Twenty-three cases of Cerebro-Spinal Meningitis treated in the City Hospital, Edinburgh, during the present outbreak.

by Andrew Adams Rutherford

31st March 1915

M. D. 1915
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Introduction

This thesis contains details of the cases of cerebro-spinal meningitis admitted to the City Hospital, Edinburgh, during the present epidemic. As Junior Resident, I was in charge of the ward in which these cases were treated. The cases were all taken by me, and I conducted the bacteriological examinations, and carried out the serum treatment described. Owing to pressure of work in other wards, it was not possible to investigate the cases more fully than was necessary for practical purposes.
Case still under treatment.

Case 1. Private M. J. aged 19 years. Soldier.
Admitted 14th July 1915

History. On the 20th of June 1915, patient was admitted to Camp with Military Hospital with severe headache & pain in the legs. He was delirious. His pupils were of medium size, & reacted sluggishly to light. Kernig's sign was present. His knee jerks were diminished. Babinski negative. No Sphenic enlargement. Widal negative.

On the 29th June, he was lumbar punctured. The C.S.F. fluid was under normal pressure; it contained numerous polymorphs, but no organisms were found.

Patient had reply in the 5th, 6th, 8th, 9th, 11th & 13th of January.

On the 17th of July, he was complaining of pain in the head & back. Pupils dilated & very sluggish. Knee jerks dim.
Nistred. Abdominal reflex exaggerated. Patient still delirious at night.

On the 13th July 1915, another lumbar puncture was done. About 60 c.c. cloudy fluid were taken off. The fluid was under great pressure. It contained numerous polymorphs, a few characteristic intra-cellular diplococci. The lumbar puncture relieved the patient's symptoms—headache.

On the 14th July 1915, the patient was transferred to the big hospital.

14th July. State on admission:
Mental condition clear.
No headache.
No head retraction.
Patient had paresis in the legs.
Kernig sign was positive but not marked.
Pulse regular.

Patient had miosis every night from the 14th till the 19th. Vomiting always occurred at the same time.
Lumbar punctures

14th July. 40 c.c. removed. normal pressure.

Slightly cloudy.

Micro. Many cells, mononuclear & polymorphonuclear. No organisms found.

25 c.c. anti. meningococcal serum injected into spinal canal. (Burrows & Walker)

17th July. 40 c.c. removed. normal pressure.

Turbid.

Micro. Polymorphs only.

25 c.c. anti. meningococcal serum injected into spinal canal (B. & W.)

18th July. 45 c.c. removed. normal pressure. Slightly turbid.

20 c.c. anti. meningococcal serum injected into S.C. (B. & W.)
19th Feb.

40 c.c. removed. Clear; yellowish.

Normal pressure.

Micro. Polymorphs & a few intra-vascular diplococci.

No injection.

The patient steadily improved.

After the 20th of Feb., a lumbar puncture was no longer necessary.

9th March. Patient got up today. His legs are still stiff. The stiffness is specially marked on the right side. He walks with a limp.

21st March. Patient quite convalescent.

The limp has entirely disappeared. He will be able to leave hospital in a few days.

Total amt. of serum injected 70 c.c. (B.W.)

Other treatment: Hot sponging t.i.d.

Aperients: Tenol. Digestives.
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<th>Resp.</th>
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**Temperature Fahrenheit Scale**

**Temperature Centigrade Scale**
Admitted 18 July 1915

History. Patient was ill for 3 days before admission. The case was thought to be one of influenza. On the 15th he complained of headache & pain all over the body. On the 16th vomiting commenced.

State on admission (18 July 1915)
Pains all over the body.
Headache
Neck rigidity & head retraction
Patient delirious.
Kernig positive on both sides but not very marked.
Abdominal reflexes exaggerated.
Knee jerks exaggerated.
Babinski negative on both sides.
Internal strabismus on both sides more marked on the right.
Incontinence of urine & feces.
Temperature 101° 2 F
Pulse weak & irregular.
18th July
Lumbar puncture. 30 c.c. drawn off.
Turbid. Under slight pressure.
Mucous Polymorphs. A few intracellular diplococci.

20 c.c. Flexner's serum injected into spinal canal.

19th July
L.P. 50 c.c. drawn off.
Turbid. Normal pressure.

20th July
L.P. 45 c.c. drawn off.
Turbid. Normal pressure.
Mucous Polymorphs only.

30 c.c. Flexner's serum injected into s.c.

21st July
L.P. 40 c.c. drawn off.
Turbid. Normal pressure.

20 c.c. Flexner's serum injected into s.c.
22nd July
L.P. 50 c.c. drawn off.
Rattis clear. Normal pressure.

20 c.c. Phenol serum injected in 5 c.c.

23rd July
Patient is still delirious at night but his mental condition has improved.
No headache.

Head retraction still present.
Kernig present on both sides.
Slight ptosis right eye.
Incontinence of urine & faeces.
Pulse intermittent at times.

8 P.M. Patient's respiration suddenly became rapid this evening, and his pulse very irregular. A lumbar puncture was done immediately. 75 c.c. were drawn off. The C.S.F. fluid was under pressure & turbid. No injection was given. The patient's symptoms were relieved to a great extent. At midnight his
breathing was still rapid although his pulse was more regular.

24th Nov. Respiration 32.
Patient rather better.

L.P. 40 c.c. druur yf. Normal
pressure. Turbid.

No injection today.

25th Nov.
L.P. 50 c.c. druur yf. Under
pressure. Turbid and yellowish.

17 c.c. Fleurier serum injected into
6 c.c.

28th Nov.
L.P. 40 c.c. druur yf. Normal
pressure. Turbid.

15 c.c. Fleurier serum injected
into 3 c.c.
3rd March
L.P. 40 c.c. drawn from 4th Turb. Normal pressure. No injection.

At 6 P.M. on St. James's advice 1000 units diphtheria antitoxin were injected subcutaneously.

8th March
Severe headache & pain in neck.


10th March

11th March
28th March

Since the 12th of March, patient has not complained of headaches. He is slowly becoming emaciated. His appetite has been failing since the 23rd of March. Although he can answer simple questions intelligently, his mind is somewhat confused, and he suffers from delusions. He has still slight muscle rigidity but no pain, and Kernig's sign is positive on both sides. The internal strabismus is well marked. Patient appears to be passing into the chronic stage. Hot sponging E.I.D. is still being continued.

Patient has been 122.c.c. chloroform and minor prococot done injected into the spinal canal since admission.

Other treatment - 100mils. intradural (diphtherial) hot sponging E.I.D.
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The diagram shows temperature recordings from July 26 to August 10, 1915, with corresponding pulse, respiratory rate, and other observations.
Case 3. Private M. Oct. 20 - A Soldier (R.A.M.C.)
Admitted 18th July 1915

History: Patient took ill 3 days before admission. He was thought to have influenza. He had shivering attacks, severe occipital headache & pain in the neck.

State on admission. (18th July 1915)

Occipital headache
Pain in neck
Nuchal rigidity & slight head retraction
Kernig positive on both sides - well marked

Very sensitive to cold.
Tache cérébrale well marked.
Pupils equal. React to light & accommodation.
Abdominal reflexes absent.
Knee jerks exaggerated.
No ankle clonus.
Babinski's negative on both sides.
Pulse regular.
Slightly delirious at night.
18th July
L.P. 40 c.c. drawn off. Turbid. Under slight pressure.
Micro? Polymorphs only.

20 c.c. Serum (Burns & Wolfe) injected into 9 c.c.

19th July
L.P. 40 c.c. drawn off. Turbid. Normal pressure.
Micro? Polymorphs, Diplorococi, intra + extracellular.

22 c.c. Serum (B. & W.) injected into 9 c.c.

20th July
Micro? Polymorphs only.

25 c.c. Serum (B. & W.) injected into 9 c.c.
21st Feb. Patient much better. Temp. normal

23rd Feb. Marked improvement.
   No headache
   Neck slightly stiff
   Kernig almost gone.
   No delirium at night.

27 March

Patient's temperature has been normal since the 21st of Feb. He has been up since the 11th of March and is perfectly well. He will be discharged as soon as a negative smear is obtained from his naso-pharynx.

67 c.c. anti meningococcal serum
(Burnet-Welcome) injected in all.
Other treatment. Hot sponging
T.I.D. for the first few days.
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Temperature Fahrenheit Scale
Admitted 19th July 1915.

History of "influenza" and consolidation since 14th July. On 19th July, slight vomiting. An injection of morphine had been given shortly before.

State on admission:
Patient - slightly delirious.
Severe headache.
Naso-radicating & head retraction.
Kernig absent on both sides.
Pupils equal and reacted to light.
Abdominal reflexes positive.
Knee jerks positive.
Slight ankle clonus.
Babinski negative on both sides.
Pulse regular.

Lumbar puncture:
19th July. 2 p.m. 60 c.c. Turbid, under slight pressure.
Micro: Polymorphs & mitral cells.
2 5 c.c. serum (B. W.) injected into S.C.
20th July
L. P. 50 c.c. drawn of the turbid.
under pressure.

30 c.c. serum (Burrans + Welch)
Injected into spinal canal.

Knee jerk marked on both sides.

21st July
L. P. 40 c.c. drawn of the turbid.
Normal pressure.

... 20 c.c. serum (B. + W.) injected
into S.C.

22nd July
L. P. 35 c.c. drawn of a much
clearer. Normal pressure.

Micro? Polymorphs only.

(Flexner)

20 c.c. serum (Flexner)
injected into

S.C.

(Flexner's serum was used as
Burrans + Welch's was not available at
the moment.)
23rd Feb
Marked improvement in patients condition.
No headache
Nerve still stiff
Kernig positive on both sides.
Temperature normal

24th Feb
Headache

No injections.

25th Feb
L.P. 45 c.c. drawn qf. Slightly turbid. Normal pressure

22 c.c. serum (B.S.W.) injected into s.c.

26th Feb
Headache & pain in back of neck
Under pressure.

No injections.
1st March  Headache & pain in back of neck
L.P. 40 c.c. drawn off. Very slightly
Turbid. Normal pressure.

25 c.c. serum (B. + W.) injected
 Afterwards,

6th March  Headache & pain in back of neck
L.P. 35 c.c. drawn off. Slightly
Turbid. Normal pressure.

No medication.

13th March  Headache & pain in back of neck
L.P. 30 c.c. drawn off. Slightly
Turbid. Slight pressure.

No medication.

17th March  Headache & pain in back of neck
L.P. 35 c.c. drawn off. Slightly
Turbid. Normal pressure.

No medication.
26 March. Patient is gradually improving, but still complains of headache & pain in the back of the neck at times. The pain, however, does not seem to be very severe.

The patient's mind is quite clear, but his memory is slightly affected.

28 March

Patient has been feeling much better yesterday & today. There is still very slight rigidity of the neck. Kernig is negative on both sides. Hot sponging & i.d. has been continued till today. Patient is to be allowed up for a little tomorrow.

3rd week Improvement maintained.

122 c.c. anti-meningo-coccal serum (Burrows & Helene) & 22 c.c. Bacutenva serum have been injected into 5 c.c. spine admission.

Other treatment: Lumbar punctures; aspirin & hot sponging i.d. & c.d.
Case 5. G. R. 40 yr. (Father not a soldier)
Admitted 19 July 1915

History: Patient has been ill for 4 days. Symptoms = vomiting, delirium, head
retraction. He was lumbar punctured on the 18th July, & a pumice fluid
containing intra-cerebral deposits was drawn off.

State on admission (19 July 1915)
Severe headache
Some mental confusion
Neck rigidity & marked head retraction
Kernig well marked on both sides
Abdominal reflexes absent
Babinski negative
Pupils equal & react to light
Right thumb flexed into palm of hand
Pulse weak & irregular

L.P. 20 c.c. drawn off. Turbid & blood-stained.
Normal pressure.

Micro? Polymorphs & intra-cel. cells?

18 c.c. serum (BOW) injected into S.C.
20th Day

L. P. 30 c.c. drawn of l. Turboïd.

Slightly blood stained. Normal pressure.

15 c.c. serum (B. O.C.) injected into l.c.

21st Day

L. P. 25 c.c. drawn of l. Turboïd.

Normal pressure.

15 c.c. serum (B. O.C.) injected into r.c.

22nd Day

L. P. 30 c.c. drawn of l. Turboïd.

Under slight pressure.

Miro$. Polymorphs only.

15 c.c. serum (B. O.C.) injected into r.c.

23rd Day. Very considerable improvement in patient’s condition.

No headache.

Nausea still present.

Pulse regular & stronger.
26th Feb

L.P. 23 c.c. drawn from turb.

Normal pressure

15 c.c. serum (B. O.W.) injected into 5 c.c.

27th Feb.

Morbilliform serum rash

especially marked on legs.

1st March

Rash has disappeared

4th March

Headache


10 c.c. serum (Poult. Diamond) injected into 5 c.c.

22nd March

Patient left this morning

Has had no headache since 4th morning.

Rash almost invisible. Disappeared.

Records disappear.
27th March: Patient's legs very stiff, but can walk a little.

Patient is quite deaf.

85 c.c. serum injected into s.c. Spirit
admixture (45 c.c. B.H.V., 30 c.c. E. and
10 c.c. P.D.)
21st July
10 a.m. 45 c.c. drawn of Y. Turkish. Normal pressure.

Mist. Polymorphs & a few intra-cellar diplococci.

25 c.c. serum (B. Wol) injected into 5 c.c.

22nd July

20 a.m. 40 c.c. drawn of Y. Turkish. Fluid under pressure.

21 c.c. serum (Flaxen) injected into 5 c.c.

23rd July

Patient febrile. Still complains of severe headache. Has had occasional epistaxis from time to time since admission. The bleeding relieves his headache. He states that he suffered from occasional epistaxis for some time before his present illness.

Marked right middle + brow
Kernig positive.
Nomahted with normal skin admission.


25 c.c. serum (B.O.W.) injected into S.C.

L.P. 40 c.c. drawn off. Turbid.
Blood stained. Normal pressure.

No injection.


No injection.
1st March

25 c.c. Peruna (B.SW.) injected into s.c.

4th March

15 c.c. normal saline injected into s.c.

5th March
Till today, since administration, patient has had marked neck rigidity and head retraction, severe headache & pain in the back of the neck. All these symptoms are less marked this morning.

14th March
Improvement maintained. Temperature normal. Neck still a little stiff. Occasional headache, but pain not nearly so severe as it was.

22nd Mar. Patient allowed up today. No headache since the 19th March. Practically no stiffness in neck.

28th March. Patient very well. No headache nor stiffness of neck. Will be able to leave hospital in a very few days.

125 c.c. anti-meningococcal serum
(Burrows & Welche) and 20 c.c. Flavine serum have been injected into s.c. o.s. on 7th March. 15 c.c. normal saline were also injected into s.c. on 14th March.

Other treatment: Lumbar puncture; hot fomenting 2 c.c. i. e. 1 ampoule.
Case 7. Driver S., aged 20 years, a soldier.

Admitted 23rd July 1915

History

Patient was ill for 5 days before admission. He was thought to have influenza. On 19th July, he had a high temperature, pains all over the body, headache & stiff neck. On the 20th July, chills & vomiting set in. The symptoms gradually increased in severity till admission.

State on admission (23rd July 1915)

No headache

Pains all over the body.

Neck rigidity & head retraction

Kernig's sign well marked on both sides.

Pupils equal, Photophobia & conjunctival injection of pain in eyes

Abdominal reflexes exaggerated.

Knee jerks normal.

Babinski's negative.

Pulse regular.
22 c.c. drawn qf. Slighty turbid
Normal pressure.

25 c.c. serum (B. o.w.) injected into S.C.

24th Feb.
25 c.c. drawn qf. Slighty turbid.
Normal pressure.

25 c.c. serum (B. o.w.) injected into S.C.

25th Feb.
45 c.c. drawn qf. Slighty turbid.
Under slight pressure.

25th Feb.
40 c.c. serum (B. o.w.) injected into S.C.

26th Feb.
48 c.c. drawn qf. Slighty turbid.
Under slight pressure.

No injection.
1st March. Temperature normal today & patient much better. No headache or neck restriction.

Patient has been delirious at times & right-sided admission. He has also suffered from severe headaches from time to time. Parietal lobe has disappeared.

8th March. Improvement maintained. Patient's condition very satisfactory.

12th March. Patient's temperature rose to 103°F today. He has been vomiting, complaints of pain in the back of his neck & severe headache. His neck is stiff. Kerning is positive on both sides. Parietal lobe.

L.P. 75 c.c. drawn off. Clear under pressure.

25 c.c. serum (B. B. W.) injected into S.C.
13th. Symptoms continue.


Under slight pressure.

No injection.

19th. No headache or pain in neck. Patient feels better. Neck much less stiff.

23rd. March. Patient got up today.

He is feeling very well.


Will leave hospital in a few days.

115 c.c. anti-meningeal serum (Burman & Co.) injected into s.c. spine admission.

Other treatment: Lumbar puncture; hot fomentings i. 1.0, for first few days & during relapse if necessary.

Admitted 27th July 1915

History. Patient was perfectly well on the 25th. In the morning of the 26th, he had a temperature of 100° F and a slight frontal headache. He was thought to have a mild attack of influenza. At 6 P.M. vomiting commenced. During the night, the patient became unconscious. The following morning he was sent to Camp with Military Hospital, and from there to the City Hospital.

State on admission (27th July 1915)

Patient in a state of profound coma.
Nuchal rigidity and head retraction.
Kernig's positive on both sides.
Tachicardia well marked.
Pupils equal, fairly large, react to light.
Knee jerks exaggerated.
Babinski's negative on both sides.
Pulse regular & strong.

Micro: Polymorphs & a few intracellular diplococci.

40 c.c. Felixserum injected.

Oct. 29. Patient beginning to be conscious. Can not speak but seems to understand simple remarks.

Patient has incontinence of urine & faeces.

28th Nov. No change in patient's condition. Hill. 40 c.c. drawn U. Rather less turbid. Under pressure.

22 c.c. serum (Burrows' Welcome) injected into s.c.

1st March. Patient quite conscious but cannot speak.
1st March. 15 c.c. drawn off. Slightly turbid.
Under slight pressure.

30 c.c. serum (B Parke Davis)
Injected into S.C.

2nd March  Headache. Stiff neck.
1st March 25 c.c. drawn off. Slightly
turbid. Under slight pressure.

30 c.c. serum injected in 5 c.c.
(B Parke Davis)

1st March  50 c.c. drawn off. Slightly
turbid. Under slight pressure.

No injection.

7th March. Patient much better. Can
speak a little today. Still
has incontinence of urine & feces.
From the 27th July till the
3rd March, patient had severe
headache at times & his neck was
very stuff. Since the 3rd March, he has had no headache & his neck is much less rigid.

11 March. Incontinence of urine & feces ceased today. Patient very much better.

21st March. Improvement maintained. Patient got up today.

28th March. Patient quite convalescent.

122 c.c. anti-meningeal serum
(40 c.c. Phrenic + 82 c.c. Burana + 3 c.c. 60 c.c. Park Davis) to have been injected in 5 c.c.
Other treatment: Lumbar puncture; hot-sponging t.i.d. till convalescent.
Aperients.
Admitted 29th July 1915.

History. On the evening of the 23rd July, the patient felt his neck stiff, and he had some abdominal pain. The following morning, he had a severe headache, and could not move. He became semi-conscious at 9 P.M. on the 27th July, and was admitted to the City Hospital at 1.10 A.M. on the 28th July.

State on admission (28th July 1915)

Patient slightly comatose but sensible & can answer simple questions.

Severe headache

Rigidity of neck & slight head retraction

Kernig sign positive on both sides.

Slightly marked tache circinale.

Very sensitive to cold.

Pupils large & equal in size: react to light.

Abdominal reflexes exaggerated.
Knee jerks exaggerated
Ankle clonus on both sides.
Patellar negative on both sides.
Pulse regular.
Patient moans a little at times.

L. P. 50 c.c. drawn off. Turbid.
Under pressure.

30 c.c. cholesterol injected
into 5 c.c.

28 Feb. Incontinence of urine & faeces.
Patient confused mentally at times.
He is restless & delirious at night.
Keeps position on both sides.

L. P. 54 c.c. drawn off. Turbid.
Under pressure.

35 c.c. Snake's serum injected
into 5 c.c.
1st March. Still marked head retraction.

L.P. 65 c.c. drawn off. Slightly turhr.
Under pressure.

40 c.c. (25 P. t.H. and 15 F) injected into s.c.

2nd March. 20 c.c. drawn off. Slightly turhr.
Under pressure.

22 c.c. (P. t.H.) injected into s.c.

3rd March.

No retraction.


5th March. Incapability of turning to face on side today.
8th March. Temperature high. Malarial rash all over body—very itchy.

11th March. Patient very deaf today.

12th March. stiffness in neck has disappeared. Patient complains of joint pains at the shoulders, wrists, knees & ankles.

15th March. Joint no longer painful in this morning. Patient still deaf; otherwise much better.

21st March. Deafness gradually passing off. Patient very well. Got up today.


127 c.c. anti-meningococcal serum
(80 c.c. Fleming & 47 c.c. Burrows' Wellcome) has been injected into 5 c.c. twice admission.

Hot dressing T.i.d. for first 16 days.

History. Patient has been ill for 6 days. Symptoms- loss of appetite, drowsiness, intermittent head retraction. Drowsiness gradually increased.

State on Admission (2nd March 1915)
No red reflex in both pupils.
Kernig negative in both sides.
Small papillae on tonsil.
Small ecchymotic spots on face.
Internal strabismus of both eyes.
Omphalophil vomiting.


Under slight pressure.

Mixed polymorphs & dysphocytes infinite & intracells.

15 c.c. serum (Pasteur Dani) injected into 9 c.c.

3rd March. Vomiting is continuing.

L.P. 5 c.c. drawn qf. Very turbid.

Normal pressure.

5 c.c. serum (Pasteur Dani) injected into 9 c.c.
4th March. Vomiting. Patient appears to be suffering from loss of the power of accommodation. Marked rigidity.

L.P. 5 c.c. drawn off, very dark.
Normal pressure.

5 c.c. serum (Parke Davis) injected into 3 c.c.

Several attempts were made after the 4th March to lumbar puncture the patient on different days and at different levels, but as nothing but blood could be obtained, no further injections were given into the spinal canal.

5th March. Vomiting ceased today.
Purpura spots have disappeared.

7th March. Power of accommodation apparent.
by Dr. James.
9 March. Neck rigidly, head retract in. 
Herpes present on both sides. 
Other than this.

5 c.c. serum (Pasteur strain) injected subcutaneously.

24 March. No change in patient's condition. Nominal wasting. Food eaten well.

100 units anti-diphtheritic serum injected subcutaneously at Dr. Jamies' advice.

25 March

Head retract in less marked.

26 March

100 units anti-diphtheritic serum injected subcutaneously.

28 March

100 units anti-diphtheritic serum injected subcutaneously.

Head retract in much less marked. Patient's condition otherwise fine.
Case 11. Mrs J.K. vol. 22. Hospital ward.

Admitted 17th March 1915.

History

16th March. In the morning patient's temperature was 104°F. She was vomiting at intervals, and complained of headache and pain in the neighborhood of the lower angle of the scapula. In the evening, she had a slight pain in the back of the neck.

At midnight, her temperature was lower, and she was apparently better. Between 4 and 6 A.M. on the 17th, patient became semi-comatose. Her head was not retracted; Kernig's sign was negative. She was admitted to the City Hospital in the forenoon.

State on admission (17th March 1915)

Patient comatose.

Slight tenderness of head. No retraction.
Kernig well marked on both sides.
Tache cirrhotale well marked.
Small purpuric spots scattered over body.

Pupils round, reacting sluggishly to light.
Pulse regular.

L.P. 5-5 c.c. drawn off. Turbid.

Under slight pressure,

Microphages & diplococci — mostly intra cellular.

L.S. c.c. serum (B.H.W.) injected into S.C.

Patient became conscious in the evening. She was able to answer simple questions. She complained of severe headache.

16 March. Headache much better.

L.P. 5-5 c.c. drawn off. Rather less turbid. Under pressure.

50 c.c. serum (B.H.W.) injected into S.C.
19 March Mental condition quite clear.
Slight herpes on lower lip.

L.P. 5 c.c. removed. Clear.
Under pressure.

50 c.c. serum (B. W.) injected into S.C.

20 March Headache.


No injection.

21 March Midnight. Severe headache.


No injection.

23 March Patient much better today.

Slight headache occasionally.
24th March. Severe headache since 4 P.M.

L.P. at 8.45 P.M. 50 c.c. removed.

Slightly encephalitic. Under pressure.

25 c.c. serum (R.W.) injected into S.C.

27th March. Patient improving. Her mood is still slightly irritable. She occasionally suffers from slight occipital headache. Patient distinctly improved.

This patient may require further treatment. 170 c.c. anti-meningococal serum have been injected into the spinal canal since admission.
25th March

L. P. 50 cc. drawn of. Slightly turbid. under normal pressure.

40 cc. serum (B.O.W.) injected into S.C.

As patient was coming out of chloroform, he apparently took a fit. His breathing suddenly became shallow, and a little later there were the twitching and prostration characteristic of the cord damage. Twitching of the hands & arms commenced. The patient's eyes were turned up. His pupils were moderately large & reacted to light. Pulse feeble. Breathing poor.
24th March. Slight twitching movements from time to time. Although conscious, able to answer questions, patient does not seem quite clear mentally. He has incontinence of urine and feces.

L.P. 25 c.c. drawn q.1 Turb'd.

Normal pressure.

20 c.c. serum (B.T.W.) injected into s.c.

26th March

L.P. 15 c.c. drawn q.1 Turb'd.

Normal pressure.

15 c.c. serum (B.T.W.) injected into s.c.

28th March

L.P. 6 c.c. drawn q.1 Turb'd.

Yellowish. Normal pressure.

10 c.c. serum (B.T.W.) injected into s.c.
29th March. No marked improvement since admission.

Still marked neck retraction & incomplete closure of mouth & face. The lipping movements continue, & the patient's mind is not quite clear. Slight ptosis both sides - termi position.

Admitted 24th March 1915 as an Observation C.S.O.

This case is quite probably not one of C.S.O. at all. It is included here as a possible example of the ambulant or abortive type of the fever.

As Dr. Hare says in his book on "Infectious Diseases" — "The true nature of such attacks would not even be suspected were it not for their appearance in connection with cases of ordinary or subclinical types, or perhaps for the presence of labial herpes."

History. On the 22nd of March, patient had a sore throat & frontal headache. He was shivering. In the evening, he had pains in his back & in the back of his neck.

State on admission (24th March 1915)

Slight headache.
Slight pain in back of neck. No headache.

Kernig absent on both sides.

Lungs healthy

K. J. closed

Throat inflamed - slight reddening - probably only irritation.

Tongue clean

I thought the patient was probably suffering from a slight attack of influenza & coryza, & treated him on that assumption. A swab was taken from throat; the culture was found to contain no diptheria bacilli the following morning.


Development of herpes round mouth.

February 28th

P. was lumbar punctured for
purposes of diagnosis today. The
fluid was clear, but as it was
under pressure, 30 c.c. were
removed. No organisms of any
kind were found on micro-
scopic examination.

The patient is apparently quite
well, but is still being kept
under observation.
Admitted on 4th July 1915.

In this case, the C.S. fluid was slightly turbid on admission. It contained numerous polymorphs but no organisms were found either then or subsequently. The causative organism may possibly have been the pneumococcus.

History. On the 31st of June, patient took ill suddenly. Shivering, headache and vomiting. Patient was feverish but delirious. Condition continued much the same till the 4th July, when patient was sent to Craigforth military hospital, lumbar puncture at the O.P.D., and transferred to the 3rd hospital in a C.S.O.T.

State on admission (4th July 1915):
Patient conscious, delirious at times. Severe headache. No neck retraction. Marked Kernig on both sides.
Pulse very irregular & flutter.
Patient has incontinence of urine & faeces.
Patient is slightly dehydrated.

5th Feb.
L.P. at 10 A.M. 15 c.c. drawn off.
Slightly turbid; Normal pressure. Micro Polymorphs only.

25 c.c. serum (B.T.W.) injected into s.c.

L.P. at 3 P.M. 27 c.c. drawn off.

20 c.c. serum (B.T.W) injected into s.c.

6th Feb.
L.P. at 2.30 P.M. 30 c.c. drawn off.
Slightly turbid; Normal pressure. Micro Polymorphs only.

25 c.c. serum (B.T.W) injected into s.c.

7th Feb.
Incontinence of urine & faeces has ceased.
L.P. at 3 P.M. 32 c.c. drawn off. Clear.
Normal pressure.

15 c.c. serum (B.T.W) injected into s.c.
7th July. Patient has a cough.
Slight dullness on left side below clavicle.

9th July. Dullness over left base posteriorly and tubular breathing in same position. Deafness increasing.

13th July. Patient's temperature fell early this morning. He is looking much better.
No headache.
Kernig present but not marked.


20th July. Rash has disappeared from back. On chest, abdomen and over joints today.

21st July. Rash has disappeared.
Finger joints swollen and painful. Shoulder, knee, wrists, ankles painful.
23rd July.  Temperature normal.

Toni's hands have disappeared.
No headache.
No diarrhoea.
Patient feeling very much better.  
His hearing is improving.

28th March.  Patient quite com-
valescent.  Deafness has almost
entirely disappeared.

8% c.c. Serum (Burrows' Vaccine) has been
injected w/ 5 c.c. saline admission.
Case 15. John McKay, age 17 (a Gordon child.)
Father has been at work since August.
Admitted 28th March 1915.

History. Patient was perfectly well on Monday, 22nd March. On Tuesday morning, he complained of severe headache, pain in the back of the neck, vomiting and shivering. There was no change till Saturday morning (27th) when he became delirious. This morning (28th) he was only semi-conscious and did not seem to recognise his people. He was admitted to the City Hospital about 12.00.

State on admission (28th March):
Patient is conscious. He can answer questions but is slightly confused mentally.
No headache.
Pain in back of neck.
Neck rigidity was not marked at all.
Tremor present but not marked.
Slight herpes, upper lip.
Pupils equal, of moderate size; react to light & accommodation.
Abdominal reflexes active.
Knee jerses scarcely perceptible.
Babinski negative.
Pulse regular.

L.P. at 1.30 P.M. 55 c.c. drawn off.
Turbid, under pressure.
Mainly polymorphs, Staphlococci, intra- and extra-cellular - the latter being more numerous.

40 c.c. serum (Burnet & Welcome)
Injected into s.c.
Case which have died since admission.

Case 16. Lenth, P. alt. 28 years, A. Sobieszew.
Admitted 4th July 1915.

History: Patient was perfectly well on the 2nd of July. He fell ill on the following morning and had a severe headache. At 10 A.M. he became unconscious. He was admitted to the City Hospital between three & four A.M. on the 4th July.

State on admission (4th July 1915)

Patient comatose.

No head retraction
Kernig positive on both sides.
Knee placed at hips & knees.
Patient irritable when moved.
Babinski positive on both sides.
4 spots over trunk.
L.P. 5.15 A.M. 15 c.c. drawn V.

Turbid, under pressure.

Merod. Phagocytes & intracellular
diphtheriae

The procedure was done without
any anaesthetic to the patient
struggled so much that it was
impossible to give an injection.

L.P. 3 P.M. 40 c.c. drawn V.

Turbid, under pressure.

30 c.c. serum (B.W.) injected into S.C.

5 "F.M.

Patient unconscious. No
improvement. Very restless.
Mooans very softly from time to time.

L.P. 3 P.M. 16 c.c. drawn V.

Turbid.

6 c.c. serum (B.W.) injected
into S.C.
Patient was conscious this morning and looking better. He appeared to recognize his mother.

12 P.M.

L.P. 10 c.c. drawn off.

Intrac.: Normal pressure.

10 c.c. serum (B. O.W.) injected.

In the afternoon patient's breathing became faster. As its rate continued increasing, he was brought back into the ward at 10 P.M. No injection was given. No improvement noticeable, and the patient died at 2 A.M. on the 7th Nov.

11 P.M. Anti-meningo-coccal serum (Bunsen & Wilhem) injected into 9 c.c. subcutaneously.
Case 17. Private B. 44015. 6/24th Mtn. 1st. Admitted 20th July 1915.

History. Patient has been ill for 2 days. He thought he was suffering from influenza. Headache and vomiting. Patient became delirious on the morning of admission at 8 A.M.

Shake on admission (20th July 1915)

Patient delirious & apparently unconscious. Marked neck rigidity & retraction of head.

Kernig positive on both sides.

Pupils equal & react to light.

Patient was very ill on admission. His face was cyanosed & his pulse intermittent & very fickle.

Hypothermia. 36.8°F. Heart sounds 5th & 6th lumbar spine were fused and a lumbar puncture was done immediately.
80 c.c. drawn off. Turbid. Under
infra pressure.

Morsi. Polymorphs +
diplococci - mainly intra.

Culture has some intracellular.

30 c.c. serum (B.S.W.) injected into S.C.

Pulse improved immediately & also
patients' colour.

L.P.

21st May. 55 c.c. drawn off. Turbid.

Normal pressure.

25 c.c. serum (B.S.W.) injected into S.C.

Patient has retention of urine & in-
continence of faeces.

22nd May

L.P. 45 c.c. drawn off. Turbid.

Normal pressure.

25 c.c. serum (B.S.W.) injected into S.C.
Patient has been delirious till this
evening since admission. 
Two hr.
Pulse still fairly strong.

13th Fly

Patient conscious today. Can
speak. Mental condition clear.
No headache

No nystagmus. Head not deviated still
present.

Kernig positive on both sides

Pulse fair.

L.P. 80 c.c. drawn off. Turbid.
Under pressure.

37 c.c. serum (P.S.W.) injected into

3 c.c.

24th Fly

L.P. 40 c.c. drawn off. Turbid

Under slight pressure.

Breathing gradually became more

Deprice this evening. Pulse very feeble.
P. 10 T. M. 4.30: Dr. Arnn, M.M.

Turbid. Normal pressure.

No injection.

26½ Fy. 7. Patient unconscious.

Patient did not regain consciousness, his pulse was so feeble that it was not thought desirable to lumbar puncture; his breathing gradually became more rapid and laboured. This remained so till about 11 P.M. He died at 2.55 A.M. (27th Fy).

P.M. 6.30 M. (27th Fy 1915)

Brain. Membranes not adherent.

Brain edematous. Fluid under peri-achondrium. Yellow pus in some of the sulci at vertex. Large quantity of yellow exudation at base of brain on anterior surface of tons & posterior to optic chiasma. Little fluid in lateral ventricles. Some yellow pus
Signs of small haemorrhages around wall of lateral ventricles.

Cord: membranes not adherent. There is deposit of yellowish exudate on surface of cord.

117 c.c. multi-meningeal dura
(42 c.c. B.P.W., and 25 c.c. Pleural)
 injected into 9 c.c. spinà admission.
Case 18. J. S., aged 8 years. Adolescent child.
Admitted 3rd March, 1915.

History. Patient took ill in the 24th of Feb. (24th Feb.).

Symptoms. Headache, shivering, vomiting, abdominal pain, constipation, and delirium. These symptoms persisted and he was sent in to the City Hospital on the 3rd March, 1915, as a typhoid.

State on admission (3rd March, 1915).

Patient conscious.
Mucous membrane present.
Keriting present on both sides.
Lymphs 22 stiff.
No abdominal tenderness.
Spleen not enlarged.

L.P. 15 c.c. drawn off. Turbid.
Normal pressure.

One or two polymorphs to a few.
Intra- and extra-cellular diplococci.

10 c.c. serum injected into S.C.
(Pasteur Baez)
In the evening of admission, P. had severe abdomen pain which seemed to localize. Examination revealed a pulse of 120. Vanishing red cell count. As soon as his hands were touched, the flinching disappeared.

4th March

Wound negative.

Patient unconscious.

Pupil rigidly fixed, retraction marked. Palsy of left eye.

L.P. 25 c.c. drama 0.1. curved.

Under slight pressure.

15 c.c. drama (Pulla Darji) injected while S.C.

Patient still unconscious.

Symptoms of urine of feces.

10 c.c. drama (Pulla Darji) injected while S.C.

Patient unconscious.

Breathing became very rapid; temperature rose to 104 F., and patient died in the evening.
Admitted 15th March 1915.

History. Patient became drowsy at school on the 12th March. On returning home, she had severe frontal headache & the drowsiness increased. During the night, vomiting commenced & there was incontinence of urine. The vomiting continued next day.

State on admission.
Patient was admitted about 5-15 P.M. She was in a dull semi-comatose condition.

No head retraction.
Kernig negative on both sides.

At 6-45 P.M. 10 c.c. 0.8% iodoform were drawn off. The fluid was clear & under slight pressure.


Patient suddenly collapsed & died at 6-55 P.M.
P.M. 28 Mar. 15th [March]

Brain: Two or three small deposits of pus near vertex of brain. Slight milky exudation below pia mater and along under cerebellum. No exudation near pus at base of brain. Blood vessel on surface of brain intact.

Cord: Slight scar. Purulent exudation on posterior aspect of cord.
<table>
<thead>
<tr>
<th>Month</th>
<th>13</th>
<th>14</th>
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History: Patient was perfectly well yesterday. At 5.30 A.M. this morning (15th March), he got up to go to work but had to go back to bed. He had a severe headache and felt sick but did not vomit. He has been febrile, complaining of headache and unconscious at intervals all day. Admitted to the City Hospital about 6 P.M.

State on admission (15th March)

Patient: practically comatose. Head slightly flexed with tendency to head retraction. Kernig negative on both sides. Pulse regular but weak.


Under great pressure.

Mucin: few cells. No organisms.

25 c.c. serum (B. typh.) injected.
16th Feb. Patient still dazed but can understand simple questions and answers intelligently. Kernig negative.


WBC: Few cells. No organisms.

22 c.c. serum (B.S.W.) injected into S.C.

17th March. Patient quite sensible.

Can talk naturally. Looks much better.

L.P. 47 c.c. drawn off. Very slightly turbid.

Normal pressure.

WBC: Few cells. No organisms.

45 c.c. serum (B.S.W.) injected into S.C.

Evening. Improvement maintained.

Right pupil larger than left.

Patient complained that he has been double for 2 or 3 days. No obvious
22nd March

Temperature falling.

23rd March

Kernig positive on both sides.
Babinski and plantar n. incontinence of faeces.


25th c.c. serum (B.W.) injected into S.C.

21st March

Some headache.

26th c.c. drawn off. Slightly turbid.

Normal pressure.

Microfi. Polymorpho. Displaced cell mostly extracellular but some intracellular.

No injection.

23rd March. Temperature on 105 F last night. Profuse sweating. Breathing becoming more rapid.
Complete ptosis in left eye.

L.P. 60 c.c. drawn off slightly turbid. Normal pressure.

25 c.c. serum (B.W.) injected into 8.c.

26th March. Patient died this evening.
Temperature 105°F. Before death, breathing became very rapid.

14 2 c.c. anti-reptile serum injected into 8.c. since admission.
Admitted 21st March, 1915.

History. Patient suddenly took ill on the 7th March. Symptoms: headache, vomiting and diarrhoea. On the 19th March he became delirious, & the vomiting which had stopped for a few days commenced again. Two days later he was admitted to the City Hospital.

State on admission:

Patient - mentally confused & noisy. He does not answer questions in intelligibly, but yet seems to understand to a certain extent what is said to him.

Neck rigid. Head retracted.

Kernig positive on both sides.

Pupils of moderate size; equal, react to light.

Abdominal reflexes absent.

Knee jerks exaggerated.

Tache cirrhose marked.
Patient makes slight nervous movements with his fingers & hands.

20 c.c. drawn off. Slightly cloudy & amber coloured.
Micro. Polymorphs only.

24 c.c. (B & W) serum injected into S.C.

22nd March

Slight facial paralysis & slight ptosis on right side. Right arm weaker than left. Patient has incontinence of urine & faeces.

23rd March Ptosis on both sides.
Patient semi-comatose. No improvement.

L.P. 15 c.c. drawn off. Serum coloured

15 c.c. serum (B & W) injected into
24th March. There was no improvement in patient's condition today. He died in the evening.

P.M. Exams (24th March)

Brain: Great congestion of blood vessels. A large amount of purulent fluid in the subiculum below the pineal area and all over the upper surface of the brain. A foul odor. Yellow pus in some positions.

Large quantities of purulent yellow exudates in front of the pore of posticum to the optic thalamus, to the posterior surface of the cerebellum.

The under surface of the cerebellum covered with a thin gelatinous exudate.

Lateral ventricle distended with turbid fluid, it also contains a little yellow pus.

Cord: No marked changes in lower half. About the level of the lower
angle of the scapula there was a deposit of thick, creamy pus, about 3 to 4 cm high up. The cord was almost completely disintegrated for 3/4 of its length. There was a large amount of creamy pus in the same position.

Characteristic intracellularly eosinophilic bodies were found in the fluid removed from the lateral ventricles.
Admitted 22nd March 1915.

History. Patient took ill on the 20th March. Symptoms. Headache, vomiting &
paroxysmal headache. He became delirious on the same evening.

State on Admission (22nd March 1915)
Patient conscious & sensible.
Severe headache
Stiffness of neck
Kernig positive but not marked on both sides.
Slight paresis on the right side.
Knee jerks positive
Babinski negative.
Incontinence of urine & faeces.

L.R. 22 c.c. Arum 1/4. Normal
pressure. Turbid.
Micro.: Polymorphs, Diplococci
Intra.: in vacuo cellular & mostly
intra cellular.

22 c.c. Arum (B.W.) injected into
23rd March

Normal pressure.

25 c.c. serum (B. o.w.) injected into S.C.

24th March

Breathing rapid. Patient much worse.

L.P. 5 c.c. drawn off. Very thick and turbid.

5 c.c. serum (B. o.w.) injected into S.C.

Patient died this evening.

14th June 6 a.m.: minute pulse 120, C.P. 200.
(Behring's Welch) injected into S.C. again admission.
Case 23. S.P. ad. 30
Cerebral
admitted as observation C.S.H. in
28th March 1915.

This case was not definitely diagnosed
as one of cerebral spinal meningitis.

History
Patient took ill on Wednesday,
28th March. Symptoms - headache,
vomiting, and pains all over the body.

State on admission (28th March 1915)
Severe headache
No definite head rotation nor
stiffness of neck.
Kemig movement on both sides.
Abdominal reflexes normal
Babinski's negative

Under pressure.
Micro Few cells. No diplococci.
No T.B.

No meningitis.
12th March

Stiffness of neck & slight head deviation
Kernig negative.

L. P. 40 c.c. drawn off. Very slightly
Emptied. Under pressure.
Micro : No organisms.

25 c.c. Serum (A.R.H.) injected into
5 c.c.

2nd March

60 c.c. drawn off. Slightly emptied.
Under pressure.
Micro : A considerable number of
Polymorphs & mononuclear cells.
No diphtheria : No TB.

60 5 c.c. injected with normal
Saline.

25 c.c. Serum (A.R.H.) injected
into 5 c.c.

Patient much worse this evening.
Pulse very weak & irregular.
On the 3rd & 4th of March, 3CC.
Bone marrow & spleen juice were injected subcutaneously on the advice
of Dr. James.

Patient died on the 6th of March.

P.M. 24th (7th March)


Slight dullness along anterior cross vertex of brain. No
condensation at base of brain.
No fluid in ventricles.

Cord apparently normal.

The fluid below the dura
brachioidea on the vertex of the
brain was examined microscopically
but no organisms were found.

5/3 c.c. oint. (Burnett's ointment) injected
into s.c. back abdomen.
Summary of cases.
<table>
<thead>
<tr>
<th>No.</th>
<th>Date</th>
<th>Name</th>
<th>Age</th>
<th>Symptoms</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>19</td>
<td>Gschiriz</td>
<td>17</td>
<td>Headache, cough, vomiting, delirium</td>
<td>70 Bw.</td>
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<tr>
<td>2</td>
<td>18</td>
<td>Gschiriz</td>
<td>22</td>
<td>Influenza symptoms, vomiting, headache</td>
<td>140 Bw.</td>
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<tr>
<td>3</td>
<td>16</td>
<td>Gschiriz</td>
<td>20</td>
<td>Influenza symptoms, Headache, pain in neck</td>
<td>67 Bw.</td>
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<tr>
<td>4</td>
<td>15</td>
<td>Gschiriz</td>
<td>26</td>
<td>Influenza symptoms.</td>
<td>122 Bw. + 22 F.</td>
</tr>
<tr>
<td>5</td>
<td>14</td>
<td>Gschiriz</td>
<td>21</td>
<td>Vomiting, delirium, head retraction</td>
<td>94 Bw. (45 Bw., 39 F.)</td>
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<td>6</td>
<td>13</td>
<td>Gschiriz</td>
<td>20</td>
<td>Influenza symptoms. Headache, pain in back of neck</td>
<td>125 Bw. + 41 F.</td>
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<tr>
<td>7</td>
<td>12</td>
<td>Gschiriz</td>
<td>22</td>
<td>Headache; vomiting; Influenza symptoms; Delticini (140 Bw., 28 Bw.)</td>
<td>115 Bw.</td>
</tr>
<tr>
<td>8</td>
<td>11</td>
<td>Gschiriz</td>
<td>26</td>
<td>Stiff neck; abdominal pain</td>
<td>90 Bw. + 7 Bw.</td>
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<td>9</td>
<td>10</td>
<td>Gschiriz child</td>
<td>4</td>
<td>Drowsiness; vomiting, head retraction. Paroxysm 8 Feb. 25th</td>
<td>140 Bw.</td>
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<tr>
<td>10</td>
<td>9</td>
<td>Hospital nurse</td>
<td>12</td>
<td>Influenza symptoms; rapidly became unconscious.</td>
<td>170 Bw.</td>
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<tr>
<td>11</td>
<td>8</td>
<td>Gschiriz</td>
<td>36</td>
<td>Cough, vomiting; Stiff neck; headache; Vomiting</td>
<td>130 Bw.</td>
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<tr>
<td>12</td>
<td>7</td>
<td>Gschiriz</td>
<td>17</td>
<td>Influenza symptoms.</td>
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<tr>
<td>13</td>
<td>6</td>
<td>Gschiriz</td>
<td>23</td>
<td>Shivering, headache, vomiting, delirium.</td>
<td>64 Bw.</td>
</tr>
<tr>
<td>14</td>
<td>5</td>
<td>Gschiriz child</td>
<td>17</td>
<td>Shivering, headache, pain in back of neck, vomiting.</td>
<td>40 Bw.</td>
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<tr>
<td>15</td>
<td>4</td>
<td>Gschiriz</td>
<td>28</td>
<td>Headache; became rapidly unconscious. Paroxysm 8 Feb. 41 Bw.</td>
<td>140 Bw.</td>
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<td>16</td>
<td>3</td>
<td>Gschiriz</td>
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<td>Influenza symptoms. Headache, vomiting, Delticini (117 Bw. 28 Bw.)</td>
<td>117 Bw. + 28 Bw.</td>
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<td>17</td>
<td>2</td>
<td>Gschiriz child</td>
<td>8</td>
<td>Headache, shivering, vomiting, abdominal pain, delirium</td>
<td>35 F. + F.</td>
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<td>18</td>
<td>1</td>
<td>Gschiriz child</td>
<td>13</td>
<td>Drowsiness, headache, vomiting, bictonium</td>
<td>142 Bw.</td>
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<td>19</td>
<td>20</td>
<td>L. Flach</td>
<td>16</td>
<td>Headache; became rapidly unconscious.</td>
<td>142 Bw.</td>
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<td>20</td>
<td>19</td>
<td>L. Flach</td>
<td>43</td>
<td>Headache, vomiting, diarrhea.</td>
<td>140 Bw.</td>
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<tr>
<td>21</td>
<td>18</td>
<td>L. Flach</td>
<td>6</td>
<td>Headache, vomiting, pain in back, delirium.</td>
<td>47 Bw.</td>
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<td>22</td>
<td>17</td>
<td>L. Flach</td>
<td>30</td>
<td>Headache, vomiting, pain in body.</td>
<td>53 Bw.</td>
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</table>
The present epidemic is mainly confined to soldiers. 13 of our 23 patients were in the army, 6 were children of soldiers. On this account
The age incidence is different from that of other general epidemics, in which more than 50% of the cases occur among children less than 10 years old. The age incidence of our cases is as follows:

- Below 10: 4
- 10 - 15: 1
- 15 - 20: 4
- 20 - 25: 9
- 25 - 30: 2
- 30 - 45: 3

Of the 23 cases, 15 are alive and have died. Of the 15 alive, 6 have been cured; 5 are improving; 1 requires further treatment. In 2 cases, an opinion cannot be formed. In 1 case, convalescence is slow and the outlook is not encouraging. In only one case has a relapse occurred in the 3rd week. (Case 7)

One case has become completely deaf (Case 5); two others were
In 7 of the cases, the symptoms at first suggested influenza. In 2 (10 & 11) drowsiness was the first marked symptom; in 1 the attack commenced with coma, vomiting, headache, profuse perspiration. Purpuric spots were only formed in 3 cases. (Case 10, 11, 16)

Treatment employed in above cases:

Delirious patients have been given

Peroral febrifuge followed by another

5 grains if necessary in half an hour.

All patients are hot sponged

i.e. while they are actually

ill. This has a very quieting

effect and relieves their symptoms.

Patients are invariably con-

stricted & require aperients.

These should be given in

Nourishing food is given

when possible.

Patients are limited frequently

to relive symptoms e.g. headache, rapid breathing.
Semen Treatment.

Anti-menstrual serum is injected into the spinal canal after the withdrawal of a large amount of CS fluid. Satisfactory results have been obtained with Burnett's Wells's serum, Flick's serum, and Parke Davis's serum have also been used occasionally.

As a rule injections are given daily for 3 or 4 days. Whether further injections are given depends on the patient's condition. My experience is that large doses - say 40-50 c.c. - should be given at first if a sufficient amount of fluid is drained.

If

Patients are given ½ gr. morphia at least ½ an hour before an injection of serum. A glass of

wine is first before the operation, or a general anaesthetic is administered.

In a few of our cases serum rash has appeared - urticarial, morbilliform or scarlatiniform etc. Case 9 and Case 14. In Case 14 the
 rash was followed by joint pain.

Patients who are making satisfactory progress are allowed up in about three weeks after admission.