hands.
The period of its occurrence is usually within the first week, usually on the 3rd or 4th day of the disease, and it commences to disappear on the 6th or 8th day. Some observers have thought that the occurrence of herpes is a favourable sign in prognosis, but the general opinion seems to be that it has no special significance.
In some Epidemics it has been rare, but of the different eruptions of the skin it is perhaps the most constant.
– Petechial and haemorrhagic Eruptions –
In some Epidemics Eruptions of this description have been very frequently observed, and have given popular names to the disease. In the Dublin Epidemic of 1866-67, the disease was known as

Malignant Purpuric Fever", & in America it has been commonly known as "Spotted Fever". This variety of eruption is noted in Cases

The eruption may occur in small dark red spots, but more often is of large size, & has been compared to Mulberries. The spots or patches appear early in the disease, & when spread over large areas of skin indicate a severe attack.

The Colour is usually dark red or purple & occurs on the trunk & limbs. They do not disappear on digital pressure.

Rose Spots - like typhoid fever have been seen in some cases.

In Case 1 there was a diffuse mottling of the skin on the first day of the illness, which looked like Measles erupting

Arthritic Symptoms - Acute inflammation of joints has frequently been observed in some epidemics - The knees, shoulders elbows, & wrists have all been affected. The joints become red & swollen effusion takes place into the Synovial Membranes. This may be absorbed or become purulent. The tendency of these affections is towards resolution & perfect recovery, but in some instances stiff joints have resulted.

Periarthritic abscesses have also been observed.

Digestive System.

Nausea & vomiting are two of the earliest & commonest symptoms of the disease. The latter may be most intractible, & in the recorded case consisted of mucus which was sometime bilestained.

The tongue presents nothing characteristic It may be quite clean, but is usually covered with a little whitish fur. & this may become yellowish

At the commencement of an attack there is anorexia, but the appetite is soon recovered & during convalescence may be voracious - Thirst is not marked.

Constipation is an important & nearly constant symptom. It is generally marked early in an attack & may persist throughout its course requiring constant purgatives or enemata for its relief.

In one case where constant slight relapses occurred it seemed to be a predisposing factor.

Circulatory System.

The heart is not affected in any way differently to other acute febrile disorders - Pericarditis may occur.

Pulse. The pulse rate is not usually

increased at the commencement of an attack & may be slower than Normal After a few days it becomes accelerated & may be weak & irregular -
A Notable feature is its Variation in frequency at different periods of the day.

Respiratory System -

The rate of respiration is not increased in this disease, unless pneumonia arise as a complication -
Croupous pneumonia has occurred frequently in some of the Epidemics of Cerebro-Spinal Fever in America & Germany. Epidemics of the two diseases may occur coincidently Some observers, prominently among whom is Netter, think that Meningitis can be produced by the pneumococcus as well as the diplococcus intracellularis; others emphatically deny that the pneumococcus has any part in its production - Meningitis does arise in cases of pneumonia, but Most observers appear to regard the presence of pneumococci in cases of cerebro-Spinal Meningitis as merely a chance, and not as an essential factor in the causation of the disease

In some ways the two diseases have points of similarity both being most frequent at the same seasons of the year, & having a sudden onset with the early appearance of herpes. But on the contrary Croupous pneumonia has a typical course & crisis Whilst Cerebro-Spinal fever has none -
Broncho-pneumonia & pleurisy sometimes appear as complications, & pulmonary congestion has frequently been reported in cases of this disease

Haemopoietic System -

Leucocytosis is present in all cases - Councilman. Mallory & Wright in their researches found that in 33 cases the number of leucocytes were markedly ~~diminished~~ increased, & that in the cases that recovered there was a gradual diminution of their number.

Spleen - is not usually enlarged, but has been found to be so in a few cases.

Urinary System -

The urine is generally normal in amount - Netter found albumen present in $\frac{1}{3}$ of his cases, but not in large quantity - Retention of urine is said to occasionally occur in adults.

Course and Duration of the disease -

The course pursued by this disease & the duration of an attack are most variable Rether states that it may last from a few hours to 30 weeks. There is usually a period of invasion lasting from a few hours to 3 days. The symptoms during this stage may be very acute the headache & spinal pain being very severe, & the vomiting intractible. In some instances the temperature is not very much elevated for the first day or two, but this is Exceptional. A point noted in some of the cases was vague abdominal pain with elevation of temperature, but no marked cerebro-spinal symptoms on the first day.

After this stage there is often a short period of reaction, with some amelioration of the symptoms; but this is usually of short duration, the acute nature of the Complaint rapidly returning -

The disease may terminate fatally in a few hours or a few days, or be prolonged over weeks, death taking place from Exhaustion - Recovery is usually slow, the emaciation & debility being very gradually recovered from; but headache may persist for months.

In a small number of cases, recovery commences after a few days.

Recovery is often complete, although sequelae frequently persist. The commonest of these are headache, deafness, Neuralgia & amaurosis. Hydrocephalus is a sequela sometimes observed in children

Relapses and second attacks are not common but may occur

Types. Several distinct forms are described - the generally recognised ones are.

1 Fulminant - The onset very sudden & severe - Headache Vomiting, Convulsions or stupor rapidly appear, and death occurs in 12 to 36 hours.

2 Acute Cases - lasting from 2 days to 2 weeks - They Resemble former variety, but are not so severe, & several symptoms may be absent. Remissions & exacerbations may occur - Symptoms may subside, & then recur as severely as before & prove fatal

3. Intermittent Cases in which for several days the temperature may become normal & the patient convalescent, and then a fresh attack occurs

4 Chronic Cases - usually acute at first - & persisting with varying severity for months

5 Abortive Cases - in which the disease in 4 or 5 days disappears - this type has been observed when an epidemic is declining

6. Mild Cases - These begin suddenly like acute cases, but the symptoms never become severe recovery soon takes place without complications

Pathology and Morbid Anatomy -

In 1887 Weichselbaum discovered a diplococcus in the exudation surrounding the brain and spinal cord which he named the Diplococcus Intracellularis Meningitidis or Meningococcus, & this has since been nearly generally regarded as the specific cause of the disease. This organism is found in the polynuclear leucocytes of the Meningeal Exudation, and a few may be found free in the fluid itself - Neither believe that the pneumococcus may cause Meningitis.

It has also been found, though rarely in the blood, Nasal Mucus, pus from joints, and consolidated patches in the lungs. It grows best on Löffler blood serum, is stained by aniline dyes. When cultivated it appears

to have feeble vitality, but appear to resist drying. It is probably capable of aerial conveyance. In a few instances according to Wentworth the disease has been produced in goats by the injection of cultures of the organism into the spinal canal, & the organism has been recovered from the exudation.

The means by which it gains access to the human body is unknown, but in some cases the nasal mucous membrane may have been the channel of infection

The lesions produced by its entrance are almost entirely confined to the pia-arachnoid membranes. An acute purulent inflammation is produced, Effusion takes place into this Membrane very early in the disease, following a preliminary hyperaemia or Cloudiness. The early effusion is serous, cloudy or blood stained, or it may be gelatinous. Pus formation rapidly follows, & after death the exudation may be liquid or semisolid.

In the brain it may be found spread over both hemispheres, or confined to the under surface of the Cerebrum and Cerebellum.

In the spinal cord the lower dorsal and lumbar region are most constantly affected by the inflammatory process, but sometimes this is found along its entire length.

The effusion may be found spread out like a sheet over the surface of the brain, or in streaks and patches along the lines of the vessels, and in the fissures and sulci.

The inflammation has a marked tendency to spread along the nerves, and in this way the optic, auditory and 5th nerves are sometimes affected.

It may spread to the substance of the brain and spinal cord, purulent infiltration taking place along the vessels and elsewhere, causing congestion, & diffuse or circumscribed softening with small haemorrhage.

Effusion may occur into the ventricle of the brain, but this is seldom purulent.

Post Mortem lividity is marked, & the blood fluid - Ecchymoses occurs in the internal organs -

Congestion and oedema of the lungs may be found - & patches of pneumonia

The liver & spleen may be engorged

with blood -

Endo and pericarditis are sometime found Suppuration of the Middle Ear, & eyeball, and effusion into the joints may be found in some cases.

Diagnosis - During Epidemics this may be easy, but when sporadic cases occur in Countries where the disease is little known this may present considerable difficulty

The disease has to be differentiated from other forms of meningitis, & if possible its specific nature demonstrated by microscopic Examination of the Cerebro-Spinal Exudation

It has also to be distinguished from certain other acute diseases

In the "Nomenclature of Disease" of the Royal College of Physicians of London, 4 Special forms of Meningitis are recognised viz Purulent, Tubercular, Syphilitic and Cerebro-Spinal (Epidemic).

Having determined that Meningitis is present it is necessary to differentiate this Special form from the other Varieties.

The onset of Cerebro-Spinal Meningitis is abrupt, often arising without any warning. The other forms are usually

insidious or slow at first, and local tubercular or septic disease may be present, or a history of syphilitic infection may be obtained, which might direct the attention to them as a cause.

Temperature - Although by no means always the case, the temperature of Cerebro-Spinal fever may be high from the commencement of an attack - Sometimes there is no fever for a day or two, but in all cases where fever is present there is a complete absence of regularity in type.

In tubercular Meningitis the fever is usually not high at first.

In septic Meningitis the fever rapidly assumes a hectic type.

The headache, pain and stiffness of the neck, the rigidity of the vertebral Column and hyperesthesia are usually marked, appear at an earlier period than in any other form of meningitis

The Skin rashes which also appear early in the disease are most Significant points in diagnosis

Herpes Zoster - also appears at an early stage of this disease

Lumbar puncture - Puncturing the Spinal Canal with an exploring

needle, and withdrawing some of the Meningeal Exudation is the most valuable means of diagnosis that has been advocated.

Quincke, who introduced the method recommended that the puncture should be made between the 3rd and 4th lumbar vertebrae just outside the middle line. The fluid thus withdrawn can be subjected to bacteriological culture and staining -

Councilman, Mallory & Wright of Boston USA found diplococci in 38 out of 55 cases Examined - There are apparently no ill effects after puncture

Cerebro-Spinal fever has to be distinguished from other acute diseases by Enteric fever, typhus fever, influenza and pneumonia

In Enteric fever the headache is less marked, the onset is insidious - Gastro-intestinal symptoms are more marked and the Spleen is generally enlarged.

Typhus fever from its Mulberry rash may be confused with the purpuric rash of Cerebro-Spinal fever - Clinically apart from the distinctive Meningeal symptoms there is irritability in the latter rather than apathy, and the intense headache & Kernig's sign help to distinguish the disease

In cerebro-spinal fever the eruption appears almost immediately whilst in typhus it appears on the 3rd, 4th or 5th days. Delirium is often early in cerebro-spinal fever, but usually till the end of the first week in typhus.

Influenza is perhaps one of the most difficult of the acute diseases to distinguish from cerebro-spinal fever until distinctive features develop. In both there is a sudden onset with severe headache and pain in the head and back with general pain all over the body. There is sometime delirium and vomiting. The two diseases may also be present at the same season of the year. Catarrhal symptoms are pronounced in influenza and often quite absent in cerebro-spinal fever. The appearance of a purpuric rash early decides the diagnosis in favour of cerebro-spinal fever, but the presence of diplococci in the spinal Exudation is the surest means of diagnosis if marked cerebro-spinal symptoms do not appear early.

In pneumonia the physical signs in the lungs clear up the diagnosis, but Meningitis may follow an attack, & pneumonia is a fairly common complication

in cerebro-spinal fever. Netter believes that the pneumococcus may be capable itself of producing cerebro-spinal fever, as well as the meningococcus, but his views are not substained by American observers.

Prognosis. This is always serious and in many epidemics the mortality has been very high. It is impossible to say how long the disease will last or what its termination will be until the lapse of a considerable interval of time during which the patient is free from symptoms. This interval cannot be definitely stated, but 2 weeks has been suggested as a fairly safe estimate. Convulsions and coma early in the disease are always of grave import. The disease is a treacherous one, and cases which survive the severity of onset, & may be progressing favorably, may suddenly relapse & terminate fatally.

Cases may recover completely even after a very prolonged convalescence, but permanent deafness, paralysis, & loss of sight may remain. Complication by pneumonia may supervene and cause death.

It is not possible to say whether acute cases will become intermittent or chronic and in all case the prognosis has to be very guarded.

Treatment. Upto the present time the treatment of cases of this disease has been most unsatisfactory, and is chiefly Symptomatic.

Owing to the indefinite knowledge of the predisposing causes and mode of infection, No prophylactic measures can be formulated. It is always safer to isolate cases, & take the same precautions observed in other acute Specific disease for preventing the Spread of the disease.

Everything that has been in contact with a patient should be destroyed or disinfected, & the excreta should be mixed with a disinfectant before being thrown away as a matter of ordinary precaution

There is no known remedy which check the disease or shortens its course. In old days depletive measures were always pursued, but have been entirely abandoned in modern times

In the Symptomatic treatment of the disease the most valuable drug we possess is opium. The best method of administering it is by hypodermic injection of morphia gr 1/4 of the Sulphate administered twice daily or even 3 times in Severe cases relieves the pain and subdues the restlessness.

. Bromide of Potash, with or without Chloral Hydrate, in large doses also prove beneficial.

Ice bags may be applied to the head & along the Spine - and at the commencement of an attack the bowels should be freely cleared out by a smart aperient, Calomel and a saline Cathartic being as good as any - Salicylic acid & Salicylate of soda are prescribed by some observers, but their value is doubtful. Warm baths have also be recommended, but no form of treatment appears to affect the course of the disease & only relieve special symptoms.

The diet should be liquid, consisting chiefly of milk & beef tea in the Acute stage, but as soon as the appetite returns other easily digested forms of Nourishment may be added.

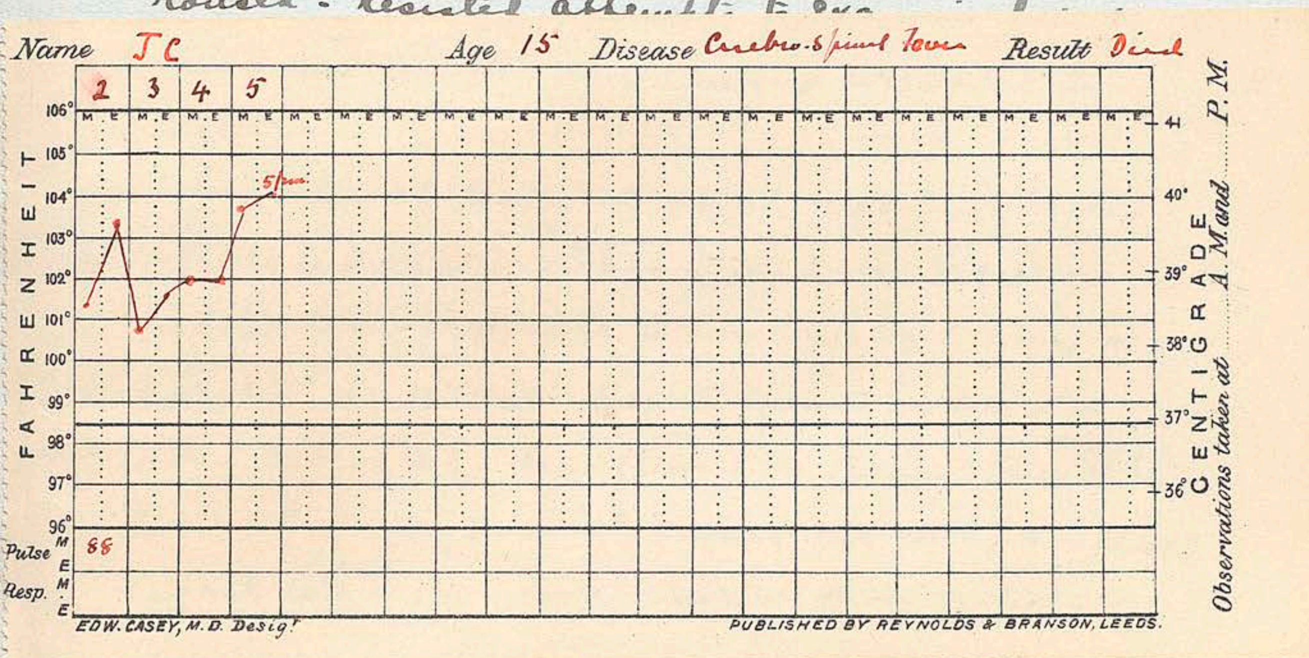
Constipation must be met by aperient & enemata.

Lumbar puncture has been repeatedly tried for curative purposes, but although of great service as a means of diagnosis, has not proved of any marked or lasting value.

Serum therapeutics have, up to the present time, not been adapted in this disease.

Summary of Cases -

I Male aet 15 years - Seen at 7 am on April 2nd 1901, complained of severe headache. T101·8 Pulse 80 per minute. At 8.45am when seen again, was found to be more or less comatose, and could not be roused - resisted attempts to exa…



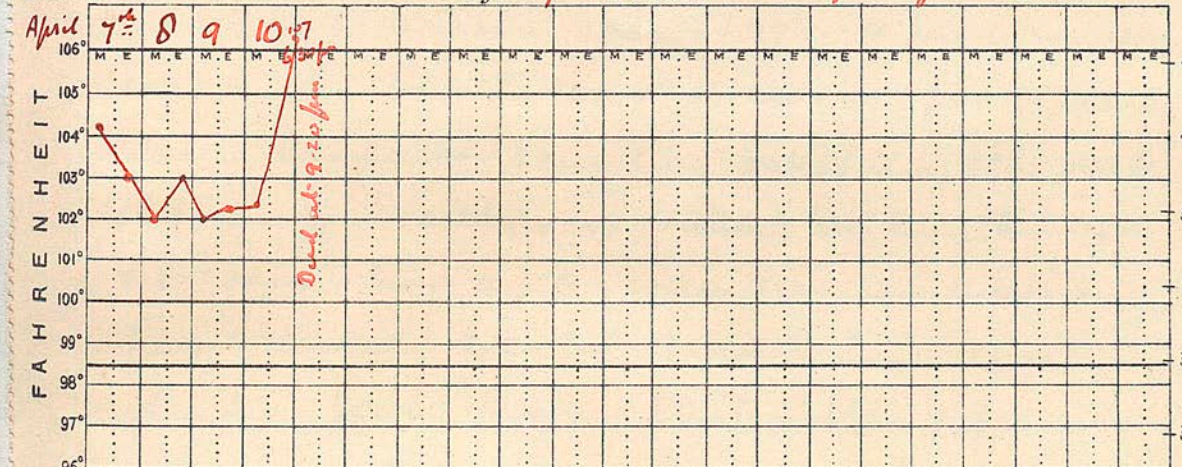
… strongly retracted - Slept fairly well - lies curled up & tosses about ET 102

April 5th T 103·8. Pulse slow & strong - no rash - at 11 am patient was cyanosed and died at 6 pm. Treatment - Bromide of Potash - Chloral - and hypodermic injections of morphia - On last day of illness Oxygen was inhaled for 10 minutes every 2nd hour & Strychnine given hypodermically when pulse was failing - Ice bags were applied to head -

April 6th Post Mortem Examination

Purulent lymph was found on upper surface of cerebrum, and also at the base of the brain.

Name T S Age 17 Disease Cerebro-Spinal fever. Result



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along the line of the vessels, which were engorged.
No excess of fluid in ventricle of the brain
Spine - Meninges congested - Purulent lymph
in subarachnoid space, and on making a
coverglass preparation of this and staining
diplococci were found
Lungs. Left - old fibrous adhesions of pleura.
red hepatisation at base -
Right - small patch of red hepatisation in
central lobe - No signs of tuberculosis.
Heart - firmly contracted - but Normal
Intestine - Normal -
No abscess of internal ear -

Case II. Male aet 17 years - belonging to a Training Ship -
April 7th 1900 - At 8.30 am complained of headache,
coryza & slight sore throat - On trunk there was an
indefinite roseolous rash - T 99° - A few hours after-
wards this rose to 104.2. Pulse 120 - face flushed,
severe headache - Vomiting & stiffness of the neck.
difficulty in sitting up without bending knees -
At 7.30 pm - had a fit - When seen was unconscious,
pupils widely dilated, throwing himself about,
grinding teeth. Marked photophobia & persistent
vomiting. ET 103°.
April 8th T 102. Pulse 96 - slept till 4 am, then became
noisy & restless - pupils less dilated. lie curled up
in bed, but throws arms about - Cries out occasionally.
Does not appear to understand when spoken to - refuses

. food . Skin mottled. Bowels confined, but opened by an enema.

April 9th T102. Noisy delirium during the night - hence scarcely passed into bed. Is conscious. Complains of headache & pain at back of neck. Arms & legs strongly flexed.

April 10th T102. Irritable. Considerable hyperaesthesia 6.30 pm. Strength failing during the day - Cyanosed - died at 9.20 pm.

Treatment. Morphia. Ice bag to head. Enemata.

Post Mortem Examination - 3 days after death.

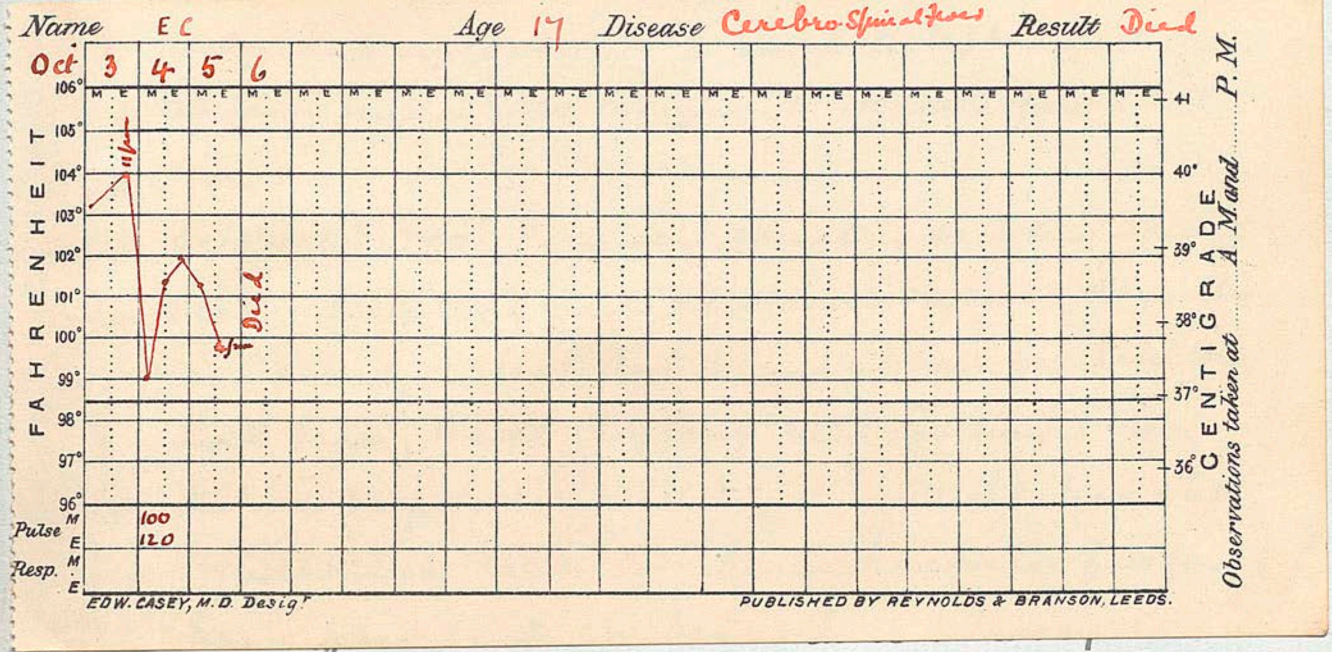
Rigor Mortis well marked. dependent parts deeply congested. On opening Skull, dura mater found to be deeply congested. deposit of purulent lymph between convolutions. Marked between cerebrum & cerebellum. Under surface of brain covered with thin lymph, extending down the Spinal Canal

Spinal Canal - Meninges deeply congested along the whole length - pus in Subarachnoid Space. On cutting out across, about 2 drachms of pus exuded from the cut surface.

Some blood stained serum in right pleural cavity - Internal organs otherwise healthy. Some diplococci found on staining Meningeal Exudation.

Case III Male aet 17 years belonging to same ship

October 3rd 1900 On the evening of this day Complained of headache & pain in his limbs T103.2


Name E C
Age 17
Disease Cerebro-Spinal Fever
Result Died
Oct 3 4 5 6
M. E
FAHRENHEIT
106° 105° 104° 103° 102° 101° 100° 99° 98° 97° 96°
11 pm
Died
Pulse M 100
E 120
Resp. M
E
CENTIGRADE
41° 40° 39° 38° 37° 36°
Observations taken at ...... A.M. and ...... P.M.
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Tongue whitish - feel quite well up to previous evening, at 11/pm temperature had risen to 104° - slight pain in abdomen complained of referred to left hypochondrium Abdomen tumid - No tympanites - Bowels open - stool loose -

October 4th T99: Persistent vomiting + retching - Vomited matter consisted of dark bile stained mucus + the quantity was scanty - Stools dark coloured at first, but later were ~~dark~~ light brown. Bowels very loose - Abdomen tumid - No dulness on percussion - tenderness in right iliac + left hypochondriac region - Severe headache - face flushed Urine passed into the bed - dull + drowsy

October 5th Temp: 101.4. Slept fairly well + seems brighter - Abdomen not so tender - only vomited once during the night - Tongue brown + dry - Bowels open - slight epistaxis - Patient restless + groans lies on belly -

4/pm - a great change noticed - T99 - restless - groaning + semiunconscious, though when roused up answers questions - lies on left side - head retracted - When placed on back there is opisthotonos - Neck cannot be flexed - Kernig's sign present -
No apparent increase of patella reflex - ankle clonus elicited in left ankle - to a less degree in right Pupils sluggish and contracted - Conjunctival slightly congested - some chemosis right upper eyelid - no strabismus - Right cheek + upper eyelid puffy - Urine drawn off by catheter - 10z - dark coloured - Nothing noted by ophthalmoscope

Name RT Age 17 Disease Cerebro-spinal fever Result Rec

July 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 | 26 27 28 29 30 31 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 | 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 1 2 3 4 5 | 6 7 8 9 10 11 12 13 14 15 16 17 18

FAHRENHEIT 106° 105° 104° 103° 102° 101° 100° 99° 98° 97° 96°

Pulse M E

Resp. M E

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Age Disease August Result

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Age Disease Result

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Age Disease September

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July 5th First seen on this date has/is been

Result e September Age Disease Result

28 29 30 31 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26

M.E M.E M.E M.E M.E M.E M.E M.E M.E M.E M.E M.E M.E M.E M.E M.E M.E M.E M.E M.E M.E M.E M.E M.E M.E M.E M.E M.E

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e Age Disease October Result

27 28 29 30 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

M.E M.E M.E M.E M.E M.E M.E M.E M.E M.E M.E M.E M.E M.E M.E M.E M.E M.E M.E M.E M.E M.E M.E M.E M.E M.E M.E M.E M.E M.E

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CENTIGRADE

41° 40° 39° 38° 37° 36°

Observations taken at A. M and P. M.

. These symptoms rapidly became worse she .
died early next morning. Shortly before death
a purpuric Eruption appeared on the trunk &
limbs - There was no post mortem Examination.

Case IV JT. 26 - belonging to one of His Majesty's ships -
June 2nd - Had been sick at his own home for
several days - When seen on this date was found
to be semicomatose - breathing rapidly Pulse 96
There was general muscular rigidity & the
head was retracted - pupils dilated but react
to light - Cries out occasionally
June 3rd - lies curled up on left side. Breathing
stertorous - unconscious - Pupils widely dilated
died during the day -
No post mortem examination allowed.

Case V Male aet 17 - belonging to a battleship
July 5th First seen on this date having been
under treatment for 3 days on board with headache,
described as splitting & shivering T 101·2.
When admitted to hospital complained of severe
pain in his back & appeared to be very deaf.
There was a history of delirium & one
epistaxis on the previous night - a Mulberry
looking rash was observed on lower part of
the abdomen - Severe pain in head & back
& epistaxis - Kernig's sign marked - Herpes
on lips

6th July T 99° Stiffness in back & pain Bowels confined.
7th July - T 101·4. Restless at night - bowels confined
8th July T 101° Mulberry rash fading - less headache - Stiffness of neck persists
9th July T 102/102·8 No headache. great pain & stiffness in Nape of neck - Herpes spread to ears - deafness more marked
10th July. Cerebral breathing observed
14th July. Symptoms less marked - feels better. No delirium Sleeps well - can lift head - herpes disappearing
17th July. Stiffness of neck persists - slight headache.
23rd July. Kernig sign still well marked
27th & 28th July. Vomiting again & headache. Neck stiff. Constipation marked
3rd August Vomiting ceased. & Symptoms less marked. Abdomen retracted - occasional headache. Stiffness neck
15th August. ducky mottling of skin. Occasional Vomiting
24th August - Kernig sign still present. Since attack commenced there has been progressive wasting of muscles. No tenderness along spine
10th Sept: General mottling of abdomen - occasional vomiting & slight headache
10th October. Attack of shivering & vomiting. Temp: rose to 103·6
29th October. Headache persists. patient gaining weight. Constipation marked
8th Nov: Again vomiting with headache
23rd Nov: - General health considerably improved - was discharged to his own home.

Case VII

Name J.M. Age 15 Disease Cerebro-spinal Fever Result Died

June 20 21 22 23 24 25 26

FAHRENHEIT: 106° 105° 104° 103° 102° 101° 100° 99° 98° 97° 96°

CENTIGRADE: 41° 40° 39° 38° 37° 36°

M. E. M. E. M. E. M. E. M. E. M. E. M. E.

Pulse M E

Resp. M E

Died

Observations taken at ..... A.M. and ..... P.M.

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Case VI

Male aet 16 years - belonging to a Training Ship -

October 18th 1900 - Complained of headache and pain in back - T 100.6 - Not felt well for 3 days - Pain commenced on day previous to being seen. Head retracted - Pain at back of the head neck and along the spine

19th October - T 102 - Legs flexed & cannot be straightened - Marked tenderness along the spinal column -

20th October - Pain in the lumbar region - Cries out occasionally

24th October - Retraction of head & neck more marked, & there is tenderness all along the spine down to the coccyx - No delirium - Is noisy & restless -

10th November - General amelioration of symptoms but head & neck are still retracted. This improvement slowly continued & he was able to leave the hospital on December 18th

Case VII Male aet 15 years.

20th June 1900 - In morning complained of slight sore throat and pain in right ear. Slight cough - T 103°. Had a rigor on previous night. During the day had screaming outbursts & attempted to get out of bed - an ice bag was applied to head & gr v of Dover's powder given at night

21st June - T 103.4. Bilious vomiting - severe headache furred tongue - delirious & attempting to get out of bed. Urine & faeces passed unconsciously

Name Fc. Age 17 Disease Cerebro-Spinal Fever Result Recovery

June 20 21 22 23 24 25 26 27 28 29 30 1 2 3 4 5

M. E. M. E.

FAHRENHEIT: 106° 105° 104° 103° 102° 101° 100° 99° 98° 97° 96°

CENTIGRADE: 41 40° 39° 38° 37° 36°

Pulse M E

Resp. M E

Observations taken at A. M and P. M.

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22nd June - No abnormal physical sign in chest - Vomiting constantly dark green bilious fluid - Tongue furred - Bowels confined

23rd June - Pain in right ear - No discharge - Vomiting some cough - Skin hyperaesthetic - Throwing himself about & trying to get out of bed - Bowels not moved - Pain in left side of chest

24th June - No improvement

25th June Some friction in right axilla - still Vomiting - Some dulness at base of right lung

26th - Symptoms much worse - died at midnight

No Post Mortem obtained

Case VIII Male aet 17 years.

~~April~~ June 20th 1900 On previous afternoon complained of severe headache, and pain in right side of chest above the nipple - No cough or abnormal physical sign in the chest -

On this date morning temperature was 101·6 - patient restless & irritable complains of headache & pain in the nape of the neck - utters short cries & screws up face - Answers questions after a time but apparently wants to be left alone - Vomiting bilious fluid - No abnormal physical sign in the chest.

June 21st MT 99·8 - Only vomited once - headache less - Tongue coated with whitish fur - Herpes on lips.

June 22nd Labial herpes more extensive - Not so much headache - retching & vomiting on previous night - very restless.

June 23rd - Retching - restless at night - Pain in nape

of neck - utters short cries -
June 24th less stiffness neck - Bowels costive
June 25th slight pain in neck - still cries out at times - No albumen in urine
June 27th at 8.30 am had a rigor lasting 15 Minute Temp: 104°. return of headache & pain in neck. Nausea - Chest sounds normal
June 28th Cries out with pain in head - herpes facies - slight pain on pressing abdomen.
From this date symptoms slowly disappeared she was able to go away for a holiday on July 20th

Remarks on Cases.

Of the 8 recorded cases 5 terminated fatally and 3 recovered. all may be described as acute at onset, and Case V, which recovered, became chronic - the ages varied between 15-26 years, but all the cases except one were under 20 years.

The patients were nearly all boys belonging to Training Ships, and in no instance did the disease spread to another person. In 2 instances more than one case occurred in the same ship, but a considerable period of time elapsed between them precluding any possibility of direct infection

In 7 cases the onset was sudden, and in the remaining case, which occurred at his home,

the mode of onset was unknown.

In 2 cases there was a history of not feeling well for 2 days before the onset of acute Symptoms.

In 5 cases Kernig's Sign was distinctly present and the patients generally lay curled up on one side.

In 1 instance diarrhoea, abdominal pain & persistent vomiting were present for a day before marked spinal Symptoms were observed.

Headache was universally one of the earliest Symptoms, being in most instances most acute - In some of the cases the patient buried their heads into the pillows. The Exact situation of the pain was difficult to ascertain, and generally appeared to be diffused over the whole cranium.

Vomiting was nearly always present early in the attack and was most intractible. The Vomited matter Consisted of mucus, often bile stained -

Pain in the Nape of the neck was also a Constant Symptom, accompanied in most instances by stiffness or rigidity of the Muscles, Causing retraction of the head.

Restlessness and irritability were nearly always observed, and in 1 fatal Case Coma set in from the Commencement of the attack. In another instance Convulsions occured on the first day of illness

and in several others there were periods of semiunconsciousness. 1 case made repeated attempts to get out of bed, and most of the patients uttered short cries or groans, screaming being frequent in 1 instance

In some patients cutaneous hyperaesthesia was marked, and pain all along the spine was complained of in several instances

Eye symptoms were not marked. In some cases the pupils were equal in size and reacted to light. As the disease progressed towards a fatal issue the tendency was towards dilatation, and in the case that had convulsions they were widely dilated at the time

Contraction and sluggish reaction to light were noted in 1 case.

Slight conjunctival congestion was noted in several instances, and photophobia was sometime present.

Deafness was noted early in 1 case, and another had pain in the right Ear.

Skin eruptions were not universally present. 2 cases had purpuric eruptions, 1 rubeola was described as Mulberry

Labial herpes was twice observed, & an erythematous mottling of the skin was

seen in Case II

In Case I pneumonia in an early stage was found on post-Mortem Examination, but lung complications were not as commonly present as in some of the described epidemics.

In the Cases that survived more than a few days marked wasting of the muscles was soon observed.

Constipation was nearly always present, & often required enemata for its relief

In the treatment Morphia gave considerable relief to the pain, but none of the other means tried seemed to be of any effect.

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