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A

# WARD MANUAL

of

# NEUROLOGY

and

# NEUROSURGERY

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Edited by

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MONTREAL NEUROLOGICAL INSTITUTE

1942

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## PREFATORY NOTE

A manual for guidance of House Staff is necessarily always subject to change and should be rewritten and altered at least once a year. Rules of routine are to be taken as information but never applied to the individual case without thought and sometimes consultation.

The manual originally written by Dr. Pudenz and Dr. Odom, former residents, is now re-edited by Dr. Guy Morton, at the close of his residency, to make it conform more closely to present routine. It is hoped to further redo and amplify certain sections in the near future. However, this mimeographed copy may be called the Morton Edition.

W.P.

September 1944.

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# CHAPTER I - THE CASE RECORD

## HISTORY AND PHYSICAL EXAMINATION

Service Dictator

Patient's name: Age: Floor: Date:
Supervision of:

Informant:

Previous admissions:

Enumerate in chronological order the various previous admissions to the Montreal Neurological Institute and to the Royal Victoria Hospital. It is not necessary to include previous admissions to other hospitals unless that information is significant, e.g.:

(1) R.V.H. (medicine) #43-1276, Aug. 16 - Aug. 30, 1943.
Diagnosis: Acute suppurative appendicitis.
Operation: Appendectomy.
(2) M.N.I. (neurosurgery) #44-852, Feb. 7-28, 1944.
Diagnosis: Glioblastoma multiforme, right parietal.
Operation: Right parietal osteoplastic craniotomy with subtotal removal of tumor.

Initial Complaints:
Enumerate complaints in chronological order and give duration of each, e.g.:

(1) Deafness, right ear - 15 years.
(2) Tinnitus, right - 4 years.
(3) Suboccipital discomfort and staggering - 4 months.
(4) etc., etc.

History of the Present Illness:

In this section discuss at length the development of symptoms in chronological order, giving a detailed account of each one. All subjective information which has any bearing on the present illness should be included, in detail, in this section.

Past History:
Family History:
General Systemic Inquiry:

This information should not be included in the interne's 'dictated history'. Instead this information should be filled in on the mimeographed form entitled "HISTORY AND GENERAL PHYSICAL CHECK LIST", a copy of which is attached hereto (PTO) and additional copies of which are available in the stationery boxes on each floor.

The purpose of the "HISTORY AND GENERAL PHYSICAL CHECK LIST" is to avoid unnecessary waste of time in recording normal or negative information which may not be pertinent to the present illness.

General Physical Examination:

This information should not be recorded in the interne's 'dictated history' unless elaboration of certain general physical findings is considered advisable because of relation to those findings to the present condition. This information should be filled in on the mimeographed form entitled 'HISTORY AND GENERAL PHYSICAL CHECK LIST' described above.

Neurological Examination:

A complete neurological examination should be carried out in each case. A complete report of the neurological examination should then be included in the interne's 'dictated history'. All neurological findings should be recorded whether they are normal or abnormal findings, e.g.:

Speech: See Chesher Test (page 9 ).
Mental State: Retrograde amnesia, drowsiness, behavior, duration of unconsciousness in head injuries, etc. (See Psychiatric examination - page 17).
Cranial Nerves:

1. Olfactory sensation - tested with camphor, coffee, benzene, etc. (available on examining tray).
2. Visual acuity, visual fields (see page 21 ); optic discs: color, outline, papilloedema, atrophy, vessels, hemorrhage, exudate, physiological cups, retina.
3,4,6, Pupils - equality, reaction to light and accommodation, cilio-spinal reflex, extraocular movements, nystagmus, ptosis, strabismus, palpebral fissures.
5. Motor, sensory, corneal reflexes.
7. Facial asymmetry on voluntary or involuntary movement, or at rest. Platysma. Taste - (anterior 2/3 of the tongue).
8. Auditory acuity, Rinne, Weber, Schwabach, Caloric tests (page 25 ).
9.10. Deviation of the uvula, pharyngeal reflex.
11. Sternomastoid and upper trapezius muscles.
12. Tongue protruded in midline (atrophy, tremor or fibrillations).

Motor System:
Right or left-handed.
Muscular development, weakness, atrophy, hypertrophy, tone. Involuntary movements, tremor, fibrillation, myoclonus athetotic, dystonic, choreic, hemiballismus, tics, convulsions. Passive movements. Kernig's sign. Brudzinski's sign. Spinal movements or tenderness. Lasegue's sign. Neck rigidity, bony development, etc.

Co-ordination:
Finger-nose-finger test. Rapidly alternating movements. Heel-knee-tibia test, writing, gait, Romberg's sign, spontaneous past-pointing, spontaneous deviation, rebound phenomenon, dissected movements, dysmetria.

| Deep Reflexes: | Right | Left | Superficial reflexes |
|---|---|---|---|
| Biceps | | | Abdominals |
| Triceps | | | Cremasterics |
| Radials | | | Plantars |
| Ulnars | | | Hoffman |
| Patellars | | | Oppenheim |
| Knee jerks | | | Chaddock |
| Ankle " | | | |

Sensation:
Superficial: Pain, touch, temperature, two-point, letter-writing.
Deep: Joint position, vibration, stereognosis, tendon pressure.
Cortical sensation: See special tests - page 26.

Note: If examination of the patient reveals the presence of abnormal sensory findings, these should be plotted on the special sensory chart forms which are available in the stationery boxes on each floor.

Sympathetic:
Localized skin moisture or dryness. Body temperature uniform, vasomotor spasm, Horner's syndrome, cilio-spinal reflex.

SUMMARY OF THE POSITIVE FINDINGS:

SUBJECTIVE: Here enumerate only the significant complaints and the duration of each.

OBJECTIVE: Here enumerate only the significant abnormal general physical and neurological findings.

Note: This section should invariably be included at the end of the interne's 'dictated history'.

IMPRESSION:

(Signed).....
(Neurological or neurosurgical interne)

# HISTORY AND GENERAL PHYSICAL CHECK LIST

NAME:

OCCUPATION:

MAIN INFORMANT:

RELIABILITY: LANGUAGE SPOKEN

INTERNE:

Negative or normal ) underline
Positive - encircle
Not asked - do not mark
Record significant positive findings in dictated case history as well.

FAMILY HISTORY: Diabetes High B.P. Nephritis Asthma
Cancer Tuberculosis Convulsions Migraine
Mental disease Other mental disease

| | | |
|---|---|---|
| Father | Sisters - L | Brothers - L |
| Mother - L. or D. | D | D |
| | L | L |
| | D | D |

PAST HISTORY:

Birth & Infancy: Pregnancy Labour Birth weight
Cyanosis Breathing
Feeding: Easy Difficult Breast Bottle

Development: First teeth Sat up Walked Talked
Fontanelle closed
Illnesses in first year
Weight gain in first year

Began school Highest class
Social adjustment to other children

Illnesses: Diphtheria Scarlatina Pneumonia Typhoid F.
Tuberculosis Tonsillitis Rh. fever Chorea
Pleurisy Malaria Syphilis Gonorrhea
Occupational poisoning

Other diseases:

Accidents:. Head injury:

Other injuries:

Operations:

Personal Habits: Tobacco Drugs Alcohol Sleep Clean or slovenly

Mental state: Recent personality change. Intellect Memory
Disposition Behaviour Tics or other invol. movements.
Work
Other interests

Consciousness: Syncope Convulsion Drowsiness Dream state
Delusions Hallucinations

SYSTEMIC INQUIRY

Head: Headache Dizziness Bruit

Mouth: Sore throats Teeth

Eyes: Vision blurring Specks Double vision Soreness

Ears: Pain Discharge Obstruction Hearing Noises

Nose: Frequent colds Discharge Obstruction
Bleeding Bad odours

Cardio-Respiratory:

Shortness of breath Swelling of feet Palpitation
Precordial pain Other chest pain Cough
Spútum Orthopnea Night sweats

Gastro-Intestinal:

Appetite Thirst Abdominal pain Jaundice
Indigestion Vomiting Bowels Hernia

Weight: Present Estimated loss or gain Lbs. in months.

Urinary: Frequency D. Dysuria Incr.. Frequency Retention
N. Incontinence Pain Blood in urine
Enuresis

Genital: Libido, potentia
Menstrual history: Onset Frequency Amount
Pain Intermittent Discharge

Marital: Children Living
Dead Causes
Miscarriages Abortions
Marital partner's health and occupation

Skin: Birthmarks Moles Ulcers Rashes

Extremities:
Weakness numbness pain tingling
Swelling of joints varicose veins deformities
Handedness - right or left

How long has the patient been in bed?

When did the patient stop work?

Medication on admission?

Insurance Company?

GENERAL PHYSICAL EXAMINATION

Inspection: Position Pain Facial expression Cooperation Build
Nourishment Muc. membranes Skin colour
Texture Rashes Other marks
Nodules Hair distribution
Condition of radial arteries

Head: Symmetry Prominent veins Tenderness Swelling
Evidence of injury Percussion Auscultation

Ears: Ext. meati Canals Drums Mastoid tenderness

Eyes: Swelling Bruises Ex or En Ophthalmos
Conjunctiva Lids

Nose: Air passages
Discharge anterior or post-nasal
Septum turbinates

Mouth: Tongue Gums Tonsils Pharynx

Neck: Rigidity Salivary glands Thyroid

Lymph Nodes: Cervical Axillary Epitrochlear Inguinal

Thorax: Symmetry Breasts Nipples

Lungs: Respiratory movements Percussion Auscultation

Heart: Apex beat Percussion Heart sounds Murmurs
B.P. Radial pulse Rate

Abdomen: Contour Rigidity Tenderness Liver
Spleen Other palpable organs or masses
Hernia Free fluid

Rectal examination:

Genitalia: External appearance Palpation

Pelvic Examination:

Extremities: General appearance Joints Movement Swelling
Oedema Varicosities Pulsation of dorsalis pedis artery

Spine: Deformity Rigidity Tenderness

REMARKS:

# ACCESSORY DATA FOR HISTORY AND PHYSICAL EXAMINATION

(1) Unilateral atrophy of face and extremities is commonly noted in the focal cerebral lesions of infancy and childhood.

(2) All infants and children with hydrocephalus, actual or potential (e.g. spina bifida with meningocele, chronic adhesive arachnitis), should have their head measurements recorded; the standard measurements are:

1) Ear to ear over vertex - across the vertex from the upper points of attachment of each auricle.

2) Circumference - maximum. The fontanelles and venous drainage of the scalp should likewise be described.

## Average Net Weight, Height and Circumference of Head and Chest of Healthy Children from Birth to Three Years.

(From "Holt's Diseases of Infancy & Childhood" by Holt, L.E. Jr., & McIntosh, Rustin, D. Appleton & Co. 1933).

| Age | Sex | Weight | | Height | | Chest | | Head | |
|---|---|---|---|---|---|---|---|---|---|
| | | Pounds | Kilos | Inches | Cm. | Inches | Cm. | Inches | Cm. |
| Birth | Boys | 7.55 | 3.43 | 20.6 | 52.5 | 13.4 | 34.2 | 13.9 | 35.2 |
| | Girls | 7.16 | 3.26 | 20.5 | 52.0 | 13.0 | 33.0 | 13.5 | 34.3 |
| 6 mos. | Boys | 16.0 | 7.26 | 26.5 | 67.4 | 16.5 | 41.9 | 17.0 | 43.2 |
| | Girls | 15.5 | 7.03 | 26.0 | 66.1 | 16.1 | 40.8 | 16.6 | 42.3 |
| 12 mos. | Boys | 21.0 | 9.54 | 29.5 | 75.0 | 18.0 | 45.7 | 18.0 | 45.7 |
| | Girls | 20.5 | 9.31 | 29.0 | 73.7 | 17.5 | 44.5 | 17.5 | 44.5 |
| 18 mos. | Boys | 24.5 | 11.13 | 31.5 | 80.0 | 18.7 | 47.8 | 18.6 | 47.5 |
| | Girls | 23.7 | 10.77 | 31.0 | 78.8 | 18.2 | 46.2 | 18.0 | 45.7 |
| 2 yrs. | Boys | 27.0 | 12.27 | 33.5 | 85.1 | 19.3 | 49.1 | 19.2 | 48.7 |
| | Girls | 26.0 | 11.81 | 33.0 | 83.8 | 18.8 | 48.0 | 18.6 | 47.5 |
| 2½ yrs. | Boys | 29.7 | 13.50 | 35.5 | 90.2 | 19.8 | 50.4 | 19.5 | 49.5 |
| | Girls | 28.7 | 13.04 | 35.0 | 89.0 | 19.3 | 49.1 | 19.0 | 48.2 |
| 3 yrs. | Boys | 32.0 | 14.54 | 37.0 | 94.0 | 20.3 | 51.5 | 19.8 | 50.4 |
| | Girls | 31.0 | 14.09 | 36.5 | 92.8 | 19.8 | 50.4 | 19.4 | 49.3 |

## (3). EXAMINATION OF SPEECH

A modified Chesher test is used. Boxes containing the necessary articles and the forms to be used will be found on all of the floors. The directions on the form should be strictly observed. The following parts of the speech mechanism are examined.

1. Naming of objects.
2. Repetition of the spoken word.
3. Ability to follow oral commands.
4. Reading aloud.
5. Reading silently.
6. Writing the names of objects shown.
7. Writing from dictation.
8. Copying the written word.
9. Spelling.
10. Pantomime.

Reference: Aphasia - technique of clinical examination. Chesher, E.C., Bull. Inst. N.Y., 6: 134, 1937.

# MODIFIED CHESHER TEST FOR APHASIA

Name _____ Case No.- - - - Age - - -Date _____

Service of Dr. _____ Examiner _____

Education _____ Occupation _____

Cooperation _____ Visual Acuity: Rt. _____ Left _____

Handedness _____ Language spoken _____

Diagnosis _____ Established _____ Tentative _____

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## INSTRUCTIONS

1. The test is applicable to individuals above the 8 or 9 years level.
2. In explaining each test to patient use only the phrases given above the form.
3. Repeat each test three times and in the same sequence.
4. Do not help the patient out.
5. Be sure to record verbatim all hesitations and incorrect responses.
6. A pause is to be judged as such depending on the mental activity of the patient.

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SYMBOLS

| | | |
|---|---|---|
| Correct response | = | + |
| Pause | = | - - - |
| Incorrect response | = | To be recorded verbatim |
| No response | = | 0 |

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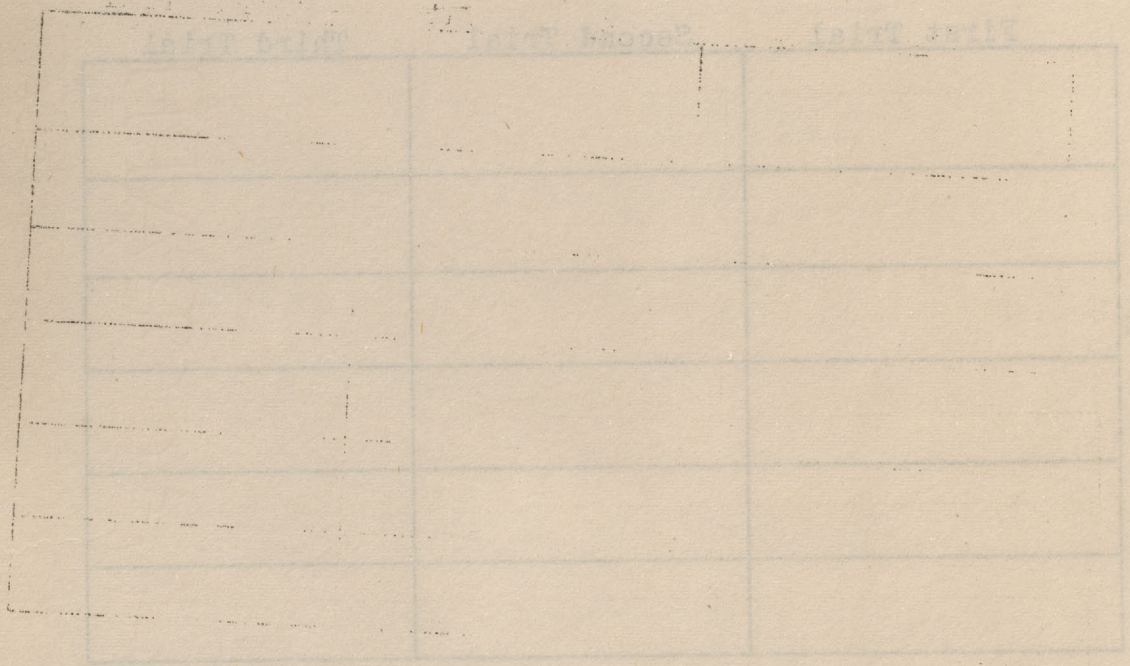
I. NAMING OBJECTS - Present each object and ask:-

English: "What is this?"
French: "Dites-moi ce que c'est".

| | First Trial | Second Trial | Third Trial |
|---|---|---|---|
| Key<br>Une clef | | | |
| Pencil<br>Un crayon | | | |
| Match<br>Une allummette | | | |
| Scissors<br>Les ciseaux | | | |
| Comb<br>Un peigne | | | |
| Spoon<br>Cuiller | | | |



II. REPETITION. Ask patient to:-

English: "Repeat after me".
French: "Répetez après moi".

| | First Trial | Second Trial | Third Trial |
|---|---|---|---|
| Key<br>Une clef | | | |
| Pencil<br>Un crayon | | | |
| Match<br>Une allummette | | | |
| Scissors<br>Les ciseaux | | | |
| Comb<br>Un peigne | | | |
| Spoon<br>Un cuiller | | | |

III. ORAL COMMANDS Ask patient to:-

English: "Touch the key, etc.", or "Show me the key, etc.".
French: "Touchez la clef, etc." or "Montrez-moi la clef,etc.

| | First Trial | Second Trial | Third Trial |
|---|---|---|---|
| Key<br>Une clef | | | |
| Pencil<br>Un crayon | | | |
| Match<br>Une allummette | | | |
| Scissors<br>Les ciseaux | | | |
| Comb<br>Un peigne | | | |
| Spoon<br>Un cuiller | | | |

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IV. ORAL READING. Show the patient the card and ask:-

English: "Read the name on each card aloud".
French: "Prononcez le nom sur chaque carte".

| | First Trial | Second Trial | Third Trial |
|---|---|---|---|
| Key<br>Uneclef | | | |
| Pencil<br>Un crayon | | | |
| Match<br>Une allummette | | | |
| Scissors<br>Les ciseaux | | | |
| Comb<br>Un peigne | | | |
| Spoon<br>Un cuiller | | | |

V. SILENT READING. Present each card and ask:

English: "Point to the object named by the word on this card.
French: "Montrez-moi l'objet nommé sur chaque carte".

| | First Trial | Second Trial | Third Trial |
|---|---|---|---|
| Key<br>Une clef | | | |
| Pencil<br>Un crayon | | | |
| Match<br>Une allummette | | | |
| Scissors<br>Les ciseaux | | | |
| Comb<br>Un peigne | | | |
| Spoon<br>Un cuiller | | | |

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VI. WRITING. Show each object in turn to patient and say:-

English: "Write the name of the object I show you".
French: "Ecrivez le nom de l'objet que je vous montre".

(N.B. Be sure to cover up the other forms on this page).

| | First Trial | Second Trial | Third Trial |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |

VII. WRITING FROM DICTATION. Ask patient to:-

English: "Write the following words".
French: "Ecrivez les mots que je vais vous dire".

(N.B. Again cover other tests on page).

| | First Trial | Second Trial | Third Trial |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |

VIII. COPYING. Show patient card and ask him to:-

English: "Copy this word".
French: "Ecrivez-moi une copie de ce mot".

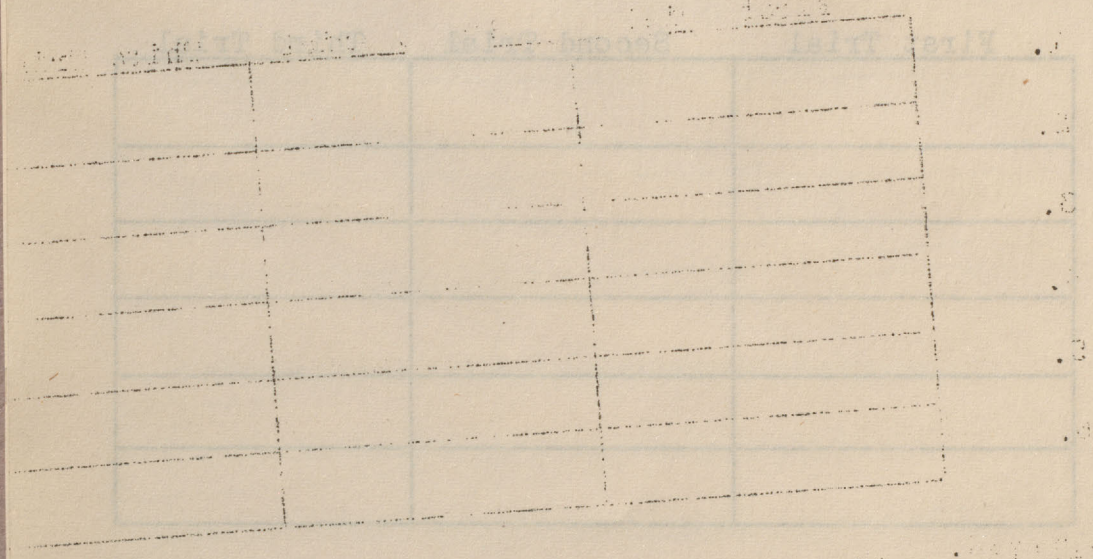
(N.B. Cover other tests).

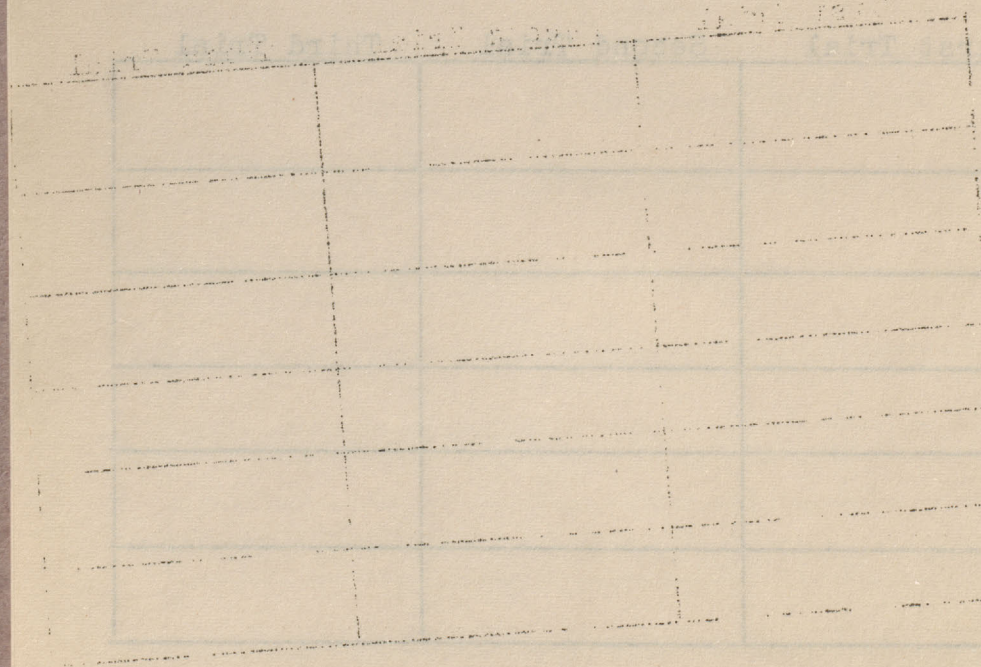
| | First Trial | Second Trial | Third Trial |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |

IX. SPELLING: Ask patient to:-

English: "Spell key, etc.".
French: "Epelez les mots que je vais vous dire".

| | First Trial | Second Trial | Third Trial |
|---|---|---|---|
| Key<br>Une clef | | | |
| Pencil<br>Un crayon | | | |
| Match<br>Une allummette | | | |
| Scissors<br>Les ciseaux | | | |
| Comb<br>Un peigne | | | |
| Spoon<br>Un cuiller | | | |





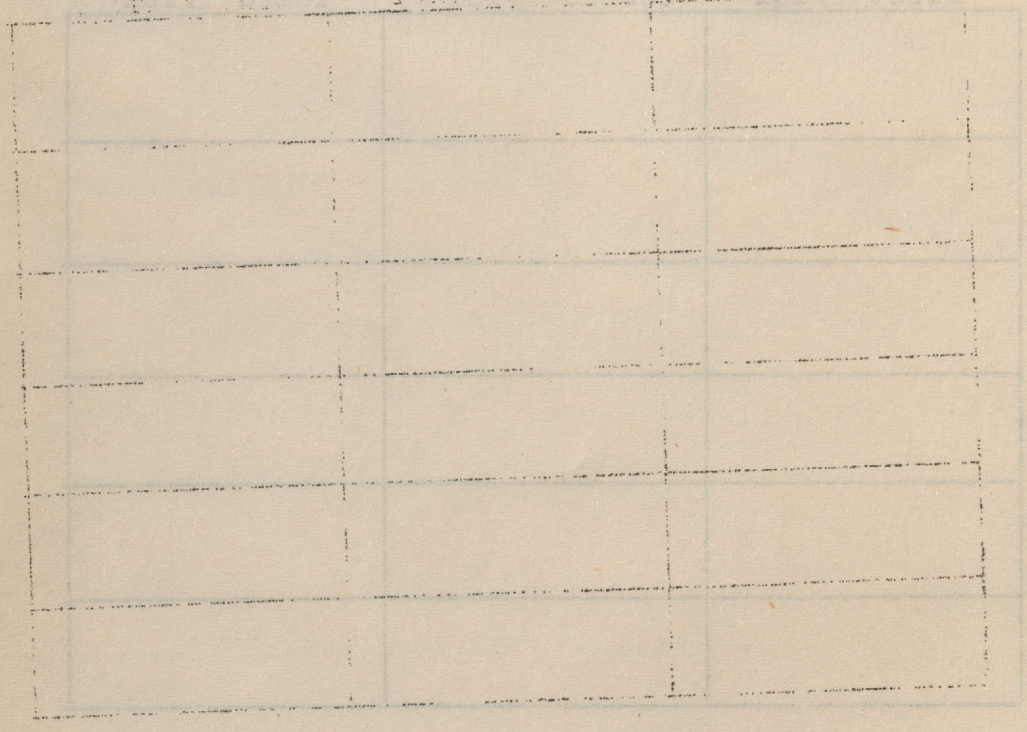
X. PANTOMIME. Present each object and ask:-

English: "How would you use this?"
French: "Vous feriez quoi avec ça?"

| | First Trial | Second Trial | Third Trial |
|---|---|---|---|
| Key<br>Une clef | | | |
| Pencil<br>Un crayon | | | |
| Match<br>Une allummette | | | |
| Scissors<br>Les ciseaux | | | |
| Comb<br>Un peigne | | | |
| Spoon<br>Un cuiller | | | |

COMPLETE TIME FOR TEST:

REMARKS:



## (4). MENTAL EXAMINATION OUTLINE

by Arthur Young

PERSONAL HISTORY.

(If personal history is obtained from an informant, give name, relationship and reliability).

Birth - Date and place of birth. Prenatal influences. Mother's condition during pregnancy. Was birth at full time and normal? Birth weight?

Early Development - Breast or bottle fed. Precocious or retarded. Time of dentition, walking and talking. Infectious and other diseases of childhood?

Neurotic traits - Any thumb sucking, nail biting, enuresis, night terrors, temper tantrums, stammering, chorea or sleep talking; finicky about food?

Play life - Ability to adapt?

Schooling - Started at what age, finished at what age, grade on leaving, school record, general health during this period, left school for what reason?

Occupational - Age at starting work, positions held; if changes occurred, reasons for making them; economic efficiency?

Sex instruction - How extensive, by whom given and how received?

Instinctive demands - Masturbation, any perversion. Hetero-sexual relationship - satisfactory, excessive, occasional, frigid, any abnormality?

Courtship and Marital - Duration of acquaintance before marriage. Home atmosphere - economic, social, harmonious. Husband or wife - habits, makeup. Number of children with ages and health. Any mis-carriages or abortions. Separation or divorce?

Personality - Determine the patient's normal personality and remark on any change in present illness:-

1. Intellectual capacity - High or low and whether up to the family standards?
2. Output of energy - Much or little, fits and starts or constant. Is he always on the go, or sluggish?

Personality (cont.)

3. Sociability - Is he sociable or shy and retiring; does he like society and entertainment, or prefer to be alone; has he many or few friends?

4. Self-estimation - Is he conceited; does he feel superior or inferior to others; is he dependent on opinion of others toward him or indifferent to opinion; is he frank and open, discussing personal affairs freely, or close-mouthed?

5. Adaptability - Can he meet new situations or must he have routine; has he initiative; does he day dream; is he absent minded or preoccupied; does he bear pain well or make a great fuss; does he quarrel; does he enjoy quarrels and arguments; is he self-assertive; is he picked on by his associates?

6. Mood - Is there any constant mood or is it variable; what is the usual mood; does it change easily; is he sensitive, placid or thick-skinned; sense of humour; is he sympathetic; does he thrive on sympathy?

7. Special interests - Does he enjoy his work; successful or inferior worker; is he ambitious; any special interests; from what does he get the greatest pleasure; church affiliation - degree?

8. Recreations - Type. Does he take part in any; does he follow any; degree of enthusiasm; are his amusements of a solitary kind; is he a good loser; a "good sport"; not a quitter; can he laugh at a joke on himself?

MENTAL STATUS

General Behaviour - As noted by physicians and nurses. Over-activity or underactivity; spontaneous or elicited by special stimuli. Type of activity - free, constrained variable, stereotyped, modified by actual or imaginery factors seen or heard. Negativism, waxy flexibility; general slowness or retardation; tension; fretting; restlessness. In a mute patient, make careful review of the behaviour.

Stream of talk - More or less than normal; abnormally slow or push of speech; spontaneous or elicited only by questioning; spontaneous comment on environment; distractability; definite goal idea; or flight of ideas or incoherence; rhyming or punning; talk fragmentary or a salad of words; self-coined words.

MENTAL STATUS (Cont.)

Sample of talk - Take down verbatim.

Mood - Apparent general feeling - describe tone. (How do you feel; what is your mood; are you in good spirits; happy; cheerful; are you in poor spirits; sad; unhappy; depressed; lonesome; perplexed; uneasy; apprehensive; afraid; worried; suspicious; a feeling of unreality; outbursts of anger; mood swinging?) Give patient's own estimate of his mood in his own words.

Delusions - (Paranoid ideas of reference, influence or persecution (poisoning), hypnotism, electricity. A special mission. Special communications from the deity or the dead).

Illusions and hallucinations -(Auditory, visual, olfactory, gustatory, tactile, muscular.) Note exactly what the patient hears or sees and what the voices say. Is it like normal hearing; heard in both ears or one?

Compulsive phenomena - (Compulsive thoughts or actions (obsessions); counting, etc.; repetition of actions; rituals - handwashing, etc.).

Intellectual functions -

1. Orientation - For time, place and person -

   (a) Day, date, month, year.
   (b) Recognition of this place.
   (c) Patient's name and identification.

2. Memory -

   (a) For remote events. Check up anamnesis with that obtained from outside sources. Memory for historic events.
   (b) For recent events. Account of past 24 hours. Period immediately preceding admission to hospital. Time and mode of arrival. Menus of recent meals here. Incidents of admission to hospital and ward. Names of physicians and nurses.

3. Loss of memory for special periods connected with important emotional incidents.

MENTAL STATUS (Cont.)

Intellectual functions (cont.)

4. Ability to grasp, retain and recall new impressions - Note how long patient can retain a number, a name and the time, with conversation intervening.

5. Attention test - Ability to repeat series of digits, forward and backward.

6. Grasp of general information - Name of Premier and his predecessors; mayor; five largest cities in Canada; five largest rivers.

7. Current events -

8. Calculation - 7 from 100 serial subtraction test. Note speed and errors and reaction to the task. Other simple arithmetical problems, addition, multiplication, division, fractions.

9. Handwriting - Describe; procure and file a sample of it.

10. Insight - Recognition that he is ill mentally and in need of hospital care.

11. Judgment - Business plans; social arrangements; family responsibility; ethical standards.

## (5) Visual Acuity & Perimetry

by

Theodore Rasmussen

### Visual Acuity

1. In a routine neurological examination the visual acuity may be adequately determined by means of the hand card reduced from the Snellen test chart. This hand card should be held 1 meter from the eyes and the result recorded in the same way as when the Snellen chart is used, i.e., if the patient reads at 3 feet what he should read at 10, the acuity is 3/10, on the hand card.

II. a) If the acuity is grossly reduced by this method, the patient should be taken to the eye room and the visual acuity accurately measured on the Snellen chart at 20 feet. The acuity should be measured both without and with glasses if the patient wears a correction, i.e., VA 20/50, VA wc 20/20.

b) The acuity for near vision should then be tested with a reading card, such as the AMA reading card, without and with glasses. The patient should hold this at a comfortable reading distance. Any person with reduced visual acuity which cannot be explained on the basis of a refractive error should have careful perimetric studies.

### Visual Fields

1. Confrontation -

For a routine neurological examination of a patient in whom there is no specific indication to study the visual system, testing the visual fields by the confrontation method suffices. Each of the quadrants of each eye should be examined separately, then with both eyes open and fixing straight ahead, the two temporal fields should be rechecked.

II. Perimetry -

The following should routinely have careful perimetric studies:-

(1) Any patient suspected of having involvement of any part of the visual system, retina, optic nerve, chiasm, tract, geniculates, geniculo-calcarine radiations or visual cortex.

(2) Any patient suspected of having a sphenoid ridge neoplasm, pituitary neoplasm, temporal or occipital lobe neoplasm and patients with unlocalized brain tumors or abscesses.

Visual Fields (Cont.)

(3) All seizure cases with foci in the temporal or occipital lobes.

(4) All patients with disseminated sclerosis, retrobulbar neuritis or history of disturbances of visual acuity.

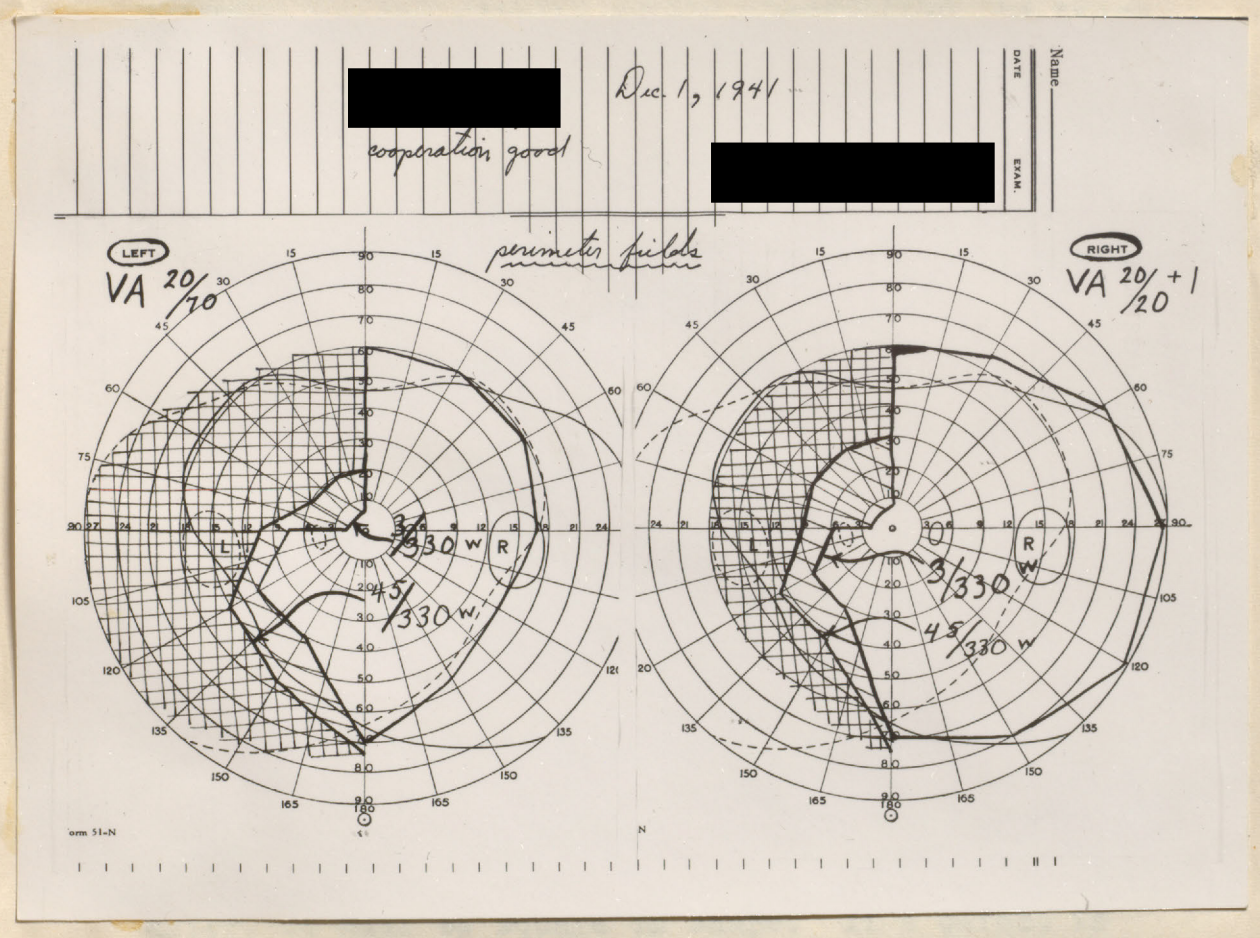
(5) Patients in whom a careful check on the progress of a papilloedema is desired.

(6) All patients with neurosyphilis in whom trypar-samide therapy is considered or being administered.

A. The first step in any perimetric examination is always a measurement of the visual acuity as described above. A visual field chart without the acuity upon it is incomplete and cannot be accurately compared with future or past examinations.

B. Perimeter - (See figure 1)

The second step is mapping out the peripheral field on the perimeter - (patient does not wear his glasses for this) - this is most conveniently done with a 3 mm. white bead, unless the visual acuity is markedly reduced, in which case an object large enough to be clearly visible should be used. The largest object commonly used on the perimeter is the 45 mm. white disc. Each eye is tested separately. The 3 mm. bead enters the visual field first, followed by the wand which carries the bead. For ordinary purposes the periphery is checked at 30° intervals unless a defect is found, in which case the affected area should be checked at 15° intervals. If a defect is found, this area should be checked with at least two larger objects so that the "steepness" of the sides of the defect can be determined. Lesions with "steep" sides (i.e. nearly as large a defect for a large as for a small object) are usually fixed lesions and are often due to vascular occlusions. Progressive or regressive lesions on the other hand, usually have field defects with "sloping" sides. The objects used are indicated on the chart as follows: 3/330 W (indicating a 3 mm. white object used at a distance of 330 mm., the radius of the perimeter). If this data is not recorded on the visual field chart it cannot be compared with any other perimetric examination.


Name
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Dec. 1, 1941
cooperation good
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perimeter fields
LEFT
VA 20/20
RIGHT
VA 20/20+1
3/330 W
45/330 W
3/330
45/330 W
L
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Form 51-N

Fig. 1.

Fig. 1.

Visual Fields (Continued)

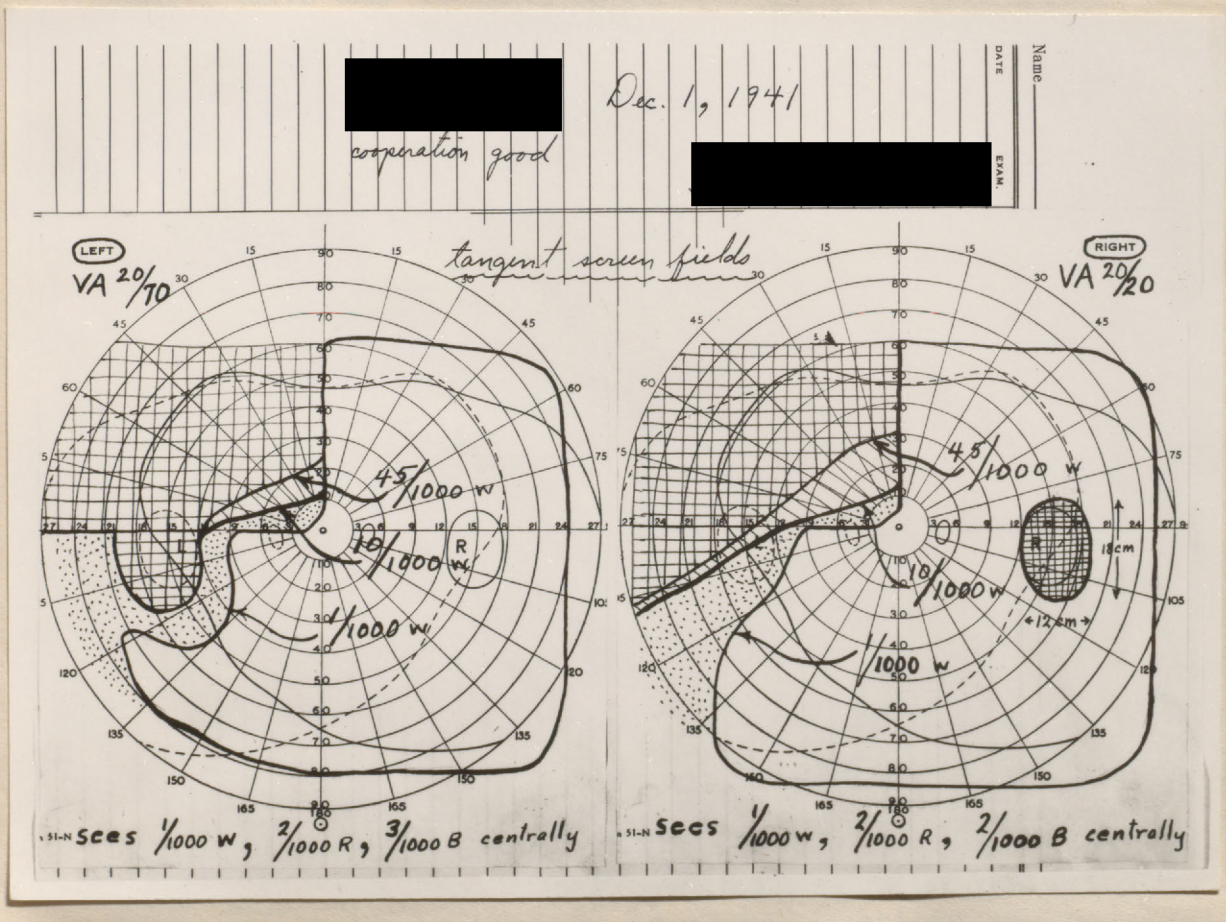
C. Tangent Screen - (See figure 2)

1. After completion of the examination of the peripheral field on the perimeter, the central and paracentral fields are examined on the tangent screen at a distance of 1 meter. (Patient should wear his glasses for the tangent screen examination, if there is an appreciable refractive error). Macular vision is first checked in each eye by having the patient fix in the middle of a chalk circle 1" in diameter and then exposing in the centre of the circle various sized white, red and blue beads. Normally one sees the 1 mm. white, 2 mm. red and 3 mm. blue beads centrally. If the patient does not recognize these beads a particularly careful search for a central scotoma should be made.

2. Next the physiological blind spots are charted, using the 3 mm. white bead - as a rule. If these are enlarged, or if the progress of a papilloedema is to be followed, the vertical and horizontal diameters of the blind spots should be measured in centimeters and indicated on the chart. Many people will continue to "see" the bead when it is carried from the seeing field into the blind spot. In this case the bead should be placed in the blind spot under cover of a finger. The finger is then withdrawn and the bead carried from the center of the blind spot into the seeing area.

3. After the blind spot is charted, the paracentral field is examined with a 1 mm. white bead, bringing the bead from the outside of the screen along the various radii. Since the field is being charted on a flat tangent of the sphere represented by the perimeter, it will be square in shape. If a defect is found, various sized objects should be used to again determine the "steepness" of the sides of the defect.

4. The final step in the perimetric routine is the search for scotomata. The smallest bead seen well by the patient (usually the 1 mm. white) is drawn from the center to the periphery along the horizontal, vertical and 45° radii, the patient announcing when the bead disappears and when he sees it again. If a scotoma is found, its "density" is determined by using various sized objects till one is found which does not disappear in the scotoma. If even the largest (45 mm. white) disappears the scotoma is considered to be an absolute one. If not it is a relative scotoma. The field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cooperation good
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DATE
EXAM.
Name
LEFT
VA 20/70
tangent screen fields
RIGHT
VA 20/20
45/1000 W
10/1000 W
1/1000 W
R
L
18cm
12cm
1/1000 W
51-N Secs 1/1000 W, 2/1000 R, 3/1000 B centrally
51-N Secs 1/1000 W, 2/1000 R, 2/1000 B centrally

Fig. 2.

Visual Fields (Cont.)

is marked on the screen by pins and transferred to the chart by referring to the back of the screen where the concentric circles are labelled. Absolute scotomas and peripheral field defects are cross-hatched on the charts and defects of lesser density are indicated by lining the areas or by stippling. The isopters are labelled as on the perimeter, 1/1000 W, meaning a 1 mm. white bead used at 10/00 mm. distance.

5. In examining patients with very slight defects one occasionally wishes to present to the patient a smaller stimulus than the 1/1000 white bead under normal illumination. This may be done by using the 1 mm. bead at a longer working distance, 1500 to 2000 mm. The visual angle subtracted by a 1 mm. bead at the latter distance, however, approaches the lower limit of visual discrimination so as a rule it is more satisfactory to use a larger object and to reduce the intensity of the illumination of the screen. An illumination, such that the normal eye can hardly see or cannot see the 1/1000 W and can see the 2/1000 W distinctly, has been found to be useful, but this may be varied in the individual case. It is important of course, that all parts of the screen receive the same illumination. This type of examination is particularly valuable in the investigation of slight central scotomata.

6. Technical Suggestions

Since this is a very delicate examination and an extremely subjective one, every effort must be made to avoid suggesting either a normal field or a defect to the patient. The bead should be moved in at a constant rate of speed and in the same manner in all parts of the field. It should be done noiselessly and each radius repeated until the accuracy is assured, so far as possible for that patient. The examiner watches the patient's eye as he brings in the bead to be sure the patient is fixing accurately. In patients with complicated defects it is often wise to do the examination in two sittings. Fatigue is usually manifested by a progressive concentric contraction of the field. To avoid this the patient should be allowed to rest his eyes frequently and examination of normal portions of the field should not be unduly prolonged. Patients with hemianopic defects frequently fix more accurately if they are told to look in the middle of a circle or at the point of crossing of two lines instead of at the conventional white bead.

Reference: Traquair, H.M. - An Introduction to Clinical Perimetry. Henry Kimpton, 1938.

## (6) Vestibular Tests -- Cold Caloric

by David Halperin

1. Spontaneous Phenomena:

   (a). History of vertigo.
   (b) Past-pointing.
   (c) Nystagmus.
   (d) Rombergism.

2. Cold Caloric Test:

   Using a #20 needle, and a 10 cc. syringe, and under good illumination, direct 5 cc. of ice water against the ear-drum. (Use water with ice floating in it, to be sure of a constant temperature). After about a minute:

   (a) Inquire about vertigo.
   (b) Look for nystagmus.
   (c) Test for past-pointing.
   (d) Test for Rombergism.

   After the effects of stimulating the labyrinth on one side have worn off, repeat in the opposite ear.

   In testing for nystagmus, with patient sitting upright and head erect, it is the vertical canals that are being tested. Then bend the head back 90°, to test the horizontal canals.

3. Precautions:

   DO NOT try a cold caloric test in the presence of a dry perforation of the drum, or in the presence of a head injury, where the drum or middle or inner ear are involved. Under these circumstances the cold air from an ethyl chloride spray may be used.

4. The average normal vestibular response will be along the following lines:

   (a) Induced vertigo will be rotatory in character.
   (b) Nystagmus will be induced with the fast phase in a direction away from the ear stimulated.
   (c) There will be past-pointing towards the stimulated side.
   (d) There will be unsteadiness or falling towards the stimulated side.

## (7) Examination of Cortical Sensation

Should a detailed examination of the sensory defects, resulting from loss of cortical function, be desired the following tests are indicated:-

1. Touch - using cotton or preferably von Frey hairs.

2. Tactile localization - having patient indicate the site touched.

3. Roughness of objects - using varying grades of sand paper.

4. Vibration - with the tuning-fork.

5. Two-point discrimination - with the ordinary compass. According to Monrad-Krohn the minimal distance between points which is detectable in various regions of the body is as follows:

| | | |
|---|---|---|
| Finger tips | - | 3-8 mm. |
| Palm of hand | - | 8-12 mm. |
| Back of hand | - | 30 mm. |
| Chest, forearm, skin | - | 40 mm. |
| Back | - | 40-70 mm. |
| Upper arm, thigh | - | 75 mm. |

6. Pain - with an ordinary pin or an algesimeter.

7. Pressure pain - an algometer reading in kilograms of pressure placed on periosteal surfaces.

8. Temperature - using large test tubes filled with hot and cold water. An attempt should be made to determine the minimal temperature differences which the patient can perceive in various parts of the body.

9. Position sense - by requiring one extremity or portion of an extremity to immitate the position of its fellow part or by having patient describe the position in which his limbs have been placed.

10. Movement - estimation of the perception of movement at a joint. The normal threshold value lies within a range of 1 - 2 degrees for the commonly tested joints.

11. Weight sense - by employing cartridges filled with varying weights of buck shot.

Examination of Cortical Sensation (Cont.)

12. Stereognoses - discrimination of the size and shape of objects.

13. Texture - employing various common materials.

14. Figure writing - ability of patient to recognize numbers or letters written on various parts of the body.

References:

Evans, J.P., A study of the sensory defects resulting from excision of cerebral substance in humans. Proc. Soc. Research Nerv. & Ment. Dis., 15: 331, 1934.

Monrad-Krohn, G.H. The Clinical Examination of the Nervous System. H.K. Lewis Co., London.

N.B. - A box containing the various test materials will be kept in the office of the Nursing Supervisor.

## (8) Sweating Test

### Starch & Iodine Method

Material:- 1. Iodine solution -
Tr. iodine 2½% - 60 cc.
Oil Ricini - 40 cc.
Spts. Vin Rect. ad 300 cc.

2. Powdered starch.

3. Brush and dish.

The above material is kept in special tray labelled "Sweating Test" in the laboratory on third floor.

Method: Patient is completely stripped and skin is then painted with the iodine solution. Occasionally it may not be necessary to paint the entire skin surface, and one should always leave a strip of several inches down the center of the chest and abdomen which is not covered with iodine solution. After the iodine solution has been allowed to thoroughly dry, the starch powder is sprinkled over the skin covered by the iodine solution. Starch should be applied to form a thin smooth surface. The baker is then placed over the patient's abdomen and chest and it is covered with a flannelette blanket and then several heavier blankets. Care must be taken to see that the blankets do not touch the skin surfaces which are being tested. If the starch becomes purple it is due to sweating in this region, and no change in the starch indicates absence of sweating. Once the baker has been turned on, patient must be watched very closely for the first signs of sweating because there may be a decrease in sweating in one region which will be missed if the sweat from one area is allowed to run over the other. When the baker has produced satisfactory sweating in normal areas the patient should be taken to the Photography Department for photographs.

## INDIVIDUAL CASE STUDY

The "work-up" of each case requires that certain laboratory and clinical diagnostic tests be carried out. The following outline is offered to serve as a guide to the houseman in charge of the case. The examinations are classified as routine and special. Those falling in the latter category are carried out only with the permission of the doctor in charge of the case. The conditions are listed in alphabetical order.

1. ALL PATIENTS MUST HAVE A URINALYSIS AND BLOOD WASSERMANN OR KAHN TEST.

2. ALL CANDIDATES FOR SURGERY SHOULD HAVE A HEMOGLOBIN DETERMINATION.

3. ALL CASES IN WHICH SURGERY IS CONTEMPLATED MUST HAVE THEIR BLOOD TYPED. THEIR BLOOD SERUM AND BLOOD CELL SPECIMENS ARE TO REMAIN IN THE THIRD FLOOR LABORATORY FOR USE IN CROSS-MATCHING.

4. IN ALL CASES IN WHICH SURGERY IS CONTEMPLATED VOLUNTARY BLOOD DONORS SHOULD BE SENT TO THE BLOOD BANK PRIOR TO THE DAY OF OPERATION.

### Brain Abscess

Routine: Roentgenograms of skull, sinuses and mastoids; hemoglobin and white blood cell count.

Special: Roentgenogram of chest; lumbar puncture with #20 needle, careful measurement of cerebrospinal fluid pressure and protein and cell count, if permitted by absence of evidence of bulbar or midbrain compression; cerebrospinal fluid culture; electroencephalography, visual fields; otolaryngology consultation; ventriculography.

### Brain Tumor

Routine: Roentgenograms of skull and chest; examination for possible source of metastatic tumor (skin, chest, breast, kidney, rectum, penis, etc.)

Special: Visual fields; roentgenograms of long bones, spine and pelvis; gall-bladder and gastro-intestinal series; presence of Bence-Jones bodies in urine; hemogram; ventriculogram; pneumoencephalogram, electroencephalography.

## Carotid Sinus Syndrome

Routine: Stimulation of carotid sinus by pressure in standing position. Take care not to go so far as to cause syncope; standing and lying blood pressure (see page 74).

Special: Electrocardiogram; cardiology consultation.

## Degenerative Diseases of Brain

Routine: Roentgenograms of skull and chest; electroencephalography; lumbar puncture with determinations of pressure, protein, cells and colloidal gold curve.

Special: Visual fields; pneumoencephalography.

## Degenerative Diseases of Spinal Cord

Routine: Lumbar puncture with manometric test and complete cerebrospinal fluid studies; sensory chart.

Special: Roentgenograms of spine; hemogram; blood chemistry with Vitamin assays; gastric analysis; faradic and galvanic stimulation of muscle; cystometrogram.

## Eighth Nerve Neoplasm

Routine: Roentgenograms of skull and of internal auditory meati; audiometer and vestibular tests; visualization of vocal cords.

Special: Photography; ventriculography; otolaryngology consultation.

## Encephalitis

Routine: Roentgenograms of skull; lumbar puncture with complete cerebrospinal fluid examination and culture.

Special: Complement fixation tests; isolation of virus.

## Epilepsy

Routine: Roentgenograms of skull, description of seizure pattern; electroencephalography; pneumoencephalography.

Special: Visual fields; hyperpnea tests; hydration regime*, basal metabolic rate; prolonged glucose tolerance test; insulin tolerance test; photography for asymmetry; standing and lying blood pressure regime; carotid sinus stimulation; in children blood smears for basophilic stippling and x-rays of wrists for lead line if plumbism is suspected; blood calcium and phosphorous for possible cases of rickets.

*Contraindicated in cases of expanding intracranial lesion.

## Head Pain and Neuralgia - Atypical

Routine: X-rays of skull.

Special: X-rays of sinuses, base of skull, teeth and cervical spine; ophthalmological and otolaryngological consultations; trial nupercaine injections of sphenopalatine ganglia; trigeminal ganglia and roots, upper cervical posterior nerve roots; cocainization of throat for suspected glossopharyngeal neuralgia; use of histamine or other vasodilator drugs; ergotamine tartrate.

## Head Injury

Routine: Roentgenograms of skull; lumbar puncture with careful estimation of pressure and the three tube test.

Special: Photography; electroencephalography.

## Ruptured Intervertebral Disc (Nucleus Pulposus)

Routine: Roentgenograms of spine centering on suspected site of lesion; sensory chart; lumbar puncture with protein determination on first fluid and manometric test. (Lumbar puncture should be done at the time of the myelogram if the latter procedure is planned).

Special: Air, lipiodol or Pantopaque myelography; orthopedic consultation.

## Hydrocephalus

Routine: Roentgenograms of skull; photography; head measurements.

Special: Electroencephalography; pneumoencephalography; ventriculography.

## Hypertension

Routine: Periodic blood pressure determinations; roentgenogram of chest; Mosenthal test; determination of fluid intake and output; blood chemistry for NPN, urea nitrogen and creatinine; electrocardiogram; effect of depressor drugs.

Special: Ophthalmological and medical consultations.

## Ménière's Syndrome

Routine: Roentgenograms of skull; audiometer and vestibular tests. Histamine sensitivity test.

Special: Otolaryngology consultation.

## Muscle Diseases

Routine: None.

Special: Blood chemistry for creatine, creatinine, calcium, phosphorous and potassium; faradic and galvanic stimulation of muscle groups; study of myasthenic reaction; photography; muscle biopsy; ophthalmology consultation for cataracts.

## Peripheral Nerve Injury

Routine: Faradic and galvanic stimulation of nerve and muscle; sensory chart.

Special: X-rays of site of injury in cases of fracture complicated by peripheral nerve injury; photography, Special tests, e.g., electromyography. Electrical skin resistance tests.

Reference - "Aids to the Investigation of Peripheral Nerve Injuries". M.R.C. War Memorandum No. 7.

## Meningitis

In suspected cases of meningitis, a lumbar puncture is done with careful measurement and pressure, complete cerebrospinal fluid studies (cells, proteins, sugar and chlorides, smear, culture).

### Purulent Meningitis

Immediately one must endeavor to determine the source of infection. (E.N.T. consultation, x-rays of the skull, sinuses mastoids, chest as indicated). At the same time one must institute therapy, (sulphonamides, penicillin, serum, etc.). In these cases, it is imperative to consult with the bacteriologists at once, have a blood culture set up, and a discussion on the best type of therapy. Blood counts and blood chemistry should be done. In following the case, routine determination of cerebrospinal fluid sugar, protein and sulpha levels are important, as well as the cell count.

### Lymphocytic Meningitis

Again, every effort should be made to determine the source. X-rays of the skull, chest, E.N.T. consultation, etc. Sufficient cerebrospinal fluid should be collected for smear, culture, guinea pig inoculation, chemistry (sugar, chlorides, protein), Wassermann and colloidal gold. Finally, 10 cc. should be set up to allow pellicle formation. Haemogram and tuberculin sensitivity (OT Test) should be done. As well as benign lymphocytic choriomeningitis and tuberculous meningitis, one must watch for signs of mumps, poliomyelitis, lues or any of the other rarer causes of lymphocytic meningitis.

Acute postoperative aseptic meningitis appearing about 7 - 10 days after a craniotomy is to be watched for. It is characterized by acutely recurring episodes of fever, stiff neck, headache, and at times mental confusion. The cerebrospinal fluid is flooded with polymorphonuclear leucocytes, but cultures remain sterile.

Reference - Penfield, W.G., Acute postoperative aseptic leptomeningitis. Arch. Neurol. & Psychiat. 46: 250-276, 1941.

## Pituitary Tumors

Routine: Roentgenograms of skull for sella turcica; visual fields; fluid intake and output; basal metabolic rate; glucose tolerance test.

Special: Pneumoencephalography; ventriculography; consultation with metabolic department.

## Poliomyelitis

Routine: Lumbar puncture with complete cerebrospinal fluid examination, including sugar and chloride determination, culture of cerebrospinal fluid; haemoglobin and W.B.C. Isolate the patient - typhoid precautions, because virus can be demonstrated in the stools.

Special: In spite of the present controversy with regard to the orthodox and the Kenny treatment,* the relief from pain, etc., following application of hot packs, justies their use. The application of the hot packs is the responsibility of the nursing and medical staff. When the patient is to be put in a respirator is the responsibility of the medical staff. The re-education of the muscles is the care of the Physiotherapists. They should be notified early. **(see p. 88 - "Both" respirator).**

Reference - *Kenny Concept of Infantile Paralysis by J.F. Pohl - Bruce Publishing Co., 1943.

## Post-traumatic Headache

Routine: Roentgenograms of skull; lumbar puncture with particular stress on pressure, protein and cell count.

Special: Ophthalmological and otolaryngological consultations; postural blood pressures.

## Spina Bifida with or without Meningocele

Routine: Head measurements; transillumination of sac; careful observation of motor and sensory power and sphincter tone; photography.

Special: Electrical stimulation of sac; lumbar manometric test; air myelography for visualization of communication with spinal subarachnoid space.

## Syphilis with or without Central Nervous System Involvement

**Routine:** Blood and spinal fluid diagnostic tests for syphilis, fluoroscopy of chest; consultation with syphilology department; case must be reported to social worker in syphilology department.

**Special:** Lumbar puncture with complete cerebrospinal fluid studies and manometric tests if necessary; special investigations depending on location of disease process.

## Trigeminal Neuralgia

**Routine:** Lateral and basal stereoscopic x-rays of the skull in 3rd division neuralgia; lateral stereoscopic views of skull and stereoscopic views of maxillary and ethmoid sinuses in 2nd division pain; sensory chart of face.

Special: Dental x-rays; consultations with departments of ophthalmology and otolaryngology.

# PENICILLIN

## Properties of Penicillin

(a) Chemical

Penicillin is an unstable organic acid which is prepared for therapeutic use either as the sodium or the calcium salt. The preparations at present supplied for clinical use are yellow to brown powders which contain only about 10 to 30 per cent of penicillin. The remaining material, which is also extracted from the culture fluid, is fortunately non-toxic. The powdered penicillin must be protected from heat and moisture, and should be stored at refrigerator temperature. Under such conditions, good preparations remain potent for periods up to six months or longer. Penicillin is destroyed by acids, alkalies, alcohol, certain antiseptics, salts of heavy metals, and certain bacterial ferments (e.g., penicillinase).

The potency of any preparation of penicillin is expressed in terms of Oxford units determined by means of a biological technique. There is no known chemical method of assay. The assay is not exact, there being a possible error of ± 15%. One milligram of crystalline penicillin (as sodium salt) contains some 1600 units.

Both the sodium and calcium salts of penicillin are freely soluble in water and in physiological solutions of saline and glucose. Solutions of penicillin may deteriorate rapidly and should be prepared each day if possible and stored in the refrigerator at temperatures below 5°C. Solutions of relatively poor penicillin lose about 10% of their potency in 24 hours, this rate being greatly increased at room temperatures, while less pure preparations deteriorate even more rapidly. The powdered sodium salt is hygroscopic, less stable and apparently more irritating when applied to open wounds than the non-hygroscopic calcium salt.

(b) Antibacterial Properties

It is highly effective against gram-positive bacteria, aerobic and anerobic, Neisseriae and spirochaetes. It is ineffective against gram-negative bacilli, viruses, acid fast organisms and yeast-like fungi. In the following table groups of common pathogenic organisms are listed with regard to their susceptibility to penicillin.

SENSITIVE TO PENICILLIN

Gram-negative diplococci
- Meningococcus
- Gonococcus

Gram-positive cocci
- Streptococcus haemolyticus
- Other streptococci except Streptococcus fecalis
- Pneumococcus
- Staphylococcus aureus

Gram-positive bacilli
- B. Welchii
- B. septicum
- B. oedematiens
- B. tetani
- B. diphtheriae
- B. anthracis

Spirochaetes of
- Syphilis
- Relapsing fever

RESISTANT TO PENICILLIN

Gram-negative bacilli
- B. typhosus
- B. paratyphosus
- B. dysenteriae
- B. coli
- B. enteritidis
- B. proteus
- B. influenzae
- B. pertussis
- B. Friedlanderei
- B. tularemia
- B. abortus (melitensis)
- B. pestis
- B. pyocyaneus
- B. tularence

Acid fast organisms
- B. tuberculosis
- B. leprae

Yeast-like fungi
- blastomyces
- coccidioides

Leptospira icterohaemorrhagiae

Viruses

No sharp line separates the sensitive organisms from those that are resistant. It is possible that some organisms said to be resistant might be affected by the higher concentrations of the drug obtainable on local administration or in the urine. Of the susceptible species, some (e.g., gonococcus and meningococcus) are highly sensitive, while others (e.g., clostridia, anaerobic streptococcus) are much less so. There is variation also in the sensitivity to penicillin of different strains of the same bacterial species.

Sensitive micro-organisms grown in small but increasing concentrations of penicillin may adapt themselves to the drug and become resistant.

Administration

To be effective, penicillin must be brought in contact with the infecting organism in the tissues and maintained at an adequate concentration for a sufficient period of time. Depending chiefly on the site of the infection this may be accomplished by (1) systemic therapy, (2) local injection, or (3) topical application.

(a) Systemic therapy is used in the treatment of generalized infections and in localized infections when local therapy is not adequate to prevent further spread of the disease process. Penicillin may be administered intravenously or intramuscularly. Both methods give essentially similar results. The choice of the method of administration is determined largely by the comfort of the patient. Penicillin is not effective when given by mouth or by rectum for it is destroyed by the hydrochloric acid of the gastric juice and by enzymes of intestinal bacteria. Subcutaneous injections are not advised because they are apt to be painful.

Following intramuscular injection, penicillin is quickly absorbed and passes to most of the tissues. It does not pass readily, however, into the spinal fluid or serous cavities. Unfortunately, also, it is quickly excreted by the kidneys and after a single dose measurable amounts cannot be detected in the blood for more than 2 to 3 hours. For satisfactory systemic therapy, therefore, penicillin must be injected every 2 to 4 hours, day and night, or else given by continuous drip.

For intravenous administration the dry powder is dissolved in sufficient physiological saline to give a concentration of 5,000 units per cc. (20 cc. of sterile saline are added to the contents of the standard 100,000 unit vial). Each dose may then be injected at the appropriate interval directly into the vein or into the rubber tubing of a continuous intravenous infusion; or, as an alternative method, half the total daily dose may be mixed in one litre of infusion fluid and given at a constant rate over each period of 12 hours. The unused penicillin solution remaining in the vial must be kept in the refrigerator under aseptic conditions.

For intramuscular use the penicillin should be dissolved to make a solution containing 5,000 or 10,000 units per cc. depending on the dose to be given with each injection. There is less local discomfort when the volume injected does not exceed 2 cc. Continuous intramuscular therapy may also be used.

(b) Local injection. In cases of meningitis, intrathecal administration is used in addition to systemic therapy in order to obtain an effective local concentration of the drug. Penicillin may be similarly used in the local treatment of empyema, suppurative arthritis and thick walled abscesses. Penicillin injected locally into these inflamed cavities, including subarachnoid space, is not readily absorbed and commonly persists in effective concentration for 24 to 48 hours. It is, therefore, not necessary to repeat such injections more frequently than daily or every second day.

Meningitis. In addition to systemic therapy, 10,000 units of penicillin dissolved in 10 cc. of sterile physiological saline should be given intrathecally each day after removal of a larger volume of spinal fluid. In some cases it may be necessary to use the cisternal route.

(c) Topical application is used in the treatment of infections of the skin and mucous membranes, of extensive soft tissue wounds and of compound fractures. Solutions of penicillin should not be used as irrigating fluids, for, to be effective several hours of contact are necessary. The choice of preparation and frequency of administration varies with the clinical condition. The preparations listed below may be used.

(1) Solution of penicillin in saline - 200 to 1000 units per cc.

(2) Penicillin-sulphonamide powder, preferably the calcium salt - 500 to 5,000 units penicillin per gm. of sterile sulphanilamide or sulphathiazole powder. (The total amount used of any powder containing sulphonamide should not exceed 10 gms.)

(3) Penicillin cream - 200 to 500 units penicillin per gm. in suitable cream or ointment base.

Reference - Penicillin - Issued by "Overseas Joint Services Penicillin Committee". Sept. 1944.

## REQUISITIONS AND CONSULTATIONS

In order to avoid any confusion or delay requisitions and consultations should be carefully filled out including all information which is requested on the slip. (Name should be printed or written clearly). Indicate whether patient is private, semi-private, public, workmen's compensation (W.C.C.) or D.V.A. All x-ray requisitions should contain a brief summary of subjective and objective findings, and brief statement of clinical course since last examination, instead of stating "see previous requisition".

X-ray requisitions should be placed on the technician's desk in x-ray department and special examinations as encephalograms, ventriculograms, intravenous pyelograms and myelograms should be posted on black board in x-ray department indicating the time that patient will arrive in x-ray, and not the time that procedure is to be started on the ward. It is extremely important that there be no delay in these procedures in order to avoid confusion among the following cases. If there is some unavoidable delay, the x-ray department should be notified. The Resident should always be consulted before posting encephalograms. False teeth and all hair pins should be removed before patient leaves the ward.

Requisitions for gastric series, barium enemas and tipp tests are all sent to the Main X-ray Department.

It is essential that the necessary preparatory orders be written the night before these procedures are carried out. In case of intravenous pyelograms, the interne is expected to be available to do the intravenous injection in the X-ray Department.

Dental x-ray requisitions are sent to the Main X-ray Department.

Bacteriology requisitions: If culture is requested, one should always indicate if patient is receiving sulfonamides.

Hemogram requisitions - are sent to Dr. Kaufmann in Medical Labs. unless otherwise requested.

To request a Social Service Report fill in the usual consultation form and leave same in the Social Service Department Office on M.N.I. - 1.

Electroencephalography requisitions - care should be taken to indicate purpose of examination and amount of medication patient is receiving, if any. Medication should be withdrawn for several days before first examination is carried out, unless a special request is made by the physician in charge.

Consultation requisitions should always contain a brief summary of positive findings and specific opinion which is requested. One should not rely on a telephone request but should see that requisition is properly filled in, and sent to the department in question.

In emergencies the Resident on the service should be called and requested to have a Staff man see the patient.

Consultation requisition should be left in the appropriate box at the entrance to the doctors' dining room.

## Photography

All interesting lesions or unusual conditions should be photographed. Clear and specific instructions as to what is to be shown must be given to the photographer (consultation with him is often most helpful). These photographs should always be examined as soon as they return to the ward, to determine whether they were taken in proper position and if they show the lesion clearly.

Photography requisitions may be placed in small container attached to door of this department, if it is closed.

## Progress Notes

Careful progress notes should be made on all patients at least every three days, recording only the positive findings. All special procedures should be written in red ink. In operative cases it is extremely important to record patient's condition when he returns to the ward and the time that he begins to respond following operation, including as complete a neurological examination as possible, but mainly whether any additional weakness, or aphasia is present. These findings are very important in attempting to judge prognosis. In cases of papilloedema, one should record the degree of swelling every few days.

Lumbar puncture pressures and cell counts may be included in the progress note, but should always be placed on the special sheet for this purpose as well.

All epileptic seizures witnessed by the interne should be very carefully described, including a neurological examination immediately following the seizure.

The last progress note made the date that the patient leaves the hospital should include a very careful neurological examination and titled "Discharge Examination". This should also include Discharge Medication.

Interne's signature and not his initials must be placed at the end of the note or in the margin beneath the date.

May 23rd, 1945.

## SOCIAL SERVICE DEPARTMENT

(Mrs.) E. McL. Davidson

Social Admitting, Treatment and Discharge.

Each patient or the family of each patient admitted to the Institute is interviewed by a member of the Social Service Department. Experience has proven that an interpretation of the costs of medical care which takes into account the social factors involved results in a fairer adjustment for both patient and hospital and often a saving in human and financial values.

To some this service consists only of the mechanics of making plans, such as obtaining a room or locating a relative, or financial adjustments related to medical care, for example: assistance from municipal and provincial authorities (in Quebec, Q.P.C.A.), Blue Cross or similar plans for hospitalization and funds established for the dependents of military personnel.

To others it is the opportunity to talk out their fears and worries. Hospitalization to most brings strain and stress but it is his attitude toward his illness and the problems it presents that indicates the patient's strength or his need of help in meeting this crisis.

Such information the social worker tries to indicate in a brief report which is placed in the patient's chart. She will provide additional social history on request of the doctor who will follow the usual procedure of filling in the consultation form and leaving it in the Social Service Office. And in the solving of those social problems as may be of significance in the cause or treatment of the patient's illness she is prepared to work in the closest cooperation with the doctors and nurses, recognizing always the patient's need and right to solve his own problems in so far as he is able.

Such problems as convalescent care, nursing care at home, institutional placement or rehabilitation may, for some patients, follow logically and easily after the social worker has interpreted community resources.

Again, for others, the implications of the need for institutional care or the limitations suggested by rehabilitation are emotional hazards which by only understanding and time-consuming interpretation can the patient or his family be helped to accept.

The doctor is urged, therefore, to refer to the social worker as soon as possible any patient he considers in need of help in making any social adjustment. This applies particularly to the care of the chronically ill for whom few community resources are provided.

SOCIAL SERVICE DEPARTMENT (continued)

Clinical Management, Treatment and Follow-up.

A social worker is responsible for the management of the daily clinic held in the Out-Patient Department of the Royal Victoria Hospital:

Monday, Neurology - Chief, Dr. F.L. McNaughton
Tuesday, Neurosurgery - Chief, Dr. A.R. Elvidge
Wednesday, Neurology,-Chief, Dr. F.L. McNaughton
Thursday, Neurology - Chief, Dr. A.W. Young
Friday, Neurosurgery - Chief, Dr. W.V. Cone

With the assistance of voluntary clinical aids, a card index is kept of each patient's attendance with routine follow-up of absentees. It is hoped that from this will be perfected a method having scientific value by providing a check on diagnosis and treatment, both medical and social.

Follow-up of ward patients through the clinic depends upon the written instructions given the patient on discharge, a copy of which is sent to the Social Service Department. Without this referral neither the Out-Patient Department nor the Social Service Department record the patients advised to return to clinic.

Each clinic patient recommended for admission is referred to the social worker who interviews the patient and arranges admission details.

In the clinics, as on the wards, are patients whose social problems are inter-related with the medical. Epileptics who become over-protected children, neglected adolescents or unhappy young people, with no training and no job probably constitute the greater number, but there are also those post-operative patients who need help in the re-adjustment at home and in the community; the post-traumatic patients for whom rehabilitation is long and difficult and the patient who faces weary months of inactivity and dependence. In following through with the doctor in his treatment of "the person in the patient" the social worker's role is to obtain such additional information required to gain an understanding of the patient and to help him in the acceptance and carrying out of such recommendations as may be jointly agreed upon.

## ORDER IN WHICH TO ARRANGE CHARTS ON DISCHARGE

Top white sheet.

Top yellow sheet.

Discharge summary.

Typed case history.

Interne's written case history.

Mimeographed history.

Any letters from outside in regard to the patient.

Interne's or surgeon's progress notes.

X-ray reports.
Electrogram reports.
Pneumoencephalogram reports.
Ventriculogram reports.
Consultations.
B. M. R.
Sugar tolerance curves.
Operation reports.

------ In chronological order.

Laboratory data.

Culture reports.
C.S.F. Examination reports.
C.S.F. Chemistry reports.
C.S.F. Wassermanns.
Blood Wassermanns.
Lumbar puncture charts.
Urinalysis.

------ These should be in chronological order, but it is preferable that all sheets of the same type be put together, i.e., all urinalyses together.

Pathological report.

Nurses' Notes.

Blood Pressure charts.

Consent for treatment.

Top white sheet.

Top yellow sheet.

Discharge summary.

Typed case history.

Interne's written case history.

Any other data from outside in regard to the patient.

Interne's progress notes.

Any letters from outside in regard to the patient.

Interne's or surgeon's progress notes.

X-Ray report.

Electrocardiogram report.

Pneumoencephalogram report.

Ventriculogram report.

Consultations.

Blood pressure charts.

Urine reports.

Laboratory data.

Operation reports.

Nurse's notes.

Special orders.

Doctor's order sheet.

Temperature, pulse and respiration chart.

Admission history and physical examination.

Admission orders.

Nurse's notes.

Special orders.

Doctor's order sheet.

Temperature, pulse and respiration chart

## DISCHARGE SUMMARIES

The purpose of the discharge summary is to serve as a source of information for the staff man or the referring physician in the future management of the case. Pertinent findings should be stressed while negative data should be reduced to a minimum.

## MODEL TO FOLLOW FOR DISCHARGE SUMMARIES

Examining Interne's name:- Neurology or Neurosurgery:-

Patient's name:- Age:- Floor:- Admission Date:-
Discharge Date:-
Case History No:- Supervising Doctor:-

## DISCHARGE SUMMARY

PREVIOUS ADMISSIONS:- List previous admissions to M.N.I. & R.V.H.
e.g.(1) R.V.H. (medicine) No.43-1276, Aug. 16-Aug. 30, 1943.
Diagnosis:- Acute Suppurative Appendicitis.
Operation:- Appendectomy.
(2) M.N.I. (neurosurgery) No. 44-852, Feb. 7-Feb. 28, 1944.
Diagnosis:- Glioblastoma multiforme, right parietal.
Operation:- Right parietal osteoplastic craniotomy with subtotal removal of tumour.

INITIAL COMPLAINTS:- ) Include only those
) items which throw
OBJECTIVE FINDINGS ON CLINICAL EXAMINATION:-) light on the case.

Laboratory Data:-
Urinalysis - if significant.
Blood Wassermann and Kahn.
C.S.F. Wassermann.
Hemograms - give details only if important.
Lumbar punctures and C.S.F. findings.
Mention all consultations with other departments but copy opinion only if important.

DIAGNOSTIC PROCEDURES:-
X-rays.
Myelograms.
Encephalograms.
Ventriculograms.
Electroencephalograms.
B.M.R.
Lumbar Manometric Test.

THERAPEUTIC PROCEDURES:-
Operations:- Date, name of operation, operator & operative summary.
Radiotherapy.
Malaria therapy.
Fever therapy.
Spinal insufflation.
Casts, injections, etc.

COURSE IN HOSPITAL:-
Salient features of patient's stay here.

MEDICATION ON DISCHARGE:-
Do not use symbols h.s., T.I.D., Q.I.D., etc.
Follow up by family physician or Out-Patient Department.

CONDITION ON DISCHARGE:-
Cured, improved, unimproved, deceased, unchanged.

PATHOLOGICAL DIAGNOSIS:- State if preliminary.

DISCHARGE DIAGNOSIS:-
To conform to terminology in official classification book.

SIGNATURE.

# MODEL TO FOLLOW FOR DICTATION OF OPERATION REPORT

Operator:-

Assistant:-

Anaesthesia:-

Skin preparation:-

Provisional Diagnosis:-

Final Diagnosis:-

Name of Operation:-

Objective Findings:-

Procedures:-

Dressing - Drainage:-

Operative Summary Note:-

# APPLICATION FOR PERMIT

Name:- Passport:- Nationality:-

Full Normal Address in:-

Tin:- Nearest:-

Age:- Date of Birth:-

Married or Single:-

Profession:-

Present - Future:-

Operative Country Role:-

## AUTOPSY PERMISSION

The percentage of autopsies obtained is an index of the "esprit de corps" of the hospital staff. An attempt should be made to obtain this permission in all cases. Only thus will we accumulate knowledge essential to the better handling of similar cases subsequently.

It is needless to point out that permission for autopsy will largely depend on the attitude of the staff toward the patient during hospitalization. In most instances the relatives are aware that everything humanly possible is being done and will be silently or openly appreciative. In the event of a hopeless prognosis it is imperative that the situation be fully discussed with them prior to death.

There is no "routine" procedure for obtaining permission for post-mortem examination. Each circumstance presents its special problems and the utmost of tact and diplomacy must be utilized. The following points of argument may be useful:

1. Medical science depends on post-mortem examinations for its progress.

2. The information obtained will be of value in the treatment of other patients with a similar condition. The disease may actually affect other members of the same family

3. The post-mortem is not a form of mutilation but a technically difficult operative procedure. It is no more mutilating than the embalming process of the undertaker.

4. The information is important in giving an accurate cause of death for death certificates, insurance forms, applications for pension, etc.

5. There is no expense attached to the examination.

N.B. In the event that failure to obtain permission is imminent, the resident or attending medical man should be summoned.

## WHO IS LEGALLY RESPONSIBLE FOR THE DECEASED?

Permission for post-mortem examination must always be obtained from nearest relative.

| | | |
|---|---|---|
| In case of death: | of wife | - from husband |
| " " " " : | " husband | - from wife |
| " " " " : | if single | - from father; if father dead from mother; if both parents are dead from oldest brother or sister. |
| In case of death if husband and wife are legally separated | | - from oldest son or daughter or parents. |
| In case of death if husband and wife separated by mutual agreement | | - from husband or wife; if unable to locate, same as above. |
| In case of death if husband is overseas | | - consent must be obtained by cable. |
| In case of death if body is unclaimed | | - permission can be obtained if hospital is willing to pay burial expenses, otherwise body goes to anatomy department. |

Coroner cases -

1. Traumatic: All accident cases come under the authority of the coroner. The neuropathological fellow is notified immediately and it is his responsibility to notify the coroner. Permission for post-mortem examination should be obtained from the relatives by the interne because frequently the coroner will give permission for the examination to be done at the hospital if the relatives have given their consent.

2. Patients dying within 24 hours after admission: The coroner must be notified of patients dying within 24 hours after admission to the hospital, but in all these cases permission must be obtained from the nearest relative for post-mortem examination.

3. Army: If traumatic - coroner must be notified and same procedure followed as above. If not traumatic permission must be obtained from the family as above. The army has no authority to grant permission.

## PROCEDURE WHEN PERMISSION IS OBTAINED

All permission slips must be witnessed and contain the extent of the examination. If possible this permission should be filled in on the back of the death certificate.

As soon as the slip has been completely filled out it is given to the nurse in charge of the ward so that it may be sent to the Main Office immediately. The interne then should notify the neuropathological fellow (Local 204).

# CHAPTER II

## ACCESSORY LABORATORY EXAMINATIONS

## URINALYSIS

The tests marked with an asterisk are done routinely, the others when indicated.

1. Specific gravity*

2. Reaction*

3. Glucose*

   Benedict's Qualitative Test: To about 5 cc. of solution add 8 drops of urine. Boil for three minutes and allow to cool to room temperature. A precipitate (greenish, yellow, or red) indicates the presence of a trace, a few tenths per cent, or larger amounts of sugar in the specimen.

| Benedict's Qualitative Solution | grm. or cc. |
|---|---|
| Copper sulphate | 17.3 |
| Sodium or potassium citrate | 173.0 |
| Sodium carbonate (crystals) or half amount anhydrous salt. | 200.0 |
| Distilled water to make | 1,000.0 |

   Dissolve citrate and carbonate (heating) in 700 cc. water, filter and add copper sulphate dissolved in 100 cc. water. Allow to cool and dilute to 1,000 cc.

4. Albumin*

   Heat and Acetic Acid Test: Fill the test-tube two-thirds full of urine. Boil upper third. Add five drops of 10 per cent acetic acid. A persistent cloud indicates the presence of albumin. Phosphates give a cloud on boiling, which disappears on the addition of acetic acid. Note: Mucin may give a faint cloud in absence of true albumin.

5. Acetone

   Nitroprusside Test: Acidify 5 cc. of urine with glacial acetic acid, add two or three crystals of sodium nitroprusside and shake well. Overlay with concentrated ammonia water. A distinct violet or purple band of colour indicates the presence of acetone or aspirin and salicylates. By then reboiling the urine the acetone will be driven off. Repetition of the test should give a negative result if colour band was due to acetone and a positive result if it was due to aspirin or salicylates.

   Note: Useful in testing for ketosis in presence of aspirin and salicylates.

URINALYSIS (Continued)

6. Diacetic Acid
   Gerhardt's Ferric Chloride Test: To 5 cc. of fresh urine add an equal volume of 5 per cent solution of ferric chloride. A precipitate of ferric phosphate first forms, then dissolves in an excess of the reagent. The depth of the Burgundy red colour indicates the amount of diacetic acid present. Salicylates, aspirin, etc., give a purple colour which changes very slightly on boiling, while the colour due to diacetic acid rapidly fades on heating.

7. Bence-Jones Bodies.
   Heat at least 10 cc. of the urine slowly on a water bath, noting the temperature. In the presence of Bence-Jones bodies turbidity will appear at 40° C., and a flocculent precipitate at 60° C.

   Acidify slightly with 10 per cent acetic acid and heat to boiling; the precipitate now diminishes or disappears completely. Filter at once; the clear filtrate again becomes turbid, or a precipitate forms when the filtrate is cooled.

   If this test be positive, it should be confirmed by adding nitric acid to a fresh specimen of urine until a precipitate forms. This precipitate should disappear on boiling and reappear on cooling.

8. Blood
   Benzidine test: Add 1 or 2 cc. of an equipart mixture of saturated solution of benzidine in glacial acetic acid and hydrogen peroxide to the centrifuged sediment of urine. A blue colour indicates blood. If red cells are present in sufficient numbers to be detected microscopically, this test on the sediment will be positive.

9. Microscopic examination*
   Note presence of red blood cells, pus cells, casts and crystals in cases receiving sulfonamides. The specimen should always be centrifuged.

## UREA CLEARANCE TEST**

At 7:30 A.M. administer 100 cc. (or more) water by mouth. At 7:45 have patient void. Note exact time to the minute. Discard this specimen or add to day's total.

At 8:45 A.M. have patient void. Note exact time to the minute. Label this "first specimen".

**From "Essentials of Hospital Practice", by Calder, R.M.

Urea Clearance Test (continued)

At 8:50 A.M. (approximately) remove 7 cc. blood by venepuncture and put in oxalate bottle.

At 9:45 A.M. have patient void. Note exact time to the minute. Label this "second specimen".

Send the two urine specimens and the blood sample to the blood chemistry laboratory. Also record patient's height and weight.

So far as possible, an attempt should be made to have the patient void at the exact times noted. However, a few minutes' variation from this schedule is permissible, provided the exact time when patient completes voiding is recorded on the specimen tag. Fluids may be forced if necessary to secure the specimens.

No coffee should be administered before or during the test.

## MOSENTHAL TEST

The purpose of this test is to determine the ability of the kidney to concentrate urine. It is used in all cases of suspected kidney damage. The routine is as follows:

1. Regular breakfast or salt-free, as ordered.

2. Patient receives 500 cc. of fluids with each meal. NO FLUIDS BETWEEN MEALS.

3. Collection of specimens.
   a) Patient voids at 6 A.M. - discard this specimen.
   b) Collect specimens at 8-10-12-2-4-6, putting each in a separate bottle.
   c) All urine voided after 6 P.M. to, and including the 6 A.M. specimen, must be saved in a 24 hour specimen jar.
   d) All specimens should be sent to the third floor laboratory unless otherwise ordered.

4. Record in the history the amount voided in each specimen, together with the specific gravity, noting day and night totals. Normally there should be 5 or 10 points difference in the various readings of specific gravity in the day specimens, and the specific gravity of the night specimen should be above 1.018. The night specimen is small in amount, usually 250 to 350 cc. and seldom above 400 to 500 cc.

# BLOOD COUNTS

## Technique for the Leucocyte Count:

The finger tip or ear lobe is first cleansed with alcohol and dried. A large drop is obtained by pricking with a three edged surgical needle. Wipe off first drop. Suck up blood to the 0.5 mark of the white cell pipette, wipe off tip, then immerse upright in the diluting fluid (acetic acid with methylene blue). Revolve pipette while sucking up diluting fluid to the 11 mark. Shake well for two minutes and then fill counting chamber. Hold pipette in right hand and control the flow by pinching rubber tubing with left hand. Discard first two drops in stem of pipette.

Using the low power objective, count the four large corner squares (each contains 16 smaller squares) add together and multiply by 50.

## Technique for the Red Cell Count:

Follow the same rules as for the leucocyte count. Suck blood to the 0.5 mark of the red cell counting pipette and dilute with Hayem's solution to the 101 mark. It is important to shake the pipette well and to control the filling of the counting chamber so that fluid does not run into the side troughs.

Use the high dry lens and focus on the large centre square of the counting chamber. This in turn is divided into twenty-five smaller squares, five of which are counted. The total is added together and multiplied by 1000.

## Cleaning the Apparatus:

Wash off the counting chamber with water and dry with soft cloth. Use the suction apparatus and draw through the pipettes; 1. Distilled water; 2. alcohol; 3. ether; 4. air. Do not put the pipettes away while there is any moisture in them.

## Making a Differential White Cell Count:

The glass slides or cover slips which are used for making blood smears must be absolutely clean with no trace of grease on them. The finger or ear lobe is cleaned with alcohol and dried, a large blood drop is obtained and wiped off. Touch the slide to the drop of blood just as it is beginning to form and quickly drop a cover slip over it. With light pressure of the fingers move the cover slip the length of the slide. This usually gives a thin, even smear. Dry the film as rapidly as possible.

BLOOD COUNTS (Continued)

To stain the film: Measure out a known number of drops of Wright's or Leishman's stain onto the slide so that it is well covered. Leave on for one minute (this time changes with the age and strength of the stain). Add an equal number of drops of distilled water to the stain and allow to remain approximately three minutes. Next flood the slide with water allowing the stain to float off. Wash thoroughly for few seconds. Dry in the air.

Examine with oil emmersion lens. Examine consecutive fields right across the slide in three different places. At least one hundred cells must be classifiedl.

Reference: Todd and Sanford. Clinical Diagnosis by Laboratory Methods.

## BLOOD CHEMISTRY

All of these examinations are carried out in the Medical Laboratories of the Royal Victoria Hospital except the bromide determinations which are done in the Montreal Neurological Institute Chemical Laboratory.

| Constituent | Normal Value | Amount needed | |
|---|---|---|---|
| | **Oxalated Blood** | | |
| Urea nitrogen | 11-16 mgm per 100 cc. | 5 cc. | |
| Uric acid | 2-4 " " " " | 5 cc. | 12 cc. |
| Creatinine | 0.5-1.5" " " " | 5 cc. | |
| N.P.N. | 25-35 " " " " | 5 cc. | |
| Total fats (as tripalmitin) | 200-400 " " " " | 8 cc. | |
| Cholesterol | 150-250 " " " " | 6 cc. | |
| Total protein nitrogen | 1000-1400" " " " | 6 cc. | |
| $CO_2$ capacity (plasma) | more than 53 vol. % | 8 cc. | |
| Chlorides (plasma) | 350-380 mgm per 100 cc. | 8 cc. | |
| Bromides (as NaBr) | 0.8-1.5 " " " " | 5 cc. | |
| | **Oxalated and Fluorided Blood** | | |
| Sugar | 80-120 mgm per 100 cc. | 5 cc. | |
| | **Unoxalated Blood** | | |
| Total base | 150-160 cc. of 0.1 normal solution | 8 cc. | |
| Serum Sodium | 320-340 mgm per 100 cc. | 10 cc. | |
| Serum Potassium | 16-22 " " " " | 10 cc. | |
| Serum Calcium | 9-11 " " " " | 10 cc. | 15 cc. |
| Inorg. Phosphorous (adults) | 3-4 " " " " | 10 cc. | |
| (children) | 4-6 " " " " | 10 cc. | |
| Bilirubin - direct | negative | 8 cc. | |
| Bilirubin - indirect | 0.2 to 0.5 units | 8 cc. | |
| Sulfonamides | 0.00 mgm per 100 cc. | 5 cc. | |

Reference: Pharmacopoeia and Clinical Methods of The Teaching Hospitals, McGill University, 1940.

## BLOOD CHEMISTRY

Many of these examinations are carried out in the clinical laboratories where Venous blood is used. Capillary blood is usually employed in the Ultra Micro-chemical laboratory.

| Constituent | Normal Value | Amount needed |
|---|---|---|
| | Oxalated Blood | |
| Urea nitrogen | 11-16 mgm per 100 cc. | 5 cc. |
| Uric acid | 2-6 " " " | 5 cc. |
| Creatinine | 0.6-1.5" " " | 5 cc. |
| N.P.N. | 25-35" " " | 5 cc. |
| Total Fats (as Cholein) | 400-600 " " " | 5 cc. |
| Cholesterol | 150-250 " " " | 5 cc. |
| Total protein nitrogen | 1000-1400" " " | 5 cc. |
| CO2 capacity (plasma) | 50-70 mgm per 100 cc. | 5 cc. |
| Chlorides (plasma) | 570-630 mgm per 100 cc. | 3 cc. |
| Bromides (se Water) | 0.3-1.0 " " " | 5 cc. |
| | Oxalated Blood | |
| Sugar | 70-120 mgm per 100 cc. | 5 cc. |
| | Serum | |
| Total base | 150-160 cc. of 0.1 Normal | |
| Serum Sodium | 320-340 mgm per 100 cc. | 10 cc. |
| Serum Potassium | 15-25 " " " | 10 cc. |
| Serum Calcium | 9-11 " " " | 10 cc. |
| Inorg. Phosphorus (Adults) | 2-4 " " " | 10 cc. |
| (Children) | 4-6 " " " | 10 cc. |
| Blirubin - direct | 0.0-0.2 " " " | 5 cc. |
| " - Indirect | 0.2 to 0.8 Units | 5 cc. |
| Iron | 0.08-0.18 mgm per 100 cc. | 5 cc. |
| Plasma Chloride | Plasma | 5 cc. |

## A.C. AND P.C. BLOOD

Standard breakfast:

| | | |
|---|---|---|
| Orange slices | 60 grams | ½ orange |
| Oatmeal or | 100 " | ½ cup |
| cornflakes | 15 " | 1 bowl |
| Milk | 200 cc. | 1 glass |
| Sugar | 20 grams | 1 tablespoon |
| Bread | 70 " | 2 thick slices |
| Butter | 20 " | 1 square |
| Eggs | one | |

Blood taken 1½ hours from middle point of meal.
(Note time begun and time finished).

## GLUCOSE TOLERANCE TEST, ROUTINE

This test is designed to determine the presence of a decreased glucose tolerance, e.g., diabetes. Normally the peak of the blood sugar level is reached at the end of an hour and usually does not go much above 150 mgm. per cent. In diabetes, the peak may be delayed to the second hour, much higher than normally, and persist for a longer period of time. The urine examinations are carried out to determine the renal threshold for glucose.

The routine is as follows:

| | | |
|---|---|---|
| 8:55 A.M. | Blood | Specimen urine (discard) |
| 9:00 " | Drink 100 grams of glucose in 300 cc. of lemonade. | |
| 9:30 " | Blood | Urine |
| 10:00 " | Blood | Urine |
| 11:00 " | Blood | Urine |
| 12 noon | Blood | Urine |

Standard Breakfast:

Orange slices
Oatmeal w/
cornflakes
Milk
Sugar
Bread
Butter
Eggs

100 grams
1C "
200 cc.
20 grams
1C "
1C "
1 "

Blood tubes to be drawn from midline point of vein.
(Note time drawn and time delayed).

PROCESS TUBES AND SPOT: PROCESS

This spot is developed ... diabetes. Normal glucose tolerance ... reading at the end of 1 hour ... of the blood sugar level ... the peak may be delayed ... mg. per cent. ... normally does not go much above 120 mg. per cent. ... examinations are carried out to ... for glucose.

The routine is as follows:

8:30 A.M. Glucose
9:00 " Orange juice plus 100 grams of glucose in lemonade.
9:30 " Blood
10:00 " Blood
11:00 " Blood
12:00 " Blood
1:00 " Blood

## GLUCOSE TOLERANCE CURVE, PROLONGED

This is designed to detect hypoglycemia. The blood samples are therefore taken at one hour intervals for five hours. Examination of the urine in the later periods is not necessary.

Time

| | | |
|---|---|---|
| 8:55 A.M. | Blood | Specimen Urine (discard) |
| 9:00 " | Drink 100 grams Glucose plus 300 cc. of lemonade. | |
| 10:00 " | Blood | Urine - Drink 200 cc. $H_2O$ |
| 11:00 " | Blood | |
| 12:00 noon | Blood | |
| 1:00 P.M. | Blood | |
| 2:00 " | Blood | |

Care must be taken to see that the proper amount of oxalate is used to prevent clotting but still not to over-oxalate. Specimens must be sent to the medical labs. immediately following the last specimen. Do not perform during "odd hours", that is, so that the specimens will reach the Medical Laboratories after 5:00 P.M. or over the weekend.

## INSULIN SENSITIVITY TEST

From the neurological viewpoint this test is particularly valuable in the study of seizures due to hypoglycemia. It is also a valuable clinical aid in the study of suspected islet cell tumours of the pancreas.

Nothing to eat or drink except water after 9 P.M.
No breakfast.
9:00 A.M. Intravenously 1/10 unit insulin per kilogram body weight (120 lbs. - 54.5 kilos - 5.45 units.) Then take blood sugar at 0, 20, 30, 45, 60 and 120 minutes.

Observe patient carefully for signs of hypoglycemia.
Take blood pressure with each blood sugar.

After 120-minute sugar give 0.01 cc. of 1:1000 adrenalin, i.e., 0.5 cc. adrenalin intramuscularly and take blood sugars at 45 and 60 minutes. Again take blood pressure with each blood sugar.

| Time | | Specimen Drawn (Fasting) |
|---|---|---|
| 8:55 A.M. | Blood | |
| | Drink 100 grams Glucose plus 300 cc. of lemonade. | |
| 9:00 " | Blood | |
| 10:00 " | Blood | |
| 11:00 " | Blood | |
| 12:00 noon | Blood | |
| 1:00 P.M. | Blood | |
| 2:00 " | Blood | |

Care must be taken to see that the proper amount of exercise is used to prevent clotting of the medical Labs. Immediately following this specimen. Do not perform during "odd hours". that is, so that the specimens will reach the medical laboratories during P.M. or over the weekend.

## INSULIN SENSITIVITY TEST

From the neurological viewpoint this test is particularly valuable in the study of seizures due to hypoglycemia. It is also a valuable adjunct in the study of [illegible]

[illegible] drink [illegible] water [illegible] P.M.

[illegible] 10 unit [illegible] Take [illegible]

[illegible] 30, 45, 60 and 120 minutes.

[illegible] 0.01 cc. [illegible] 300 cc. [illegible]

[illegible] 60 minutes. Again take blood [illegible]

[illegible]

[illegible]

[

## EXAMINATION OF THE CEREBROSPINAL FLUID

The examination of the cerebrospinal fluid begins at the time of the lumbar puncture. The pressure should be recorded only when the patient has completely relaxed. The cardiac and respiratory excursions should likewise be noted.

In traumatic cases the THREE-TUBE TEST is employed. This test requires the collection of 2 cc. samples of fluid in a series of three tubes which are labelled #1, #2 and #3. The number of red blood cells per cubic millimeter is determined in the first and third tubes. In the event that this number is significantly higher in the first tube, a traumatic tap has occurred. On the other hand should the counts in the 1st and 3rd tubes be similar, or actually higher in the 3rd tube, a diagnosis of subarachnoid hemorrhage is substantiated.

In non-traumatic cases with normal cerebrospinal fluid pressure the fluid is collected in three test tubes as follows:

1. 2 cc. for protein determination.
2. 1 cc. for cell count and Pandy test.
3. 5 cc. for Wassermann test.
4. 2 cc. for sulfonamide level determination.

### Routine Examination of the Cerebrospinal Fluid

The following examinations are carried out routinely or under special conditions.

1. Characteristics - clear or turbid.
2. Color - clear, colorless - xanthochromic - blood tinged. Xanthochromic cerebrospinal fluid should be kept as a sample in a special test tube rack so that deepening or lightening of color may be compared with subsequent specimens.
3. Pandy Test for Globulin - To 1 cc. of Pandy's reagent (saturated aqueous solution of phenol.) in a small test tube or watch crystal, add 1 drop of cerebrospinal fluid. A bluish opalescence is obtained if traces are present, changing to a white cloud and definite white precipitate if quantities of globulin are increased. Report as one, two, three or four plus.

Routine examination of the cerebrospinal fluid (Continued)

4. Cell Counts - All cell counts should be done immediately following withdrawal of the fluid. The Fuchs-Rosenthal counting chamber is used, and five groups of sixteen squares counted. The total number of cells in these equals the number of cells per cubic millimeter.

   a). Red Blood Cells - Agitate the sample to obtain an even dispersion of the cells. Draw up the fluid in a blood or capillary pipette and run under cover glass of chamber. The numbers of cells in the total of 5 large squares (a large square equals 16 small squares) equals the red cells per cubic millimeter of fluid. If the fluid contains a large amount of blood it is advisable to employ the routine procedure for counting erythrocytes in the blood.

   b). White Blood Cells - In the absence of red blood cells the procedure is similar to that outlined in the preceding paragraph. In the event that erythrocytes are present they should be destroyed by acetic acid according to either one of the following methods.

      1. Use W.B.C. pipet. Draw up glacial acetic acid to the 0.5 mark and then methylene blue in equal amount. (Note: Turck's solution is not a satisfactory substitute, methylene blue should be filtered through several layers of filter paper before use). Then draw up cerebrospinal fluid to the 11 mark. Merritt and Fremont-Smith recommend the use of trichrome methylene blue which stains both the red and white cells distinctly.

      2. Draw the diluting fluid (methyl violet 0.2 gm.; glacial acetic acid 5.0 cc. and distilled water to 100 cc.) to the 1 mark on the W.B.C. pipet and fill with cerebrospinal fluid to mark 11.

      In both of these instances it is necessary to multiply the result by 10/9 to account for the dilution factor.

   c). Tumor and Special cells in Fluid (If indicated)
      1. Add 2 parts alcohol (95%) to one part spinal fluid.
      2. Allow mixture to stand 4 to 12 hours.
      3. Centrifugalize for a long period at high speed.
      4. Pour off supernatant fluid.
      5. Carefully crack test tube and remove cake of cells and precipitate.
      6. Run this cake through routine paraffin method and stain with routine stains.

Routine examination of the cerebrospinal fluid (continued)

5. Total Protein Examination

This test is carried out by the biochemistry laboratory on the sixth floor. Two cc. of cerebrospinal fluid will suffice for this examination.

6. Wassermann Test

Ordinarily 5 cc. of cerebrospinal fluid will suffice for this test. The specimen with special "Wassermann Requisition" should be left in the allotted rack in the third floor laboratory.

Kahn tests are done each week day - Wassermann tests every Tuesday and Friday.

In addition to the above-mentioned routine tests the following additional tests may be requested if indicated:

1. Lange - 0.5 cc. C.S.F.
2. Sugar - 2.5 cc. C.S.F.
3. Chlorides - 2.5 cc. C.S.F.
4. Sulfonamide level - 2 cc. C.S.F.

N.B. If a sulfonamide determination is desired nupercaine should be used as the local anaesthetic. Procaine (novocaine) gives a color which interferes with the chemical determination.

Reference: The Cerebrospinal Fluid by Merritt, H.H. and Fremont-Smith, F. W.B. Saunders Co. 1937.

## EXAMINATIONS OF CEREBROSPINAL FLUID FOR BACTERIA

Many bacteria disintegrate within a few minutes and hence in cases of suspected meningitis smears of cerebrospinal fluid should be prepared at the bedside and stained immediately by Gram's method (vide infra.)

### Gram's Method

1. Allow several drops of fluid to dry on glass slide on the hot plate. Smears are made and similarly dried.

2. Stain in sterling gentian violet solution for 20 seconds.

Formula

| | |
|---|---|
| Gentian violet | - 5 gms. |
| Absolute alcohol | - 10 cc. |
| Aniline | - 2 cc. |
| Distilled water | - 88 cc. |

Directions: Dissolve the gentian violet in the alcohol with the aid of heat. Mix the aniline oil in the distilled water with constant stirring, after adding drop by drop. Filter the aniline water into the alcoholic solution of gentian violet - filter the entire solution again into the storage bottle. The solution keeps remarkably well.

3. Wash slide thoroughly in running tap water.

4. Treat with Gram's iodine solution for 20 seconds.

Formula

| | |
|---|---|
| Iodine | - 1 gm. |
| Potassium iodide | - 2 gms. |
| Distilled water | - 300 cc. |

5. Wash in running tap water.

6. Decolorize with absolute alcohol until no more color comes off.

7. Wash in running tap water.

8. Counterstain with a 1% aqueous solution of safranine for 20 seconds.

9. Wash in tap water and blot with filter paper. The section is now ready for examination under the oil immersion lens. If it is desired to preserve the smear as a permanent specimen it should be cleared in toluol after absolutely dry and mounted in Canada Balsam.

Results: Gram positive bacteria deep violet
Gram negative bacteria red

Examination of cerebrospinal fluid for bacteria (continued)

In cases of SUSPECTED TUBERCULOUS MENINGITIS the fluid should be handled as follows:

1. The fluid (10 - 15 cc.) is collected at the time of lumbar puncture in a small specimen dish containing a cover glass. This is covered and allowed to stand until the pellicle settles on the cover slip (usually 8 - 16 hours).

2. The fluid is then aspirated by a narrow gauge needle and syringe. The needle is placed on the bottom at the side of the dish so that the pellicle is not disturbed.

3. After the fluid has been completely withdrawn the cover slip is removed with slide forceps and dried on the hot plate.

4. Stain by the Ziehl-Neelsen technique for smears.

The cover slips are stained by the Ziehl-Neelsen method as follows:

General remarks: The method described below is particularly applicable to cover slips containing the pellicle from the cerebrospinal fluid of patients having tuberculous meningitis. The method of preparing this cover glass has been described previously. It may also be modified for the staining of smears on glass slides. The latter will, naturally, require larger containers throughout.

Method

1. Place cover glass in small staining dish (glass slide in petri dish) and cover with Ziehl-carbol fuchsin.

Formula

Basic fuchsin, saturated alcoholic solution (about 5.95%) - 10 cc.
Carbolic acid water, 5% - 90 cc.

Directions: Carbolic acid water, 5% - is made by shaking together 5 cc. of melted carbolic acid crystals, and 95 cc. water. Filter solution. It is very powerful, stains quickly and keeps well.

2. Heat to steaming over alcohol flame and allow to steam for 5 minutes.

Examination of cerebrospinal fluid for bacteria (continued)

3. Pour off staining solution, remove cover glass or slide and differentiate in absolute alcohol until the material is a pale pink color. It may be necessary in this step to use acid alcohol (1% hydrochloric acid in 70% alcohol) instead of the absolute alcohol, because of slow decolorization, with the latter. However, if acid alcohol is used the tubercle bacilli do not stain as brilliantly.

4. Wash in distilled water.

5. Counterstain for a few seconds with Loeffler's methylene blue.

Formula

Methylene blue, saturated solution in 95% alcohol (about 1.48%) - 30 cc.

Sodium hydroxide, 1/10,000 aqueous solution -100 cc.

6. Wash in distilled water.

7. Blot and allow to dry in air or with aid of gentle heat.

8. Dehydrate very rapidly with a few drops of absolute alcohol, clear in toluol and mount in Canada Balsam.

Results: Tubercle bacilli are stained a brilliant red against a blue background of the tissue.

Culture: A minimum of 1 cc. of cerebrospinal fluid is required for culture. The fluid should be collected in a sterile test tube and dispatched immediately to the bacteriology laboratory. The person on call for bacteriology should be notified if the examination is done during "odd" hours.

## CEREBROSPINAL FLUID CHEMISTRY

| Constituent | Average | | Range |
|---|---|---|---|
| Specific Gravity | 1.0075 | | 1.006 to 1.009 |
| Total Solids | 1.00 | gms. per 100 cc. | 0.83 to 1.77 |
| Water Content | 99.00 | " " " " | 98.23 to 99.17 |
| Freezing point - °C | -0.570 | | -0.534 to 0.603 |
| Chloride | 440.0 | mgms. " " " | 424.0 to 454.0 |
| Chloride (as NaCl) | 726.0 | " " " " | 700.0 to 750.0 |
| Bicarbonate | 21.0 | millimols per liter | |
| Phosphorus | 1.5 | mgms. per 100 cc. | 1.2 to 2.1 |
| Lactic acid | 15.0 | " " " " | 10.0 to 20.0 |
| Sodium | 324.0 | " " " " | 301.0 to 343.0 |
| Potassium | 13.0 | " " " " | 11.0 to 15.0 |
| Calcium | 5.0 | " " " " | 4.5 to 5.5 |
| Magnesium | 3.0 | " " " " | 1.0 to 3.5 |
| Total base | 155.0 | millimols per liter | |
| Protein | 28.0 | mgms. per 100 cc. | 15.0 to 45.0 |
| Albumin | 23.0 | | |
| Globulin | 5.0 | | |
| Fibrinogen | 0.0 | | |
| Nonprotein Nitrogen | 19.0 | " " " " | 11.0 to 38.0 |
| Urea | 14.0 | " " " " | 8.0 to 28.0 |
| Creatinine | 1.1 | " " " " | 0.5 to 1.9 |
| Amino-acid | 1.6 | " " " " | 1.2 to 2.0 |
| Uric acid | 1.7 | " " " " | 0.4 to 2.8 |
| Cholesterin | 0.14 | " " " " | 0.06 to 0.22 |
| Reducing substances | 65.0 | " " " " | 50.0 to 80.0 |
| Glucose | 61.0 | | |
| Nonglucose | 4.0 | | |

Reference: "The Cerebrospinal Fluid" data by Merritt, H.H. & Fremont-Smith, F. W.B. Saunders Company, 1937.

## ELECTROENCEPHALOGRAPHY

The electroencephalogram (EEG) is one of the later additions to our diagnostic armamentarium. From the clinical standpoint it has been particularly valuable in the following conditions: (It should be remembered that a low blood sugar affects the E.E.G. Patients should not go for this test when fasting).

1. Epilepsy. The clinical differentiation of a focal from a diffuse cortical discharge is frequently difficult. The EEG has done much to obviate this difficulty.

   Before ordering an EEG on these patients the effect of medication on the pattern of the brain waves must be considered. In some instances all anti-convulsive medication should be discontinued for 3 days prior to the recording. In non-hospitalized patients the stoppage of medication is dangerous because status epilepticus may be precipitated. Care must be taken not to produce status epilepticus in any case. Records closely following severe seizures are often confusing.

   When results are negative hydration or ethyl hydroxide regimes may be instituted.

   Lastly, it should be borne in mind that the EEG must be repeated postoperatively on all patients who have had a craniotomy for convulsive seizures.

2. Expanding Lesion. The value of the EEG in the localization of brain tumors is lessened by the presence of increased intracranial pressure. Therefore, if the electrographic diagnosis is felt necessary the intracranial hypertension may sometimes be lowered with intravenous hypertonic solutions. This procedure, however, is frequently contraindicated from the clinical standpoint.

3. Head Injuries. In cases of head trauma the EEG is useful in determining the extent and severity of cerebral damage and in following the recovery from this damage.

References: Jasper, H.H. Electroencephalography - from "Epilepsy and Cerebral Localization" by Penfield, W. and Erickson, T.C. Charles C. Thomas, 1941.

Gibbs, F.A. and Gibbs, E.L. Atlas of Electroencephalography. Lew and Cummings Co. 1941.

Jasper, H.H., Kershman, J. and Elvidge, A. Electroencephalographic Studies of Injuries of the Head. Arch. Neurol. & Psychiat. 44: 328-348, 1940.

## BASAL METABOLISM

This test is carried out by the Montreal Neurological Institute Chemical Laboratory. The technician in this department (Local #218) should be notified by noon on the day before the test so that a trial examination may be done. The tests are routinely performed on Tuesday and Thursday mornings. They should not be ordered for other days unless circumstances warrant the emergency examination. To prepare the patient for the test the following routine should be enforced:

1. No food or drink and No Smoking after 10 P.M. on the day prior to examination.

2. No laxatives on the night before.

3. If the patient has seizures a nurse should remain in the room until the test is completed.

4. In order to assure a good night's sleep the night before the test a mild sedative may be given, such as Phenobarbital, gr. 1½ at bed time (adult). This is recommended only in case the patient is very excitable.

## GASTRIC ANALYSIS

### Passing the Stomach Tube

For gastric analyses the tubes are placed in a pan containing crushed ice. The alcohol-histamine method is perhaps the best. A small tube about 0.5 cm. in diameter is satisfactory. The end of the tube is dipped in white oil before insertion.

It is always well to explain the procedure to the patient so as to secure his cooperation. He is directed to lean slightly forward, to open his mouth, and then when the end of the tube is against the pharynx, to swallow and breathe deeply through the mouth. Just at the moment the patient swallows, the operator pushes gently on the tube to start it down the oesophagus. It should then be pushed in gently and slowly, for quick, uncertain, or rough movements will inevitably make the patient gag and uncooperative.

GASTRIC ANALYSIS (Continued)

Collection of gastric contents

a). Withdraw fasting contents and introduce 50 cc. of 7% alcohol through the tube.

b). Withdraw specimens at ½ and 1 hour intervals following the alcohol and examine for free HCL. (vide infra). If free HCL is present the tube is now removed.

c). If no free HCL is present 0.5 mgm of histamine is administered subcutaneously and samples are again collected at ½ and 1 hour intervals. Occasionally the histamine induces mild or more severe symptoms of shock; administration of 1 cc. of 1:1000 epinephrine is indicated. The nurse should be instructed to watch closely for the development of untoward symptoms and to administer the epinephrine if the houseman is not available, especially if the pulse is very weak.

d). Withdraw the tube.

Examination of gastric contents.

1) Free HCL: Measure 5 or 10 cc. of the strained stomach contents into a white porcelain dish, dilute with 10 or 15 cc. distilled water, add 3 drops of Topfer's reagent (0.5% solution of dimethylamino-azobenzene in 95% alcohol) and titrate with N-10 NaOH until the initial red color is replaced by a salmon pink color; do not titrate to yellow. If no red color appears when Topfer's is added, free HCL is absent. Calculate free HCL in terms of cc. of N/10 acid per 100 cc. of stomach contents.

2) Total Acidity: Add 2 drops of 1% alcoholic solution of phenolphthalein to the above material and titrate with N/10 NaOH to a faint pink color. Calculate total acidity in terms of N/10 acid per 100 cc. of stomach contents, including both the base used for the Topfer's titration and that used for the phenolphthalein titration.

3) Blood: The benzidine test, as given for urine, is employed.

# CHAPTER III

## ACCESSORY CLINICAL EXAMINATIONS

## RORSCHACH EXAMINATION

by

W. Donald Ross.

This method is particularly suited for the assessment of the personality characteristics of the individual being examined. Its validity for this purpose has been shown empirically although the thecretical rationale of the method has nct yet been completely worked out. In essence it consists in the analysis of the interpretations which the subject gives to a standardized set of printed ink blots (1). The technique of administration of the test can be learned by anyone with psychological or medical experience in a few weeks, but the ability to interpret the results requires months of experience under supervision. The taking and interpreting of a Rorschach record from the average hospital patient takes at least one hour of the time of an expert so trained, and often considerably more in the case of more highly intelligent subjects. This should be borne in mind when a Rorschach examination is being requested. The indications for this examination include all cases in which a thorough understanding of the personality of the patient would contribute to diagnosis and treatment. It is particularly useful as a guide to psychotherapy. The method should not be expected to make a diagnosis for the clinician, although in some cases, e.g., many cases of intracranial neoplasm and some psychoneurotics and psychotics, the Rorschach characteristics may be almost diagnostic. Some signs elicited by the method show statistical correlations which might qualify them as diagnostic aids apart from the personality description given by the expert, but the reliability in the use of these has yet to be shown (2). It is helpful to the Rorschach expert if the reason the examination is desired is stated with the requisition, e.g., as a diagnostic aid, or as a help to psychotherapy in disease either with or without structural changes.

References: (1) M.R. Harrower-Erickson: The Patient and His Personality. McGill Medical Journal, 9, 25, October 1941.

(2) W.D. Ross: The Contribution of the Rorschach Method to Clinical Diagnosis. Journal of Mental Science, July, 1941.

## HYPERPNEA TEST

The hyperpnea test of Foerster is carried out by inducing the patient to breathe deeply and rapidly for from 10 to 12 minutes. If he cooperates well, this will produce carpopedal spasm and stiffening of the facial muscles because of the alkalosis induced. If this produces a seizure, it will be typical of the patient's usual attacks. Unfortunately, the method is successful in only a minority of cases. The reflexes should be examined before and after the hyperpnea, as the test sometimes brings out evidence of involvement of one pyramidal tract, which was not apparent before.

Reference: Epilepsy and Cerebral Localization - Penfield, W.G., and Erickson, T.C. - Charles C. Thomas, 1941.

## HYDRATION REGIME

If it is desirable to induce a seizure in a patient undergoing seizure investigation, this may frequently be brought about by hydrating the patient. Administration of pitressin and increased water-drinking is sufficient to cause a sharp rise in the patient's weight. This produces an attack in the majority of cases. In order to avoid plunging the patient into status epilepticus care should be taken to stop the procedure as soon as a satisfactory result is obtained and anti-convulsant drugs administered. This regime, which we have modified with the help of our former associate, Dr. Haddow Keith, after McQuarrie's (1929) original description, may be carried out as follows:

If anti-convulsant drugs are being taken, they are withdrawn a few days before. The 24 hours are divided into four equal periods of 6 hours each. At the beginning of each six hour period the patient voids, and is then weighed carefully. At the end of each period the fluid intake and output are charted.

1. Fluid is forced by mouth up to 3000-6000 cubic centimeters per day, attempting to get in an equal amount in each six hour period.*

2. Pitressin 0.5 cc. is injected intramuscularly every two hours during the procedure.

3. Diet should contain considerable amounts of carbohydrate in various forms.

4. Observation should be continuous by a trained nurse. Pulse taken every hour, blood pressure every 2 hours. Record made of seizures, vomiting, falling blood pressure, fainting.

*Larger amounts of plain cold water will be accepted than if sweetened drinks are used.

HYDRATION REGIME (Continued)

The regime may be carried on for from 24 - 48 hours. Patients should gain weight. They are apt to become pale if the regime is carried on long, and they may be nauseated and abnormally irritable.

(From Epilepsy and Cerebral Localization - Penfield, W.G. & Erickson, T.C. - Chas. C. Thomas, 1941).

## ETHYL HYDROXIDE TEST

This test, like the hydration regime is used to produce in epileptic patients an increase in the amount of recordable electroencephalographic abnormality. The results are less satisfactory than those obtained with the hydration regime.

The patient is given hospital whiskey, ounces 2, at hourly intervals for three doses and then taken immediately to the electroencephalography department where the recording is done. An appointment with the E.E.G. department should be made prior to institution of the test.

## OBSERVATION REGARDING THE SEIZURE PATTERN

1. Premonitory signs - e.g., facial expression, patient's activity, etc.

2. Aura - if patient calls, before an attack, or indicates that something is wrong, ask him quickly what he feels; you may thus learn what his aura is before the convulsion occurs. He may have forgotten his aura afterwards.

3. Site of commencement of attack - i.e., hand, thumb, etc. The FIRST movement is of utmost importance.

4. The pattern of attack, i.e., the order of spread.

5. The side involved and the extent of involvement, e.g., - Did the head and eyes turn? Which side? Did the mouth pull to one side? Which side?

6. Voluntary movements - Was patient able to make any during the attack, and if so, which hand, etc.?

7. Colour changes - pallor, flushing, cyanosis.

8. Degree of perspiration, and lacrimation.

9. Pupillary changes.

OBSERVATION REGARDING THE SEIZURE PATTERN (Continued)

10. Pulse changes.

11. Blood pressure changes.

12. Respiration changes.

13. If there was involuntary micturition and defecation, or not.

14. Duration of attack.

15. Method of termination and length of time to return to normal.

16. Speech difficulty - type and extent.

17. Automatic movements - type and extent.

18. Any other abnormality or significant observation, should be recorded.

NOTE: In writing description of seizure in progress notes state whether the actual beginning of attack was seen.

# EPILEPTIC SEIZURES

## CLINICAL AND ANATOMICAL CLASSIFICATION

| Clinical Type | Localization |
|---|---|
| **Somatic Motor** | |
| 1. Generalized Seizure (Grand Mal) | Complete Motor |
| 2. Jacksonian Seizure (Local Motor) | Pre-Rolandic Gyrus |
| 3. Masticatory Seizure. | Lower Rolandic |
| 4. Simple Adversive Seizure. | Frontal |
| 5. Tonic Postural S. (Decerebrate, Opisthotonic) | Brain stem |
| **Somatic Sensory** (Auras) | |
| 6. Somatosensory Seizure | Post-Rolandic Gyrus |
| 7. Visual Seizure | Occipital |
| 8. Auditory Seizure | Temporal |
| 9. Vertiginous Seizure | Temporal |
| 10. Olfactory Seizure | Infra-Temporal |
| **Visceral** | |
| 11. Autonomic Seizure | Diencephalic |
| **Psychical** | |
| 12. Dreamy State Seizure | Temporal |
| 13. Petit Mal | |
| 14. Automatism (Ictal & Post-Ictal) | |
| 15. Psychotic States (Secondary) | |

Reference: From "Epilepsy & Cerebral Localization" by Penfield, W. and Erickson, T.C., Charles C. Thomas, 1941.

## CLINICAL ANALYSIS OF SEIZURE TYPES

1). If generalized seizures give no evidence of a local beginning, they are apt to be an evidence that no objective lesion of the brain will be found.

2). Jacksonian seizures, which are almost always associated with well localized spikes or sharp waves in the electroencephalogram, argue strongly for the presence of a cerebral lesion near the cortex that should be demonstrable.

3). Masticatory seizures also argue for a local cerebral lesion and the electrographic localization is apt to indicate a somewhat less superficial position with sharp waves in the region of one fissure of Sylvius, or apparently, deep within the temporal lobe. The cause of such seizures may prove to be an atrophic, but perhaps more often an expanding lesion.

4). Simple adversive seizures suggest a lesion which may be placed anywhere over a wide area of frontal lobe.

5). Tonic postural seizures occur as the result of an expanding lesion in the posterior fossa or an increasing pressure originating above the tentorium or, occasionally, local disease of the general area of the mesencephalon. Electroencephalographic study is apt to indicate the location of the expanding cause without detecting potentials typical of an epileptogenic focus.

6). Somatosensory seizures have much the same significance, as far as cause is concerned, as in the case of local motor (Jacksonian) seizures.

7). Visual seizures are suggestive of a demonstrable lesion and the electroencephalogram most often easily indicates an epileptogenic focus by means of spikes or sharp waves.

8 & 9). True auditory-vertiginous seizures may suggest an objective lesion of the brain rather than a functional influence. But such attacks are not infrequent in what may seem to be cryptogenic epilepsy.

10). Olfactory seizures most often prove to be associated with an expanding lesion in, or beneath, the temporal lobe and the encephalographic localization is apt to point to a deep temporal localization.

CLINICAL ANALYSIS OF SEIZURE TYPES (Continued)

11). Autonomic seizures point toward a lesion of the region of the third ventricle which most often proves to be neoplasm but which occasionally seems to be the result of brain trauma. On the other hand, visceral auras such as the epigastric aura associated with any of the various types of seizure, suggests strongly a deep cerebral epileptogenic lesion, as distinguished from a superficial one, but gives little suspicion as to the nature of the cause. The epigastric aura may be associated with a cerebral scar or tumor, or it may be encountered in a cryptogenic case.

12). Dreamy state seizures suggest a lesion in the temporal region that is apt to be superficial but which may well be expanding or atrophic within the lobe. The electrogram is apt to give evidence of an active temporal discharge that may well be superficial.

13). Petit mal argues very strongly for the diagnosis of cryptogenic epilepsy, and the electrogram gives a consistent record of electrical potentials in both frontal lobes that has usually been taken to indicate a diffuse origin. However, it may indicate a focal origin of abnormal potentials near the midline and beneath the frontal lobes.

14). Automatism gives no definite suggestion, as yet, as to localization. It does at times occur after seizures which have originated in one temporal lobe, but the number of such observations is insufficient to carry much evidence.

15). Psychotic states have occurred after a series of seizures that arose from a superficial focus in the posterior part of one frontal area, anterior to the precentral gyrus and, so far as our observations go, this area may be suggested as that most severely injured during the convulsive series.

Reference: From "Epilepsy & Cerebral Localization", Penfield, W. and Erickson, T.C., Charles C. Thomas, 1941.

## FLUID INTAKE AND OUTPUT MEASUREMENTS

The following conditions require a careful measure of the daily fluid intake and output:-

1. Lesions affecting the pituitary body and/or hypothalamus.

2. Hypertension with or without clinical evidence of renal damage.

FLUID INTAKE AND OUTPUT MEASUREMENTS (Continued)

3. During administration of chemotherapy.

4. Following blood transfusion.

5. Routinely after any major operative procedure.

## STANDING AND LYING BLOOD PRESSURE

When ordered, routine procedure will be:

B.P. and pulse - lying.

B.P. and pulse - immediately on standing.

B.P. and pulse - after 5 minutes standing.

B.P. and pulse - lying.

This procedure, when ordered, will be done three times daily for one day and is then automatically terminated unless specifically ordered.

## DEPRESSOR DRUGS IN HYPERTENSION

In the study of cases of essential hypertension it is valuable to know what role vasospasm is playing in the maintenance of the elevated arterial pressure. This information is particularly valuable to the surgeon who will then have an indication of the potential value of radical inferference. To relax this vascular spasm either sodium nitrite or sodium amytal are used according to the following routine:

1. Patient to be kept at complete bed rest.

2. Beginning at 7 P.M. the pulse and blood pressure are recorded hourly.

3. At 10 P.M. the adult patient receives sodium amytal, grains 3. This dose is repeated at 11 p.m. and at 12 midnight - a total of 9 grains. As an alternative sodium nitrite is used. This drug is given in doses of grains ½ repeated half-hourly for a total of 6 doses (3 grains).

4. The hourly observations of pulse and blood pressure are continued until the latter has returned to its previous level or sooner with the permission of the attending medical man.

# CHAPTER IV

## PROCEDURES

N.B. All of the procedures outlined subsequently require that the operation permit be signed.

### Lumbar Puncture

Remarks: This is a surgical procedure and should be done with the best possible aseptic precautions.

Technique: (see figure 3)

1. The patient is postured on the side in a position of maximum flexion. The back should be flush with the side of the bed. Restless patients and children are best restrained in this position by passing a large folded sheet around the neck and beneath the knees and tying securely. The use of a pillow between the patient's knees and a cylindrical roll in the dependent ilio-vertebro-costal space are helpful in posturing the patient.

2. The skin is prepared widely around the point of injection with 2½% iodine and alcohol. (N.B. If excess hair is present it should be shaved before this step.)

3. 1% or 2% novocaine is then injected into the overlying skin and into the fibres of the interspinous ligaments. Nupercaine (1-1500 solution) should be used instead of novocaine if sulfonamide determinations are to be carried out. The interspace of election is that between L 3 and L 4, which lies in the line joining the crest of the ilia, or a little higher.

4. The needle, with stilette in place, is passed perpendicularly inward through the fibres of the interspinous ligaments until the "snap" of its passage through the dura is felt. One should feel the smooth resistance of the interspinous ligaments all the way. If a brain tumor is suspected a small bore needle should be used. It should also be remembered that post-lumbar-puncture headache is less likely if a small needle is used.

5. The stilette is removed and stop cock with the valve handle in the oblique position is quickly attached. If this is done with dexterity no more than a drop of fluid will escape. When increased intracranial pressure is suspected it is better to attach the stop cock before penetrating the dura.

Lumbar Puncture (continued)

6. The manometer is now attached and the initial pressure recorded. One should make sure that the patient's head is now extended a little and that he or she is fully relaxed.

7. If the pressure is not elevated* 2 cc. of cerebrospinal fluid is collected in the first tube for protein determination, 1 cc. in the second tube for cell count and Pandy test and 5 cc. in the third for the Wassermann test. The final pressure is then recorded. In traumatic cases, or where subarachnoid bleeding is suspected, 2 cc. of fluid is collected in each of three tubes and comparative cell counts are done on the first and third specimens. This differentiates between traumatic and true subarachnoid haemorrhage. In addition to the three tube test blood tinged fluid should be centrifuged and examined for xanthochromia which, according to Merritt and Fremont-Smith, may appear within a few hours of the haemorrhage. If the pressure is elevated fluid should not be removed unless authorized by the attending physician. The general rule to follow is that at the first lumbar puncture the pressure should never be reduced more than half of its elevation above 150, i.e., if the pressure is 400 it should not be allowed to fall below 275.

8. A sterile sponge is then wrapped around the needle and the latter quickly removed. The sponge is used to apply pressure over the needle tract.

9. Excess iodine is removed with alcohol and the puncture wound sealed with sterile baked vaseline. A dry dressing is then applied.

10. The patient is then instructed to lie in the ventral decubitus for the next hour. This minimizes the escape of cerebrospinal fluid through the punctured theca.

11. Do not allow patient to sit or stand for at least 12 hours and then only if free of symptoms.

*According to Merritt and Fremont-Smith the upper limit of cerebrospinal fluid pressure in the relaxed patient is 150 mm. of water.

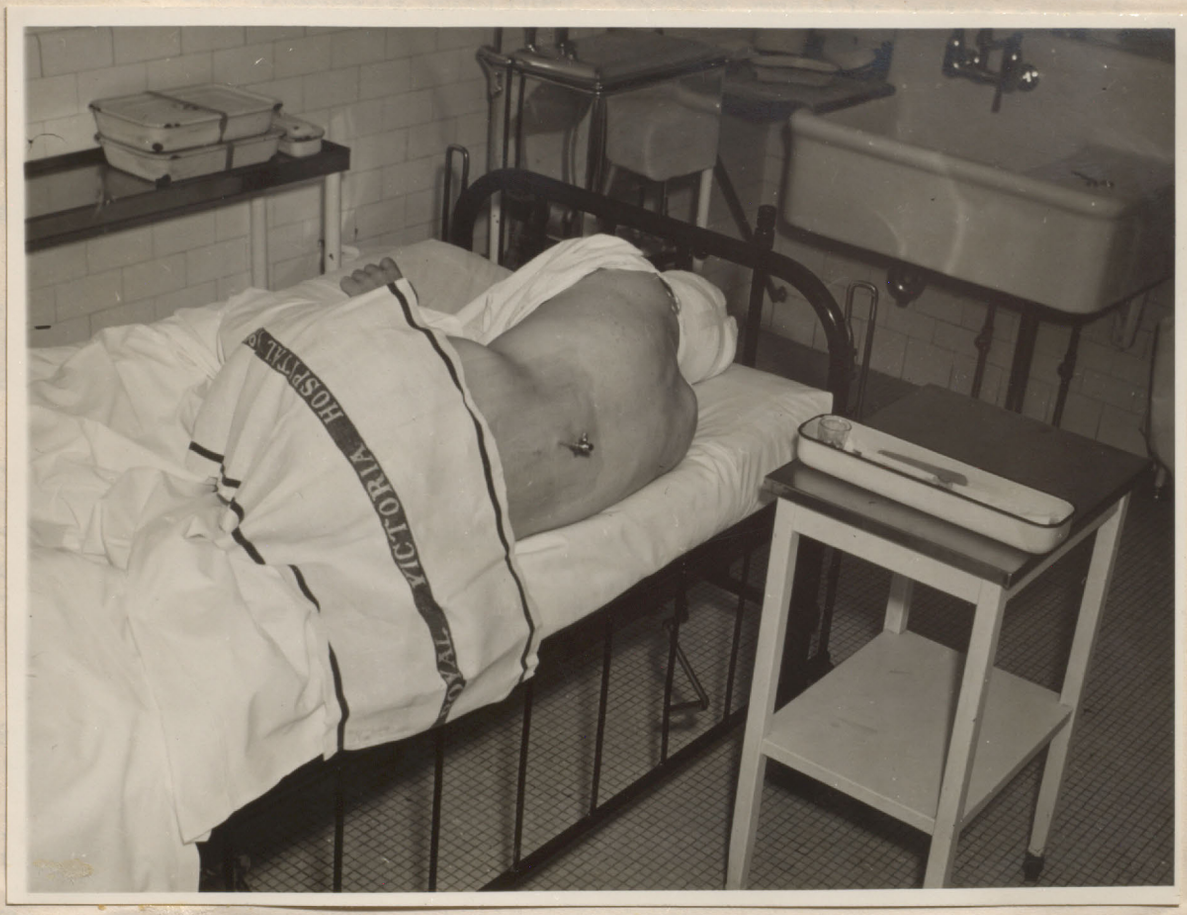



Fig. 3.

## Lumbar Manometric Test

The venous return from the brain takes place through internal jugular and vertebral veins; that from the extracranial structures of the head, through the external jugular veins. The extracranial and intracranial circulations are connected through the various large emissary and diploic veins of the skull. The amount of blood returning from within the cranium, by either of the channels outlined, varies greatly under normal physiological conditions.

With the method of accurately controlled jugular compression it is possible to produce a graduated obstruction to the venous return. The great gap between momentary touch compression and deep jugular compression is eliminated. Partial blocks are more clearly proved.

Furthermore, it gives a measured, graduated jugular compression which can be duplicated in the same individual, gives a standard which can be used from patient to patient and lastly, brings the results of different operators into closer agreements.

Procedure: (see figure 4) An ordinary blood pressure cuff is wrapped loosely about the neck. It is then completely covered by several layers of gauze bandage to prevent undue expansion of the rubber bag and to decrease the amount of pumping required in its adjustment. If it is too tight it may obstruct the venous return somewhat so that the initial pressure is slightly raised, but it does not alter the character or magnitude of the responses. If it is too loose it means only that more pumping is required to obtain the desired pressure readings. The mercury manometer or a gauge of the aneroid type is then attached to the cuff around the neck. The lumbar puncture is done and a spinal fluid manometer of the Ayer type attached. When the pressure has become stabilized the initial readings are taken and the oscillations due to respiration and pulse are recorded.

To compress the jugular veins the cuff is pumped up as rapidly as possible to the desired pressure and held there for ten seconds, and then the pressure is suddenly released. The cuff is first inflated till the gauge registers 5 mm. of mercury and released after ten seconds. When the fluid in the manometer has come to rest the cuff is again pumped up, this time to 10 mm. The same procedure is repeated five times, using cuff pressures of 20, 40, and 60 mm. On releasing the pressure in the cuff, manometric readings are made every 5 seconds until the fluid level remains stationary.

The results are recorded on the standard form. The operator must leave his impression and sign it.

Reference: From Grant, W.T. and Cone, W.V. - Graduated Jugular Compression in the Lumbar Manometric test for Spinal Subarachnoid Block. Arch. Neurol. & Psychiat. 32:1194-1201, 1934.

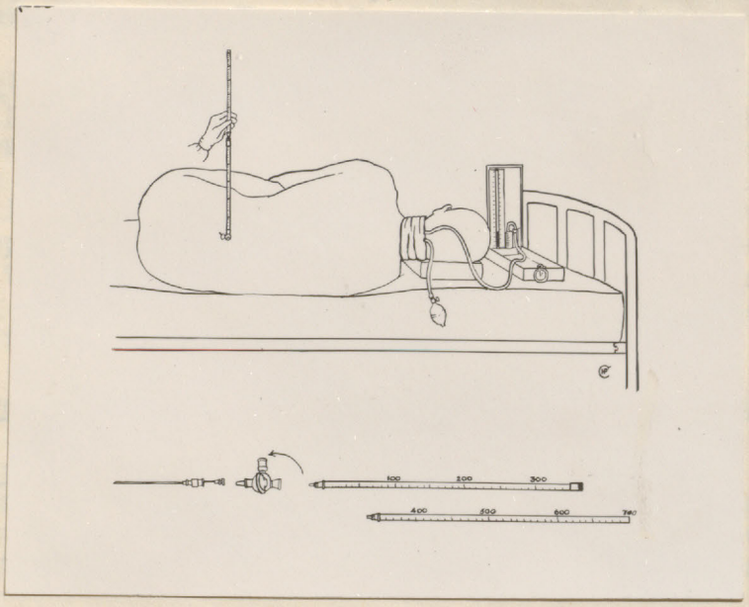



Fig. 4.

# MYELOGRAPHY

## Pneumomyelography

I. Cervical Subarachnoid Space: This procedure is useful for x-ray visualization of the upper cervical subarachnoid space.

a) Preparation of the patient:

1. Pre-operative sedation as under pneumoencephalogram.
2. Nothing by mouth for the previous 6 - 8 hours.
3. Book procedure on X-ray Department appointment blackboard.

b) Procedure: Lumbar puncture is done in the X-ray Department with the patient in the erect pneumogram position beside the x-ray chest stand. Removal of cerebrospinal fluid and replacement by oxygen is carried out as in a pneumoencephalogram. All available cerebrospinal fluid is removed. Stereoscopic lateral x-ray films are then taken without changing the patient's position. Additional films as suggested by the attending physician or the Radiologist are then taken.

c) Post-Operative Orders: As under pneumoencephalogram.

II. Lumbar Subarachnoid Space: This procedure is useful in x-ray visualization of lesions of the lumbar region. A previous lumbar puncture should not be done if this procedure is contemplated. The procedure is carried out on the x-ray table.

1. L.P. as previously described is done between L 2 and L 3.

2. 40 - 50 cc. of cerebrospinal fluid are removed; the table is then tilted twenty-five degrees with the head down to determine whether any more cerebrospinal fluid is below the needle in the lumbo-sacral region.

3. 90 cc. of oxygen are then injected into the subarachnoid space through the needle -- care being taken that there is no leakage.

4. The table is then tilted to an angle of about 40 degrees with the head down and the patient's pelvis is shaken to attempt to free any fluid which is clinging as droplets to the cauda equina.

5. X-ray films are then taken as suggested by the Radiologist.

MYELOGRAPHY (Continued)

III. Myelogram - Pantopaque

1. Preparation of the patient:

a) No sedation necessary unless the patient is having considerable discomfort.

b) Book procedure for 3:30 p.m. or 4:00 p.m. on the X-ray Department appointment board.

c) It is important that no previous lumbar puncture should have been done for at least two weeks.

2. Preparation of Pantopaque:

The ampoules of Pantopaque may be sterilized by boiling without deleterious effects. One 5 cc. ampoule or two 3 cc. ampoules should be prepared.

A special myelogram set which is autoclaved in the Operating Room is used. This set contains one long and one short hypo needle, 2 cc. syringe, medicine glass, sponges, haemostat, 2 #18 lumbar puncture needles, 2 test tubes, 5 cc. syringe, tongue depressor, sterile dressings, and a metal file.

The patient is placed in the prone position of the x-ray table with a pillow (not rubber covered) under the lower abdomen. Lumbar puncture is done in the interspace between the 3rd and 4th lumbar spinous processes (unless that level is contraindicated). It is particularly important that the puncture be an accurate one. Fluid is removed for Pandy, protein and cell count, as indicated.

Pantopaque is aspirated into the 5 cc. syringe and 1/4 cc. injected into the subarachnoid space. The stillette is replaced in the needle and a sterile dressing is fastened on with adhesive so as to cover the needle and adjacent sterile area.

Fluoroscopic check on the position of the material injected is then carried out by the Radiologist. If the Pantopaque proves to be freely movable in the subarachnoid space the remainder of the injection may then be carried out. The needle is again covered with the sterile dressing.

Fluoroscopic studies are carried out and spot films taken with the needle in situ. For visualization of the dorsal or cervical subarachnoid space, it may be necessary to place an additional pillow under the pelvis or else turn the patient end for end on the table and apply traction boots. The original position is again resumed, after fluoroscopic studies have been completed, so that the Pantopaque may be aspirated.

3. Aspiration of Pantopaque:

Aspiration of the Pantopaque is carried out under the supervision of the Radiologist by means of fluoroscopic control. The radio-opaque material should be aspirated by gentle steady traction on the syringe plunger, using the 5 cc. syringe. Other factors being equal the success of aspiration depends on the accuracy of the original lumbar puncture. Under ideal conditions the aspiration should be complete or very nearly complete.

MYELOGRAM-LIPIODOL

1. Preparation of the patient: Same as under myelogram-Pantopaque.

2. Preparation of Lipiodol: Lipiodol must not be boiled because of the danger of liberation of free iodine. The method of ampoule sterilization used at present is immersion of the 5 cc. ampoule in pure phenol solution over night or for twelve hours. It has been found that the use of strictly dry syringes has greatly reduced the incidence of post-myelographic reactions.

3. Procedure: The procedure is similar to that noted above under myelogram-Pantopaque.

4. Aspiration: Because of its higher viscosity the aspiration of lipiodol is more difficult but the method described above has proven very satisfactory.

## Technique of Pneumoencephalography

Preparation:

1. No food or fluids for at least 4 hours prior to the procedure.

2. Book the procedure the night before on the X-ray Department appointment blackboard.

Technique of Pneumoencephalography (continued)

3. Premedication: The following is a table of pre-pneumoencephalogram medication calculated according to the weight of the patient in pounds.

| Patient's weight in pounds | Hyoscine | Morphine |
|---|---|---|
| 90 - 95 | Gr. 1/200 | Gr. 1/12 |
| 95 - 100 | Gr. 1/175 | Gr. 1/11 |
| 100 - 110 | Gr. 1/160 | Gr. 1/10 |
| 110 - 120 | Gr. 1/145 | Gr. 1/9 |
| 120 - 130 | Gr. 1/135 | Gr. 1/8 |
| 130 - 140 | Gr. 1/125 | Gr. 1/8 |
| 140 - 150 | Gr. 1/115 | Gr. 1/7 |
| 150 - 160 | Gr. 1/110 | Gr. 1/7 |
| 160 - 170 | Gr. 1/105 | Gr. 1/6 |
| 170 - 180 | Gr. 1/100 | Gr. 1/5 |
| 180 - 190 | Gr. 1/100 | Gr. 1/4 |
| 190 - 200 & over | Gr. 1/100 | Gr. 1/4 |

The hyoscine is given 2 hours prior to the injection and repeated one hour before the injection. The morphine is given 15 minutes prior to the injection.

This "Twilight Sleep" pre-medication is used on Dr. Penfield's and Dr. Elvidge's cases. There is no routine pre-medication for Dr. Cone's cases.

Children and very uncooperative adults are best done under avertin or intravenous sodium pentothal anaesthesia. Paraldehyde and codeine have been used at times with varying degrees of success.

NOTE: Patients with increased intracranial pressure should not be given the above premedication without first consulting the staff physician or surgeon.

Technique of Pneumoencephalography (continued)

Procedure: (see figure 5)

1. The patient is postured in the sitting position on the side of the bed. The knees and thighs should be well flexed and the feet supported on a chair. The head, with the back of the neck stretched and arched, is held forward at an angle of 25 or 30 degrees by an assistant. The arms are supported on an adjacent adjustable table (see illustration on next page).

2. The back is prepared for the insertion of the needle in the manner described for lumbar puncture. The bed is draped as a sterile field with two towels over a rubber sheet. The latter is placed somewhat beneath the patient to avoid soiling the bed.

3. After preliminary infiltration of the skin with Nupercaine a #18 needle is inserted in the interspace between L 3 and L 4 or between L 4 and L 5. With the recovery of fluid the stop-cock is rapidly inserted with the valve closed.

4. If the cerebrospinal pressure is not increased (i.e., if the tip of the column of fluid is below the vertex) 10 cc. of oxygen are slowly injected and 5 cc. of cerebrospinal fluid removed, using an accentric tip syringe (see illustration). In the event of increased intracranial pressure the procedure is not continued without consulting the attending physician. The cerebrospinal fluid should never be removed initially because of the necessity of maintaining the patency of the foramina of Magendie and Luschka. Five cc. exchanges of oxygen and cerebrospinal fluid are then made. The intrathecal pressure and pulse should be recorded after the injection of each 30 cc. The pressure, as recorded in the manometer, should be kept constant by increasing or decreasing, within reasonable limits, the proportionate exchange of oxygen and cerebrospinal fluid.

5. After the injection of 40 cc. and again after 80 cc. of oxygen, the head should be placed in a position of slight hyperextension and slowly turned to both right and left sides with slight oscillation. This elevates the temporal horns and makes for a more complete filling of the ventricular system. After this manoeuvre the head is again slowly returned to the previous position of slight flexion on the chest.

6. In cases where it is desirable to visualize only the ventricular system, 50 to 80 cc. of oxygen will suffice. However, if the complete visualization of the subarachnoid space is desired the procedure should continue until oxygen is returned in the lumbar puncture needle (usually 120 cc.).

Technique of Pneumoencephalography (continued)

Procedure: (See Figure 8)

Fig. 5.

Technique of Pneumoencephalography (continued)

Procedure: (See Figure 5)

Fig. 5.

Fig. 6.

Technique of Pneumoencephalography (continued)

7. At the end of the procedure the needle tract and back are treated in the manner described for lumbar puncture.

8. The patient is then placed in a semi-Fowler's position, with the head held in the midline and transported to the X-ray Department.

9. In the x-ray room the initial four films consist of stereo anteroposterior and stereo lateral views with the brow up. These are developed and if ventricular filling is satisfactory the remaining films are taken. These consist of stereo lateral with the brow down and stereo P.A. with the brow down. The head is then oscillated to fill the right and left lateral ventricles with special attention to the temporal horn and stereo right and left lateral views are taken to complete the series.

   In oscillating the head care should be taken that it is not placed below the horizontal plane because the ventricular oxygen may escape through the aqueduct and 4th ventricle into the subarachnoid space. The lateral ventricle on the side of the lesion should always be filled first.

10. The intern carrying out the procedure must stay with the patient in the X-ray Department, oscillate the head, fill out the x-ray requisition, return to the ward with the patient and write the post-encephalogram orders in the order book.

11. Following the taking of the x-rays the patient is kept flat and the pulse recorded every thirty minutes for four hours and then every hour until satisfactory.

12. Headache is treated with aspirin and phenacetin. In certain instances oxygen inhalations and codeine subcutaneously may be indicated.

## Spinal Subdural Insufflation

At the end of the second, third or fourth week after head injury any patient who seems to have developed a chronic headache of the post-traumatic variety should be treated by a spinal insufflation of air in order to relieve the condition before it has had time to become well established. Encephalography, with filling of the ventricles, is therapeutically useless.

Outline of Pneumoperitoneum Follow-up Technique (continued)

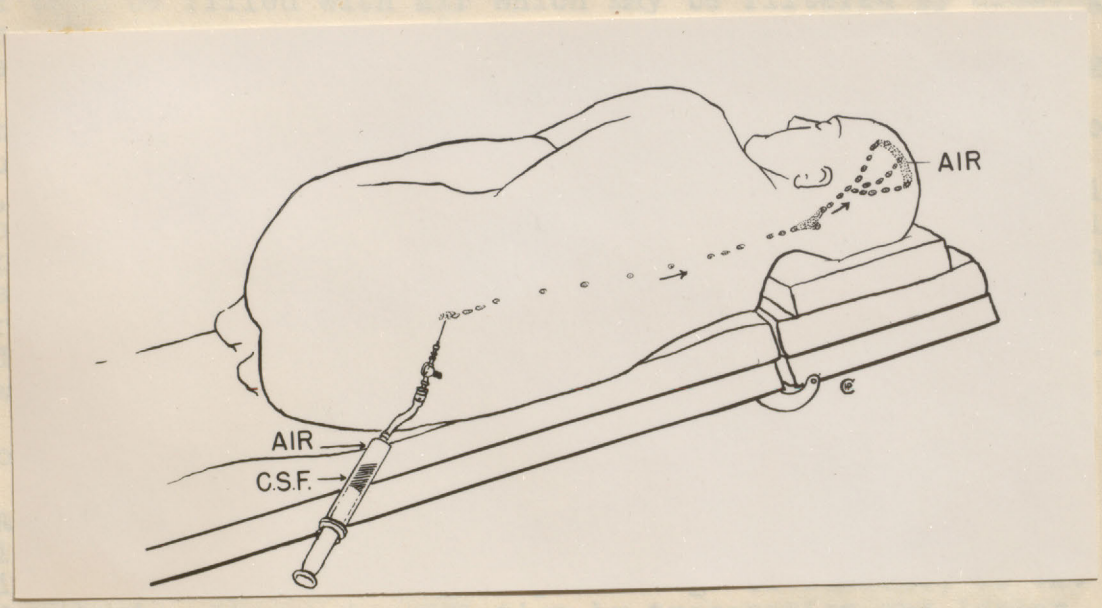



Fig. 7.

Spinal Subdural Insufflation (continued)

Therapeutic insufflation should be carried out as follows: Place the patient on his side and with his head rotated half way to the vertical with the side of the head on which the headache occurs uppermost. The head of the bed should be somewhat elevated. Lumbar puncture is done and as much spinal fluid withdrawn into a large syringe as possible without undue discomfort (20 - 60 cc.). The syringe should then be filled with air which may be filtered by drawing it through a gauze sponge. The syringe is then reinserted in the needle and air injected in 5 to 10 cc. amounts, withdrawing aqual amounts of fluid, until 50 to 90 cc. of air have been injected. When injected in this way the air passes upward into the subarachnoid spaces of the basal cisterns and intergyral sulci, avoiding the ventricles, and breaks through the arachnoid membrane so that it enters the subdural space over the cerebral hemisphere. Alteration of head position every 5 minutes during the next hour will carry the air to different portions of the subdural space and thus allow the brain to pull away, breaking its adhesions. The brain thus assumes its normal resting position within the subdural space. This procedure is painful. It is well therefore to administer premedication as outlined previously for encephalography.

At a later stage, after the patient is up and about, spinal insufflation may also be used as treatment, but a more certain procedure, with a higher percentage of success, is the second method: direct insufflation by trepanation and lumbar puncture.

## Direct Subdural Insufflation

The patient is placed on his side on the operating table. A small scalp incision is made at the site of his head-pain and a hole is made in the bone with a perforator and burr. The dura is then opened. The head of the table is raised slightly and a lumbar puncture needle is inserted and, as the spinal fluid escapes from the needle, the brain falls away from the overlying skull. The scalp is then sutured in two layers with particular attention to haemostasis because of the fact that the dura is left open. A small hollow needle may then be passed through the scalp and not more than 10 cc. more air injected into the burr hole. This further displaces brain from dura. Care must be taken at this point as tributory veins to the longitudinal sinus may be broken by the exertion of too great a pressure. To guard against this, the procedure should always be carried out under local anaesthesia so that the patient will object if too great a traction be exerted upon such a vein. To lessen the pain morphine may be used during the period of head oscillation which should follow the procedure.

Reference: (From "Military Neurosurgery" by Penfield, W. 1941)

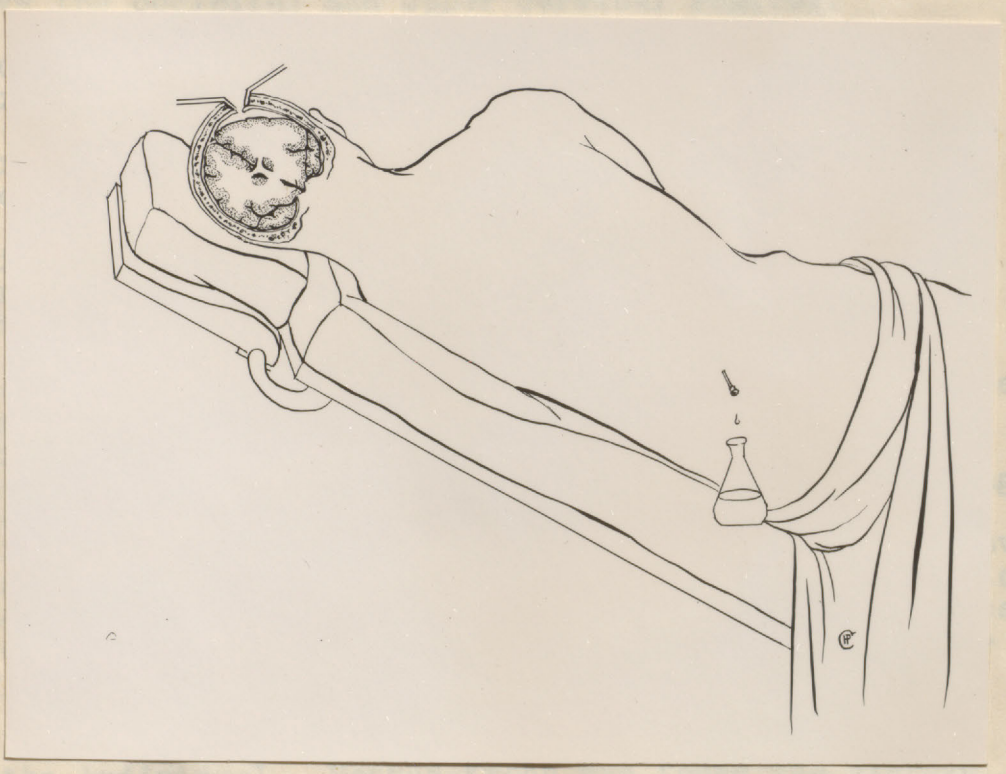


Fig. 8.

## Cisternal Puncture

This procedure is rarely indicated. It is occasionally used for the injection of various sera, chemotherapeutic agents and radio-opaque media, for combined lumbar and cisternal puncture and less frequently to obtain specimens of cerebrospinal fluid for examination. One advantage of this method is the absence of the "post-puncture" headache.

Procedure: The standard lumbar puncture set is used.

1. Shave the occipital and upper cervical regions.

2. Place the patient on the side with the head in maximum flexion.

3. Sterilize the skin in the manner outlined for lumbar puncture.

4. Infiltrate skin with novocaine or nupercaine at a point ½ inch above the spinous process of the second cervical vertebra (the highest palpable spinous process).

5. Insert an 18 or 20 gauge lumbar puncture needle which has been previously measured off, so that the operator is aware of the depth to which the needle has penetrated. The needle should be directed forward in a plane passing through the external auditory meatus and the nasion. It is often advisable to direct the needle somewhat above this plane so that it comes in contact with the occipital bone. The point may then be depressed so that it passes through the atlanto-occipital ligament with the characteristic "snap".

6. The depth of the cistern varies according to the size of the individual. Monrad-Krohn has found the average depth in cadavers and patients to be 4.3 centimeters. Therefore, when a depth of 2.5 centimeters has been reached, the stilette is removed to see if fluid escapes. The needle is then carefully advanced in 0.5 centimeter phases removing the stilette with each advance until cerebrospinal fluid escapes. A depth of 6 cms. should never be exceeded.

7. ALWAYS BEAR IN MIND THAT THE MEDULLA LIES DIRECTLY IN THE PATH OF THE NEEDLE.

8. The recording of pressure, withdrawal of fluid and care of the skin are essentially similar to the technique outlined for lumbar puncture.

Procedure:

## Surgical Exposure of Veins

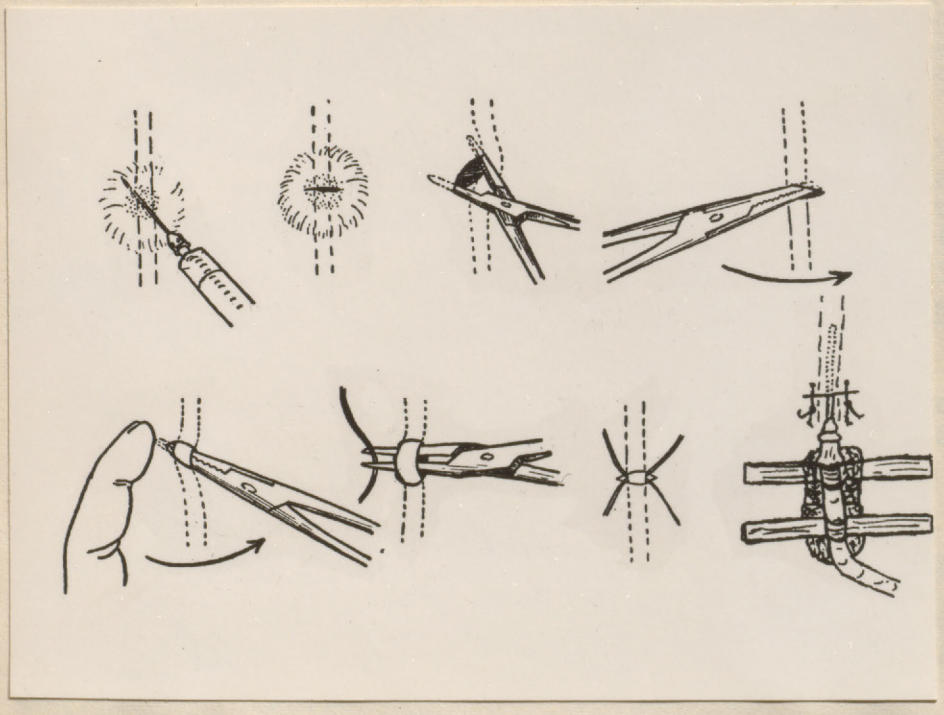
Occasionally when a collapsed vein cannot be made to fill and speed is essential, it is necessary to expose a vein surgically. This can be a swift, neat and accurate procedure but usually is accompanied with a great deal of unnecessary bungling. Unless they have been sclerosed by frequent administrations of hypertonic solution, veins can be found at the antecubital fossa or at the medial malleolus. If injections have been made in the arm veins the latter location is the preferable one to use, particularly when the patient is on the operating table.

A tourniquet is applied well above the vein to be exposed. The vein is discovered by palpation if possible. If it is not palpable, it must be discovered after the incision is made. The extremity is painted with tincture of iodine well beyond the vein area, is supported by a nurse and towels are wrapped around it, above and below the operative area and secured with clips. The third towel is placed on a table and the extremity is laid upon it. A wheal of nupercaine is raised in the skin directly above the vein and the subcutaneous tissue is infiltrated down to the fascia for 1" around the wheal. With a gauze pledget this is massaged into the surrounding area. Under general anaesthesia this is of course unnecessary. With the scalpel an incision is made through the wheal, across the vein. This need not be more than 1 cm. in length in the majority of cases. The usual mistake is to make the incision in the direction of the long axis of the vein and too long, thus necessitating waste of time with oozing of blood from severed small vessels. The incision is made cleanly into the subcutaneous layer and the point of a hemostat is introduced. The blades of the forceps are forced open rapidly several times in different directions. This strips the subcutaneous tissue from the vein and the deep fascia upon which it lies. The tip of the hemostat now is pointed across the incision and is introduced down to the deep fascia. The tip is now worked slowly across and upward to the surface and in almost every instance it will be found to have the vein upon it. If the vein is not there, the manoeuvre is repeated until it is found. A strand of very fine nylon suture is grasped by the hemostat and pulled through under the vein. A needle of suitable calibre now can be introduced into the vein and the tourniquet released. If a cannula is to be inserted, the tourniquet is released, a small area of the exposed vein is grasped with a mosquito forceps and a nick is made into the wall, being sure to enter the lumen. The cannula then can be introduced and tied in place with a strand of the suture material, the free ends of which are cut off <u>on the knot</u>. The skin is closed with one skin suture that can be removed three days later. Connection is made with the intravenous tubing from which air has been expelled and the wound is dressed with a small moist sulfonamide crystal dressing.

Surgical Exposure of Veins (continued)

If a vein cannot be secured through the incision, do not lengthen the incision. Close it with a skin suture and repeat the procedure a few centimeters to the side of this area. This method will allow infusion to be started within ten minutes in 90 to 95% of cases.

Reference: The Hospital Care of Neurosurgical Patients. Wallace B. Hamby.



# THE "BOTH" RESPIRATOR

## MANAGEMENT AND NURSING OF PATIENTS

### Placing the patient in the Respirator for the first time:

Before bringing the patient to the machine make sure that the apparatus is working by switching on the motor, closing the respirator, and holding an object, such as a pillow or cushion, against the opening through which the patient's head is to pass. The manometer on the side of the cabinet will then register the fluctuations in pressure within the cabinet. The level of the water in the manometer should show a variation of at least 10 cm. (of water) on the scale. If the oscillation is less than this, try closing the valves on the top of the pump chamber and on the top of the cabinet. Small leaks do not matter, but if, under the conditions of the test, the fluid in the manometer cannot be made to oscillate to the required degree, there is a large and serious leak somewhere. If the site of this is not obvious at once, it may be that the bellows is torn.

When it is certain that the machine is in good working order fasten the rubber diaphragm to the headpiece. Then undo the clamps and open the cabinet to its full extent and prepare the cough.

Start the motor now, before putting in the patient.

Three persons are required to place an adult in the cabinet, two for a child. In the case of an adult, two persons should approach the patient from the same side, lift him from the stretcher and place him on the couch of the respirator with his head against the rubber diaphragm. The third person then takes up his position at the head of the machine, passes his hands through the rubber diaphragm and grasps the head of the patient on either side. He then draws the head through the rubber

The "BOTH" Respirator (continued)

diaphragm, keeping it well flexed, whilst the other two lift the patient and gently push. As soon as the head has been brought through the diaphragm, push the couch back and close the machine. Even though, at this stage, considerable leakage may be taking place around the neck, the patient will be reassured by the feeling of suction, and his breathing will be assisted. Support the patient's head in a comfortable position by means of pillows. In order to safeguard the neck against the effects of friction, place around the patient's neck a collar of lint, well greased with a suitable grease, such as vaseline or lanolin. Tuck the collar in well all around between the neck and the rubber diaphragm. If, after this, there should still be any leakage at the neck, place cotton wool firmly around the neck between the lint collar and the diaphragm. Lastly, unclamp the diaphragm once again and slip in behind and in front of it the thin metal templates provided and quickly clamp up the diaphragm, with the templates in position. These will reduce the movements of the diaphragm, and hence any tendency to chafe the neck, to a minimum. It has been advisable to tilt the machine to secure drainage of the air-passages. When there is mucus in the throat, a sucker is very useful.

When the patient has been comfortably settled, adjust the valves on the top of the cabinet and on the top of the pump chamber, until the required variation of pressure, as indicated by the manometer, is obtained. Generally speaking, this should be about 15 cm. of water. The rate of the machine per minute, the pressure in centimetres of water, and the inclination of the cabinet should be determined by the medical officer in charge and should not be altered without his instructions.

General Nursing:

In most cases it is possible to open the machine for a few minutes at a time in order to nurse the patient. Before doing so, see that everything is ready and explain to the patient what is going to be done. Get him to understand, if possible, that he is not in any danger and ask him to make an effort to breathe. For the first day or so, it is wise to insert a nasal catheter for continuous oxygen before unclamping the respirator.

Do not stop the motor.

Open the apparatus and slide out the couch, remove the blankets. If time allows, treat all pressure points, then recover the patient and close apparatus. Do not attempt to bathe the patient unless he can remain out of the machine for a quarter of an hour.

As improvement occurs, the length of time for which the respirator is open may be progressively increased. Do not switch off the motor until the patient shows considerable signs of assurance of his own ability to breathe. It is a good plan to insert a fresh lint collar daily.

It is important to turn the patient's head every two hours to relieve undue pressure on the back of the head.

Feeding:

Generally speaking, the feeding problems are those presented by any helpless patient and, as such, need not be described here. Fluids may be sucked through a bent glass tube. Sometimes the patient has not the power to suck, and when that is so a pipette may be used to give small half-hourly feeds. Where there is pharyngeal paralysis, special care must be taken to see that food remnants are not left in the mouth or throat.

Taking the patient out of the machine:

Do not attempt to remove the patient from the machine until the stage is reached where he remains comfortable for at least two hours when the machine is open. If he can manage for this length of time with the machine open, and the motor stopped it is worth while removing him entirely from the machine. On the first few occasions, leave the rubber neck-piece around the patient's neck. It may help the patient considerably to see and hear the motor going, even though he is not in the machine. Gradually increase the time out of the apparatus, and when the patient is able to remain out for as long as three or four hours the rubber neck-piece can be removed.

A patient should be encouraged to sleep while he is out of the machine. The patient should remain in the respirator at nights for some time after he is able to stay out all day.

The difficulties encountered on removing a recovering patient from the machine are chiefly psychological, and for this reason, great care should be taken to soothe and encourage the patient. Sometimes a patient whose respiratory mechanism is still damaged, but able to carry on if undisturbed, will be stricken with panic when taken from the respirator, making intense, irregular and fatiguing efforts to breathe more deeply. These efforts become progressively more inefficient and cyanosis rapidly develops. These efforts may be due to unnecessary alarm and can be avoided if the pump is kept working and the machine left open, at first without the patient's knowledge. Some patients require a relatively prolonged course of treatment at this stage.

# CHAPTER V

## PRE-OPERATIVE ROUTINE

A. Examine:-

a). The scalp - the presence of folliculitis or eczema are contraindications to operation, except in the case of emergency. These various skin lesions should be treated by clipping the hair and the application of wet dressings. The assistance of the dermatologists is frequently necessary.

b). The heart and lungs - lesions may contraindicate certain types of anaesthesia, or rarely, the operative procedure.

c). Other conditions - coryza, fever, sore throat, etc. are contraindications to surgery and the surgeon in charge must be notified.

BE SURE THAT THE OPERATION PERMIT HAS BEEN SIGNED BY THE LEGALLY RESPONSIBLE INDIVIDUAL.

B. Notify:-

1). The relatives - so that the important aspects of the operation may be discussed with them.

2). The referring doctor - on the night before the operation.

3). The chaplain - for all Roman Catholic patients.

C. Pre-Operative Orders:-

1). Nature and Time of Operation -

The nature of the operation and the time the patient is to be dispatched to the operating room should be written in the order book. Arrangements should be so made that the patient will be in the operating suite 60 minutes prior to the time set for operation if avertin is to be given and 30 minutes in advance if gas-oxygen-ether or local anaesthesia are to be used.

PRE-OPERATIVE ROUTINE (Continued)

2). Shaving -

a). Scalp: In certain instances and especially in women, only the site of operation is shaved (Dr. Penfield). Generally the entire head is shaved for all craniotomies. The shaving should be done on the morning of operation.

b). Back and other areas: These are shaved fairly extensively around the proposed site of operation. High thoracic or cervical laminectomies should have the occipital scalp shaved in addition to the back. All cases with spinal cord neoplasm should have the entire back shaved. Meningoceles must be shaved by the surgeon not by the hospital orderly.

3). Post the patient's weight in the operating room.

4). A saline enema is to be given to all patients on the night before operation except those with increased intracranial pressure.

5). All food and fluid administration is stopped during the last 8 hour period prior to operation except for 200 cc. of sweetened fruit juice which is given 3 hours before the procedure.

6). Pre-Operative medication -

a). Avertin anaesthesia.
Codeine, grs. 1 and atropine, grs. 1/150 (adult dosage) hypodermically are given at the time of call to the operating room.
Avertin must not be ordered for patients with liver damage or hypertension cases, unless specifically requested by the surgeon.

N.B. In the event that the procedure planned is a ventriculogram followed by the craniotomy only the codeine should be given. The atropine should be sent to the operating room in a sterile syringe ready for administration.

b). Gas-oxygen-ether.
Morphine, grs. 1/6 to 1/4 and atropine, grs. 1/150 hypodermically are given to adults.

c). Local anaesthesia:
Codeine, grs. 1 or morphine, grs. 1/6 to 1/4 hypodermically. Atropine should not be ordered.

Epileptic cases undergoing craniotomy under local anaesthesia should be given a full breakfast 2 hours before operation.

PRE-OPERATIVE ROUTINE (Continued)

7). Blood -

On the morning of operation the interne in charge of the case should order 500 cc. of blood of the proper type from the Blood Bank and make the necessary arrangements for the cross-matching. This, of course, applies only to major procedures, (See regulations of the Blood Bank).

## BLOOD TRANSFUSIONS AND THE BLOOD BANK

In all major surgical procedures the interne in charge of the patient is responsible for obtaining blood from the bank. He should also make the necessary arrangements for its replacement. It is important that every attempt be made to maintain credit in the bank.

The interne should obtain 500 cc. of blood on the morning of operation. If he is operating he should arrange for the cross-matching and delivery of the blood with another member of the interne staff. The blood should be in the refrigerator in the operating room 30 minutes after the case is posted to start.

All blood used from the bank must be recorded on the chart on the notice board in the operating room, as well as the date and the amount of replacement. This procedure should be followed whether the blood is given to the patient in the operating room or on the ward.

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## DETAILS OF VARIOUS TECHNIQUES IN THE TYPING AND CROSS-MATCHING OF BLOOD PREPARATORY TO TRANSFUSION

by

G.J.E. van Dorsser

The methods featured are those in use at the Blood Bank of the Royal Victoria Hospital, Montreal, where they have proved very satisfactory.

Throughout, international nomenclature has been used rather than the systems of Moss and Jansky. These latter systems lead to considerable confusion.

BLOOD TRANSFUSIONS AND THE BLOOD BANK (continued)

1. Prerequisites.

Cell suspensions and sera should be reasonably fresh and uncontaminated, clean tubes being used and fresh saline or citrate saline solution.

Sera should be entirely clear of all particulate matter.

All cells in the suspensions should be distinct and with no evidence of haemolysis.

All equipment must be clean.

2. Technique of grouping.

The technique of grouping is described graphically in Figure 1. One drop each of the appropriate grouping sera is mixed with a drop of the unknown cells. Either by means of mechanical agitation or by means of gentle rocking in the hands of the operator the mixtures are agitated for about 10 to 15 minutes.

ALL readings should be done microscopically. NEVER ACCEPT A NEGATIVE RESULT THAT HAS BEEN READ ONLY BY THE NAKED EYE.

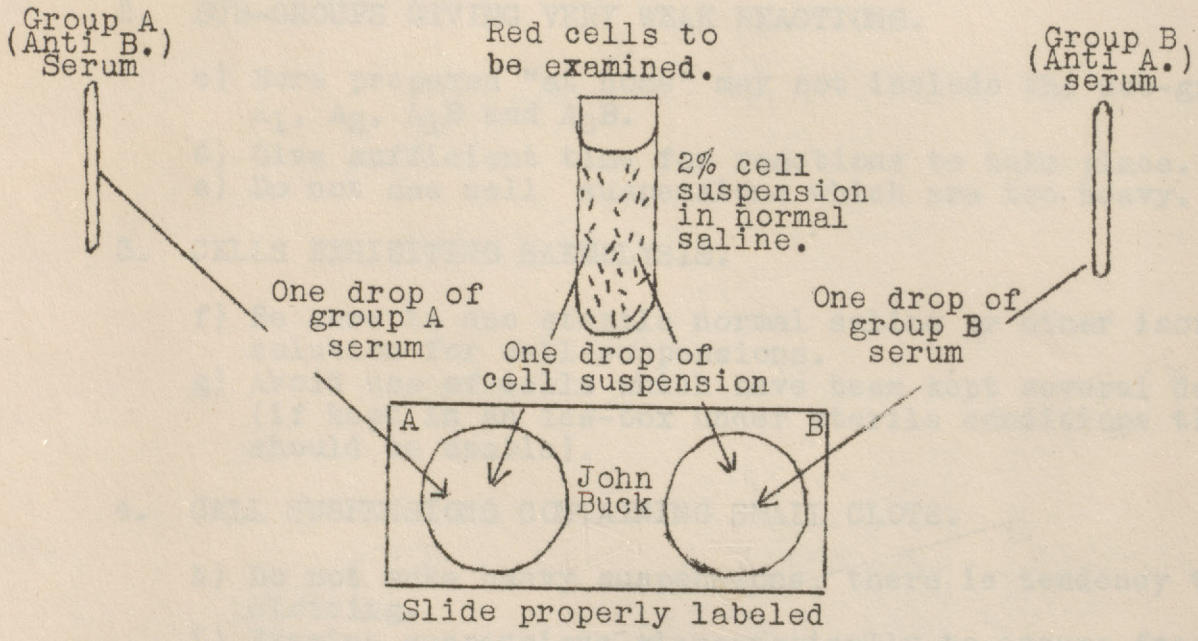
An alternative method is the substitution of Kahn precipitation tubes for the microscope slide. In this method two tubes are employed, one for each typing serum. A drop of the serum and a drop of the cell suspension is placed in the appropriate tube, agitated gently to mix, allowed to stand for a minute or so and centrifuged at 500 R.P.M. for 3 minutes. Readings are done microscopically if not positive on macroscopic observation.

Figure 2 indicates the results to be expected in typing tests.

BLOOD TRANSFUSIONS AND THE BLOOD BANK (Continued)

Figure 1

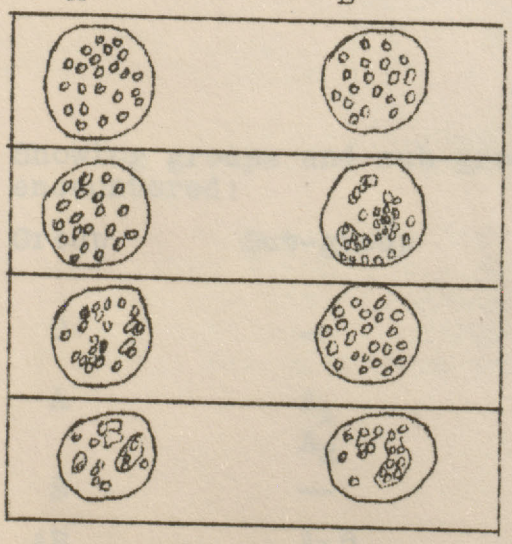
TECHNIQUE OF BLOOD GROUPING



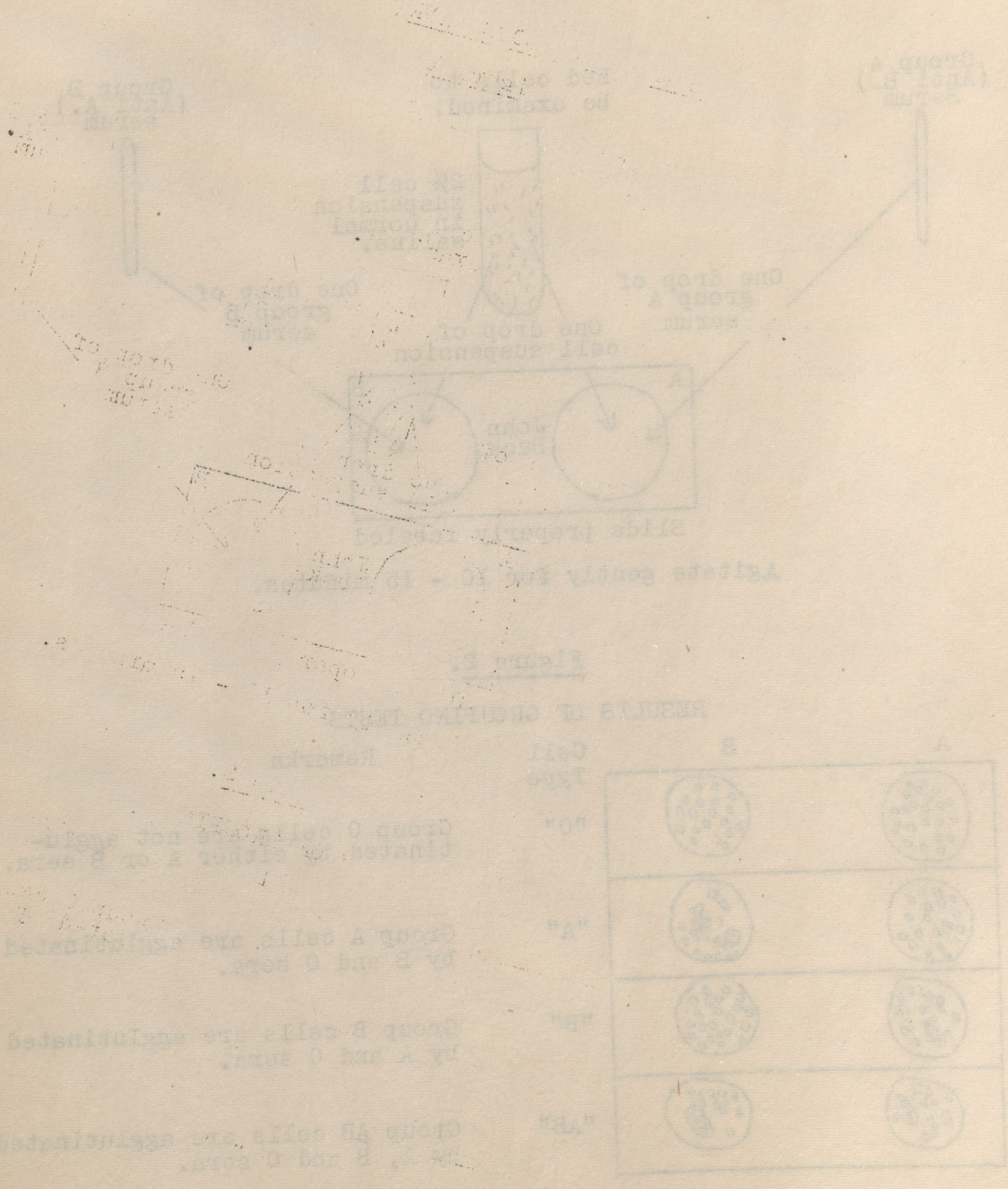

Agitate gently for 10 - 15 minutes.

Figure 2.

RESULTS OF GROUPING TESTS




| Cell Type | Remarks |
|---|---|
| "O" | Group O cells are not agglutinated by either A or B sera. |
| "A" | Group A cells are agglutinated by B and O sera. |
| "B" | Group B cells are agglutinated by A and O sera. |
| "AB" | Group AB cells are agglutinated by A, B and O sera. |



BLOOD TRANSFUSIONS AND THE BLOOD BANK (Continued)

2a. Sources of error in blood grouping.

1. SERA NOT OF SUFFICIENT POTENCY.

a) Obtain sera of good potency.
b) Test sera from time to time against known A and B cells.

2. SUB-GROUPS GIVING VERY WEAK REACTIONS.

c) Sera prepared "at home" may not include the sub-groups $A_1$, $A_2$, $A_1B$ and $A_2B$.
d) Give sufficient time for reactions to take place.
e) Do not use cell suspensions which are too heavy.

3. CELLS EXHIBITING HAEMOLYSIS.

f) Be sure to use sterile normal saline or other isotonic solution for cell suspensions.
g) Avoid use of cells which have been kept several days. (if kept in an ice-box under sterile conditions they should be usable).

4. CELL SUSPENSIONS CONTAINING SMALL CLOTS.

h) Do not make heavy suspensions, there is tendency to clotting.
i) Examine suspensions microscopically to ensure freedom from small cell agglomerates.

5. CONTAMINATED SERA.
j) Discard any sera which are believed to be contaminated.

6. ROULEAUX OR PSEUDO-AGGLUTINATION.

TABLE I

Showing groups and sub-groups with the antibodies which are encountered:

| Group | Sub-group | Normal agglutinins in sera | Agglutinins exceptionally present in sera. |
|---|---|---|---|
| O | -- | $\alpha$ ($\alpha_1$ & $\alpha_2$ ) & $\beta$ | ----- |
| A | $A_1$ | $\beta$ | $\alpha_2$ |
| | $A_2$ | | $\alpha_1$ |
| B | -- | $\alpha$ ($\alpha_1$ & $\alpha_2$ ) | --- |
| AB | $A_1B$ | ----- | $\alpha_2$ |
| | $A_2B$ | ----- | $\alpha_1$ |

BLOOD TRANSFUSIONS AND BLOOD BANK (Continued)

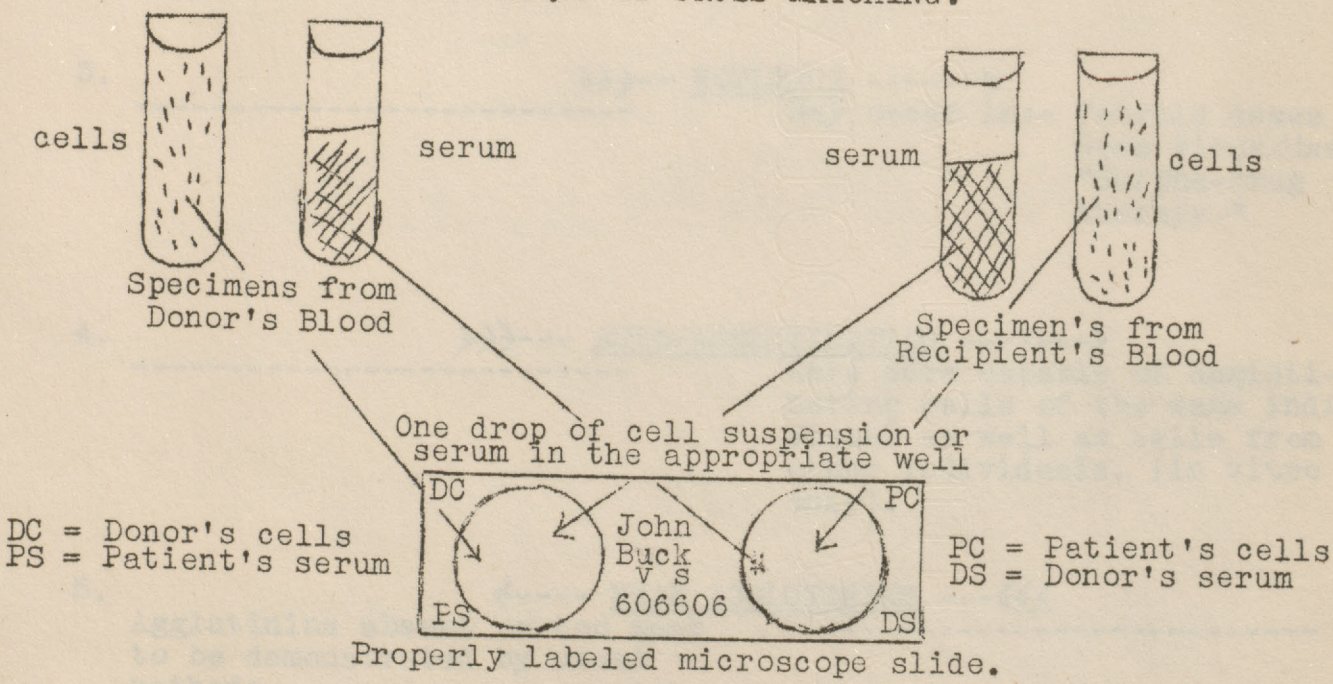
3. Technique of cross-matching.

It is NOT enough to say that patient and donor are GROUP A or GROUP O as the case may be. There are various sub-groups and extra agglutinins and agglutinogens which may occur and which may be the cause of a serious or fatal reaction.

The usual method of testing the compatibility of a blood in vitro can be seen by studying Figure 3. Here the serum and cells of the donor are mixed on a slide with the cells and serum of the recipient. In reading the final results there should be no evidence of agglutination -- all cells should be free -- the blood then qualifies for transfusion.

Figure 3.

TECHNIQUE OF CROSS-MATCHING.




Properly labeled microscope slide.

As with typing, the slide method may be substituted by the centrifuge technique. About five minutes should be allowed between the time of setting up the cross-match and the time of centrifugation. Readings must be done microscopically by transferring one drop from each test tube to a microscope slide.

BLOOD TRANSFUSIONS AND THE BLOOD BANK (Continued)

3a. Sources of error in cross-matching.

| | FALSE NEGATIVES | FALSE POSITIVES |
|---|---|---|
| 1. | <- - TIME ELEMENT - -> | |
| | Insufficient time for reaction. | Too long:-<br>i. Drying of mixture - cannot be read.<br>ii. Concentration of mixture - Pseudo-agglutination. |
| 2. | <---- CONTAMINATED CELLS ----> | |
| | May fail to agglutinate with appropriate sera. | May be agglutinated with any sera.<br>Haemolysed cells. |
| 3. | >>>-- ROULEAUX ------> | |
| | ---------- | May occur in:- Febrile cases<br>Some virus diseases<br>"Sulpha-drug therapy." |
| 4. | >>>--- AUTO-AGGLUTINATION -------> | |
| | ---------- | Rare sera capable of agglutinating cells of the same individual as well as cells from other individuals. (in vitro only). |
| 5. | <---- WEAK AGGLUTININS ---<<< | |
| | Agglutinins absent or too weak to be demonstrated by usual methods. | ---------- |
| 6. | <------ CONTAMINATED SERA -----> | |
| | May fail to agglutinate cells of other groups. | May agglutinate all cells regardless of group. |
| 7. | <---- HAEMOLYSIS ----<<< | |
| | Agglutination and haemolysis should be considered as synonymous. | ---------- |

BLOOD TRANSFUSIONS AND THE BLOOD BANK (Continued)

3b. Positive factors in incompatible cross-matches.

1. Anti-Rh Agglutinins:-
   a) Most commonly found in post-partum women who are Rh negative.

   b) Occasionally found in cases of multiple transfusions where the recipient is Rh negative.

2. Sub-groups of agglutinogen "A". ($A_1$, $A_2$, $A_1B$ and $A_2B$).

   c) Sub-groups $A_1$ may contain agglutinins for sub-group $A_2$, and Group O cells.

   d) Sub-group $A_2$ may contain agglutinins for sub-group $A_1$.

   NOTE:- These agglutinins rarely occur naturally but can be developed.

3. Donors' cells haemolysed by patients' serum.

   e) This may occur with true incompatibilities caused by the key groups or by any of the sub-groups or extra agglutinins.

References:

1. Guiou, Norman: Teaching compatibility tests for blood donors. Canad. M.A.J. 48: 322 - 4, 1943.

2. Wiener, A.S.: Technique of blood grouping tests preliminary to blood transfusions. Am. J. Clin. Path. 9 (4) 1939.

3. Wiener, A.S.: Blood grouping tests in relation to transfusion. Am. J.M. Technol. 7 (2) 1941.

4. Wiener, A.S. : Subdivisions of Group A and AB. J. Immunol. 41 (2) 1941.

5. Wiener, A.S. : Blood groups and transfusion. 3rd Edit. Chas. C. Thomas, 1943.

6. Medical Research Council War Memorandum No. 9. The determination of blood groups. His Majesty's Stationary Office, London, 1943.

7. Wiener, A.S. : A new test (block test) for Rh. sensitization. Proc. Soc. Exper. Biol. & Med. 56 173-176, 1944.

BLOOD TRANSFUSIONS AND THE BLOOD BANK (Continued)

Precautions in an Emergency:

If, due to a great emergency, tests for syphilis cannot be carried out, this fact and the existence of an emergency should be plainly stated to the patient, or to a responsible relative of the patient. The donor also should be asked, in the presence of the patient or the relative, regarding the possibility of syphilitic infection. These facts should be noted on the record.

In such circumstances the interne should obtain from the patient or his next of kin a signed declaration that the patient releases the hospital and staff of responsibilities involved in the emergency administration of blood which has not had the usual serological tests.

N.B. Important Note: The above information is for general use and is not intended to replace the special regulations regarding transfusions, which exist in the hospital.

Reference: Pharmacopoeia and Clinical Methods of the Teaching Hospitals, McGill University, 1940.

## REGULATIONS OF THE BLOOD BANK

by

Paul G. Weil

WITHDRAWAL OF BLOOD OR PLASMA

1. (a) To withdraw blood or plasma, fill out completely a requisition form. (Full name of patient, case number, diagnosis, and 'service' are essential). Send requisition to the blood bank.

   (b) If the interne is withdrawing blood or plasma from the bank in the absence of those responsible for the dispensing, please see that the specimen number of the bottle is entered on the requisition. (The number put on with grease pencil).

   (c) Porters, orderlies and those not familiar with the routine of the bank, WILL NOT take blood or plasma from the bank in the absence of someone responsible.

BLOOD TRANSFUSIONS AND THE BLOOD BANK (Continued)

REPLACEMENTS

2. If possible, try to have 2 or more donors come in before blood or plasma is given. If this is not possible, make arrangements for replacements as soon as possible after the transfusion.

TRANSFUSION INFORMATION CARDS

3. After the patient has received transfusion, the card attached to the bottle MUST be filled out and returned to the Blood Bank with the cleaned set and empty bottles.

NOTE:- IT IS ESSENTIAL THAT A CARD BE FILLED OUT FOR EVERY TRANSFUSION GIVEN. When several bottles from different donors are used, each card must be completed.

RETURNING UNUSED BLOOD OR PLASMA

4. When returning either blood or plasma which has not been used, complete the usual requisition form, stating specimen number, quantity and clearly marked "RETURNED".

The successful operation of the bank depends upon your cooperation in these details.

# CHAPTER VI

## POST-OPERATIVE CARE

1. Blood pressure, pulse and respirations are to be recorded every 15 to 30 minutes for 2 hours and then every 1 to 2 hours for the next 12 hours. The intervals of these observations are obviously subject to any change indicated by the patient's condition. The blood pressure recordings should be discontinued as soon as the patient's condition is satisfactory.

2. Pupils. All unconscious patients who have had a craniotomy should have their pupils examined for unilateral or bilateral dilatation and reaction to light at each time the blood pressure is taken.

3. Posture. The unconscious or vomiting patient should be kept semi-prone and turned from side to side every 2 hours. They must not be permitted to lie on the site of operation. To avoid this the skin flap should be outlined on the patient's dressing.

   If there are symptoms and signs of bulbar involvement the individual should be "postured" face-downwards in the portable cerebellar head rest, with pillows under the thighs and legs and sponge rubber pads under the shoulders. If the patient is to be kept in this position the face should be massaged every two hours.

4. Respiratory obstruction. All unconscious patients must be watched closely for collections of mucous which embarrass respiration. These are easily removed by the gentle manipulation of a portable suction apparatus.

5. Medication.

   a). Sedation: Patients who have had craniotomies are best controlled with paraldehyde, drams 3 - 4 per rectum. Half the dose may be repeated in two hours if necessary. In the convalescent period the barbiturates may be used. The exception is the group of seizure cases who will frequently require sodium luminal hypodermically in the immediate postoperative period. They should receive 2 grains every 6 hours. The sodium salt is later supplanted by phenobarbital in doses of 1 to 1½ grains every 6 hours. The staff surgeon is wisely consulted in this regard.

   Postoperative patients, other than craniotomies, may be safely given any of the recognized sedatives.

POST-OPERATIVE CARE (Continued)

b). Analgesia: Headache following craniotomy is best handled by lumbar puncture, posture, etc. If these measures fail, aspirin in 10 grain doses repeated every four hours will usually suffice. Codeine is rarely used. Patients who have had procedures other than a craniotomy may be given codeine, or even morphine and its derivatives. The possibility of addiction must always be considered.

c). Chemotherapy: Any case of imminent or established infection should receive the proper sulfonamide. An accurate chart should be kept which includes temperature, pulse, respiration, dosage and amount of the drug, white blood count and fluid intake and output (see figure 9). Penicillin - previously discussed.

d). Catharsis: Bedridden post-operative patients should be placed on a regular cathartic regime. These are discussed in the section on Symptomatic Medication.

6. Fluids. A total daily fluid intake of 2000 - 3000 cc. should be maintained. Patients who are unable to drink should receive intravenous fluids for 2 - 3 days. After the third day fluid may be administered via the nasal tube (see below) unless there is a contraindication (e.g., cerebrospinal fluid rhinorrhea).

5% glucose-saline is the intravenous fluid of choice. 10% glucose in distilled water or in saline is occasionally indicated. Hypertonic sucrose or glucose solutions are rarely indicated. Lumbar puncture is usually more effective in lowering intracranial pressure.

7. Diet. The type of diet is influenced by the condition of the patient and is generally well supervised by the nursing staff. In the unconscious patient the caloric intake is best maintained by nasal feedings.

## Nasal Feedings

General Remarks:

These are of great value in maintaining the nutrition of moribund patients. Water, orange juice and eggnog are the fluids generally employed. Vitamins (B 1 elixirs, cod liver oil, etc.) and cathartics (milk of magnesia, liquid paraffin, etc.) are frequently added.

Staff: Dr. Neurosurgery

Intern: [redacted]

# ROYAL VICTORIA HOSPITAL
AND
MONTREAL NEUROLOGICAL INSTITUTE

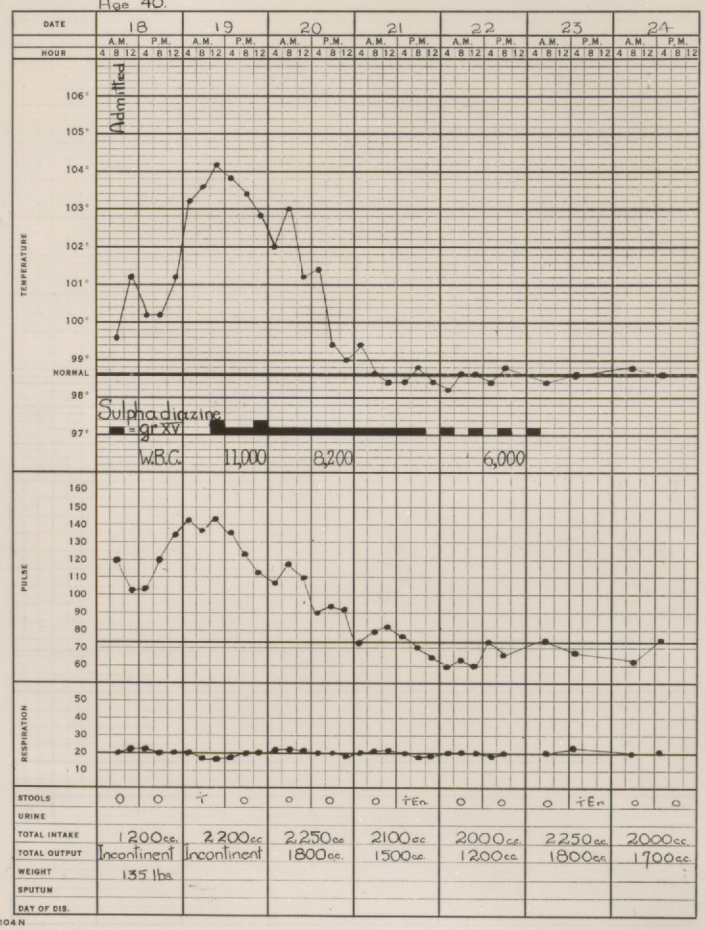
Dept. No. _____

Hosp. No. 41-6837

Name [redacted] Age 40.

Date November 18th

Ward III




FORM 104 N

Fig. 9.

POST-OPERATIVE CARE (Continued)
Nasal Feedings

Eggnog Nasal Feeding

2 eggs (well beaten)
500 cc. milk
1 ounce glucose
Flavoring (vanilla)
B. Plex if ordered

Fruit Juice Nasal Feeding

1 ounce glucose
500 cc. fruit juice

Casec Nasal Feeding

700 cc. milk
50 gms. Casec
2 eggs (raw)
Beminal 1 ounce
Nicotinic acid, 25 mgms.
Vitamin C, 100 mgms.

Technique:

1. Cool the nasal tube in ice to increase its rigidity and lubricate the tip with liquid paraffin.

2. Put the patient in the dorsal decubitus and slowly insert the tube into the nasal passage until the pharynx is reached. Following the swallowing mechanism, which is then generally induced, the tube can be passed more rapidly.

3. This step is important. It is now necessary to ascertain whether or not the tube is in the stomach. This is preferably done by blowing a small amount of air through the tube with a bulb syringe and listening for the escape of the bubble with a stethescope placed over the epigastrium.

4. As a double check a small amount of water is injected before the feeding. Furthermore, water should always be used to clean the bore of the tube before its removal.

5. After completion of the feeding always place the patient semi-prone. This lessens the danger of aspiration should vomiting occur.

POST-OPERATIVE CARE (Continued)

8. Urinary Retention. To combat this condition the simplest measures should be resorted to first. The patient will frequently void following the institution of such measures as the giving of warm saline or milk and molasses enemata, dropping ether on the pubis or psychological stimulation by the sound of running water. Should these fail prostigmine in doses of 1 cc. hypodermically repeated hourly for three hours is valuable.

Treatment of Bladder Paralysis -

Paralysis of the urinary bladder, due to injury of the spinal cord or nerves, presents a difficult practical problem. It is best not to allow the bladder to become too greatly distended at first for this reduces the bladder's resistance to the development of cystitis. Comsequently, catheterization* should be carried out at regular intervals so spaced as to prevent the bladder from filling up to a point beyond 500 to 800 cc. Usually every eight hours will suffice. During the period of catheterization the patient should be given urotropin from 7½ to 15 grs. t.i.d. a.c. and, if necessary, acid sodium phosphate in amounts necessary to give the urine an acid reaction. In place of this, sulfanilamide therapy may be an effective preventive.

If spontaneous micturition does not return within a few days the patient should be placed on tidal drainage and a cystometrogram should be done. An indwelling catheter is inserted, and held in place by means of 3 pipe cleaners. A strip of adhesive is placed about two-thirds of the way around the penis and the pipe cleaners are then attached to this strip of adhesive by a separate strip of adhesive. The pipe cleaners are then brought over the glans and strapped to the catheter with a strip of adhesive. The catheter is then attached to a tidal drainage system (Cone modification - figure 10). This simple apparatus gradually adds, to the urine of the bladder, a solution of a mixture of the sulfonamides:

| | |
|---|---|
| (sulfanilamide | 9.0 gm. |
| sulfapyridine | 0.9 " |
| sulfathiazole | 0.9 " |
| Sterile Ringer's solution | 3000 cc. |

Boil 10 minutes to dissolve the crystals) or a sterile saturated solution of boracic acid under a low pressure.

*If the paralysis is obviously complete from the beginning, an indwelling catheter may be inserted at the start and periodic irrigation used until the tidal drainage is started, as described below.

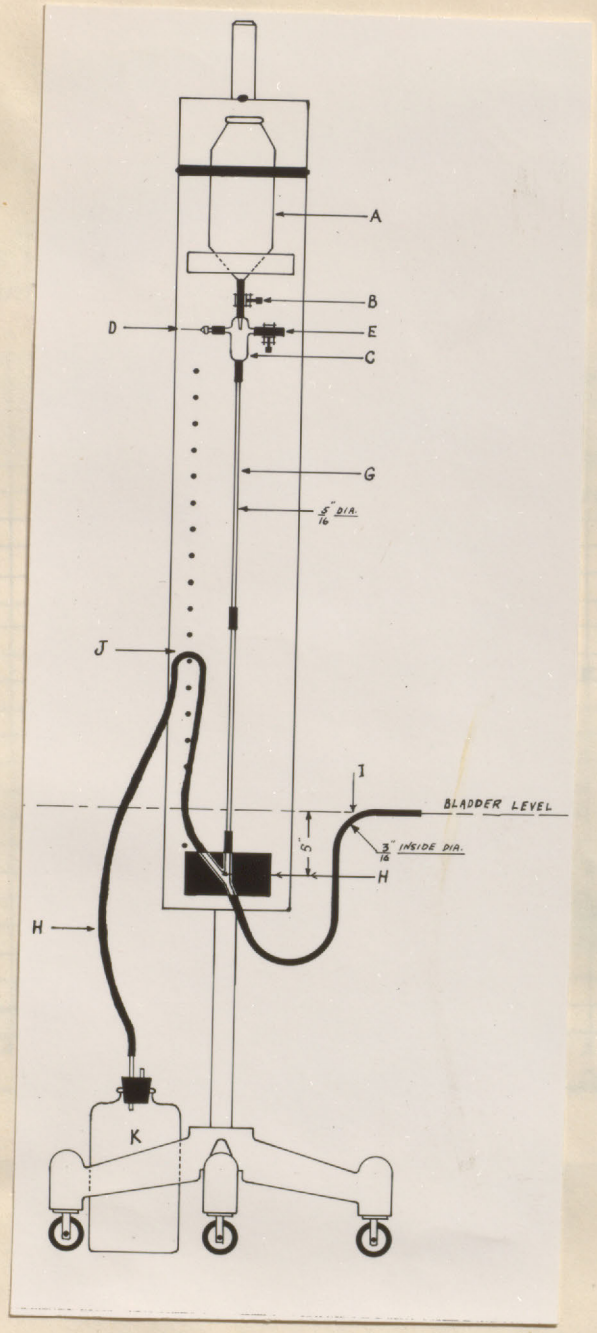



Fig. 10.

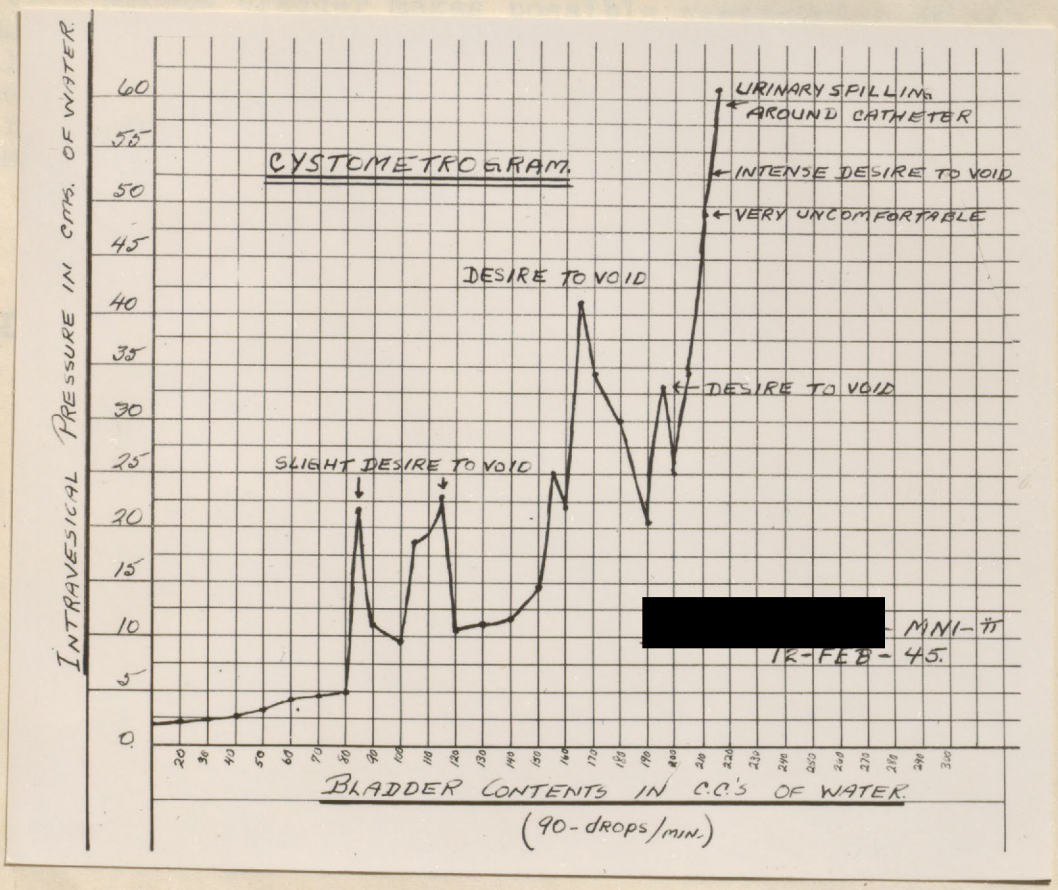

CYSTOMETROGRAM.
INTRAVESICAL PRESSURE IN CMS. OF WATER.
60
55
50
45
40
35
30
25
20
15
10
5
0
URINARY SPILLING AROUND CATHETER
INTENSE DESIRE TO VOID
VERY UNCOMFORTABLE
DESIRE TO VOID
DESIRE TO VOID
SLIGHT DESIRE TO VOID
[redacted] - MNI-11
12-FEB-45.
BLADDER CONTENTS IN C.C.'S OF WATER.
(90-drops/min.)

Fig. 11.

Fig. 11.

POST-OPERATIVE CARE (Continued)

When the pressure rises, due to fluid accumulation or to a tendency of the bladder to contract, siphonage in the system is precipitated and this completely empties the bladder. It then fills gradually again with urine and with irrigation fluid until the whole process repeats itself. The rhythmic activity of the bladder makes possible restoration of its normal activity as soon as nerve control returns, and the indwelling catheter is remarkably well tolerated, with comfort to patient and a minimum of nursing care. In case control does not return when the patient is gotten up he may develop an automatic bladder or may be given a suprapubic cystostomy.

References: 1) Penfield, W., From Military Neurosurgery.

2) Bellis, C.J., Surgery, 8: 791-797, 1940.

3) Lawrie, R.S. and Nathan, P.W., Lancet, 2: 1072, 1940.

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# CHAPTER VII

# MISCELLANEOUS

## MALARIA ROUTINE

Preliminary Routine:

Before the inoculation with malaria, the patient should have a complete clinical history and physical examination, a blood N.P.N., an icteric index, chest plate, E.K.G., a B.S.P. test, and a P.S.P. test, urinalysis, and concentration test, haemogram, visual fields and fluoroscopy of heart and aorta, lumbar puncture for the cells, proteins, Wassermann, colloidal gold. Finally, in cases with neurogenic bladder, a cystometrogram.

Contra-indications:

All patients with serious chronic disease, such as chronic nephritis, cirrhosis of the liver, myocardial degeneration, diabetes, active tuberculosis, severe anaemia, extreme old age or extreme obesity, do not make good subjects, and if possible should not be treated with malaria.

Selection of Malaria:

One must be sure that one is dealing with the plasmodium vivax, the benign nature of which has been ascertained by repeated transmissions. As a result of the war, there are a large number of latent tropical malaria carriers about.

Method of Inoculation:

The intravenous injection of 2 - 5 cc. of blood without cross matching has proved safe. The blood should be citrated with an equal amount of 0.5% sodium citrate, or 1 cc. of 2.5% sodium citrate for 10 cc. of blood. It is best to take the blood from the donor, as the fever subsides, but any time will do if necessary. If it is to be stored, it is best to keep it in an ice box. It will keep there for 48 hours. The incubation period is from 3 - 8 days with the intravenous method, but it may be longer. Risk of superinfection with syphilis - none. Blood matching unnecessary.

Period of Paroxysms:

One attempts to get a total of 50 hours, with a temperature over 104. However, Dattner feels one should be very cautious about allowing the patient to have over 10 chills. At all times one must watch the patient for signs of collapse. Red blood count, haemoglobin, and white blood count estimations, and bilirubin are determined twice weekly. Ephedrin, 25 mgms. p.r.n. is useful when blood pressure is below 100 mm. of mercury. Codeine, grains $\frac{1}{2}$, is a useful sedative, and does not seem to effect the chill. For further details during the active malarial period, read standard nurses' orders for malaria. (p. 111)

MALARIA ROUTINE (Continued)

Interrupt a malaria temporarily, or permanently for:

(1) A systolic blood pressure, below 70 mm. hg. (cardiac collapse).

(2) Persistent marked tachycardia in afebrile periods (Pulse 120 - 140).

(3) Intractable nausea and vomiting.

(4) Severe and deepening jaundice, icteric index over 50.

(5) Severe anaemia; haemoglobin 50%, R.B.Cs. two million.

(6) Rising N.P.N. above 60 - 80 mgms. %.

For Temporary Interruption of Malaria:

The paroxysms may be temporarily interrupted by giving 0.1 grams of Thiobismal (Parke-Davis) intramuscularly. Optimum time to give it is when the temperature is going up, or near the peak of its elevation. If the temperature in chill exceeds 106° the fever should be reduced by sponging, ice water, enemata, etc. The chill may be terminated with 0.05 gms. of N.A.B. intravenously.

To Terminate Malaria Permanently:

This is done by the oral administration of 1 gram of quinine sulphate on three successive days (usually divided into 0.5 gram doses), and 0.5 grams on the next four consecutive days. Thiobismal may be given as well. If the patient is vomiting and one wants to arrest the paroxysms suddenly, 0.5 grams of quinine bihydrochloride may be given intravenously. It must be injected very slowly into the vein, as it causes severe necrosis when injected into the tissues. It may cause a rapid drop of B.P., and sudden collapse. Every patient who has been inoculated must have a course of quinine whether they have or have not paroxysms and fever. If they do not receive the quinine, they become potential carriers.

During Convalescence:

1) Complete bed rest for 7 - 14 days after last fever.
2) 4 - 5 days after last fever start intravenous neoarsphenamine, 0.3 to 0.6 grams. Give 6 doses at 5 - 7 days intervals, largely for tonic effect.
3) If necessary, use insulin, 10 units, twice daily, 30 minutes before meals to stimulate appetite.
4) Resumption of full physical activity gradually over 3-4 week period.

References: "The Modern Treatment of Syphilis" by J.E. Moore, Charles C. Thomas, 1941.
"Neurosyphilis." by B.Dattner, Grune & Stratton, 1944.

## STANDARD NURSES ORDERS FOR MALARIA

During incubation period.

1. Temperature by mouth q. 4 h. while awake.
2. When the temperature reaches 101° F complete bed rest.
3. Blood pressure daily.

During active malarial period.

1. Complete bed rest.
2. Temperature q. 2 h. while awake, q. 30 minutes from the start of a paroxysm until deferescence begins, then q. 1 h. until the temperature is down to 102° after which temperature is taken q. 2 h.
3. Blood pressure t.i.d. between paroxysms, q. h. during paroxysms.
4. Sodium chloride (enteric coated pills) gr. XXX t.i.d., to replace sodium chloride lost by sweating and to increase the fluid intake.
5. Specimen to be sent to the clinical laboratory for examination every three days.
6. Diet as desired. Liquids and softs preferable. Encourage the patient to eat and drink. Fluid intake should be 4,000 to 5,000 cc. on days of paroxysms.
7. Watch patient for distension of the bladder.
8. Notify the doctor if -

    1. Temperature goes over 106, or below 96.
    2. Pulse rises over 140 per minute during paroxysm, or over 120 between paroxysms.
    3. Blood pressure falls below 90 mm. of Hg.
    4. If the patient is having great pain (lightening pain) or is very restless.
    5. The urine becomes dark or pink.
    6. Persistent nausea and vomiting.
    7. If patient appears to be becoming rapidly exhausted.

During convalescence.

1. Complete bed rest for seven to fourteen days.
2. Full diet.
3. Medication as ordered.

## FEVER THERAPY - INSTRUCTIONS FOR INTERNES AND NURSES

### Before Treatment:

Cases must be selected carefully for this form of treatment, as for malarial treatment. The requisition form must be completed in every case, before course of therapy can be started. It is advisable to have all the necessary data available before an appointment is made.

Patients are admitted the evening before treatment, and routine physical examination completed. Contra-indications for treatment:

1. An unusual drop in blood pressure from average level.
2. Infections causing a febrile reaction.
   In case of doubt notify the Fever Therapy Department.

Fluids are forced during the evening. Four enteric-coated salt (NaCl) tablets - 7½ grains each - are given about 9 p.m. with a high carbohydrate meal (cocoa or milk, and bread). A mild sedative may be given if necessary to ensure a restful night.

Bismuth subsalicylate - 2 cc. intramuscularly, is given during the evening in cases of neurosyphilis, unless otherwise indicated.

On the morning of treatment - at 5 a.m. - a saline enema is given. Fluids given ad lib., 30 gms. glucose given in lemonade at 5 a.m. Sweetened tea or coffee is allowed, but no milk.

### During Treatment:

Patient is called for by orderly from the Fever Therapy Department at 7 a.m. The general supervision of the patient, and the use of sedatives, etc. from this point are the responsibility of the Fever Therapy Department but the interne in charge of the case will be on call for:

1. Injection of arsenicals in cases of neurosyphilis. (Interne will be called about 1 p.m. when fever is completed. It is important to give the treatment at the optimum time and internes are expected to come promptly when called.)

2. Emergency calls.

Patient will be returned to the ward, 2 - 3 p.m., when the temperature has fallen to 101° F. or lower, and from that time will again be under the supervision of the interne and the nursing staff.

FEVER THERAPY (continued)

After Treatment:

Mouth temperature 30 minutes until normal. B.P. as indicated by the condition of the patient.

Fluids: 500 cc. 5% glucose saline given intravenously immediately after return to the ward if ordered by Fever Therapy Department or interne in charge. Force fluids by mouth.

Tepid sponging, if ordered.

Discharge examination should record particularly the B.P. and state of cardiovascular system.

## POTASSIUM CHLORIDE REGIME FOR MÉNIÈRE'S SYNDROME

Talbott and Brown recommend potassium chloride for the medical treatment of this condition. The patient should receive from 6 - 10 grams daily. A good method of administering the drug is in the form of a 25% solution as follows:

Potassium chloride, gr. XV
Aromatic Elixir m. XV
Distilled water q.s. ad drams 1

This mixture is given in doses of 2 drams 3 to 5 times daily between meals in fruit juice or any pleasant tasting liquid.

Reference: Ménière's Syndrome - acid-base constituents of the blood-treatment with potassium chloride.
Talbott, J.H. and Brown, M. J.A.M.A. 114: 125-130,1940.

## FURSTENBERG DIET

1. Low salt content.

2. Medication: Ammonium Chloride, 3 gm. with each meal in capsules (6 capsules each containing 7.5 grs. - 0.5 gm. - taken during the meal), three days on and two days off. The capsules should not be replaced by the chocolate coated or the enteric coated pills because the latter sometimes pass through the gastro-intestinal tract without being absorbed.

3. Water intake unrestricted.

4. Diet, approximate neutral, low sodium diet.

Group A: The following foods may be taken daily:

1. Eggs, meat, fish and fowl as desired.
2. Bread as desired.
3. Cereal, one of the following: farina, oatmeal, rice, puffed rice or puffed wheat.
4. Potato and one or more servings of any of the following: a) macaroni, b) spaghetti, c) rice, d) corn, e) cranberries, f) prunes, g) plums.
5. Milk as desired.
6. Vegetables and fruits daily of any fruit and of any vegetable not included in groups B and C as desired.
7. Butter, cream, honey, jellies, jams, sugar and candy permitted as desired.
8. Tea and coffee as desired.

Group B: Foods to be avoided:

All salt meats and fish, or bread, crackers and butter prepared with salt. Carrots, clams, condensed milk, raisins, caviar, cowpeas, olives, spinach, cheese, endive, oysters, bacon, salt pork, bananas, beef chipped or corned, ham-smoked.

Group C: Foods to be taken no more than twice weekly:

Lima beans, beets, buttermilk, cantaloupe, cauliflower, celery, chard, dried cocoanut, dried currants, dates, figs, horseradish, kohlrabi, limes, musk-melon, peanuts, peaches, mustard, pumpkin, rutabagas, radishes, strawberries, turnips, turnip tops, water-cress.

NOTE; All food to be prepared and served without salt. Preparations containing sodium to be avoided, sodium salicylate, bicarbonate, bromide, tartrate, iodide, nitrite, phosphate, thiosulfate, benzoate, sodium phenobarbital and amytal, compound effervescent powders, potassium and sodium tartrate and baking powder.

## KETOGENIC DIET

A ketogenic diet, to be effective, must be rigidly controlled, and should be a weighed diet. It is necessary that in the diet the ratio of ketogenic material to the anti-ketogenic be at least 3:1. This ratio is calculated according to Woodyatt's formula in the following manner:

Ketogenic - 90% of Fat
46% of Protein

Anti-ketogenic - All of Carbohydrate
58% of Protein
10% of Fat

$$\frac{\text{Ketogenic}}{\text{Anti-ketogenic}} \text{ or } \frac{\text{Fatty Acid}}{\text{Glucose}}$$

ratio is

$$\frac{.90F + .46P}{C + .1F + .58P}$$

We then calculate the diet for the individual patient as follows: For children the number of calories is 55 per kilogram, or 25 per pound of body weight. The amount of protein is set at 1 gram per kilogram body weight, which has been found quite satisfactory. The carbohydrate and the fat are then adjusted so that the ratio is as indicated and the calories are satisfactory for nutrition and growth. The caloric requirement is based upon the estimated weight for height, as given in standard tables.

It is seen that over a period of four days the carbohydrate in the diet decreases rapidly and the fat increases.

Boy, 8 years, 55 lbs. (25K)
Calories, 1375
(25 cals. per lb. body weight)
(55 cals. per kg. body weight)

| | C g. | P g. | F g. | Cals. | K AK |
|---|---|---|---|---|---|
| 1 day ... | 50 | 25 | 119 | 1371 | 1.5 |
| 2 " ... | 35 | 25 | 126 | 1374 | 2.0 |
| 3 " ... | 20 | 25 | 133 | 1377 | 2.7 |
| 4 " ... | 15 | 25 | 135 | 1375 | 3.1 |

KETOGENIC DIET (Continued)

This is advisable because most children placed immediately on the final diet will become nauseated and sometimes will have severe vomiting. However, with the plan indicated this very seldom occurs. In order to make certain that the patient is in ketosis a urine test for diacetic acid is done on the first morning specimen daily. This, the patients can be taught to do quite readily. Patients must be kept on this diet, in ketosis, for a period of from six to twelve months. The carbohydrate in the diet is then gradually increased and the amount of fat reduced until the diet is essentially normal again; this usually takes place over a period of three to six months. The diet for an adult is the same in principle, although the caloric demand and the amount of protein necessary are different.

Reference: The Treatment of Epilepsy in Children, Keith, H.M. Canad. M.A.J. 37: 485-489, 1937.

## TOWNS-LAMBERT ROUTINE FOR ALCOHOLISM AND DRUG ADDICTION

FIRST DAY:

7 a.m. (Pil. Cath. Co. No. V.
(Blue Mass Grs. V.

1 p.m. Mag. Sulph. Oz. 2.

3 p.m. Start capsules.

1) Add 6 drops of mixture to empty capsule and give one capsule q.1 h. for 6 doses.
2) Increase the amount to 8 m. q.1 h. for 6 doses
3) " " " " 10 m. " " 6 "
4) " " " " 12 m. " " 6 "
5) " " " " 14 m. " " 6 "
6) " " " " 16 m. " " 6 "

12 midnight (Pil. Cath. Co. No. V.
(Blue Mass Grs. V.

SECOND DAY:

6 a.m. Mag. Sulph. oz. 1.

6 p.m. Pil. Cath. Co. No. 3.
Blue Mass. Grs. V.

12 p.m. Mag. Sulph. Oz. 1.

TOWNS-LAMBERT ROUTINE FOR ALCOHOLISM AND DRUG ADDICTION (continued)

| | | |
|---|---|---|
| THIRD DAY: | 12 noon. | Pil. Cath. Co. No. V.<br>Blue Mass Grs. V. |
| | 6 p.m. | Mag. Sulph. Oz. 1. |
| FOURTH DAY: | 4 a.m. | Pil. Cath. Co. No. V.<br>Blue Mass. Grs. V. |
| | 10 a.m. | Mag. Sulph. Oz. 1.<br>Day following Green Stool. |
| | 7 a.m. | Castor oil oz. 2. |

MIXTURE: Tr. Belladonna 15%, oz. 4.
Tr. Hyoscyamus, oz. 2.
Fld. Extract Xantoxylum.

Continue four days reducing mixture to 10 min. instead of 16.

Give only ½ the purgative dosage.

# CHAPTER VIII

## SYMPTOMATIC THERAPY

This chapter is presented as a guide in the treatment of various conditions which are frequently encountered, and, at times, troublesome. It is unnecessary to mention that in all instances the cause of the sign or symptom should be sought out and treated. Frequently, though, it remains undisclosed and it is necessary to resort to these symptomatic measures. They are listed alphabetically.

### Anorexia

To stimulate appetite the following mixtures are recommended:

1. One of the proprietary vitamin B 1 preparations, particularly the elixirs.

2. Mistura Gentianae et Nucis Vomica Alkalina

| | | |
|---|---|---|
| Sodii bicarbonatis | grs. | 5 |
| Tincturae Gentianae Compositae | mm. | 15 |
| Tincture Nucis Vomicae | " | 10 |
| Aquae Menthae Piperitae ad | drams | 2 |

Dose - drams 2, t.i.d a.c.

### Constipation

A. One of the following is recommended for bed-ridden patients:

1. A.C. Mixture:
Senna leaves - 2 ounces. Pour 1 pint of boiling water over leaves - let stand ½ hour, then strain.
½ lb. prunes; ½ lb. large raisins; ½ lb. figs. Put fruit through a meat chopper, then stew in senna leaf tea until thick.

Dose - 1 dram - t.i.d. a.c.

SYMPTOMATIC THERAPY (Continued)
Constipation -

2. Mineral oil (liquid paraffin) has been criticized because of coating the gastro-intestinal tract and interfering with the absorption of food and vitamins. According to Beckman ("Treatment in General Practice") this is not substantiated.

   Dose = ounces ½ or 1 b.i.d.

3. Cascara. This is a mild yet reliable cathartic. Beckman recommends the following prescription for regular administration:

| | | |
|---|---|---|
| Aromatic fluid extract cascara sagrada | drams | 10 |
| Syrup cinnamon | " | 10 |
| Water to make | ounces | 4 |

   Dose - drams 1, ½ hour before meals and upon retiring.

4. Mistura ferri aperiens -

| | | | |
|---|---|---|---|
| Magnesium sulphate | | grs. | XXX |
| Ferrous sulphate | | " | iii |
| Oilute sulphuric acid | | min. | V |
| Tinct. calumbae | | min. | X |
| Peppermint water | q.s. ad | oz. | ii |

   Dose - 2 drams

5. Dr. Tidmarsh's regime for spastic constipation:

   1. At night - Mazola oil retention enema.
   2. During day - capsules containing phenobarbital and atropine (grains ¼ and 1/400 or grs. ½ and 1/200 respectively) t.i.d.

   3. Glass of warm water ½ hour before each meal.

B. For more drastic catharsis:

1. Milk of Magnesia. Recommended especially for children.

   Dose = drams 2 to 4 at bedtime.

SYMPTOMATIC THERAPY (Continued)
Constipation -

2. Magnesium sulphate.

   Dose = ounces 1 or 2 of the 50% solution, mixed with fruit juice. Best given in morning.

3. Compound cathartic pills.

   Dose = 1 or 2 pills at bedtime

4. Dr. Russel's favorite:

   At bedtime: Pil. cath. co. grs. 5
   Blue mass. " 5
   In the a.m. hot seidlitz fizz.

C. Enemata: These should never be administered to patients with increased intracranial pressure.

1. Saline enema.

2. Olive oil and glycerine enema -
   Olive oil - 3 ounces
   Glycerine - 3 "

3. Milk and molasses enema -
   Milk - 8 ounces
   Molasses - 8 "
   Heat the mixture to 160° F. Stir thoroughly.
   Cool to 103° F. and inject.

## Coryza

Treatment consists in:

1. Bed rest.
2. Promotion of diaphoresis is of doubtful value but may be promoted by -
   a) Hot whiskey toddy (whiskey, hot water & honey).
   b) Capsules containing:

      Aspirin - grs. 5
      Phenacetin - " 2½
      Caffeine citrate - " ½

      Dose = 1 capsule q.3 h. for 3-4 doses.

SYMPTOMATIC THERAPY (Continued)
Coryza -

3. To combat nasal discharge and congestion:

a) Diehl recommends capsules of:
Codeine sulfate - grs. ¼
Papaverine hydrochloride - " ¼

These capsules are given on the basis of body weight as follows:

75- 99 lbs. - 1 after breakfast, 2 at bedtime
100-129 " - 1 " " , 3 " "
130-169 " - 1 " " , 1 after lunch and 3 at bedtime.
170 lbs. and over - 1 after each meal and 3 or 4 at bedtime.

Addiction to either of these drugs is not to be feared.

b) Benzedrine and ephedrine drops may give temporary relief but the secondary congestion is frequently greater than the primary.

c) The Royal Victoria Otolaryngology Department routine is as follows:

1. Hot normal saline nasal irrigations.
2. Alkaline nasal spray.
3. Ephedrine and chloretone 1% spray.

N.B. At times a 2% cocaine spray is helpful before the nasal irrigation.

d) Dr. W.J. McNally's routine:

1. Spray nose with ½% cocaine.
2. Irrigate nose with the following alkaline wash:
Sodium bicarbonate grs. iii
Sodium Biborate " iii
Glycerin drams iii
Cinnamon water " ii
Water to ounces iii

3. Chloretone inhalant - parts iii
Ephedrine inhalant " ii
Liq. paraffin ad " i

SYMPTOMATIC THERAPY (Continued)
Coryza -

4. To combat cough :

1. Inhalation Mixtures. The following mixture:
   Oil of pine needles - drams 4
   Tincture of benzoin to make ounces 4
   added to the boiling water in a kettle gives a soothing, medicated steam.

2. Elixir Terpin Hydrate with Codeine

| | |
|---|---|
| Terpini Hydratis | - gr. 2 |
| Codeine | - " ¼ |
| Alcoholis (95%) | - drams 1 |
| Glycerini | - minims 45 |
| Vanillini | - gr. 1/60 |
| Aquae Destillatae | - ad drams 2 |

   Dose - drams 1 q. 4 h., p.r.n.

3. Mistura Pectoralis.

| | |
|---|---|
| Potassii Citratis | - gr. 15 |
| Tincturae Opii Camphoratae | - minims 20 |
| Tincturae Ipecacuanhae | - " 7½ |
| Syrupi Tolutani | - " 30 |
| Aquae | - ad drams 2 |

   Dose - drams 1 q. 4 h., p.r.n.

4. Linctus Codeine,

| | |
|---|---|
| Liquoris Ferri Perchloridi | - minims 15 |
| Potassii Chlorate | - gr. 5 |
| Glycerini | - minims 10 |
| Syrupi Limonis | - " 20 |
| Aquae | - ad drams 2 |

   Dose - drams 1 q. 4 h., p.r.n.

5. In more severe cases codeine grs. ½ to 1, or rarely, heroin, may be necessary.

## Cystitis

1. Force fluids.
2. To relax bladder spasm the "bladder mixture" may be used:

| | |
|---|---|
| Potassium citrate | - grs. 30 |
| Tincture hyoscyamus | - minims 30 |
| Aromatic elixir | - " 20 |
| Simple syrup | - " 20 |
| Water to make | - drams 2 |

   Dose - drams 1 or 2, t.i.d.

SYMPTOMATIC THERAPY (Continued)
Cystitis -

3. Urotropin in doses of grains 7½ to 15 t.i.d. a.c. The urine should be kept acid during this medication by giving acid sodium phosphate grs. 15 to 30 with each dose of urotropin.

4. Sulfathiazole -
   Dose - grs. 15 q.6 h. for 36 hours and then grs. 7½ q.6 h. until urine is clear.

## Diarrhea

An attempt should be made to determine the cause. Symptomatic treatment consists in:

1. Liquid diet only.

2. Catharsis - preferably with magnesium sulfate.

3. Bismuth - Mistura Bismuthi Composita:

| | |
|---|---|
| Bismuthi carbonatis | - gr. 10 |
| Cretae | - " 10 |
| Tincturae Opii | - minims 5 |
| Elixiris Aromatici Rubri C.F. | - " 20 |
| Pulveris Tragacanthae Compositi | - gr. 3 |
| Aquae Cinnamoni | - ad drams 2 |

   Dose - drams 2, q.4 h., until relieved.

4. To combat abdominal cramps - paregoric in doses of drams 2, q.2 h. (adult dose) until relieved, is valuable.

5. A saline enema may be helpful.

## Distention

This may be treated by:

1. Indwelling rectal tube.

2. Heat to the abdomen in the form of:
   a) Hot water bottle or electric pad.
   b) Turpentine stupes.
   c) Linseed poultices.

3. Water and glycerin or milk and molasses enemata.

SYMPTOMATIC THERAPY (Continued)
Distention -

4. Drugs - always use rectal tube before administering.
   a) Peristaltin - 1 ampoule subcutaneously.
   b) Pituitrin - 0.5 to 1 cc. intramuscularly.
   c) Eserine - grs. 1/150 hypodermically and repeat in 2 hours if necessary.

5. In the presence of paralytic ileus, it is generally advisable to stop everything by mouth, use the intravenous route to administer fluids and to pass a Miller-Abbott tube attached to a Wangensteen apparatus.

## Epistaxis

Apply 2% cocaine or 1-1000 adrenalin solution to the bleeding point with a swab, or pack. Then pack nostrils and apply pressure.

## Headache

As stated previously the cause of the headache should be determined and treated accordingly. In addition to discussing symptomatic headaches the treatment of a few etiological factors is included.

1. Symptomatic headache.
   a) Aspirin - grs. 10, q.4.h., p.r.n.
   b) Codeine - grs. ½ or 1, q.6.h., p.r.n.

   To be used with due caution in chronic headache.

2. Post-encephalogram headache - in addition to above the administration of oxygen with the Boothby mask will generally give much relief.

3. Post-operative pressure headache - usually much relieved by elevating head of bed and controlling cerebrospinal fluid pressure with lumbar puncture once or twice daily.

4. Post-lumbar puncture headache - is generally associated with low cerebrospinal fluid pressure. Treatment consists in:

   a) Keeping patient in prone face down position with foot of bed elevated.

   b) Forcing fluids by mouth.

SYMPTOMATIC THERAPY (Continued)
Headache -

c) Promoting cerebral vasodilatation with whiskey or brandy, ounces 1, or caffeine sodium benzoate, grs. 7½, b.i.d. The last dose of caffeine should not be administered after 6 p.m. The value of these methods to promote cerebral vasodilatation is controversial.

d) Pitressin 0.5 cc. repeated q.6. to q.8.h. Do not use in cases of epilepsy because of danger of inducing a seizure.

5. Migraine - Ergotamine tartrate is used. The dose is 0.5 cc. (0.25 mgm) intramuscularly, repeated in ½ to 1 hour if necessary. The drug should not be given to pregnant women or over any prolonged period of time.

## Hemorrhoids

1. Medicated suppositories - p.r.n.

2. Unguentum "Foote".

| | |
|---|---|
| Camphorae | - gr. 4 |
| Mentholis | - " 3 |
| Phenolis | - " 3 |
| Hydrargyri Subchloridi | - " 10 |
| Acidi Borici | - " 10 |
| Ungenti Zinci Oxidi | - ad ounces 1 |

## Hiccough

This is frequently most difficult to combat. At times it is necessary to run the whole gamut of treatment before finding relief for the patient.

1. First to be tried are:

a) Inhalations of 5% carbon dioxide in 95% oxygen or rebreathing on a closed system (e.g., paper bag).

b) Gastric lavage.

c) Codeine, grs. 1 hypodermically.

SYMPTOMATIC THERAPY (Continued)
Hiccough -

2. Should these measures fail one of the following may be helpful:

   a) Langdon Brown recommends 0.5 cc. 1-1000 epinephrine in combination with 1 drop of carbolic acid and 3 drops of dilute hydrocyanic acid, diluted with water.

   b) Spiritus aetheris compositi (Hoffmann's Anodyne). Dose - drams 1, p.r.n. in ice water.

   c) Tincture of capsicum - 5 drops well diluted with water.

3. Rarely it is necessary to resort to chemical or surgical block of the phrenic nerves.

## Hyperthermia

It is usually not difficult to recognize neurogenic hyperthermia. The patient's hands and feet are cold and may be mottled. His skin is dry while his temperature rises to 102° or even 106° F. and above. He does not have chills. There is a striking tachycardia and tachypnea. In contrast to this a patient with a beginning infection is flushed and feels hot.

Proper treatment is to expose his body completely except for a loin cloth. This is usually enough to bring the temperature down. But, if not, aspirin may be given and ice bags may be placed in the axillae and wet towels applied to the skin.

In addition the following measures may be helpful:

1. Use of electric fans directed toward patient.
2. Alcohol sponges and ice water enemas.
3. Massage of extremities with a rough towel.
4. Nembutal - in repeated small doses.
5. Morphine sulphate, grs. 1/64 to 1/32 q.l.h. until respirations are slowed to 20 per minute.
6. Under certain conditions it may be valuable to use paravertebral block or spinal anaesthesia.

SYMPTOMATIC THERAPY (Continued)

## Insomnia

(including restlessness)

To combat insomnia and restlessness one of the barbiturates is generally effective. These drugs should always be discontinued before the patient leaves the hospital.

1. Phenobarbital - grs. 1½ and repeat in 4 hours if necessary.
2. Amytal - " ¾ " " " " " " "
3. Sodium amytal - " 3 " " " " " " "
4. Seconal - " 1½ " " " " " " "
5. Dial - " 3 " " " " " " "

In more obstinate cases paraldehyde is recommended. It is preferably given by rectum in doses of 4 drams. Half of this dose may be repeated in 2 to 4 hours if necessary. If expelled by rectum an equivalent amount may be administered orally, by disguising the drug in strong sweetened iced tea; or by means of a stomach tube.

Rarely it is necessary to use one of the barbiturates subcutaneously, intramuscularly or intravenously. These drugs are provided in ampoules for this purpose.

The restlessness associated with a psychosis will in most instances be alleviated by the use of cold packs or the continuous tub. In addition paraldehyde is frequently helpful.

## STATUS EPILEPTICUS

The possible precipitating factors should be carefully sought. If status follows a craniotomy, increased intracranial pressure, due to hemorrhage or edema, should be suspected and confirmed or denied by lumbar puncture. Intracranial hypertension due to hemorrhage is obviously treated by evacuation of the clot. Should the convulsions be due to edema the pressure may be reduced by:

1. The intravenous injection of 50 to 125 cc. of a 25 or 50% solution of glucose or sucrose.

2. A retention enema consisting of 30 grams of magnesium sulphate in 100 cc. of water.

3. Repeated one ounce doses of 50% magnesium sulphate by mouth.

The anticonvulsant drugs are almost invariably necessary and are best given in a rapidly absorbable form such as:

1. Sodium luminal - for adults - grains 2 intramuscularly, repeated if necessary.

2. Paraldehyde - for children and adults - in doses of 1 to 4 drams per rectum.

3. Avertin - by rectum in 2/3 to 3/4 the usual anaesthetic dose.

4. Ether - by the open drop, carrying the patient into the third stage and then allowing recovery.

5. Methylene blue - 10 cc. of a 1% solution, intravenously at 1 hour intervals, not exceeding a total dose of 20 cc. if the patient does not improve. This should only be attempted if the established measures have failed.

Reference: Epilepsy and Cerebral Localization, Penfield, W.G. and Erickson, T.C. Charles C. Thomas, 1941.

# URINARY TRACT INFECTIONS

by

Harold Eggers

This regime is essentially that employed by the Urology Department of the Royal Victoria Hospital. The first step is to determine the type of infecting organism by Gram stain and culture. The second step is to maintain a large fluid intake.

Acute Infections:

A. Relieve dysuria by alkalinizing the urine with one of the following:

1. Sodium bicarbonate - grains 15, q.4.h., while awake.

2. Citrocarbonate - grains 60, q.1.h. while awake for 1 - 2 days and then q.2.h.

B. Sulfonamides (sulfanilamide, sulfathiazole or sulfadiazine) given in doses of grains 15 the first day, 30 grains on the second day, 45 grains on the third day and 60 grains on the 4th day. This dosage is maintained for 4 days and then reduced 5 grains daily until withdrawal.

Chronic Infections:

A. If urine is not acid it should be acidified with one of the following:

1. Acid sodium phosphate, grs. 30 t.i.d., p.c.
2. Ammonium chloride, grs. 15, daily for 6 days.

B. Administer one of the following:

1. Mandelic acid, grs. 180 daily for 6 days.
2. Calcium mandelate, grs. 180 daily for 6 days.

Old Debilitated Patients:

A. Acidify urine as above.

B. Urotropin, grs. 15 t.i.d., a.c.

C. One of the sulfonamides (see above) in a dosage of grains 30 the first day followed by a maintenance dose of grains 45 until discontinued.

## WEIGHTS AND MEASURES

1 grain, gr. = 1 minim.

1 dram = 60 grains or minims.

1 ounce = 8 drams = 480 grains or minims.

1 pint, pt. = 16 ounces.

1 quart, qt. = 2 pints = 32 ounces.

### Approximate Metric-Apothecaries' Equivalents

1 Gm. = 15 grains

1 cc. = 15 minims

1 mg. = 1/64 grain

1 L = 2 pints or 1 qt.

1 Kilogram = 2.2 pounds

1 grain = 65 mg. (0.065 Gm.)

1 minim = 0.065 cc.

1 dram = 4 cc.

1 ounce = 30 cc.

1 pint = 0.5 L. (480 cc.)

1 quart = 1 L. (960 cc.)

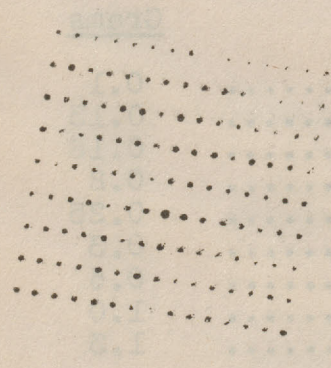
---

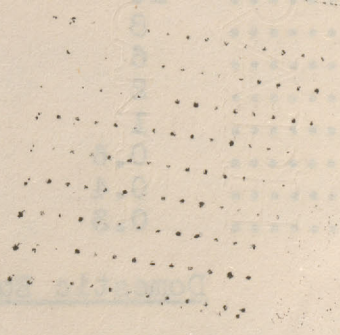
| Grains | Milligrams | Grains | Grams |
|---|---|---|---|
| 1/2 | 32 | 1.5 | 0.1 |
| 1/4 | 16 | 2 | 0.13 |
| 1/8 | 8 | 2.5 | 0.16 |
| 1/10 | 6 | 3 | 0.2 |
| 1/32 | 2 | 4 | 0.25 |
| 1/60 | 1 | 5 | 0.3 |
| 1/100 | 0.6 | 10 | 0.6 |
| 1/150 | 0.4 | 15 | 1.0 |
| 1/200 | 0.3 | 20 | 1.3 |

### Domestic Equivalents

1 teaspoon = 4 cc. = 60 minims = 1 dram.
1 tablespoon = 15 cc. = 240 minims = 4 drams = 1/2 ounces.
1 teacup = 180 cc. = 6 ounces.
1 tumbler = 240 cc. = 8 ounces.

(United States Apothecaries' System from "Essentials of Hospital Practice", by Calder, Royal M., M.D.)





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