SIX CASES
submitted by Hilary F. Hamilton, for the
PATTISON PRIZE
in Clinical Surgery.

1. Carcinoma of Tongue
2. Renal Calculi
3. Carbuncle of Lip
4. Acute Appendicitis
5. Fracture-Dislocation of Spine
6. Carcinoma of Rectum
CASE NO. I
CARCINOMA of the TONGUE
Treated by excision.

John Cunningham. Age 65. of 75 Grassmarket.

Recommended by Dr. Burt, Canongate.

Admitted: 2. Nov. 43. (first examined by me 3. II. 42)
Discharged: 22. Nov. 43.

Complaint is of an ulcer on his tongue (left side), which is very painful: "Like a ball of fire," & hinders mandibular speech. Also of a lump in his left submandibular region, both have been present for 3 weeks.

HISTORY OF PRESENT ILLNESS

Early in May 1939 he noticed that his left lower alveolus was sore on its anterior aspect. He also noticed a large swelling under the left angle of his jaw. This swelling was not painful, though the alveolar lesion was painful.

He came to S.O.P.D., & was sent on 10 May 39 to Beech Mount, & remained there till 21 June 39. While there he had full dosage with a Radium bomb, & also Radium needles inserted into each cheek.

The alveolar lesion was a squamous cell carcinoma, & the enlarged gland in sub-mandibular region was due to direct spread -(lymphatic)- from the primary focus in the alveolus.

Both the primary lesion & the enlarged gland responded well to treatment. When he left Beech Mount the gland enlargement had completely disappeared, & his gum had almost healed.

While in Beech Mount he had an attack of Bronchitis, & was given medicine for his heart. He also lost a great deal of weight, which he has not regained. He felt very weak after discharge, & did not resume work till Jan. 44.
when he began working for Peter Adams at a nursery garden.

He felt perfectly fit from this time until three weeks ago. During this time he reported regularly to Dr. McWhirter: at first every 2-3 months; later every 6 months, & lastly only once a year.

Then, three weeks ago, he suddenly felt rotten in every way, very tired, & easily fagged out. His mouth became very painful, especially on eating, swallowing & speaking. The sore in his mouth grew rapidly.

About the same time he noticed a small lump growing gradually under the left angle of his lower jaw. This lump was painful.

The pain due to the sore in his mouth began in the region of the ulcer (i.e. mid-tongue) & radiated to just below his left ear. The pain felt like a ball of fire & was not relieved by anything except sleep. Heat was ineffectual. Usually the pain was a little better on first awaking.

He has never had any haemorrhage from either the alveolar lesion, or the sore on his tongue.

The alveolar lesion does not give him any trouble unless touched. This prevents him from using his dentures.

He had his molar teeth removed in 1918, and in 1939 the rest of his teeth were extracted, including his left lower canine & incisors. He has worn no dentures since then.

HISTORY OF PREVIOUS HEALTH

Bronchitis while in BeechMount in May-June 1939.
Heart Medicine at the same time.
Cardiac Failure & auricular fibrillation, with oedema of both legs & scrotum, on admission to Dr. Alexander's ward 3,7,40. He was discharged on 11,7,40 with the oedema completely cured, & went to a convalescent home at Musselborough. He then returned to work. He has had no other attacks of oedema, & does not take digitalis
regularly.

**SOCIAL CONDITIONS** are those of an ordinary working man.

**FOOD**

Ever since the alveolar lesion, his diet has been mainly vegetables, all very well boiled: potatoes, always mashed: meat in the form of mince: bread without crusts: & tea.

For the last three weeks everything he eats must be extra soft, & vegetables pulped. He now takes a longer time to eat his meals. If he can spend the time, then he can eat the food. He dislikes fish, & never takes it. Milk ½ pint daily, & wishes for more.

**SMOKING**

He smokes a pipe, but not to excess.

**FAMILY**

He has a wife & one son, from both of whom he is separated.

**STATE ON EXAMINATION**

**SPEECH,** most noticeably, is difficult to understand, being thick & slurred, poorly articulated, & sounds as if his tongue did not, or could not move freely.

As a witness, he gives a rather jumbled history, & is vague as to actual dates. He is cooperative & anxious to help, & is interested in his condition, & the possible cure

**NUTRITION** is very poor. Muscles are thin & wasted. Bones stand out prominently, & he has little subcutaneous fat. Skin is very pale, & can be easily be pinched up between thumb & finger.

**GENERAL APPEARANCE** is that of a thin lanky man, anxious, flushed face, hollow cheeks, & sunken eyes. He spends the day curled up under the bedclothes, & has no appearance of the open-air look of a gardener.

**Temperature** on examination was 97 F.
ALIMENTARY SYSTEM EXAMINATION

SYMPTOMS

All are referable to the mouth condition.

A. General

Appetite is fair, & he eats whatever food he is given.

Has never had indigestion

B. Local

Pain is the most prominent, & began 3 weeks ago, when he first noticed the ulcer. It is continuous, boring, & like a ball of fire. Nothing relieves it. It is made worse when he moves his tongue, especially on speaking & eating.

Slight dysphagia, & finds pulpy food easier to swallow.

SIGNS

A. MOUTH

Lips are normal, with a good colour

Edentulous, & has worn no dentures since 1939.

Gums are healthy. On the left lower gum, ant. margin, there is a depressed scar, the base of which is a deeper red than the surrounding tissue. This scar is 1 cm. long, & corresponds to the left lateral incisor & canine teeth area. It is tender to the touch, & prevents him wearing his dentures, but otherwise does not trouble him.

Tongue is clean, smoother than normal, & of a healthy pink colour. It has very little fur on it. The median sulcus is deviated towards the left, & the tip of the tongue lies appreciably to the left of the median plane, thus giving the tongue an unduly broad side-to-side appearance. On protrusion it deviates to the left. It is extruded with difficulty, & the tip only just overlaps the lower lip. He can push the tongue to the right, but less than the normal. In this position, a necrotic ulcer is seen on the left lateral margin and...
surface. It is situated in the middle third of the tongue. It is ovoid in shape, & nearer the floor of the mouth anteriorly. Posteriorly it is more rounded. In size its longest antero-post. length is 3 cm., & vertical height 1.5 cm. at the widest part. In appearance, the base of the ulcer is filled with a necrotic, friable yellow slough, beginning to separate at the edges, but adherent in the centre. The edges are raised, rounded, & slightly paler than the surrounding area of the tongue. These edges are hard, & on palpation the whole ulcer is hard to the touch, & very tender. The left side of the tongue seems to be bound down to the floor of the mouth by the ulcer. Salivation is not excessive. Fauces are healthy.

B. ABDOMEN

Inspection. The abdomen moves freely with respiration. It is rather flattened; the skin is white, & loose. There are no striae visible, no dilated veins, & no abnormal prominences. No scars are present. Slight pulsation at the epigastrium is probably due to his general thinness.

Palpation. The abdominal walls are slack, the skin moves freely, & there is very little subcutaneous tissue. There is no tenderness, no rigidity, & nothing abnormal can be detected. Liver & spleen are not enlarged, nor nodular.

Percussion. A resonant note was obtained, & no fluid was found in abdomen.

Summary: Nil abnormal found in abdomen, which shared in the general thinness.
HAEMOPOIETIC SYSTEM

LYMPHATIC SYSTEM

Symptoms
The patient complains of a swelling under the angle of the left lower jaw.

Signs

Inspection: The inspection of the neck shews a slight fulness below the left angle of the mandible. The skin over this area was redder than usual, & shewed a slight induration, typical of skin exposed to a radium bomb. No other part of the lymphatic system shewed any changes.

Palpation: Palpation found a slightly enlarged gland of the left upper ant. deep cervical group, under & below the angle of the mandible. It was 1.5cms. long by 0.5 cm. broad. It lay immediately above the greater horn of the hyoid bone. Consistence was firm, but not stony, and did not pulsate. Shape is an elongated oval.

It was unattached to skin, & moved freely from the deep structures, but was slightly adherent to surrounding connective tissues. It was not tender.

It appeared to shew a slight decrease in size when observed for five days. It was most easily felt with the head on the pillow, face turned to the left, and mouth open.

The upper post. deep cervical & the supra-clavicular lymph glands were not enlarged on either side.

Spleen was not palpable.

BLOOD

Symptoms: Nil abnormal found

Signs: Haemoglobin estimation:- 102%
W.B.C. count:- 7600 / cc.

There was no anaemia. Mucous membranes of conjunctivae & lips are healthy, & of good colour.
MENTAL FUNCTIONS

Intelligence is average. He takes an interest in his surroundings & treatment, and co-operates well. History was fairly well given.

Emotionally he appears quite stable; rather sad.
Memory is average, events remembered, but muddled.
Speech is as described previously.

CRANIAL NERVES

Olfactory nerve: Normal smell at all times
Optic Nerve:
  a) Visual acuity normal.
  b) Fields of vision normal
  c) Ophthalmoscope: N.A.F.
  d) (associated with oculomotor N.)

Pupils: normal in size, shape & reactions to normal & consensual light
Accommodation: normal

Oculomotor N. Medial, Inferior & Superior recti and
  Inferior oblique & Levator palpebrae muscles normal

Trochlear N. Superior oblique normal

Abducens N.: Lateral rectus normal.

Ocular movements were normal in all directions, in both eyes. There was no squint, no nystagmus, no diplopia, & no ptosis of upper eyelids.

Trigeminal N.:
  a) Ophthalmic division:
    Supra-orbital N. & Supra-trochlear N. intact. Corneal reflexes present. (this can be affected by the Facial N.)
  b) Maxillary division:
    Infra-orbital N. Sensation normal to skin of upper eyelids, lateral sides of the nose, cheek, & upper lip, and to teeth of the upper jaw and to palate.
  c) Mandibular division:
Diagram illustrating the explanation of the difference between U.M.N. & L.M.N. lesions of the facial nerve.
Trigeminal N. (contd.)

c) **Mandibular division.**

**Motor power:** Normal movements of mouth & jaw. i.e. muscles of mastication (temporalis, masseter, medial & lateral pterygoids) working normally & with good co-ordination.

**Sensation:**

Mental branch of inf. dental N. (to lower lip) intact.

Sensory branches of inf. dental N. (to gums & teeth of lower jaw) intact. The pain when the alveolar scar is touched may be due to a stump neuroma.

Lingual branch intact. (supplies the ant. 2/3 of tongue with ordinary sensation)

Chorda tympani N. (supplies branches through the submaxillary ganglion from the Facial N to the ant 2/3 of the tongue) intact.

**Facial N.**

Tests used were  

a) wrinkling forehead  
b) screw eyes up tightly  
c) retract lips & smile

If a lesion of the Facial N. after it had left the brain, had been present (L.M.N. lesion), complete paralysis of ½ of the face would have occurred (Bell's palsy). If a supra-nuclear lesion were present, the lower ½ only of the affected side would have been paralysed, as the upper motor fibres neurone fibres of each side give branches to the opposite half of the upper face.

**AUDITORY N.**

Intact—as there is no difficulty in hearing, and no pain, tinnitus nor other ear symptoms.

**GLOSSOPHARYNGEAL N.**

Intact—as there is no interference with sensation & secretion of posterior ⅓ of tongue, as supplied by this nerve.

**VAGUS N.**
VAGUS N.

Is motor for the palate, larynx & pharynx, and is sensory & motor for the respiratory passages, the heart, & most of the abdominal viscera. There is no regurgitation of oral contents into the nose. There is no difficulty in voice production.

SPINAL ACCESSORY N.

Is motor for sternomastoid & trapezius. Intact.

HYPOGLOSSAL N.

Is motor to the intrinsic muscles of the tongue, and to all the extrinsic muscles also, except the palatoglossus (spinal-accessory N.)

Here the tongue is deviated to the left side on protrusion, but this is almost certainly due to mechanical interference by the growth binding the left side of tongue to the floor of the mouth. The dysphagia complained of is also likely caused by the painful growth, and mechanical interference of the tongue’s share in swallowing.

CERVICAL SYMPATHIC N. SYSTEM.

No evidence of disturbance.

REFLEXES

A. SUPERFICIAL

Conjunctival-Intact, depends on integrity of fifth (sensory) & seventh (motor) (cranial)

Pharyngeal & palatal present-Intact:— depends on integrity of ninth & tenth Ns. (cranial)

Abdominal-Intact:— depends on integrity of motor & sensory Ns. of segments seven - twelve (thoracic)

Plantar reflex normal:— depends on integrity of L. five & S. one Ns. segments
REFLEXES

B. SUPERFICIAL DEEP

Knee jerk: (depends on integrity of segments L. 3, 4.) Present.

Ankle jerk: (depends on integrity of segments S. I. 2.) Present.

Biceps jerk: (depends on integrity of segments C. 5, 6.) Present.

Triceps jerk: (depends on integrity of segments C. 7, 8.) Present.

C. ORGANIC.

Micturition normal
Defaecation normal.

MUSCLE POWER IN THE LIMBS.

A. ARM

<table>
<thead>
<tr>
<th>Muscle</th>
<th>Nerve</th>
<th>Segment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deltoid</td>
<td>Circumflex</td>
<td>C.5,6.</td>
</tr>
<tr>
<td>Biceps</td>
<td>Musculo-cutan.</td>
<td>C.5,6.</td>
</tr>
<tr>
<td>Triceps</td>
<td>Radial</td>
<td>C.7,8.</td>
</tr>
<tr>
<td>Wrist flexion</td>
<td>Median</td>
<td>C.7,8.</td>
</tr>
<tr>
<td></td>
<td>Ulnar</td>
<td>C.6,7,8.</td>
</tr>
<tr>
<td>Wrist extension</td>
<td>Radial</td>
<td>C.6,7,8.</td>
</tr>
<tr>
<td>Finger flexion</td>
<td>Median</td>
<td>C.(7) 3.</td>
</tr>
<tr>
<td></td>
<td>Ulnar</td>
<td>C.8.</td>
</tr>
<tr>
<td>Finger extension</td>
<td>Radial</td>
<td>C.7.</td>
</tr>
<tr>
<td>Little finger exten.</td>
<td>Ulnar</td>
<td>Th.1.</td>
</tr>
</tbody>
</table>

All these muscles had good power, & each segment in the arm is tested in these movements. Thus the Cervical cord segments (motor) 5,6,7,8, & Thoracic I. are intact.
**MUSCLE POWER IN THE LIMBS (contd)**

**B. LEG.**

<table>
<thead>
<tr>
<th>Muscle</th>
<th>Nerve</th>
<th>Segment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iliopsoas</td>
<td>Branches of</td>
<td>L.2.3.4.</td>
</tr>
<tr>
<td>Adductors</td>
<td>Obturator</td>
<td>L.2.3.4.</td>
</tr>
<tr>
<td>Gluteus maximus</td>
<td>Inf. gluteal</td>
<td>L.5. S.1.2.</td>
</tr>
<tr>
<td><strong>Knee</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quadriceps</td>
<td>Femoral</td>
<td>L.2.3.4.</td>
</tr>
<tr>
<td>Hamstrings</td>
<td>Sciatic</td>
<td>L.5. S.1.2.</td>
</tr>
<tr>
<td><strong>Ankle</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tibialis ant.</td>
<td>Ant. tibial</td>
<td>L.4.</td>
</tr>
<tr>
<td>Long extensors</td>
<td>Ant. tibial</td>
<td>L.5.</td>
</tr>
<tr>
<td>Short extensors</td>
<td>Ant tibial</td>
<td>S.1.</td>
</tr>
<tr>
<td>Gastrocnemius</td>
<td>Post. tibial</td>
<td>S.2.</td>
</tr>
<tr>
<td>Tibialis post.</td>
<td>Post tibial</td>
<td>L.4.</td>
</tr>
<tr>
<td>Peronei</td>
<td>Peroneal</td>
<td>L.5. S.1</td>
</tr>
<tr>
<td><strong>Toes</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extensors</td>
<td>Ant tibial</td>
<td>L.5.</td>
</tr>
<tr>
<td>Flexors</td>
<td>Post. tibial</td>
<td>L.5.</td>
</tr>
</tbody>
</table>

All these muscles have good power. Thus cord segments L.2.3.4.5. & S.1.2. (motor) are intact.

**SENSORY FUNCTIONS**

Subjective sensations are normal

**SENSATION in ARM**

a) **Segmental Drill** covering segments 0.2.3.4.5.6.7.8 & Th. I. These were all intact.

b) **Main Nerves** intact,

- Median N.:- index finger pulp is sensitive.
- Ulnar N.:- little finger pulp is sensitive.
- Radial N.:- proximal parts of dorsal surface of Ist, interosseous space is sensitive.
SENSATION in ARM (contd.)

c) Stereognosis:— Movements of thumb, gripped on its lateral and medial aspects with steady, constant pressure were appreciated. Stereognostic sense is intact.

d) Co-ordination:—Normal. So cerebellar function is intact.

SENSATION in LEG.

a) Segmental Drill:— covering segments L.I.2,3,4,5, & S,1,2,3,4,5, are intact

b) Main Nerves are intact
   - Saphenous N.:—medial border of foot sensitive.
   - Musculo-cutaneous N.:—lateral,border foot is sensitive.
   - Post. tibial N.:—pulp of great toe is sensitive.
   - Ant. tibial N.:—the skin between the heads of the Ist. & 2nd. metacarpals (dorsum) is sensitive.

c) Stereognosis:— Similar movements of great toe are appreciated correctly. So stereognostic sense of legs is normal.

  d) Co)ordination:—Moving one heel up & down the other shin. This was well performed. Co-ordination intact.

VASO-MOTOR and TROPHIC disorders are absent.

The Nervous System shews no abnormality.

ENDOCRINE SYSTEM

No abnormality. (See Case VI.)
CIRCULATORY SYSTEM

Symptoms

Patient complains of slight breathlessness on exertion. He has no pain, palpitation or faintness.

ARTERIES

Pulse: regular, rather fast (82-88)

Rhythm normal, character of wave normal,

Vessel walls palpable, but not calcareous.

B.P. 118/80

VEINS

No distended veins seen

No varicose nor pulsating veins seen.

The thin skin of the neck allowed the normal veins (ext. jugular & ant jugular) to be seen unaltered.

CAPILLARIES

No cyanosis

No oedema

HEART

INSPECTION

Chest wall is thin, so ribs are prominent, and intercostal spaces hollowed.

Apex beat seen below & lateral to left nipple. Pulsations are also seen in two intercostal spaces just below left axilla. A synchronous pulsation seen in epigastrium.

No pulsations seen in neck.

PALPATION

Apex beat located in 6th. intercostal space 1/2" outside nipple line. Pulsation fairly strong but not forcible.

Axillary pulsations in lateral 1/3 of the 2nd. & 3rd. intercostal spaces were synchronous with apex beat. Ditto epigastric pulsation.

No thrills felt.
CIRCULATORY SYSTEM

AUSCULTATION

Rate of the heart was that of the pulse: no pulse deficit.

Rhythm normal.

The 1st & 2nd sounds were easily heard, and not forceful

There were no murmurs.

Summary

The heart shows a moderate degree of dilatation, associated with a little hypertrophy, producing the pulsation. This was made more evident by the emaciation of chest wall.

There was no sign of cardiac decompensation while the patient was at rest. His breathlessness on moderate exertion suggests a very slight decompensation.

In 1940 he had had transitory auricular fibrillation & cardiac failure.

Therefore there must be some myocardial weakness.

RESPIRATORY SYSTEM

SYMPTOMS

Slight chronic cough plus expectoration.

Breathlessness on exertion.

SIGNS

Breathing rate is 20/mt. It is regular, effortless and without wheezing.

Chest capacity is good.

Sputum consists mainly of a clear watery secretion with a little tenacious black mucus. It is usually expectorated without difficulty. Sometime cough & expectoration are troublesome, but there is no real complaint.
RESPIRATORY SYSTEM (contd)

THORAX

Inspection: - Asthenic type of thorax. Chest is symmetrical, and moves well. Breathing is abdominal/thoracic.

Palpation: - Movement is equal on both sides, and fairly good. Vocal fremitus is normal.

Percussion: - Note is hyperresonant, the left being more so than the right.

Auscultation: - Breath sounds vesicular in character, and easily heard

Vocal resonance slightly increased.

A few rhonchi heard during the expiratory phase, espec. on the left side.

Summary: This is a typical picture of mild chr. bronchitis, with slight dyspnoea, sputum & cough, with hyperresonance (due to associated emphysema), vocal resonance increased & expiratory rhonchi.

INTEGUMENTARY SYSTEM

SYMPTOMS: Nil.

SIGNS: There is an atypical radium-treatment pigmentation of the skin over the upper anterior left half of the neck. Otherwise normal.

URINARY SYSTEM

SYMPTOMS: Nil.

SIGNS: The kidneys were not palpable, nor was the bladder enlarged to palpation.

Urine (3.II.43) Appearance: - clear straw colour but mucus positive. S.G.: - 1020 Reaction acid Albumen, Blood, Sugar, Bile, Pus, & icteric bodies all absent

Summary: - The urinary system is intact, & functions normally.
LOCOMOTARY SYSTEM
Nothing abnormal was found in bones, joints or muscles.

RADIOLOGISTS REPORT
In 1939 the patient had a squamous cell carcinoma of the left lower alveolus anteriorly. He was treated with radium needles in both cheeks, & a radium bomb at Beechmount from 10.5.39 - 21.6.39 (full dosage)
A biopsy is suggested for the present clinical carcinoma of the tongue

PATHOLOGIST REPORT
The lesion is a squamous cell carcinoma of tongue.

DIAGNOSIS
Lesion is a carcinoma of tongue with metastatic involvement of the ant. upper deep cervical glands on the left side. This is a recurrence of the carcinoma of the left lower alveolus, with metastasis in the neck, treated with radium in 1939.

TREATMENT
Palliative operation, as cure is unlikely.

OPERATION
Anaesthetic:- Pre-medication by omnopon gr.1/3 & scopolamine gr. 1/100
Induction by gas, oxygen & ether and maintenance by gas, oxygen & trilene (chosen as it was non-inflammable, and with no ill effects on heart)
Fauces were packed with gauze after the passing of an endo-tracheal tube, to prevent inhalation of blood.
Light anaesthesia was maintained as the heart was fibrillating (pulse fast & irregular in time & force)
TREATMENT

Operation (surgeon Mr. Miller)

A silkworm gut suture through the tip of the tongue was used for continuous traction. First the necrotic tissue was swabbed away. Retraction of the cheek & lower lip gave good access.

To seal off the blood vessels, a coagulating diathermy needle made a series of punctures around the growth, about a ¼ inch from its boundary, and from ¼ to ½" deep. The growth was excised by the diathermy knife including 1/8" of surrounding tissue.

A slight haemorrhage from the deep branch of the lingual A. was controlled by a silk suture. The wound was packed with gauze for haemostasis; all blood was swabbed from the mouth, and the tongue traction suture removed. The faucial packing was removed, an air-way inserted, and the patient removed to bed.

Progress:— Ommopon Gr. 1/100 gave him rest the next night. Tr.100. 2°F Pulse 100. (9.II.43)

I0.II.43:— Fairly comfortable. Tr. 99.4 (A.M. & P.M.) Pulse 98.

II.II.43:— Fairly comfortable. Tr. 102. (P.M.). Pulse 84.

I2.II.43:— Pain on eating: muscles of jaw stiff: speech poorly articulated. Tr.100. Pulse 90-100.

I3.II.43:— As on the day before.

I4.II.43:— Tr, subnormal, and pulse 84.

After this, Pulse varied btw. 70 & 100, & Tr. subnormal. A small burn at the angle of the mouth at operation healed rapidly. Pulse was regular after the anaesthetic was stopped, and remained so.

I9.II.43. Out of bed.

When discharged, he could eat most things, & was free from pain except on eating. He could not protrude the tongue at all well. He was very thin and looked ill. He was to report regularly for X-ray treatment. The ulcer was still unhealed, but looked moderately clean.

8.7.44. Ulcer healed, but crater present.
The role of heredity in causing tumors is difficult to ascertain - but gliomas of the retina, neurofibromas of Von Recklinghausen's disease & large intestine polyps show a definite hereditary tendency. In man, generations pass relatively slowly, & the chances of developing cancer are moderately high (it is a widespread disease) so that even within a few generations - Cancer family (415 people), 4 members dying of cancer of alimentary canal or uterus is inconclusive proof of heredity transmission.

In mice, cross-breeding can increase or decrease cancer tendency. It has proved the existence of an important hereditary factor in mouse cancer of breast lump it breast - transmitted by either male or female - presumably chromosomal in origin.

In mouse cancer of the breast a hereditary factor has been shown to be transmitted to the mother within a few hours after birth, as in Cancer susceptible strain (such that 80-100% develop breast cancer), if the babies are removed from their mothers, & nursed by mothers of nil 90% (cancer breast) susceptibility

Immediately after birth - 7% develop breast cancer
17 hours " " 25% " " 63% " "
24 hours " " 63% " "

but this tendency may be modified later in mouse life by diet.

In human females - there is a curious class incidence of cancer

Hospital class patients developing uterine cancer
Private patients developing mammary cancer

Relation to hermaphrodites, contraception, birth families, cleanliness, nature of confinement & pre-parenthesis & diet.
A squamous cell carcinoma in this position most frequently is associated with a carious tooth or ill-fitting dentures. This man first used dentures in 1919 and wore the same set till 1939. Probably they were a poor fit by this time. As he had some teeth extracted at that time, they were possibly carious. Trauma is suggested as a possible starting cause. He also smoked a pipe, which may have aggravated any irritation, especially if defective.

The question of heredity is undecided, but there is probably some hereditary weakness leading to overgrowth of cells. (Cases are recorded of identical twins developing cancer in the same area and at the same age). Repair of a trauma (especially if long continued) may be followed by excessive regenerative growth, which may become uncontrollable, and produce a neoplasm.

Age:-- Cancer occurs most often in the 50-70th period. This man was about 61 yrs. old at his original operation. Body tissues are most liable to cancer when, having attained maturity, they start upon the period of decadence or involution.

Excess of alcohol & tobacco are possible causes of cancer.

Glossitis, ulcers & syphilitic lesions are predisposing causes, and may form precancerous lesions. Cancer developing from these causes is usually less malignant than primary cancer.

In this case there was a combination of several possible causes i.e. teeth, age, trauma, tobacco.
The characteristic findings of a malignant growth are:

1) Rapid growth.
2) Early ulceration.
3) Edges are hard, raised, indurated & pearly grey.
4) Metastases to lymph nodes draining the area, probably by permeation, and not by embolic spread.
5) No capsule is formed by the tumour, as the rapid infiltration of surrounding tissues & organs prevents encapsulation.
6) The general condition of the patient deteriorates rapidly, especially in loss of weight.

The spread of a carcinoma is usually by:

a) Direct continuity
b) Lymph vessels. The lower ant. alveolus drains into Submandibular glands. These communicate with the post. upper deep Cervical, and later with the supra-clavicular glands. (the submandibular glands were enlarged in this alveolar cancer.)

This squamous cell carcinoma responds very well to treatment by Radiation. In this case both tumour and metastasis were reduced to normal size by the full course at Beechmount. The only criticism would be that there was no follow up courses to perfect the cure.

In this case there was marked loss of weight. The sense of taste was lost during radiation, and for some time after. This illustrates the risks of radium & deep x ray treatment, in that not only the growth is affected, but also healthy tissues. Also the patient left Beechmount outwardly cured, but felt very seedy for 6 months, and never regained his weight. Thus, though seemingly cured, the underlying tendency was still there, and he carried on the dangerous pipe habit. The alveolar lesion was still tender, and the scar remained.

The food eaten during this time was necessarily soft, owing to absence of dentures.

Prolonged exposure to radium of itself can induce
DIFFERENTIAL DIAGNOSIS (contd)

Syphilis, tertiary stage (contd):- Multiple gummatas & Diffuse syphilitic lesion producing leucoplakia are quite unlike this condition, though syphilitic lesions may be precancerous. A blood test will discriminate in tertiary stages, and diagnosis clinched by biopsy.

5) Actinomycosis:—The tongue would be a rare site. It usually occurs at the angle of the jaw, spreading over the maxilla. The skin is indurated, and yellow pus containing "sulphur granules" exudes from many persistent sinuses. Culture clinches diagnosis.

6) Papilloma:—Projects above surface, and is pedunculated. Has no gland involvement, and is benign.

7) Sarcoma:—Very rare on the tongue, and only differentiated by biopsy. In this area would be metastatic by the blood stream, and so no lymph gland involvement likely.

8) Lipoma Characterised by slow growth, no ulceration, and no lymphatic involvement.

9) Angioma, haemangioma lymphangioma

10) Fibroma

II) Dermoid cyst:—Only occur in the middle of the tongue.

I2) Lingual thyroid:—Only occur near foramen caecum in post I/3 of tongue.

I3 Carcinoma:—Usually situated on the edge of the tongue, mid. I/3, and spreading to involve the floor of the mouth, & the regional lymph nodes. The edges are hard and indurated, and ulceration is rapid. The tongue is fixed, producing a characteristic difficulty on articulation. The other characteristics of malignancy are present.

Final diagnosis:—A squamous cell carcinoma of the tongue, a recurrence of the previous alveolar carcinoma.
TREATMENT POSSIBILITIES

1) Excision of the tumour.
2) Excision of left \(\frac{1}{2}\) of the tongue, & block dissection of the lymph area.
3) Radium & deep x ray
4) Resection of the lingual N., or its injection with alcohol.

Here method 1\(\frac{1}{2}\) is the best, as no. 2) is very extensive, and opens many new planes of possible spread, and the patient is in a poor state of health. It must be remembered that this is a recurrence of the alveolar carcinoma. Method 3) is contraindicated by this being a recurrence, and already treated by radium. If the pain still persists, Method 4) will give relief but no prolongation of life.

The DANGERS of the operation are:--

1) Haemorrhage during operation.
2) Inhalation of infected material, producing a broncho-pneumonia, a lobar pneumonia, or atalectasis & secondary lung abscess.
3) Hypostatic pneumonia, from long confinement in bed in one position.
4) Pulmonary embolism with all its sequelae.
5) Secondary haemorrhage, a real & dangerous complication, as area is left open and bound to become infected. It may arise from a) septic necrosis of vessel wall, b) Blood clot dissolution from sepsis, c) too rapid absorption of a ligature
6) Mucus plug producing atalectasis, secondary infection and lung abscess.
7) Implantation of cancer cells in previously healthy tissue i.e. scar recurrences.
PROGNOSIS is bad. This is a recurrence, and only palliative treatment is possible. He will probably go steadily downhill, suffer a good deal of pain, and die of malignant cachexia in 12-18 months.

POST-OPERATIVE TREATMENT

The general state of his health must be maintained if possible. Diet as full & generous as possible, with extra milk & eggs.

His chr. Bronchitis does not seem to worry him. Avoid dusty, overcrowded places, and foggy weather. Wrap up well when he goes out.

His Auricular fibrillation, paroxysmal in Xter, is initiated by abnormal stimuli. Avoid excess in all things: smoking, drinking & over strenuous exercise. There is probably a certain amt. of myocardial degen. He has no history of Rheumatic fever to suggest grave organic lesion of heart. There is no hypertension. For cardiac decompensation digitalis & hospitalisation will be necessary.

Avoid introspection & hypochondriasis by occupying his mind. He will be unfit for any active work.

If pain persists & increases, partial resection of lingual N. or alcohol injection may be necessary.
CASE No 2
RECURRENT RENAL STONES
Treated by nephro-lithotomy

Landham Grange near Nottingham
Admitted 22.I2.43 Discharged 10.I.44

First examined by me 22.I2.43

Complaint—Pain in his left side, present for 2 years, but absent just now.

History of illness.

In August 1940, he began to have constant pain in his left side, which did not radiate. He had never had similar pain to this before, and it was accompanied by several day's dysuria. On August 10th 1940 he had a stone removed from his left ureter. He remained perfectly well, passing a few stones without any symptoms until Dec 1942, when he developed a pain in his right loin, somewhat similar to the pain experienced in August 1940. Pain gradually became worse, and more continuous; it did not radiate. No stone was passed per urethra. X-ray showed a calcified stone situated in right renal pelvis. It was removed on March 1943. (these operations were not performed in R.I.E.). In March 1943 he was told that he had a stone in his left kidney, but as it was not causing symptoms and the patient was unfit for bilateral removal of stones, it was left in situ.

He reported (Dec. 1943) to ward 13 for removal of this stone from left kidney. This stone is causing him no pain at the moment, nor other symptoms; he has no pain nor difficulty with micturition, and no frequency. He has a good appetite, and his bowels are regular.

Previous History

In October '39, he had an Albee bone-graft operation in the thoraco-lumbar region for suspected tuberculosis of spine.

In March '43, following operations on
Previous History (contd)
kidney, he developed a bilateral basal pneumonia.
Otherwise he was perfectly healthy.

GENERAL EXAMINATION
He is well built young man, with a good complexion.
He is well nourished, and in excellent health. Tr 97-6 °F.
A detailed examination of the urinary system is indicated

URINARY SYSTEM.
Symptoms:- nil now
Previous symptoms:- pain & dysuria in 1940, and
again in 1942-1943. (see history)
Signs:- The left kidney is not palpable, and
the lowest pole of the right kidney is just palpable.
No tenderness
The Bladder is not palpable, and not
tender.

Urine:- Amount passed in 24 hours is satis-
factory
Colour- clear, lemon,
Reaction- alkaline
S.G. 1022
Sugar, albumen, bile, blood, & pus all absent.
Mucus a trace.
Microscopic exam. showed the presence of 2-3
"ghost" red blood corpuscles / H.P.F., and a few
epithelial cells & debris. No pus cells were seen.

Radiological Report.
The left renal outline appears normal.
Calduli are present in the lower renal pelvis (left).
The right kidney is completely obscured by
gas.

Destruction of the disc between thoracic T28
and lumbar I vertebrae, resulting in the fusion of the
bodies. A bone graft is seen posteriorly. There seems
to have been some absorption of the lower part of the
graft. The vertebral bodies are uniformly calcified.
Diagram of straight X-ray appearances
X Ray Examination (contd)

graft. The vertebral bodies are uniformly calcified.

**Uroselectan films:** Both kidneys secrete uroselectan. The pelves & calices appear normal.

three calculi were seen lying opposite the disc btw. lumbar vertebrae I & 2.

The largest one was pyramidal in shape, the apex pointing towards mid line. Ther were two small calculi (round) immediately below the pyramidal calculus. (The pyramidal calculus should lie in the lower part of the pelvis of kidney, with the 2 rounded calculi lying in the lower calyx.) The uroselectan films shew normal calyx formation, with wide cupping, and no suspicion of clubbing. (see page 39)

**Summary:** - X ray shews presence of calculi in left renal pelvis. Urine contains a few ghost red blood corpuscles, but no pus cells.

**blood urea** 19 mgm % is normal.
HAEMOPOIETIC SYSTEM
Symptoms: Nil
Signs: Spleen not enlarged.

No Lymphatic enlargement

ENDOCRINE SYSTEM
Symptoms: Nil.
Signs: Pancreas: No thirst, polyuria, glycosuria, emaciation, coma, nor acetone (in breath).

Thyroid: No exophthalmos, diarrhoea, nervousness, tremors, tachycardia, incr. weight, lethargy deposits of fat, falling out of hair or eyebrows, nor constipation.

Parathyroids: Chvostek’s & Troussseau’s signs are absent, and tongue is not centrally furred & brown.

Supra-renal: No Addisonian crises, no pigmentation, & no weakness.

Pituitary: No gross skeletal nor sex changes. No polyuria etc.

Gonads: Healthy.

Summary: No disease of endocrine system.

LOCOMOTORY SYSTEM
Symptoms: Nil.
Signs: Bones Normal. (e.g. X-ray thoraco-lumbar region)

Joint normal. No pain, swelling, effusion nor crepitus. Movements free in all directions.

NERVOUS SYSTEM
Cranial & Spinal Nervous reactions normal
Sensory & motor reactions normal
Sympathetic Nervous system normal
Reflexes normal.

(For detailed examination of nervous system see Case I)
Intelligence is average. He takes an interest in his surroundings & treatment, and co-operates well. History was fairly well given.

Emotionally he appears stable & sensible.

Memory is excellent.

Speech is excellent.

**CRANIAL NERVES**

Olfactory nerve: Normal smell at all times.

Optic Nerve:—

a) Visual acuity normal.

b) Fields of vision normal.

c) Ophthalmoscope:— N.A.F.

d) (associated with oculomotor N.)

Pupils:— normal in size, shape & reactions to normal & consensual light.

Accommodation:— normal.

Oculomotor N. Medial, Inferior & Superior recti and Inferior oblique & Levator palpebrae muscles normal.

Trochlear N. Superior oblique normal.

Abducent N.:— Lateral rectus normal.

Ocular movements were normal in all directions, in both eyes. There was no squint, no nystagmus, no diplopia, & no ptosis of upper eyelids.

Trigeminal N.:—

a) Ophthalmic division:—

Supra-orbital N. & Supra-trochlear N. intact. Corneal reflexes present. (this can be affected by the Facial N.)

b) Maxillary division:—

Infra-orbital N. Sensation normal to skin of upper eyelids, lateral sides of the nose, cheek, & upper lip, and to teeth of the upper jaw and to palate.

c) Mandibular division:—
**Trigeminal N. (contd.)**

c) **Mandibular division.**

   **Motor power:** Normal movements of mouth & jaw. i.e. muscles of mastication (temporalis, masseter, medial & lateral pterygoids) working normally & with good co-ordination.

   **Sensation:**

   Mental branch of inf. dental N. (to lower lip) intact.

   Sensory branches of inf. dental N. (to gums & teeth of lower jaw) intact. The

   Lingual branch intact. (supplies the ant. 2/3 off tongue with ordinary sensation)

   Chorda tympani N. supplies branches through the submaxillary ganglion from the Facial N to the ant 2/3 of the tongue intact.

   **Facial N.**

   Tests used were a) wrinkling forehead

   b) screw eyes up tightly

   c) retract lips & smile

   If a lesion of the Facial N. after it had left the brain had been present (L.M.N. lesion), complete paralysis of 1/2 of the face would have occurred (Bell's palsy). If a supra-nuclear lesion were present, the lower 1/2 only of the affected side would have been paralysed, as the upper motor fibres neurone fibres of each side give branches to the opposite half of the upper face.

   **AUDITORY N.**

   Intact as there is no difficulty in hearing, and no pain, tinnitus nor other ear symptoms.

   **GLOSSOPHARYNGEAL N.**

   Intact as there is no interference with sensation & secretion of posterior 1/3 of tongue, as supplied by this nerve.

   **VAGUS N.**
VAGUS N.

Is motor for the palate, larynx & pharynx, and is sensory & motor for the respiratory passages, the heart & most of the abdominal viscera. There is no regurgitation of oral contents into the nose. There is no difficulty in voice production.

SPINAL ACCESSORY N.

Is motor for sternomastoid & trapezius. Intact.

HYPOGLOSSAL N.

Is motor to the intrinsic muscles of the tongue, and to all the extrinsic muscles also except the palato-glossus (spinal-accessory N.)

CERVICAL SYMPATHIC N. SYSTEM.

No evidence of disturbance.

REFLEXES

A. SUPERFICIAL

Conjunctival intact: depends on intensity of fifth (sensory) & seventh (motor)

Pharyngeal & palatal present intact: depends on integrity of ninth & tenth Ns.

Abdominal intact: depends on integrity of motor & sensory Ns. of segments seven - twelve

Plantar reflex normal: depends on integrity of L. five & S. one Ns. segments
B. SUPPLEMENTARY DEEP

Knee jerk:— depends on integrity of segments
L. 3. 4. Present.

Ankle jerk:— (depends on integrity of segments
S. I. 2.) Present.

Biceps jerk:— (depends on integrity of segments
C. 5. 6.) Present

Triceps jerk:— (depends on integrity of segments
C. 7. 8.) Present.

C. ORGANIC.

Micturition normal
Defaecation normal.

MUSCLE POWER IN THE LIMBS.

A. ARM

<table>
<thead>
<tr>
<th>Muscle</th>
<th>Nerve</th>
<th>Segment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deltoid</td>
<td>Circumflex</td>
<td>C.5.5.</td>
</tr>
<tr>
<td>Biceps</td>
<td>Musculo-cutan.</td>
<td>C.5.6.</td>
</tr>
<tr>
<td>Triceps</td>
<td>Radial</td>
<td>C.7.3.</td>
</tr>
<tr>
<td>Wrist flexion</td>
<td>Median</td>
<td>C.7.3.</td>
</tr>
<tr>
<td></td>
<td>Ulnar</td>
<td>C.8.7.8.</td>
</tr>
<tr>
<td>Wrist extension</td>
<td>Radial</td>
<td>C.6.7.8.</td>
</tr>
<tr>
<td>Finger flexion</td>
<td>Median</td>
<td>C.(7) 3.</td>
</tr>
<tr>
<td></td>
<td>Ulnar</td>
<td>C.8.</td>
</tr>
<tr>
<td>Finger extension</td>
<td>Radial</td>
<td>C.7.</td>
</tr>
<tr>
<td>Little finger exten.</td>
<td>Ulnar</td>
<td>Th.I.</td>
</tr>
</tbody>
</table>

All these muscles had good power; & each segment in
the arm is tested in these movements. Thus the Cervical
cord segments (motor) 5.5.7.8.& Thoracic I. are intact.
### MUSCLE POWER IN THE LIMBS (contd)

#### B. LEG.

<table>
<thead>
<tr>
<th>Muscle</th>
<th>Nerve</th>
<th>Segment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hip</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ilioc-psoas</td>
<td>Branches of</td>
<td>L.2.3.4.</td>
</tr>
<tr>
<td>Adductors</td>
<td>Obturator</td>
<td>L.2.3.4.</td>
</tr>
<tr>
<td>Gluteus maximus</td>
<td>Inf. gluteal</td>
<td>L.5. S.1.2.</td>
</tr>
<tr>
<td><strong>Knee</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quadriceps</td>
<td>Femoral</td>
<td>L.2.3.4.</td>
</tr>
<tr>
<td>Hamstrings</td>
<td>Sciatic</td>
<td>L.5. S.1.2.</td>
</tr>
<tr>
<td><strong>Ankle</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tibialis ant.</td>
<td>Ant. tibial</td>
<td>L.4.</td>
</tr>
<tr>
<td>Long extensors</td>
<td>Ant tibial</td>
<td>L.5.</td>
</tr>
<tr>
<td>Short extensors</td>
<td>Ant tibial</td>
<td>S.1.</td>
</tr>
<tr>
<td>Gastrocnemius</td>
<td>Post. tibial</td>
<td>S.2.</td>
</tr>
<tr>
<td>Tibialis post.</td>
<td>Post tibial</td>
<td>L.4.</td>
</tr>
<tr>
<td>Peronei</td>
<td>Peroneal</td>
<td>L.5. S.1</td>
</tr>
<tr>
<td><strong>Toes</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extensors</td>
<td>Ant tibial</td>
<td>L.5.</td>
</tr>
<tr>
<td>Flexors</td>
<td>Post. tibial</td>
<td>L.5.</td>
</tr>
</tbody>
</table>

All these muscles have good power. Thus cord segments L.2.3.4.5. & S.1.2. (motor) are intact.

#### SENSORY FUNCTIONS

Subjective sensations are normal.

#### SENSATION in ARM

a) Segmental Drill covering segments C.2.3.4.5.6.7.8 & Th. 1. These were all intact.

b) Main Nerves intact.

- Median N.: index finger pulp is sensitive.
- Ulnar N.: little finger pulp is sensitive.
- Radial N.: proximal parts of dorsal surface of Ist. interosseous space is sensitive.
c) **Stereognosis:** Movements of thumb, gripped on its lateral and medial aspects with steady, constant pressure, were appreciated. Stereognostic sense is intact.

d) **Co-ordination:** Normal. So cerebellar function is intact.

**SENSATION in LEG.**

a) **Segmental Drill:** covering segments L.1.2.3.4.5. & S.1.2.3.4.5. are intact

b) **Main Nerves** are intact

- **Saphenous N.** - medial border of foot sensitive.
- **Musculo-cutaneous N.** - lateral, border foot is sensitive.
- **Post. tibial N.** - pulp of great toe is sensitive.
- **Ant. tibial N.** - the skin between the heads of the Ist. & 2nd, metacarpals (dorsum) is sensitive.

c) **Stereognosis:** Similar movements of great toe are appreciated correctly. So stereognostic sense of legs is normal

d) **Co-ordination:** Moving one heel up & down the other shin. This was well performed. Co-ordination intact.

**VASO-MOTOR and TROPHIC** disorders are absent.

The Nervous System shews no abnormality.
ALIMENTARY SYSTEM

Symptoms: Nil
Signs: Mouth is healthy. Tongue clean; fauces, lips & gums are healthy.

Abdomen: Inspection—shews 2 oblique scars, one in each loin. There is no abnormal retraction nor distension. The movements are good & easy. No pulsations were seen.

Palpation—No tenderness, no guarding elicited. The liver, spleen, & left kidney were palpable, and the lower pole of right kidney was appreciable.

Percussion—Uniformly resonant note was obtained; no localised dulness found.

The Back: shewed a linear scar running from Thoracic 10 to Lumbar 2 vertebrae, and in this region there was some limitation of movement.

The Bowels: have always been regular, one motion occuring each day.

Summary:—There is no abnormality of alimentary system.

RESPIRATORY SYSTEM Normal in all respects.

Symptoms: Nil.
Signs: Breathing is effortless, 20 / per min., and predominantly abdomino-thoracic.

The chest is of the sthenic variety.

Thorax: Inspection—Both sides move equally, and have good excursion. Ribs were just visible. The accessory muscles of respiration were not used.

Palpation—The equality and extent of movement were confirmed. Vocal fremitus normal.

Percussion—A resonant note obtained in all areas.

Auscultation—Vesicular breath sounds, and no accompaniments were heard. Vocal resonance normal.
CIRCULATORY SYSTEM
Symptoms: - Nil.
Signs: - Arteries- Pulse rate 80 per mt. Wave & rhythm normal. Vessel walls could not be felt.

Veins - No distensions, varicosity & pulsations were found.

Capillaries: - No cyanosis, oedema nor pulsation. Lips, conjunctiva, & nails were of good colour, and no anaemia was suspected.

Heart: - Inspection - Pulsation of apex beat was seen, and was localised by palpation in 5th interspace, \( \frac{1}{2} \) inch inside nipple line. No other pulsations, and no thrills were present.

Auscultation - Normal heart sounds present, and closed in all areas, and no murmurs heard.

Summary: - No abnormality of circulation.

DIAGNOSIS
Calculus disease of both kidneys.

TREATMENT

23 fl. oz. 4 y

Excision of the large stone by nephrolithotomy. Surgeon Prof Learmonth.

Anaesthetist Dr McKinlay. Premedication by morphia gr \( \frac{1}{6} \) & hyoscine gr \( \frac{1}{100} \). Spinal anaesthesia reinforced by gas & oxygen.

Operation: - The patient was placed on his right side, with a kidney pillow in position.

An oblique incision, extending from over the left 12th rib towards the ant. sup. iliac spine was made, and the muscles (Latissimus dorsi, Serratus post. inf., Ext. oblique, Int. oblique, & Transversus) were divided by diathermy, after all the bleeding points had been caught and coagulated. Some difficulty in exposing the
kidney was experienced, due to the scar tissue resulting from the previous operation. The kidney was exposed, and an incision made in its convex surface, in the long axis of the kidney. A finger was inserted into the kidney, but no stone was palpable. The incision was enlarged, and the stone was eventually found in one of the calyces. This was removed, and the kidney washed out with warm dettol solution. The renal tissue was brought together by deep interrupted catgut sutures. The kidney was returned to its bed, and two lengths of soft rubber dam drain were inserted. The abdominal wall was closed in layers.

Progress: After the operation an intravenous 6% glucose saline drip was set up. This was stopped on 25.12.44. When the patient came round, he was rather restless, and in pain; he was given morphia gr I/6 at 2.20 P.M. at 7.15 P.M. & at II.45 P.M.
On 24th he passed urine with some blood clots, and because of pain, was given morphia gr I/6 at 2 P.M. and at 10.30 P.M.
On 25.12.44 blood clots were still being passed in the urine. Total amt. urine in 24 hrs being 50 oz. Morphia gr I/6 at 3 A.M.
On 26.12.44 patient was very comfortable, and had passed 70 oz urine containing some large clots, which caused slight dysuria.
On 28.12.44 the urine was free of blood both macro- & microscopically. On the 29th the drains were shortened, and he felt well. On 1.1.44 he passed 48 oz urine, and felt "fine".
On 4.1.44, drains were removed, and stitches taken out.
On 10.1.44, he was discharged, feeling very well.
During his stay in hospital pulse varied 80-100 beats per mt. On 22nd, 24th, & 28th he had soap & water enemas with good results, and after that purgatives, ensuring
Diagram of X-ray of 29.2.44.

Uroselectan X-ray appearances of renal pelvis
He reported on 16.2.44 and was feeling and looking well. On 29.2.44 he had a straight X-ray:

"There is a small opacity, cylindrical, above the right transverse process of 3rd Lumbar vertebra, which may be a small calculus in the right ureter. It was uniformly calcified, and was not seen in the X-ray of 22.12.43.

There has been a partial resection of 12th rib on both sides. The 12th thoracic & 1st lumbar vertebrae were fused as already reported."

He still was free of symptoms, and was permitted to resume work.

**DISCUSSION**

The diagnosis of calculus disease of the kidney was made on the history of previous calculi, and the report that a stone existed in the left kidney in March '43. Also on the history of aching pain in the left loin for the past 2 years. To confirm this diagnosis, and to ascertain the exact position of the calculi, the number of the calculi, and the state of the right kidney stones, a straight X-ray was performed. It shewed the presence of 3 calculi in the left kidney. Since they were opposite the disc between Lumbar I & 2 vert., and since their position corresponds to the lower half of the kidney, and since one stone is pyramidal (characteristic shape of renal pelvis stones), it must have been in the power part of the renal pelvis. The 2 smaller stones (oval) were probably in the lower calyces, or might have been discharged recently into the lower part of the renal pelvis. No other calculi were demonstrated in any part other part of the renal tract.

Uroselectan X-ray demonstrated that both kidneys were functioning well enough to concentrate the dye satisfactorily, i.e., I) function good in both kidneys.
DISCUSSION (contd)

Uroselectan demonstrated 2) the outline of the pelvis & calyces; also whether there was macroscopic structural damage (e.g., hydronephrosis) resulted from the presence of the stone in the kidney.

Examination of the urine shewed only a few red blood corpuscles, and no pus cells on microscopic exam. This indicated a small amount of trauma from the stone, but no renal infection. Therefore, probably they did not cause any obstruction to the outflow of urine, as both stasis & infecting organisms are necessary before a urinary infection can arise. This confirms the X ray findings of normal calyces, and the absence of any degree of hydronephrosis.

The site of the pyramidal stone was such that passage per ureter was impossible. So operative removal was decided on while I- patient was in good health.

2- stone was of a size to be easily removed.
3- no renal infection had occurred, and no important trauma. Symtomless stones tend to grow, and size affects all above conditions, and may necessitate wide incision of renal tissue to remove.
4- renal function was not impaired, and operation could be done immediately. If postponed hydronephrosis is always possible to occur.

Choice of operation:- The kidney must first be exposed before the type, of removal can be decided. Pelvio-lithotomy is the operation of choice, if good exposure of the post, surface of the kidney can be obtained. Its value is that no incisions are made in kidney substance, (which tend to destroy kidney tissue). It is contraindicated when 1) pelvis cannot be easily exposed 2) pelvis is intramural.
3) stone is in a calyx, which does not communicate by a wide channel with pelvis.


DISCUSSION (contd) Choice of operation (contd)

Nephrolithotomy was done in this case because of difficulty of access from scarring of previous operation. The large pyramidal, stone was removed, and the 2 small stones were either removed in the dettol washout of the kidney, or else were passed per ureter. No stone was found in the X ray exam. of 29.2.44, except the doubtful calculus shadow in the right ureter.

The post-operative intravenous drip of 6% glucose saline was given, so as to insure an adequate fluid intake, and consequently large renal excretion to wash away the debris & blood clot caused by the operation.

Constitution of urinary calculi- A stone consists of solid urinary constituents, held together by an organic basis of albuminous or colloid nature, which is derived from the blood serum of desquemated epithelium. Most calculi contain calcium salts, and the exact compound varies with I) salt in excess in the urine.

2) the reaction of the urine.

Calcium oxalate is the salt most frequently found in renal calculi, and these are homogenous throughout. These give a uniform shadow on X ray exam. Only the comparatively rare pure uric acid (in children) & cystine (familial) stones are translucent. These however shew as a filling defect if they are situated in the pelvis or calyces, on uroselectn or retrograde pyelograms. (see Page 43)

The differentiation of calculi from other calcified masses in the renal region is by 1) History of renal pain, dysuria, haematuria, 2) Situation- Renal area corresponds to a) kidney- opposite thoracic II & I2 to lumbar 2 & 3 vertebrae. Hilum corresponds with 2 in. from midline.

b) Ureter- Along the tips of the transverse processes, and medial to the spine of Ischium.

c) Bladder- Retropubic - Heterogenous shadows
FILLING DEFECT DUE TO
NON-OPAQUE CALCULUS IN
LOWER PART OF RENAL PELVI

Outline of Pelvis

Outline (probable) of defect.

DIAGRAM OF SITE & APPEARANCE OF CALCAREOUS MATTER SEEN ON X-RAY

Outline of Kidney

Outline of Gall Bladder

Gall Stone

Outline of Renal Pelvis

Pelvic Stone

Calyx Stone

Ureteral Stone

Outline of Ureter

Calcified Gland

Bladder

Genital Bladder
DISCUSSION (contd) Differentiation of calculi (con 3) Shape- i.e.

In Calyces- Flattened & oval.
Pelvis- -Pyramidal or
Ureter- -Cylindrical (fixed & immobile)
Bladder- -Usually irregularly spherical.
Gall stones Signet Ring (rarely contain enough
calcium to be seen)

Calciﬁed glands- Irregular calcification in region
of iliac fossa, slightly mobile.
Phleboliths- Cylindrical, but not in line of ureter.

4) A Retrograde or intra-
venous pyelogram shews up the stone, and gives the
exact position in the kidney tract.

AETIOLOGY

There is a certain familial tendency.—No such
family history was obtained in this case.

Locality:—A maximum incidence of stone
formation is found in certain areas i.e. Central Russia,
N.W. India (children have been known to have been born
Most stones occur in adults, so geographical strata
are not of fundamental importance.

Temperature cannot be shewn to play any
part in causation.

Food:—There is a definite prevalence in
dairy farming areas, and where a cereal diet is the
main staple food. Query? if due to lack of vitamin A.?

Racial:—Negros shew a definite immunity.
European Spaniards have a greater tendency to stone
formation than S. American Spaniards.

Disease:—Calculi are often associated
with other diseases. a) Prolonged immobility, eg. Tubercu-
losis of bones & joints, (This patient had Potts
disease of spine, and prolonged period in bed before
bone-graft operation)
HYDRONEPHROSIS

Showing formation of high ureter-pelvic junction, forming a flap valve and obstructing urine outflow.

NORMAL PELVIS

Showing an unusually high pelvi-ureteral junction.

R. Kidney

R. Renal Vein

R. Renal Artery

R. Renal Pelvis

Isthmus (level of Lumbus III, crossed by both crossing arteries)

HORSESHOE KIDNEY (DIAGRAM - from the front)
DISCUSSION (contd) AETIOLOGY (contd)

Bone-graft operation in 1939. The first calculus probably originated then, and caused symptoms in 1940.

Rheumatoid Arthritis, Osteitis Fibrosa cystica, "and Osteomyelitis are other diseases needing a prolonged stay in bed.

**Other Diseases** predispose to calculus formation e.g. 1) General Decalcification (in rheumatoid arthritis) and 2) Local Decalcification (in tuberculosis, osteomyelitis etc.) Here calcium is released from bones and can be deposited elsewhere.

3) Low fluid intake leading to high concentration of salts in urine, and so a likelihood of deposition with other debris i.e. bacteria, inspissated mucus

4) Constipation (excess calcium is absorbed from bowel.).

5) Coincident infection: - the desquamated cells form a nucleus for stone formation.

6) Changes in the reaction of urine throw different salts out of solution.

**Local renal conditions** predispose to stone formation. 1) Abnormalities preventing proper emptying of calyces & pelvis.

2) Hydronephrosis

3) Horse-shoe kidney

4) High uretero-pelvic junction.

5) Infection & obstruction (stasis) are most prominent when secondary stone formation occurs, and increase the rate of stone growth. The majority of primary calculi lie in sterile urine. In this case, secondary stone formation occurred while urine was still sterile.

In this case immobility, residence in the Midlands, & local decalcification from spinal tuberculosis were probably the main aetiological factors.
CLINICAL FEATURES OF RENAL STONES

I. Pain: characteristic of a calculus in any part of the renal tract. It is a) relieved by rest.
   b) aggravated by movement.
   c) constant, due to the presence of a foreign body in the tract.
   d) punctuated by exacerbations of colic (renal, ureteral & vesical), which are attempts to get rid of obstruction by violent contractions.

Renal and ureteral colic start in the one side, and radiates to iliac fossa & to labium & scrotum of same side. Pain comes on suddenly, and is characteristic, fluctuating from crescendo to crescendo, and finally suddenly ceasing, leaving the continual aching pain behind. The colic spasm ceases when either the stone is passed into bladder, or when the stone settles down again in pelvis. The attacks are usually accompanied by nausea, vomiting, collapse, and associated with urinary symptoms of urgency, dysuria & difficulty.
The abdominal muscles are contracted, and maximum tenderness is in kidney angle. (Mr. Riddick had renal colic in 1940, but only the steady boring, aching pain in March & Dec '43).

2. Haematuria occurs in 75% of cases, and is due to trauma of mucosa. Here it was minimal, and only found microscopically.

3. Infection may occur, and go on to pyelitis, pyelonephrosis, or pyonephrosis. Infection spreading can produce perinephric abscess. The urine will shew pus; it is copious & turbid.

4. Urinary changes: a) Albuminuria, when nephritis complicates the condition.
   b) Crystals indicating which salt has been thrown out of solution.
   c) passage of small stones & "gravel" past all obstructions.
PATHOLOGY

1) When stones are small, and not causing obstruction or trauma, there are no pathological changes.

2) If the stone causes slight trauma, that area of kidney substance may be replaced by fibrous tissue.

3) If infection occurs, then the typical picture of the condition occurs i.e. pyelitis, pyelonephrosis, or pyonephrosis.

4) When the stone causes intermittent obstruction, by blocking & unblocking ureter, and returning to pelvis in between, (characterised by spasms of renal colic), then hydronephrosis occurs.

5) Should the stone suddenly & completely & permanently obstruct ureter, then after a preliminary dilatation of pelvis, all fluid & renal tissue is absorbed, and the kidney is replaced by a fibro-lipomatous organ.

COMPLICATIONS OF RENAL STONES.

Small stones are of themselves harmless, but larger ones necessitate removal, not only on account of their symptoms, but also from the effects of trauma, which may lead to impairment of renal function, and also to infection, which still further impairs the renal funct.

Normal renal function is dependent on a) Blood pressure greater than 60 mm mercury (systolic)

b) At least I/4 of kidney parenchyma must be capable of functioning.

c) Unimpeded flow of urine
Determination of Renal function.

1) Amount of urine passed in the day. Estimate by water excretion test:—Drink 1500 cc in \( \frac{1}{2} \) hour. This should be excreted in 2 hrs.

2) Specific gravity:—If persistently low, then kidney function is poor, as it is unable to concentrate suffic.

3) Urea content:—Normal is 2%.

4) Abnormal constituents:— a) albumen (nephritis) 
   b) cells RBC. (haematuria) 
   W.B.C. (pyuria) 
   Tumour cells (rare) 
   c) casts- (coincident damage to perenchyma) 
   d) crystals (of predominant salt) 
   e) organisms.

5) Blood chemistry:—a) Blood urea—normal 20-40 mgm %.
   If raised persistently, and unaffected by curtailing protein in diet, is of serious import.
   b) Creatinin—normal 2-3 mgm %.
   Is a product of endogenous metabolism, and so cannot be influenced by diet. It forms an accurate test of renal function.
   c) Urea range & urea clearance tests are satisfactory if in each hour 10 % of urea is excreted. (e.g. 15 grm urea in 1000 cc drunk should give 1.5 grm urea % in urine)
   d) Use of Dyes:— A. 10 cc indigo-carmine (0.4 %) intravenously, in normal function, is seen by cystoscope in 4-6 mts. If not seen till 12-15 mts function is poor. B. Phenyl sulphone phthaline (P.S.P). Is yellow in acid solution, & red in alkaline. injected intravenously 6 mgm. Urine of \( \text{diluted} \to 1000 \text{cc.} \)
   1st hour collected, alkalinised and compared with calorimetric standards. Good function is 30 %. This test plus the use of ureteric catheters, enables the function
and concentration of each kidney to be estimated.

In this case examination of urine, & X ray uroselectan shewed renal function to be satisfactory, and unimpaired by the presence of calculi.

**TREATMENT**

Renal function can be improved by

a) providing free outflow of urine,
b) raising the blood pressure,
c) increasing the fluid intake.

In cases of bilateral calculus disease, the stone in the best functioning kidney is removed first. Then, when it has regained its maximum function, the other kidney is dealt with. Palliative measures will not materially improve renal function in calculus cases, and operative measures are necessary.

The removal of the stone removes the cause of the symptoms & complications, and so renal health should rapidly improve following nephrolithotomy. Calculi are liable to recur, especially if kidney function is impaired. This should be watched for, and if discovered early enough, copious fluid intake (by lavage of the renal pelvis) may wash them down the ureter into the bladder, and so obviate further operation.

In this case a small ureteric calculus was demonstrated by X ray on the right side on 27.2.44, which was not present 2 months before. Now in Jan 1945 he has not reported back to hospital, and may have passed it. (it takes up to 6 weeks for a stone to pass painlessly through the ureter).

Calculus ámpula, from the sudden impaction of a calculus in one ureter is unlikely to occur when both kidneys are functioning well. Reflex suppression is unlikely.
PROGNOSIS

Recurrence of renal stones after lithotomy is claimed to occur in 14-49% of cases. This case has had calculi at least once in both kidneys in the past 3½ years, and so recurrences are likely.
CASE 3 CARBUNCLE of UPPER LIP

Treated expectantly

Henry Abbott  age 19  44 Prestonfield Av.  
Edinburgh

Born in Edinburgh. Works in a brewery.

Admitted 19.2.44  Discharged 25.2.44.

First examined by me 22.2.44.

COMPLAINT:— is of pain & swelling in the right cheek and upper lip; of 6 days duration.

HISTORY A) of this illness.

On 15.2.44 the patient noticed, in the morning, that his right cheek & mouth were slightly swollen, and a little sore. On account of this he was sent home from the brewery in the afternoon.

The next day, his right eye became puffy, and on 17.2.44 his whole upper lip became swollen and tender. On Friday his upper lip was very painful, (his cheek & eye swelling having subsided), and throbbed all the time. He went to his doctor who told him to foment the lip with hot water & epsom salts. It was no better on Saturday, and he was admitted to ward F.

The patient felt very well generally until 14.2.44, when he had a bout of toothache, and he thought he was going to develop a gum-boil. During the first 5 days of his illness he became miserable, and had a slight headache, which became worse on Thursday. He could not sleep at all well because of the throbbing pain. His appetite was slightly impaired. These 5 days were spent in the house, feeling "rotten & miserable".

B) Previous history.

Motor accident at age 4, when he was 10 weeks in hospital. This accident left no after effects, mental or physical. There have been no fits.

Diphtheria at age 5 (in City Hospital). No other illness.

He has always had very bad teeth, with periodic
Previous History. (contd)
gumboils, and ulcers of mouth. He was kicked on his teeth last January, when playing football.
He remembers no attacks of sore throat.
Socially:- he is a working class boy, living at home, with a healthy appetite, and a craze for football.
Mother & father alive and well. Three brothers (he is two the youngest boy) and three sisters, all in good health.

State on Examination

Henry Abbott appears to have a good average intelligence, and has a quiet manner and seems anxious to please. He has a rather shy expression, and looks alert and well, and in good general health, and with good average muscularity and development. There are no morbid signs visible. Temperature 97.6 F.

A detailed examination of his mouth, glands of the neck, and possible avenues of spread of infection is indicated.

ALIMENTARY SYSTEM

Symptoms:- Nil.

Signs:- The Upper Lip is swollen, protruding, and looks tense, but does not look inflamed. It feels tense, and on gentle pressure there is no pain. There is no swelling of nose, right eyelid and cheek. The swollen lip is not noticeably hotter than the surrounding tissues, and does not shew the other classical features of inflammation (calor, rubor, dolor). But when he was admitted 3 days earlier, Sister states that the swelling had obliterated the normal markings of the filtrum, and that there were the usual signs of inflammation, i.e. a) hotter than the surrounding skin
b) raised above the surrounding skin
c) painful on gentle pressure.
d) redder than surrounds
Alimentary System (contd)

His gums & fauces were normal, but the tonsils were enlarged and slightly congested. His tongue was slightly furred; his teeth shewed gross caries, most marked in a right upper premolar & left lower premolar. Nearly all his teeth shewed evidence of decay.

His abdomen was normal on inspection, moved freely with respiration, and no evident peristalsis was seen. On palpation there was no hyperaesthesia, tenderness, nor pain, and no muscle guarding. There was no free fluid in abdomen. His bowels move regularly once a day.

So his teeth shew gross dental caries (a probable source of infection), and his upper lip is grossly swollen. Otherwise alimentary system is normal.

CIRCULATORY SYSTEM

Symptoms: nil.

Arteries: The pulse rate is 56 / mt. The rhythm is regular, and the character of the wave is normal, the up-stroke being greater than the downstroke, a uniform wave being obtained. The walls were not palpable.

Veins: did not shew any distension, varicosity, nor pulsation.

Capillaries: do not shew any cyanosis, dropsy or pulsation.

Heart: On Inspection the apex beat was not visible, and no thrills were seen nor other pulsations.

On Palpation the apex beat was found in the 5th intercostal space, ½ " inside the nipple line. No other pulsations were felt. Apex beat pulsation was of normal amplitude.

On Auscultation normal 1st & 2nd heart sounds were heard, and no murmurs were present.

So Circulatory system is normal.
HAEMOPOIETIC SYSTEM
Symptoms: Nil
Signs: Spleen not enlarged.
No Lymphatic enlargement

ENDOCRINE SYSTEM.
Symptoms: Nil.
Signs: Pancreas: No thirst, polyuria, glycosuria, emaciation, coma, nor acetone (in breath).
Thyroid: No exophthalmos, diarrhoea, nervousness, tremors, tachycardia, incr. weight, lethargy deposits of fat, falling out of hair or eyebrows, nor constipation.
Parathyroids: No Chvostek's & Trousseau's signs are absent, and tongue is not centrally furred & brown.
Supra-renal: No Addisonian crises, no pigmentation, & no weakness.
Pituitary: No gross skeletal nor sex changes. No polyuria etc.
Gonads: Healthy.
Summary: No disease of endocrine system.

LOCOMOTORY SYSTEM
Symptoms: Nil.
Signs: Bones Normal.
Joints normal. No pain, swelling, effusion nor crepitus. Movements free in all directions

REPRODUCTIVE SYSTEM
No abnormality was present.

Integumentary System
Pain & Swelling were described in the history.
There are no abnormal signs in skin, hair & nails, all being well nourished & healthy.
RESPIRATORY SYSTEM
Symptoms: - Nil

The Breathing is regular @ 20 / mt., and abdomino-thoracic in type.

The lower part of the columella of nose is slightly swollen, continuous with the swelling on the upper lip, and with the same characteristics. It is not marked now, but on admission it shewed same signs as the upper lip.

His voice has broken rather unusually.

Thorax: - On Inspection it is of the asthenic type and the lower 1/3 of the body of the sternum protrudes. The chest moves well on respiration, and the accessory muscles are not used in quiet respiration.

On Palpation the movements were good and equal on both sides, and vocal fremitus was normal.

On Percussion the note was tympanitic and equal over whole chest in corresponding areas. No dull areas found.

On Auscultation the breath sounds were readily heard, and were vesicular in type. There were no accompaniments. Vocal resonance was normal.

Respiratory system is normal.

URINARY SYSTEM
Symptoms: - Nil

Neither kidney was palpable, nor was the bladder.

Urine: - Normal amount passed in 24 hrs.
Appearance - lemon colour.
S.G. 1025
Reaction alkaline
No Albumen, Blood, Pus, Sugar, Bile nor Ketone bodies were present.

No abnormality of urinary system found.
THE NERVOUS SYSTEM

MENTAL FUNCTIONS

Intelligence is average. He takes an interest in his surroundings & treatment, and co-operates well. History was fairly well given

Emotionally he appears moderately sensible - a little childish.

Memory is good

Speech clear

CRANIAL NERVES

Olfactory nerve:- Normal smell at all times

Optic Nerve:- a) Visual acuity normal.
    b) Fields of vision normal.
    c) Ophthalmoscope: N.A.
    d) (associated with ocular N.)
        Pupils: normal in size, shape & reactions to normal & consensual light

Accommodation: normal

Oculomotor N. Medial, Inferior & Superior recti and Inferior oblique & levator palpebrae muscles normal

Trochlear N. Superior oblique normal

Abducens N.: Lateral rectus normal.

Ocular movements were normal in all directions, in both eyes. There was no squint, no nystagmus, no diplopia, no ptosis of upper eyelids.

Trigeminal N.:
    a) Ophthalmic division:-
        Supra-orbital & Supra-trochlear N. intact. Corneal reflexes present. (this can be affected by the Facial N.)
    b) Maxillary division:-
        Infra-orbital N. Sensation normal to skin of upper eyelids, lateral sides of the nose, cheek, & upper lip, and to teeth of the upper jaw and to palate.
Trigeminal N. (contd.)

c) Mandibular division.

Motor power: Normal movements of mouth & jaw, i.e. muscles of mastication (temporalis, masseter, medial & lateral pterygoids) working normally & with good co-ordination.

Sensation:

Mental branch of inf. dental N. (to lower lip) intact.

Sensory branches of inf. dental N. (to gums & teeth of lower jaw) intact. The

Lingual branch intact. (supplies the ant. 2/3 off tongue with ordinary sensation)

Chorda tympani N. supplies branches through the submaxillary ganglion from the Facial N to the ant 2/3 of the tongue, intact.

Facial N.

Tests used were:

a) wrinkling forehead
b) screw eyes up tightly
c) retract lips & smile

If a lesion of the Facial N. after it had left the brain had been present (L.M.N. lesion), complete paralysis of 1/3 of the face would have occurred (Bell's palsy). If a supra-nuclear lesion were present, the lower 1/3 only of the affected side would have been paralysed, as the upper motor fibres neurone fibres of each side give branches to the opposite half of the upper face.

AUDITORY N.

Intact as there is no difficulty in hearing, and no pain, tinnitus nor other ear symptoms.

GLOSSOPHARYNGEAL N.

Intact as there is no interference with sensation & secretion of posterior 1/3 of tongue, as supplied by this nerve.

VAGUS N.
VAGUS N.

Is motor for the palate, larynx & pharynx, and is sensory & motor for the respiratory passages, the heart & most of the abdominal viscera. There is no regurgitation of oral contents into the nose, there is no difficulty in voice production.

SPINAL ACCESSORY N.

Is motor for sternomastoid & trapezius. Intact.

HYPOGLOSSAL N.

Is motor to the intrinsic muscles of the tongue, and to all the extrinsic muscles also except the palato-glossus (spinal-accessory N.).

CERVICAL SYMPATHETIC N. SYSTEM.

No evidence of disturbance.

REFLEXES

A. SUPERFICIAL

 Conjunctival intact: depends on intensity of
fifth (sensory) & seventh (motor).
Pharyngeal & palatal present intact: depends on integrity of ninth & tenth Ns.
Abdominal intact: depends on integrity of motor & sensory Ns. of segments seven - twelve.
Plantar reflex normal: depends on integrity of
L. five & S. one Ns. segments
### REFLEXES

#### A. SUPRASYLLIAL DEEP

- Knee jerk:— depends on integrity of segments 1, 2, 4. Present.
- Ankle jerk:— (depends on integrity of segments S, I, 2.) Present.
- Biceps jerk:— (depends on integrity of segments C, 5, 6.) Present.
- Triceps jerk:— (depends on integrity of segments C, 7, 8.) Present.

#### C. ORGANIC

- Micturition normal.
- Defaecation normal.

### MUSCLE POWER IN THE LINDES.

#### A. ARM

<table>
<thead>
<tr>
<th>Muscle</th>
<th>Nerve</th>
<th>Segment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deltoid</td>
<td>Circumflex</td>
<td>C.5,6.</td>
</tr>
<tr>
<td>Biceps</td>
<td>Musculo-cutaneus</td>
<td>C.5,6.</td>
</tr>
<tr>
<td>Triceps</td>
<td>Radial</td>
<td>C.7,8.</td>
</tr>
<tr>
<td>Wrist flexion</td>
<td>Median</td>
<td>C.7,8.</td>
</tr>
<tr>
<td>Wrist extension</td>
<td>Ulnar</td>
<td>C.6,7,8.</td>
</tr>
<tr>
<td>Finger flexion</td>
<td>Median</td>
<td>C.(7) S.</td>
</tr>
<tr>
<td>Finger extension</td>
<td>Radial</td>
<td>C.7.</td>
</tr>
<tr>
<td>Little finger ext.</td>
<td>Ulnar</td>
<td>Th.I.</td>
</tr>
</tbody>
</table>

All these muscles had good power, & each segment in the arm is tested in these movements. Thus the Cervical cord segments (motor) 5, 6, 7, 8, & Thoracic I. are intact.
**MUSCLE POWER IN THE LIMBS (contd)**

### B. LEG.

<table>
<thead>
<tr>
<th>Muscle</th>
<th>Nerve</th>
<th>Segment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hip</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ilio-psoas</td>
<td>Branches of</td>
<td>L.2.3.4.</td>
</tr>
<tr>
<td>Adductors</td>
<td>Obturator</td>
<td>L.2.3.4.</td>
</tr>
<tr>
<td>Gluteus maximus</td>
<td>Inf. gluteal</td>
<td>L.5. S.I.2.</td>
</tr>
<tr>
<td>Gluteus med. &amp; min. &amp; T.F.I.</td>
<td>Sup. gluteal</td>
<td>L.4.5. S.I.</td>
</tr>
<tr>
<td>Knee</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quadriceps</td>
<td>Femoral</td>
<td>L.2.3.4.</td>
</tr>
<tr>
<td>Hamstrings</td>
<td>Sciatic</td>
<td>L.5. S.I.2.</td>
</tr>
<tr>
<td><strong>Ankle</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tibialis ant.</td>
<td>Ant. tibial</td>
<td>L.4.</td>
</tr>
<tr>
<td>Long extensors</td>
<td>Ant tibial</td>
<td>L.5.</td>
</tr>
<tr>
<td>Short extensors</td>
<td>Ant tibial</td>
<td>S.I.</td>
</tr>
<tr>
<td>Gastrocnemius</td>
<td>Post. tibial</td>
<td>S.2.</td>
</tr>
<tr>
<td>Tibialis post.</td>
<td>Post tibial</td>
<td>L.4.</td>
</tr>
<tr>
<td>Peronei</td>
<td>Peroneal</td>
<td>L.5. S.I.</td>
</tr>
<tr>
<td><strong>Toes</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extensors</td>
<td>Ant tibial</td>
<td>L.5.</td>
</tr>
<tr>
<td>Flexors</td>
<td>Post. tibial</td>
<td>L.5.</td>
</tr>
</tbody>
</table>

All these muscles have good power. Thus cord segments L.2.3.4.5. & S.I.2. (motor) are intact.

**SENSORY FUNCTIONS**

Subjective sensations are normal.

**SENSATION in ARM**

a) **Segmental Drill** covering segments C.2.3.4.5.6.7.8. & Th.I. These were all intact.

b) **Main Nerves intact.**
   - Median N.: - index finger pulp is sensitive.
   - Ulnar N.: - little finger pulp is sensitive.
   - Radial N.: - proximal parts of dorsal surface of lst. interosseous space is sensitive.

c) **Stereognosis:** - Movements of thumb gripped on its lateral & medial aspects, with steady, constant
SENSEATION in ARM (contd.)

c) Stereognosis: - Movements of thumb, gripped on its lateral and medial aspects with steady, constant pressure, were appreciated. Stereognostic sense is intact.

d) Co-ordination: - Normal. So cerebellar function is intact.

SENSEATION in LEG.

a) Segmental Drills: - covering segments L.1.2.3.4.5 & S.1.2.3.4.5, are intact.

b) Main Nerves are intact.

Saphenous N.: -medial border of foot sensitive.
Musculo-cutaneous N.: -lateral border foot is sensitive.

Post. tibial N.: -pulp of great toe is sensitive.
Ant. tibial N.: - the skin between the heads of the 1st. & 2nd. metacarpals (dorsum) is sensitive.

c) Stereognosis: - Similar movements of great toe are appreciated correctly. So stereognostic sense of legs is normal.

d) Co-ordination: - Moving one heel up & down the other skin. This was well performed. Co-ordination intact.

VASCULAR and TROPHIC disorders are absent.

The Nervous System shows no abnormality.
DIAGNOSIS
On admission, the patient seemed to be suffering developing a carbuncle of his upper lip, which was beginning to involve the columella.

TREATMENT
The aim is to abort the formation of the carbuncle by a) local measures & b) general measures

Local measures consisted of hot fomentations of boracic lint applied to the part by the patient himself on a wooden spoon or spatula.
Short-wave therapy is also useful to help resolution.
Mouth washes to improve oral hygiene.

General measures consist of rest in bed, adequate sleep, relief of pain, slight nourishing diet, and sulphadiazine (or other sulphanamides) I g m, 4 hourly, for 4 days.

The important part of the treatment is to be strictly conservative. No operative procedure, no squeezing to be attempted, owing to the very real risk of cavernous sinus thrombosis, due to the spread of an infected thrombus to the sinus.

PROGRESS
The patient was kept in hospital, in view of the possibility of cavernous sinus thrombosis. He had a slight temperature on the night of admission (100.4) which fell to normal by next morning.
His pulse rate that evening was 104. It fell rapidly to 52 during the next 48 hrs.
Respirations remained at 20 / min.
The day after admission the swelling began to subside, the pain diminished, and was entirely away by Monday.
He slept well as soon as the throbbing pain stopped, and felt well, though rather tired, and took his food well.
He was allowed up on 22.2.44. (4 days after admission) and the day of cessation of sulphanamide). He had U.V.
He had U.V.L. on this day, and daily till he was discharged on 25.2.44.
His bowels were normally opened daily, except for one dose of liquorice on the 22nd.
The swelling of his lip rapidly subsided, and the markings of the philtrum were visible on the 23rd.,
and the swelling had almost disappeared when he was discharged.

DISCUSSION
A Carbuncle is an infective process of the subcutaneous tissue. It is often single.
It arises frequently from direct infection (surface abrasion, or a prick), or less commonly, by spread from another infective process in the body. Here there is no history of a prick, but shaving is always a possible mode of entry. His teeth are very carious & septic, and are the probable source of infection. The mode of spread from the teeth is not likely to be via the blood stream, as the lip is supplied by branches of the Facial A., while the teeth draw their supply in the upper jaw from branches of the Maxillary A.
The lymphatic vessels of the maxillary teeth run superficially, and drain into the superficial lymph glands over the parotid gland & the submaxillary glands. Here infection was probably conveyed by the lymphatics, though another possibility is direct spread by infection of mucosa of upper lip by an abrasion in shaving, or from a jagged tooth.

The usual site for a carbuncle is subcutaneous tissue liberally supplied with fibrous tissue, which separate divides this subcutaneous tissue into numerous compartments by means of fibrous septa. Such sites are found on the back of the neck, the back between the shoulders, and, less commonly & more dangerously, on the anterior
Diagram of Formation of a Carbuncle

I. Normal

II. Invasion

III. Early Spread

IV. Widespread + Commencing Localisation

V. Localised, Discharging

- Skin
- Subcutaneous Tissue
- Fibrous Septa
- Deep Fascia

- Infection
- Single infected compartment

- Infection spreads to adjacent compartments

- Widespread infection
- Early haemorrhage
- Fibroconnective tissue

- Sinus discharging pus
- Slough masses
- Bozner

- Unaffected deep fascia
DISCUSSION (contd)

part of the neck, and on the face.
The infecting organism (usually the staphylococcus aureus) causes infection in one compartment, and kills the tissue inside it by a) toxins, & b) Vascular constriction, due to the increased tension in the rigid compartments. Next the septa and the blood vessels running in the septa are destroyed, and the infection spreads to adjacent compartments. Thrombi tend to occur in the neighbouring veins, owing to infection, pressure, & stasis.

Thus a carbuncle is a type of gangrene produced by necrosis & death of the subcutaneous tissue. If the condition is not aborted by rational treatment, a disc shaped area of subcutaneous tissue becomes gangrenous; and the overlying skin is oedematous, brawny, hard, & painful, tender, & hotter than the surrounding skin, while the deep fascia & muscles are not usually involved. A large slough forms, and "points" through the skin in several places. Resolution occurs by separation of the slough, which may be helped in suitable circumstances by surgical incisions, which should not transgress nature's barrier of granulation tissue.

In the early stages a carbuncle may be aborted by general & local measures taken to increase the local blood supply. Thus local resistance is increased, and toxic products absorbed. Such measures include hot fomentations (magnesium & sodium sulphate), U.V.L. rays, and diathermy.

B- Restrict flow of lymph, and lymphatic spread of infection. In the skin and subcutaneous tissue there are large & intercommunicating lymph spaces, the vessels of which possess no valves. Lymph thus flows in any direction, being propelled by muscular contraction and general
Diagram of Cavernous Sinus Interconnexions

A. = Angular Vein
B. = Anterior Facial Vein
C. = Ophthalmic Veins
D. = Deep Facial Vein
E. = Petrosal Venous Plexus
F. = Maxillary Vein
G. = Foramen Ovale
H. = Foramen Lacerum
I. = Sphenopalatine Sinus
J. = Superficial Middle Cerebral Vein
K. = Interlaceroseous Sinus
L. = Superior Petrosal Sinus
M. = Inferior Petrosal Sinus
N. = Basilar Sinus
DISCUSSION (contd)

movement. If the lymph is kept static, the leucocytes & macrophages can attack the bacteria, and so limit the spread of infection. Means to accomplish this are general rest, and local immobilisation by means of elastoplast.

The larger lymph vessels are valved, so lymph flow is only in one direction, impelled by muscular action.

Carbuncles on the face, especially on the nose & upper lip, are potentially very dangerous, as in this area there are multiple venous connections by which communication can be established with the cavernous sinus. Venous thrombosis always occurs in the area of the carbuncle. Should the carbuncle be treated by surgical incision, or by squeezing, a widespread thrombosis may occur which may spread, either continuously, or by emboli to the cavernous sinus. This was almost invariably fatal until the introduction of penicillin.

The venous drainage of the face, nose & lip is by:

1. Angular vein → ophthalmic V. → Cavernous S.
2. Ant. facial V. → Ophthalmic Vs. → Cavernous S.
3. Ant. Facial V. → Deep Facial V. → Pterygoid venous plexus, which communicates with the cavernous S. by a) Maxillary V.
b) Emissary Vs. via foramina ovale & lacerum.

With a carbuncle of the upper lip channels 2. & 3. would be most liable to involvement. The thrombus may spread along any of these veins, and may involve other tributaries of the cavernous sinus, i.e. 1. Sphenoparietal sinus. 2. Superficial middle Cerebral Veins. 3. Superior Petrosal sinus. 4. Inf. Petrosal sinus. 5. Intercavernous sinus. 6. Basilar sinuses.

Other sites where various intracranial & extracranial channels communicate by emissary veins are:

1) Vertex of scalp → Parietal Vs. → Sup. Sagittal S.
2) Post. Auricular Vs. → Mastoid Vs. → Sigmoid Sinus
3) Veins of neck → Hypoglossal canal → Straight S.
Penicillin, probable dosage = 100,000 units/day for about 14 days, or for 2 days longer than the acute symptoms persist.
Cavernous Sinus Thrombosis

Any venous sinus that becomes thrombosed inside skull gives rise to congestion & oedema of the brain, due to the local venous congestion. The thrombus also blocks the transmission of cerebro-spinal fluid from the subarachnoid space to the sinus, and so may give rise to an external hydrocephalus. If the thrombus is infected, then abscesses of brain or meningitis (acute) often result.

The special features seen in cavernous sinus thrombosis are mainly related to its connections with, and the blockage of drainage of the Orbital Vs. This leads to orbital oedema, severe proptosis, swelling of the eyelids, and chemosis. The displacement and tension (greatly increased) on the eyeball produces great pain plus restriction of the eye movements. The oedema spreads along the line of least resistance, over the nose & lips, and may reach the neck. Drowsiness→coma results from obstruction of the Mid. Cerebral V.

Pressure from the congested tissues of the orbit may produce neuralgia of the ophthalmic division of the Trigeminal N., the distribution being to forehead & eyes. Paralyses of the motor N may occur.

The thrombotic process may spread to the other side, via the intercavernous sinuses, producing a similar picture.

Signs of meningitis or brain abscess may supervene.

Signs of developing cavernous sinus thrombosis must be watched for daily, and penicillin therapy started on suspicion. Thus any case of carbuncle of nose or lip should be nursed in bed and under expert supervision. The condition is not to be regarded lightly.

The systemic disturbance is great in carbuncles, and the patient complains of malaise, lassitude, anorexia, and insomnia from the continuous pain.
Systemic disturbance is always to be suspected in carbuncles. The urine should always be tested for sugar, red blood corpuscles, epithelial & pus cells & casts to exclude the commonly associated Diabetes and Nephritis.

These lower both general and local resistance to infection, so that the invading organism has a good start in oedematous or sugar-laden tissues. Thus general treatment is essential, rest in bed, a light nourishing diet, a warm room, plenty of fresh air (shielded from draughts), analgesics for insomnia and pain, and sulphonamides.

Skin grafts will materially hasten healing in a large carbuncle, once the base is clean.

Convalescence should be prolonged, nourishing food, adequate vitamins, and a tonic. Treat also any associated disease.

In this case the inflammatory process was successfully abated, the general symptoms were not severe, and the patient made a rapid & satisfactory recovery. He should have immediate treatment by a dentist, and be instructed in oral hygiene. There is a liability for recurrence of carbuncles when the original cause remains untreated.

PROGNOSIS:— is excellent, provided his oral sepsis is dealt with.
Case No. 4 A Case of ACUTE APPENDICITIS
Treated by APPENDICECTOMY

Alexander Wright Age 32,

Occupation Miner, Married
Recommended by Dr. Robb. 20 Merchiston Av.

Date of admission 29.1.44. First examined by me 29th,
Date of discharge II.2.44.

COMPLAINT: of abdominal pain & vomiting for one day

HISTORY of this illness.

The patient was perfectly well until the early evening of 28th, when, at 5 P.M., after a simple meal, he began to get discomfort in the central part of his abdomen. This discomfort gradually became a persistent pain, which grew progressively worse, keeping him awake all night. That evening he felt sick, but did not vomit. In the early hours of the morning he vomited watery material several times. Once the vomiting stopped, the site of the pain shifted to the right flank, and became more severe. He was admitted to ward 13 in the early evening. He then complained of slight backache as well. He had had no urinary disturbances, and his bowels were regular, the last motion being on 29.1.44.

Previous History.

Mr. Wright has been a very healthy man, and has had no serious illness. He remembers that he had an attack of abdominal pain, several years ago, situated mainly centrally. This passed off in 24-48 hrs. His doctor was not consulted.

STATE ON EXAMINATION

He is a healthy looking man, well built, well nourished & muscular, and with a ruddy complexion. His teeth are healthy; his conjunctivae & nails are of good colour.
He is happy at his work as a miner.
He does not appear to be in great pain, and lies quietly in bed.

Temperature 99. F. Pulse 96.

So a detailed examination of, first the alimentary system, and second the urinary system is indicated.

**ALIMENTARY SYSTEM**

1) **Symptoms:** He complains of abdominal pain, nausea & vomiting of one day’s duration. Bowels are regular.

2) **Signs.**
   a) **Mouth:** teeth, gums, fauces, & tonsils are healthy. The tongue was moist and slightly furred, the edge of the fur being brownish. There was a slight faecal odour to his breath.
   b) **Abdomen:** Inspection— The upper part of the abdomen moved well with & easily with respiration. The lower part did not move with respiration. There were no local nor general signs of distension or retraction. The skin is white, firm, elastic, and has a good supporting layer of subcutaneous tissue. No pulsations were seen.

   Palpation:— (commencing in the right iliac fossa). The abdomen was soft, flaccid, and easy to palpate in all parts except the right iliac fossa, where there was tenderness on light palpation, and pain on deep palpation. There was guarding (muscular) over the lower half of the right rectus. The point of maximum tenderness was situated at a point almost on a level with the umbilicus, and at the level lateral edge of the right rectus muscle. 

   Rovsing’s sign was negative.

No abnormal swellings were found. Liver, spleen & kidneys were not palpable. No tenderness found in kidney angle.
ALIMENTARY SYSTEM (contd)

Percussion:- A resonant note was obtained in all areas; no fixed nor floating dulness was found; no free nor confined fluid was found in peritoneal cavity.

Auscultation:- No passage of flatus heard at ileo-caecal junction.

c) Rectal Examination:- The rectum was empty, and felt normal, and was not hotter than usual. Tenderness was felt in the region of the right iliac fossa, but no fluctuation nor abnormal swelling could be defined.

Summary:- This case presents the picture of an acute abdominal lesion, the sequence of events being

I) Umbilical pain & nausea.

2) Vomiting.

3) Right iliac fossa pain.

4) Examination shews/ tenderness and guarding in the right iliac fossa only.

URINARY SYSTEM

Symptoms:- Nil. The patient had no frequency of micturition nor dysuria.

Signs:- The kidneys were not palpable. There was no tenderness in either kidney angle. The bladder was not palpable, nor tender on abdominal examination.

Urine on 29,1,44

Appearance- Clear, lemon coloured.

S.G.- 1024

Reaction- Acid.

Albumen, Blood, Sugar, Ketone bodies, & Bile were absent.

Mucus- Slight trace.

On microscopic examination only debris & a few uric acid crystals were found. No pus cells, R.B.C., Epithelial cells, Nor casts were found.

So no abnormality of urinary system found.
Hematopoietic System
Symptoms: Nil
Signs: Spleen not enlarged.
No lymphatic enlargement

Endocrine System
Symptoms: Nil.
Signs: Pancreas: No thirst, polyuria, glycosuria, emaciation, coma, nor acetone (in breath).
Thyroid: No exophthalmos, diarrhoea, nervousness, tremors, tachycardia, incr. weight, lethargy, deposits of fat, falling out of hair or eyebrows, nor constipation.
Parathyroids: Chvostek's & signs are absent, and tongue is not centrally furred & brown.
Supra-renal: No Addisonian crises, no pigmentation, & no weakness.
Pituitary: No gross skeletal nor sex changes. No polyuria etc.
Gonads: healthy.
Summary: No disease of endocrine system.

Locomotory System
Symptoms: Nil.
Signs: Bones Normal.
Joints normal. No pain swelling, effusion nor crepitus. Movements free in all directions.

Integumentary System
Though tenderness was found in right iliac fossa, (see alimentary system), the skin was normally nourished, not pigmented, and hair & nails were healthy.
CIRCULATORY SYSTEM

Symptoms:- Nil

Arteries:- The pulse rate on admission was 88 and the rhythm was regular. The character of wave is normal (the upstroke is greater than the downstroke, a uniform curve being obtained)

Veins:- Did not shew any distension, varicosity, nor pulsation.

Capillaries:- Do not shew any cyanosis, oedema, nor pulsation.

Heart:- Inspection- No pulsations in thorax & abdomen were seen.

Palpation- The apex beat was localised in the 5th intercostal space, in the nipple line. It was of normal amplitude. No other pulsations & no thrills were felt.

Auscultation- Both heart sounds heard closed in all areas. No murmurs were heard.

Summary:- There is no abnormality of the circulatory system.

RESPIRATORY SYSTEM

Symptoms:- Nil.

Signs:- The breathing is regular, 20 per Min., and is predominantly thoracico-abdominal in type. Only the upper part of the abdomen moves on respiration. No stridor was heard, and the breathing was effortless.

Thorax- Inspection- Is of the sthenic type. The ribs are not visible. The chest moves well and equally on both sides. The accessory muscles of respiration were not used.

Palpation- Equal movements of good excursion was confirmed on both sides. Vocal fremitus was normal.

Percussion- A resonant, uniform
THE NERVOUS SYSTEM

MENTAL FUNCTIONS

Intelligence is average. He takes an interest in his surroundings & treatment, and co-operates well. History was fairly well given emotionally he appears normal.

Memory is excellent

Speech excellent.

CRANIAL NERVES

Olfactory nerve— Normal smell at all times.

Optic Nerve— a) Visual acuity normal.

b) Fields of vision normal
c) Ophthalmoscope— N.A.
d) (Associated with oculomotor N.)

Pupils— Normal in size, shape & reactions to normal & consentual light.

Accommodation— Normal.

Oculomotor N. Medial, Inferior & Superior recti and Inferior oblique & Levator palpebrae muscles normal.

Trochlear N. Superior oblique normal.

Abducens N.— Lateral rectus normal.

Ocular movements were normal in all directions, in both eyes. There was no squint, no nystagmus, no diplopia, & no ptosis of upper eyelids.

Trigeminal N.:—

a) Ophthalmic division—

Supra-orbital N. & Supra-trochlear N. intact. Corneal reflexes present. (This can be affected by the Facial N.)

b) Maxillary division—

Infra-orbital N. Sensation normal to skin of upper eyelids, lateral sides of the nose, cheek, & upper lip, and to teeth of the upper jaw and to palate.
Trigeminal N. (contd.)

c) Mandibular division.

Motor power - Normal movements of mouth & jaw, i.e. muscles of mastication (temporalis, masseter, medial & lateral pterygoids) working normally & with good co-ordination.

Sensation -

Mental branch of inf. dental N. (to lower lip) intact.

Sensory branches of inf. dental N. (to gums & teeth of lower jaw) intact. The

Lingual branch intact. (supplies the ant. 2/3 off tongue with ordinary sensation)

Chorda tympani N. supplies branches through the submaxillary ganglion from the Facial N to the ant 2/3 of the tongue intact.

Facial N.-

Tests used were a) wrinkling forehead
b) screw eyes up tightly
c) retract lips & smile

If a lesion of the Facial N. after it had left the brain had been present (L.H.N. lesion), complete paralysis of ½ of the face would have occurred (Bell's palsy). If a supra-nuclear lesion were present, the lower ½ only of the affected side would have been paralysed, as the upper motor fibres of each side give branches to the opposite half of the upper face.

AUDITORY N.

Intact as there is no difficulty in hearing, and no pain, tinnitus nor other ear symptoms.

GLOSSOPHARYNGEAL N.

Intact as there is no interference with sensation & secretion of posterior 1/3 of tongue, as supplied by this nerve.

VAGUS N.
VAGUS N.

Is motor for the palate, larynx & pharynx, and is sensory & motor for the respiratory passages, the heart & most of the abdominal viscera. There is no regurgitation of oral contents into the nose. there is no difficulty in voice production.

SPINAL ACCESSORY N.

Is motor for sternomastoid & trapezius. Intact.

HYPOGLOSSAL N.

Is motor to the intrinsic muscles of the tongue, and to all the extrinsic muscles also except the palato-glossus (spinal-accessory N.)

CERVICAL SYMPATHIC N. SYSTEM.

No evidence of disturbance.

REFLEXES

A. SUPERFICIAL

Conjunctival intact, depends on intensity of fifth (sensory) & seventh (motor)

Pharyngeal & palatal present intact:—depends on integrity of ninth & tenth Ns.

Abdominal intact:—depends on integrity of motor & sensory Ns. of segments seven - twelve

Plantar reflex normal:—depends on integrity of L. five & S. one Ns. segments
**REFLEXES**

**B. SUPERFICIAL DEEP**

Knee jerk: depends on integrity of segments 1, 3, 4. Present.

Ankle jerk: (depends on integrity of segments 5, 1, 2.) Present.

Biceps jerk: (depends on integrity of segments)

C. 5, 6, 8.) Present.

Triceps jerk: (depends on integrity of segments)

C. 7, 8.) Present.

**C. ORGANIC.**

Miscuration normal

Plastic rigidity normal.

**MUSCLE POWER IN THE LIMBS.**

**A. ARM**

<table>
<thead>
<tr>
<th>Muscle</th>
<th>Nerve</th>
<th>Segment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deltoid</td>
<td>Circumflex</td>
<td>C.5.6.</td>
</tr>
<tr>
<td>Biceps</td>
<td>Musculo-cutaneous</td>
<td>C.5.6.</td>
</tr>
<tr>
<td>Triceps</td>
<td>Radial</td>
<td>C.7.8.</td>
</tr>
<tr>
<td>Wrist flexion</td>
<td>Median</td>
<td>C.7.8.</td>
</tr>
<tr>
<td></td>
<td>Ulnar</td>
<td>C.8.7.8.</td>
</tr>
<tr>
<td>Wrist extension</td>
<td>Radial</td>
<td>C.6.7.8.</td>
</tr>
<tr>
<td>Finger flexion</td>
<td>Median</td>
<td>C.(7) 3.</td>
</tr>
<tr>
<td></td>
<td>Ulnar</td>
<td>C.8.</td>
</tr>
<tr>
<td>Finger extension</td>
<td>Radial</td>
<td>C.7.</td>
</tr>
<tr>
<td>Little finger exten.</td>
<td>Ulnar</td>
<td>Th.1.</td>
</tr>
</tbody>
</table>

All these muscles had good power, & each segment in the arm is tested in these movements. Thus the Cervical cord segments (motor) 5, 6, 7, 8 & Thoracic I. are intact.
### MUSCLE POWER IN THE LIMBS (contd)

<table>
<thead>
<tr>
<th>Muscle</th>
<th>Nerve</th>
<th>Segment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hip</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ilio-psoas</td>
<td>Branches of</td>
<td>L.2,3,4,5,9</td>
</tr>
<tr>
<td>Adductors</td>
<td>Obturator</td>
<td>L.2,3,4,5,9</td>
</tr>
<tr>
<td>Gluteus maximus</td>
<td>Inf. gluteal</td>
<td>L.5, 8,12</td>
</tr>
<tr>
<td>Gluteus med. &amp; min. &amp; T.P.L.</td>
<td>Sup. gluteal</td>
<td>L.4,5, 9,12</td>
</tr>
<tr>
<td>Knee</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quadriceps</td>
<td>Femoral</td>
<td>L.2,3,4,5,9</td>
</tr>
<tr>
<td>Hamstrings</td>
<td>Sciatic</td>
<td>L.5, 8,12</td>
</tr>
<tr>
<td>Ankle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tibialis ant.</td>
<td>Ant. tibial</td>
<td>L.4,5, 9,12</td>
</tr>
<tr>
<td>Long extensors</td>
<td>Ant tibial</td>
<td>L.4,5, 9,12</td>
</tr>
<tr>
<td>Short extensors</td>
<td>Ant tibial</td>
<td>L.4,5, 9,12</td>
</tr>
<tr>
<td>Gastrocnemius</td>
<td>Post. tibial</td>
<td>L.4,5, 9,12</td>
</tr>
<tr>
<td>Tibialis post.</td>
<td>Post tibial</td>
<td>L.4,5, 9,12</td>
</tr>
<tr>
<td>Peronei</td>
<td>Peroneal</td>
<td>L.5, 8,12</td>
</tr>
<tr>
<td>Toes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extensors</td>
<td>Ant tibial</td>
<td>L.5, 8,12</td>
</tr>
<tr>
<td>Flexors</td>
<td>Post. tibial</td>
<td>L.5, 8,12</td>
</tr>
</tbody>
</table>

All these muscles have good power. Thus cord segments L.2,3,4,5,6 & 8,12 (motor) are intact.

---

### SENSORY FUNCTIONS

Subjective sensations are normal.

**SENSATION in ARM**

a) **Segmenental Drill** covering segments C.2,2,4,5,6,7,8 & Th. 1. These were all intact.

b) **Main Nerves intact.**

- **Median N.** - index finger pulp is sensitive.
- **Ulnar N.** - little finger pulp is sensitive.
- **Radial N.** - proximal parts of dorsal surface of Ist. interosseous space is sensitive.
SENSATION in ARM (contd.)

c) Stereognosis: Movements of thumb, gripped on its lateral and medial aspects with steady, constant pressure, were appreciated. Stereognostic sense is intact.

d) Co-ordination: Normal. So cerebellar function is intact.

SENSATION in LEG.

a) Segmental Drill: covering segments L1, L2, L3, L4, L5, & S1, S2, S3, S4, S5 are intact.

b) Main Nerves are intact.

Saphenous N.: medial border of foot sensitive.
Musculo-cutaneous N.: lateral border foot is sensitive.

Post. tibial N.: pulp of great toe is sensitive.
Ant. tibial N.: the skin between the heads of the Ist. & 2nd. metacarpals (dorsum) is sensitive.

c) Stereognosis: Similar movements of great toe are appreciated correctly. So stereognostic sense of legs is normal.

d) Co-ordination: Moving one heel up & down the other shin. This was well performed. Co-ordination intact.

VASCULAR and TROPHIC disorders are absent.

The Nervous System shows no abnormality.
RESPIRATORY SYSTEM (cont'd)

note was obtained in all areas indicated.

Auscultation: The breath sounds were vesicular in type, and no adventitious sounds were heard. Vocal resonance was normal.

Summary: There is no abnormality found in the respiratory system.

REPRODUCTIVE SYSTEM

No abnormality.

NERVOUS SYSTEM

Mental & psychological faculties normal.

Cranial nerves normal.

Spinal nerves, sensory & motor normal.

Reflexes normal.

Summary: No abnormality found in Nervous system.

DIAGNOSIS

This patient has an acute appendicitis of 24 hrs duration. It was preceded by a somewhat similar attack several years ago.

TREATMENT

Appendicectomy on 29.I.44

Anaesthetist Dr McKinlay.

Premedication: morphia gr, I/4 & hyoscine gr. I/100

Induction & maintenance by gas & oxygen & ether, with insertion of an airway.

Surgeon Mr Millar

The abdomen was opened by a right McBurney incision. The ext. oblique was split obliquely in the line of its fibres, and retracted upwards & downwards, exposing fleshy fibres of the int. oblique muscle, which were incised transversely and retracted. The peritoneum was picked up and incised, and the caecum presented in the wound. The appendix was easily found, drawn out of
TREATMENT (contd)

the wound, and isolated by warm swabs. The appendix was acutely inflamed, and surrounded by omentum. The appendix was gradually dissected away, until the appendix was free in its entire length. The base of the appendix was isolated, crushed, and ligated, and divided. A purse-string suture was inserted round the stump of the appendix, and the stump invaginated into the wall of the caecum. A small piece of omentum was sewn over the suture line. All bleeding points were secured, and the abdomen closed in layers. The skin edges were united with silk worm gut, sutures and Michel clips.

Progress

The patient spent a fairly comfortable night, but next day his temperature rose to 102°F., and pulse 120, Respirations 28. Early peritoneal infection was feared, and he was given sulphacetamide grm. I. four hourly, and this was continued till 6.2.44 (six days later). He was complaining of some abdominal pain, and was given morphia.gr. 1/6 at 12.30 a.m. This ensured sound sleep for the rest of the night.

On 31.1.44 & 1.2.44 his temperature varied from 98.4°F. to 99°F. Pulse rate 98-102, Respirations 26.

On evening of 2.2.44 his temperature rose to 100.2°F., falling to 98°F during the next 48 hrs. His pulse rate settled to approximately 70 and respirations 20-24.

By 7.2.44 his temperature was 97°F. Pulse 60-68, and Respirations 20.

The first two days, Mr Wright suffered from moderate flatulence, relieved by a molasses enema on 31.1.44. He required liquorice (one teaspoonful) on 1.2.44, and thereafter had one motion a day.

He was very cheerful and progressed rapidly once his temperature was normal. Stitches removed on 4.2.44, and his wound was perfectly healed on discharge (11.2.44).
DISCUSSION

DIFFERENTIAL DIAGNOSIS

1) Tuberculous adenitis:- This usually occurs in children. On examination there is usually less rigidity, unless there is superadded pyogenic infection. Then there will be an increase of white blood corpuscles, instead of the tuberculous diminution. A firm glandular mass is usually felt on palpation, and by combined recto-abdominal examination. A straight X-ray may show typical irregular calcified nodules.

2) An internal Hernia:- The pain is generally continuously midline in site, is continuous, and colicky. Vomiting, at first reflex (from abnormal peristalsis), later turns faecal & persistent if the bowel becomes obstructed. Constipation is obstinate if bowel is completely obstructed. The vomiting is much more pronounced than in appendicitis. The pain remains localised to the primary site of onset, unless perforation and gangrene set in, causing general peritonitis.

3) Carcinoma of the caecum:- Simulates appendicitis if it perforates. It is rare at 32. It would have a preceding history of diarrhoea, melaena, anorexia, loss of weight, and anaemia. The mass would probably be palpable. Central small intestine hypertrophy and distension would also fill up the picture in most cases.

4) Actinomycosis:- of Caecum produces a long history of chronic pain, which is never acute unless the appendix is involved to produce obstructive appendicitis.

5) Enteric fevers (Typhoid & Paratyphoid):- Produce acute abdominal pain if rupture of an ulcer occurs. In an epidemic diagnosis is easy. In sporadic cases the insidious onset, diarrhoea, malaise, temperature chart, rash, splenic enlargement, bacterial investigation, previous to the sudden onset & collapse point to the true state of affairs.
DIFFERENTIAL DIAGNOSIS (contd)

6) Meckel's Diverticulum:— This may give a typical appendicitis picture, though the pain (secondary) is usually situated nearer the umbilicus. 2% of people have a Meckel's Diverticulum (Denis Brown). Operation is always indicated.

7) Intestinal Obstruction:— See Int Hernia.

8) Regional Ileitis (Crohn's disease):— A chronic disease characterised by right sided pain and a doughy abdomen.

9) Tuberculous Peritonitis:— Rare in adults, Generally a chronic history of pain and abdominal distension, constipation or diarrhoea. In the moist type there is shifting dulness and abdominal distension. In the plastic variety there is a hard nodular abdomen, the nodules persisting after repeated enemata.

10) Mesenteric Thrombosis:— Continuous midline pain, moderate vomiting, and rapid general deterioration.

11) Primary Streptococcal Peritonitis:— Diagnosis only made on operation.

12) Acute Pyelitis:— Often bilateral. Characterised by pain in the loin, acute kidney tenderness, frequency, dysuria (only present in a pelvic appendicitis), characteristic temperature (high & swinging), and the urine contains pus cells & bacteria, and is turbid. Often ushered in by a rigor.

13) Stone in Right Ureter:— Typical renal colic, with pain radiating into groin and testicle (never in appendicular pain) Temperature is not raised. Vomiting irregular. The urine may contain blood. An X-ray will shew the typical calcified shape when stone is calcified. Ureteral catherisation clinches diagnosis.

14) Intermittent Hydronephrosis:— diagnosed by X

15) Dietl's crises:— urinary methods (see Case 2)

16) Oxalate Crystals:—
DIFFERENTIAL DIAGNOSIS (contd)

18) **Perforated Peptic Ulcer**:— Sudden onset, stabbing pain (first in epigastrium, then, as acid contents trickle down into right paricolic gutter and into right iliac fossa, peritoneal irritation produces spreading pain). Vomiting is rare; collapse is marked; history will probably be of previous trouble (gastric). Tenderness is always in epigastrium, and rigidity is very marked in the upper abdomen. Liver dulness may be diminished.

19) **Biliary Colic**. Pain may be referred to the right iliac fossa, but is usually maximum in the right hypochondrium, at the tip of the 9th costal cartilage, radiating to the tip of the shoulder. The patient is "fair, fat, & forty" and female (*preponderantly*), and gives a history of chr. indigestion, and possibly of similar attacks. Jaundice may be present.

19) **Diaphragmatic Pleurisy**. Pain along subcostal nerve distribution is of sudden onset, worse on deep breathing, increased by compressing costal margins together, and there is no muscle guarding. Later the signs of these conditions rapidly supervene.

20) **Pneumonia (basal)**. Pain along subcostal nerve distribution is of sudden onset, worse on deep breathing, increased by compressing costal margins together, and there is no muscle guarding. Later the signs of these conditions rapidly supervene.

21) **Herpes Zoster**. The pain is restricted to the band of distribution of one or more cutaneous nerves. There is no true rigidity, vomiting, nor rise of temperature, and the rash follows in a few days.

22) **External Iliac Adenitis**. Produces localised pain & swelling, and a localised primary focus of infection is usually found in the leg.

23) **Acute Adenitis of the Inguinal Glands** produces fairly superficial swelling, and the pain is never central abdominal.

24) **Influenza** may cause severe abdominal pain, and one type of influenza is a true catarrhal inflammation of the gastro-intestinal tract, including the
Influenza (contd)

appendix. Lowered vitality etc. may allow an acute appendicitis to develop. But in general, the presence of an epidemic gives the right clue, especially as the pain is more generalised, rigidity is absent, toxic symptoms are marked, and temperature is much higher.

25) Intestinal Colic & Gastro-intestinal catarrh may produce severe abdominal pain, which is relieved (not worsened) by pressure, and there is no muscular guarding between attacks of pain.

26) Rupture of the deep Epigastric Artery as a result of sudden strain (history) produces sudden pain in the right iliac fossa, due to extraperitoneal haemorrhage. The rectus muscle is rigid, and the haematoma which is deep to the muscle cannot be felt, and produces a very small area of localised pain.

27) Acute Appendicitis:

**Incidence**- Commonest acute abdominal catastrophe, occurring at any age.

**Aetiology**- Occurs in races living on a high protein diet, and not in vegetarians.

**Trauma**, in the form of faecal concretions, and thread-worms is most often potent when there is a preexisting stricture or disease of the appendix.

**Pathology**- The inflammatory process may be localised in the wall of the appendix, or may involve the peritoneum of the appendix, giving rise to adhesions, or general or local peritonitis. Whether this spread of infection occurs or not is largely determined by the amount of obstruction to the lumen of the appendix.

In catarrhal appendicitis the wall only is involved, and the lumen is patent, allowing discharge of the inflammatory material into the bowel. The inflammation gradually subsides with a certain amount of scarring. Reinfection is liable to occur.
Differential Diagnosis (contd)

Acute Appendicitis (contd)

Catarrhal appendicitis may progress to form the obstructive type, where the obstruction may come from faecal concretion, threadworms, from congestion of the mucosa, from a stricture from old scarring, or a congenital condition. Now the appendix becomes a closed loop of bowel containing septic material.

The sequelae of obstructed appendicitis are:

1) Mild infection → mucocele.
2) Moderate infection → empyema of appendix gangrene and perforation in 24-48 hrs.
3) Highly virulent infection → gangrene & perforation in 6-8 hrs. → widespread peritonitis.

The Microscopic Pathology shows:

a) increased outpouring of serum and pus into lumen.
b) distension of walls.
c) colicky spasm of muscle (primary abdominal pain) to overcome the obstruction.
d) pressure on the blood vessels; first the veins, and then the arteries are occluded. →

e) gangrene
f) perforation.

The sequelae of perforation differ according to whether it occurs early or late. If infection is virulent (6-8 hrs), then no adhesions are formed, and widespread general peritonitis develops.

If infection is very mild, only omental adhesions occur, and no abscess may be formed, the inflammatory products being absorbed.

If infection is of moderate severity then adhesions have formed round the appendix before rupture occurs, and a localised abscess is formed. This may track in any direction, open into any hollow organ (producing a fistula), form a pelvic abscess.
COMMON POSITIONS OF APPENDIX.

Diagram after Jaimison.
DIFFERENTIAL DIAGNOSIS (contd)

Acute Appendicitis (contd)

or other abscess, point at the surface under the skin, or may rupture secondarily into the general peritoneal cavity. This type occurs most frequently after several mild attacks. A retrocaecal abscess, in such cases, may give rise to an extraperitoneal abscess doughy mass in the loin, or in the right iliac fossa. This may secondarily perforate the peritoneum.

Commonest sites of the appendix:

1) Retrocaecal
2) Pelvic
3) Among coils of the small intestine near McBurney's point.
4) Iliac position (in relation to Iliacus & Psoas)
5) Subcaecal (in relation to Iliacus alone).
6) Paracaecal (in relation to lateral sides of caecum)
7) Splenic (points towards the spleen, and lies either anterior or posterior to the terminal ileum).

Clinical Features of Acute Appendicitis:

The patient is often young (10-30 yrs), and in good general health. This case gives a history of sudden abdominal pain, followed some hours later by a little vomiting, and then by a cessation of the pain (due to paralytic distension of the lumen of appendix), and followed by pain localised in the right iliac fossa. This is the classic type. The sequence of events will bear summarising, as it points to the clinical diagnosis.

1) Central abdominal pain (primary pain)
2) Nausea or vomiting (not severe nor prolonged)
3) Tenderness in the right iliac fossa
4) Pain in the right iliac fossa (secondary pain)
5) Leucocytosis
6) Rise in temperature & pulse rate
7) Perforation & its sequelae.
Diagram illustrating explanation of primary & secondary pain & muscle guarding.

- Visceral nerve stimulated by overstretching of wall of appendix, hence hyperesthesia. Felt in midline, ie primary pain with no connection with motor nerve.
- Normal somatic sensory nerve, stimulated by inflammation involving peritoneum, & connected with:
- Normal somatic motor nerve, serving the true visceral reflex (viscero-sensory reflex) ie muscle spasm.
Acute Appendicitis (contd)

Postulations as to the Causation of Symptoms

1) **Primary pain in the midline** is explained by the fact that the Midgut (from where the appendix is derived) is a midline organ in early foetal life, and so its visceral nerve-supply refers appendicular pain to its original site of origin (mid-abdominal region). These visceral nerves only react to certain stimuli, as is the case with other abdominal viscera. Distension produces increased peristalsis of a painful character. Normal peristalsis is painless and unappreciated. So nerves only respond to abnormal harmful stimuli, the nature of the stimulus varying with the structure in question.

2) The nausea & vomiting is merely reflex from the abnormal peristalsis of the appendix.

3) The localised tenderness is due to palpation increasing a subliminal stimulus to the somatic nerves of the peritoneum into a liminal, appreciable one. So a diagnosis can be made before pain is felt in the right iliac fossa, and when tenderness only can be elicited.

4) The secondary pain is due to involvement of the peritoneum in the inflammatory process, the stimulus of the inflammation being adequate to stimulate the somatic nerves which supply the peritoneum of the right iliac fossa, and only the nerves of the area involved. This differentiation is sufficient to localise the area to the investigator. There is no foetal midline reference in this case. These nerves respond to stimuli of acidity, alkalinity, and infection. The primary midline pain indicates that the lesion is in the midgut; the secondary pain localises the site of the lesion.

5) Involuntary true muscle spasm is produced by this involvement of the peritoneum.

6) The pulse rate & temperature are only slightly raised till involvement of peritoneum occurs. An early
**Pouch Method**

- Ligated stump
- Pore-string suture

**INVAGINATING METHOD**

- Invaginating suture
- Base of appendage (clamped)
- Lower of cecum
Acute Appendicitis (contd)

high temperature (over 100 F.) militates against a diagnosis of appendicitis.

7) Partial or complete cessation of abdominal movements is due to peritoneal involvement.

3) Generalised signs of peritoneal irritation occur when rupture of an abscess spreads infection widespread.

Thus if the diagnosis is in doubt, and facilities are available, an hourly examination for localised tenderness is more valuable even than an hourly pulse & temperature estimation. The greatest difficulty occurs in cases of acute pyelitis, where however, the onset of rigors, the high temperature, and urinary examination will usually point the way.

Rectal examination should always be performed, as constipation may closely simulate appendicitis. An enema should always be given pre-operatively. Rectal examination shows:

a) Increased heat  b) Swelling  c) Tenderness in the Pouch of Douglas (in pelvic appendicitis).

This patient was seen, diagnosed, and operated on at the stage of localised peritoneal irritation, and the appendix was removed before it had ruptured.

TREATMENT

Always operate on an acute case as early as is compatible with a reasonably sure diagnosis.

The basic principles of the operation have been described under the description of Mr. Wright’s operation, with different minor details peculiar to the individual surgeon.

An alternative operation is occasionally used, the stump of the appendix being invaginated by continuous Lembert sutures in two layers (similar to an anastomatic junction), instead of the ligature round the base. Thus there is no pouch formed containing the appendix stump buried in a peritoneal-lined bowel pocket. There is danger of infection, and even abscess formation in this
Acute Appendicitis (contd)

Treatment (contd)

Pocket should infection persist in the stump, in spite of its carbolisation; it may lead to rupture of the pouch internally into the bowel, or externally into peritoneal cavity. The invaginating operation leaves the infected cut end of the stump free in lumen of bowel where inflammatory products are discharged direct. This operation is especially called for when the base of the appendix is involved in the inflammation process, and in the case of children where inflammatory processes tend to be fulminating.

If an abscess has already formed at time of operation, incision & drainage are advisable. If the general peritoneal cavity is shut off by adhesions, do not remove the appendix till 6 months have elapsed. But should this walling-off not have accrued, then remove the appendix, the cause of the trouble, as well as drain the abscess cavity & the peritoneal cavity too.

The importance of early operation is shewn by the fact that the mortality varies directly with the time after onset at which operation is performed. The mortality is negligible during the first 48 hours (or before rupture), but rises rapidly in the next 24 hours. → 9.8% when the patient is either dead or recovering

POST-OPERATIVE COMPLICATIONS.

These are mainly encountered when delay in operating has allowed infection to become widespread. These are suspected when there is a rise of temperature post-operatively (usually between the 2nd & 5th days) Prophylactic oral sulphonamide administration is commenced on suspicion. Accompanying the rise of temperature there are general symptoms of malaise, discomfort, & possibly headache. He does not recover his spirits as rapidly as an uncomplicated case.

Possible Lesions are:
Possible Lesions are:-

1) **Spreading peritonitis**

2) **Localised abscess elsewhere in the peritoneal cavity**, i.e. pelvis, subphrenic region etc. This is usually accompanied by rigors, as also in-

3) **Pylephlebitis** (inflammation of the Portal Vein), generally marked by symptoms of pyaemia, and may produce liver abscess.

4) **Tracking abscess in the wound**, producing infection of the wound.

5) **Distant complications** - a) **acute parotitis**. b) **Femoral thrombosis**.

6) **Pulmonary complications** - a) **Atalectasis**. b) **Pneumonia**. c) **Bronchopneumonia**. d) **empyema**. e) **lung abscess**. f) **Infarction of lung**.

7) **Faecal fistula formation**. This usually closes spontaneously in 2-6 days, or within the following 6 months. Is most often seen when extensive necrosis & gangrene of appendix has occurred.

8) **Paralytic Ileus** - generally associated with general peritonitis, and due to paralysis of a loop of bowel. Treatment is to still further immobilise the gut, by large doses of morphia, plus intravenous fluids, until the general condition improves, when the abdomen becomes softer, flatus is heard passing in the abdomen. Then an enema may be given.

9) **Mechanical obstruction** is rare - due to adhesions kinking the bowel. It does not occur before the 5th day. Strong peristalsis of bowel produced by purgatives may loosen these early adhesions, and save operation.

Therefore when a rise of temperature occurs post-operatively (as in this case), examine as follows:-
POST-OPERATIVE COMPLICATIONS (contd)

1) Examination of the wound for infection or fistula.
2) Palpation of abdomen for tenderness, rigidity, & swelling (general or local peritonitis).
3) Examine lower limbs (femoral thrombosis).
4) Rectal examination (pelvic abscess)
5) Examination of chest by physical & Xrays.

All these examinations were made in this case, and were negative. So the focus of infection must have been very small not to have been detected.

LATE COMPILATIONS.

1) Incisional hernia (most liable to occur with a gridiron incision).
2) Mechanical obstruction due to adhesions (firm)
3) Right inguinal hernia, when the subcostal nerve is cut, and the Int. Oblique muscle is weakened, thus predisposing to hernia formation.

Treatment Summary:— All cases of appendicitis should be watched with a view to early operation (within 48 hrs). Any post-operative rise of temperature should be thoroughly investigated, and the cause treated.
Muscle Wasting.

Lateral Rotation of Foot; absence of tenden lines.

Pulpy sole, flat & smooth.

Muscle Wasting.
CASE 5

This was a case seen in outpatients, the diagnosis of a 12 year old lesion being made from a neurological examination.

Thomas Gilbert

History given: -
1931 Involved in a mining accident.
1932 Laminectomy in lumber region performed by Mr Cochrane.
1942 Seen at outpatients

Examination

Inspection: - General - Patient cannot walk, and must be supported on both sides. He states that he can get around the house provided that he has something to hold on to with both hands.

When lying or sitting on a couch, the lower limbs lie in a neutral position, the long axis quite straight, with slight lateral rotation of the feet & ankles.

Muscles - Both legs are very wasted and quite out of proportion to the rest of his body, which is normal in development and size.

The thigh & calf muscles are wasted to such a degree that the normal shape & curves have been lost, and there is little difference in girth between thigh & calf.

The lines of the extensor digitorum longus and the extensor hallucis longus tendons, normally seen on the dorsum of the feet are lost, and the sole of the feet is very flat, pulpy-looking, and resembling that of a new-born baby (a foot that has never been used in any definite purposeful muscular actions)

The toes were curled up, and the big toe showed a certain amount of lateral rotation.
Examination (contd) Inspection (Contd)

Skin— Healthy looking, quite a good colour, and well covered with hairs.

The skin of the sole of the foot, instead of being horny & thick, was pink, looked fleshy, and resembled that of the palm of a normal hand. No veins stood out noticeably.

Palpation— The skin was loose, dry, and contained little, if any, subcutaneous tissue. Both legs were warm.

The muscles were very much wasted in both thigh & calf, and were flaccid & flabby to the touch.

EXAMINATION OF MOTOR POWER

A. HIP JOINT

<table>
<thead>
<tr>
<th>MUSCLE</th>
<th>NERVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ilio-psoas</td>
<td>L 2.3.4.</td>
</tr>
<tr>
<td>Rectus Femoris</td>
<td>L 2.3.4.</td>
</tr>
<tr>
<td>Sartorius</td>
<td>L 2.3.4.</td>
</tr>
<tr>
<td>Pectineus</td>
<td>L 2.3.4.</td>
</tr>
<tr>
<td>Obturator Externus</td>
<td>L 2.3.4.</td>
</tr>
<tr>
<td>Adductors Longus &amp; Brevis</td>
<td>L 2.3.4.</td>
</tr>
<tr>
<td>Adductor Magnus (pubic part)</td>
<td>L 2.3.4.</td>
</tr>
<tr>
<td>Gluteus Medius &amp; Minimus (ant. parts)</td>
<td>L 4.5. S I(Superior Gluteal N.)</td>
</tr>
<tr>
<td>Adductor Magnus (ischial part)</td>
<td>L 2.3.4.</td>
</tr>
<tr>
<td>Gluteus Medius &amp; Minimus</td>
<td>L 4.5. S I.</td>
</tr>
<tr>
<td>Gluteus Maximus (upper part)</td>
<td>L 5. S I.</td>
</tr>
<tr>
<td>Tensor Fascia Lata</td>
<td>L 4.5. S I.</td>
</tr>
<tr>
<td>Sartorius</td>
<td>L 2.3.4.</td>
</tr>
<tr>
<td>Obturator Externus</td>
<td>L 2.3.4.</td>
</tr>
</tbody>
</table>
**EXAMINATION OF MOTOR POWER** (contd)

**A. HIP JOINT** (contd)

<table>
<thead>
<tr>
<th>Muscle</th>
<th>Nerve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adductors</td>
<td>L 2, 3, 4.</td>
</tr>
<tr>
<td>Pectineus</td>
<td>L 2, 3, 4.</td>
</tr>
<tr>
<td>Quadratus Femoris</td>
<td>L 4, 5.</td>
</tr>
<tr>
<td>Gluteus Maximus (lower part)</td>
<td>L 5.</td>
</tr>
</tbody>
</table>

**B. KNEE JOINT**

- **Hamstrings** *(Sciatic)*
- **Popliteus** *(Med. Popliteal N)*
- **Gastrocnemius** *(Med. Popliteal N)*
- **Plantaris** *(Med. Popliteal N)*
- **Sartorius & Gracilis**

- Nerve: L 4, 5. S 1, 2.

**C. ANKLE JOINT**

<table>
<thead>
<tr>
<th>Muscle</th>
<th>Nerve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tibialis Anterior</td>
<td>L 4, 5.</td>
</tr>
<tr>
<td>Peroneus Tertius</td>
<td>L 4, 5.</td>
</tr>
<tr>
<td>Long Extensors</td>
<td>L 4, 5.</td>
</tr>
<tr>
<td>Gastrocnemius</td>
<td>S 1, 2.</td>
</tr>
<tr>
<td>Plantaris</td>
<td>L 5.</td>
</tr>
<tr>
<td>Tibialis Posterior</td>
<td>L 5.</td>
</tr>
<tr>
<td>Peroneus Longus &amp; Brevis</td>
<td>L 4, 5.</td>
</tr>
<tr>
<td>Long Flexors</td>
<td>L 5.</td>
</tr>
</tbody>
</table>

**Examination of Right Leg**

**A. HIP JOINT**

1) **Flexion** is slight; leg being just raised off the couch. The only muscle contracting (seen) is Sartorius. On palpation Sartorius is felt contracting, and the Rectus Femoris felt contracting slightly. All other flexor muscles were lax.

2) **Extension:** absent  
3) **Adduction:** absent  
4) **Abduction:** absent  

All muscles normally performing these movements were flaccid to touch.
Muscles still functioning in right leg.
EXAMINATION OF RIGHT LEG (contd)

B. KNEE JOINT

1) Flexion: very slight. The only muscle seen & felt contracting was Sartorius. All other muscles were lax & flaccid.

2) Extension: absent.

C. ANKLE JOINT

1) Dorsiflexion: absent.

2) Plantar flexion: absent.

Conclusions:

1) Only Sartorius & Rectus Femoris have any power of contraction.

2) Therefore the only motor nerves in the lower limb which are intact are parts of L2.3.4. Ns. i.e. Femoral N.

3) The Obturator nerves (L 2.3.4,) are completely nonfunctional, as is also the part of the Femoral N. supplying the Pectineus muscle.

REFLEXES in RIGHT LEG

1) Knee jerk, depending on the integrity of segments L 3.4: -- absent.

2) Ankle jerk, depending on integrity of segments S I.2, is absent.

3) Plantar reflex (Babinski), depending on the integrity of segments L 5, & S.I: -- absent.

Conclusions: No complete (i.e. motor & sensory) spinal segment from L 3, downwards is functioning, and so no information as to an upper motor neurone lesion (extensor Babinski), or lower motor neurone lesion (plantar flexion Babinski) could be obtained.

We know from the examination of muscles that no motor nerve from L 5, downwards is intact. So it is possible that the sensory part of the reflex arcs are intact, and to ascertain this an examination of the sensory nerves must be made, before full conclusions can be drawn.
SPINAL SEGMENTS

RIGHT

L.1.
L.2.
L.3.
L.4.
L.5.
S.1.

CUTANEOUS NERVES

LEFT

Lat. cut. of Thigh.
Int. med. cut. of Thigh.
Med. cut. of Thigh.
Saphenous
Lat. cut. of Calf.
Musculocutaneous
Sural
Ant. Tibial

ANT.

Post. Tibial.
Lat. cut. of Thigh.
Med. cut. of Thigh.

LAT.

Sural
Saphenous
Post. Tibial.
EXAMINATION of SENSORY NERVES to RIGHT LEG

Cutaneous sensibility was tested by using a sharp pin. The pin was only felt in areas marked in diagram. On the small area in the foot the patient "felt something" but only after the pin had been pressed hard into the skin for a second or two. So conduction was delayed.

Discrimination of sharpness and bluntness was lost in this area.

The large area limited inferiorly by was where normal cutaneous sensation began.

Conclusions:— 1) Complete anaesthesia of segments L 3, 4, 5, & S I, 2, 3.
               2) Partial anaesthesia of segment L 2.
               3) Slight sensibility in region of most distal sensibility distribution of Saphenous N. in possibly segments L 2, 3, 4.

EXAMINATION of LEFT LEG

I. MOTOR POWER.

This was completely absent.

Therefore all spinal motor segments to left lower limb (i.e. L 2, 3, 4, 5, & S I, 2, 3, 4, 5.) were not functioning.

2. REFLEXES.

These were all absent, and conclusions hold as for, right leg.

3. CUTANEOUS SENSIBILITY

Area of cutaneous sensibility was limited in part of L 1, segment (see diagram).

No areas of cutaneous sensibility were found elsewhere on the limb.
EXAMINATION of BLADDER

Patient complained of incontinence (probably overflow), but said that, if he wished, he could help micturition voluntarily to a certain extent, but he could not retain urine. This suggests that, at any rate, some of the fibres of the parasympathetic nerve supply were intact, their action being inhibition of sphincter of urethra, and motor to the muscle of the bladder wall. The fibres come from L 2, 3, 4. The patient also used the abdominal muscles to help evacuate bladder. A further suggestion follows, i.e., that very few of the Sympathetic nervous system fibres are intact, as their action is inhibition of the bladder wall plus contraction of the circular fibres of sphincter. The patient cannot retain water. Therefore extensive damage must have been done to these fibres.

EXAMINATION of BOWELS

The patient stated that he always needed a purgative to secure regular motions, but that he could voluntarily help to expel faeces. (This suggests that Parasympathetic fibres have not been extensively damaged). If, however, he has an attack of diarrhoea, he cannot retain the faeces. (This suggests that gross interference with the Sympathetic nervous system fibres has occurred).

GENERALLY

The patient was well, and said that both the movements in the right leg and the cutaneous sensibility of both legs was improving slowly but gradually. The scar of the laminectomy was that of a left paramedian incision in the region of lumbar vertebrae T1 to 2. N.B. Neither limb was examined for sensation on its post. aspect, but cutaneous insensibility is presumed from knowledge of the segments affected on the ant. aspect.
Diagram after Cunningham.
FACTS OBTAINED are

RIGHT LEG

I) Evidence (Sartorius & Rectus Femoris) that at any rate some of the fibres of the Femoral N. (L 2, 3, 4,) are intact, allowing of slight flexion of Hip & Knee.
2) The sensory part of L I. is intact, and that part (at any rate) of the fibres of L 2. are intact.
Also a small area of delayed cutaneous sensibility is present in the distribution of the Saphenous N., and so from segments L 2, 3, 4. (L 4, being most likely due to segmental distribution of spinal nerves).

LEFT LEG

I) Evidence that all the motor Ns. to the limb have been destroyed (i.e. segments L 2, 3, 4, & S I, 2, 3, 4, 5.)
2) Evidence that all the sensory Ns. to the lower limb have been destroyed, except part (or even all) of the fibres of L I.

THE PROBLEM IS:-- Primarily that of a man, paralysed in both limbs, and both limbs shewing large areas of anaesthesia, with only partial control of rectum & bladder.

Secondarily-- a) what was the nature of the accident? b) What part of his vertebral column was damaged? c) What lesion or lesions did the bony damage cause to the nervous system? ( b) & c) must be examined together to draw correct conclusions)

d) What was the effect of the laminectomy? e) Prognosis

Necessary anatomical knowledge:--

I) The spinal cord terminates at the level of L 2. Verteb.
2) The spinal Ns. to the lower limb arise therefore from the cord at a higher level than the intervertebral foraminal which they go through.
3) The anterior & posterior N. roots do not unite till
Normal Segments:
11
12
1
2
3
4
5
Sa. 1
2
3
4
5
Co. 1

Flaccid Segments:

Spastic Segments, cut off by lesion from all up, p.a., motor neurone impulses.

Possible Lesion I - Diagram of State of Affairs
in a section of the cord involving L.2 + L.3.
Anatomical knowledge necessary (contd)

4) In the Cauda Equina a) the Filum Terminale is centrally placed in position, b) The N. roots are placed in two bundles (right & left lateral) on either side of the Filum terminale. c) The roots which emerge from the vertebral column higher up are placed laterally and the ones emerging lowest down (e.g. S 5 & Co I.) are placed medially in the Cauda Equina.

5) Each Post. N. root has a ganglion on it, situated just before it enters the intervertebral foramen.

6) The blood supply to the spinal cord is plenteous, and there are many anastomoses between all the vessels. So section of one vessel would not produce a lesion of the spinal cord by degeneration.

Deductions:— Now the spinal segments down to, & including L I. are intact on both sides, both motor & sensory. Spinal segment lies opposite the 10th Thoracic vertebra. Spinal segment L 2. Lies opposite vertebra Th II, and is not intact on both sides, as the lesion affected the left half, and part of the right half of L 2. spinal segment. Possible lesion I.

If the accident had been a fracture-dislocation, the site would have been the vertebrae Th II & Th I2. But the laminectomy scar was in the lumbar region, and not near the II Th. Vertebra.

In such a fracture-dislocation the vertebra is not driven forwards en masse, as a rule, but at an angle, so that one edge of the vertebra causes the damage to the cord. Then only one or two segments are completely damaged (here L 2, 3.), while the segments above escape. The damaged segments show a flaccid paralysis and anaesthesia. The sections below the lesion would show a spastic paralysis (i.e. upper motor neurone lesion), exaggerated reflexes, ankle clonus (as segments SaI. 2.
Normal Segments

Lesion producing flaccid paralysis in affected segments.

Possible lesion II - Complete destruction of spinal segments below L1 and part of L2.
Deductions (contd)

would be below the bisected part of the cord), After some years the limb would gradually become flaccid.

In this case there has been a flaccid paralysis ever since the accident. There has been no history of initial spasticity, clonus, dorsi-flexion Babinski, exaggerated ankle reflex.

Possible lesion "2"
That the arches of the Th. 12 & L.1 vertebrae had been driven forward and crushed the spinal cord in front of them, producing signs exactly similar to those found here, where the segments L.1 & part of L 2. are normal, and all other lumbar & sacral & coccygeal segments are destroyed.

Possible Lesion "3"
That the lesion did not affect the cord itself, but that the damage was somewhere in the region of the Cauda Equina, sectioning not the cord, but the Ant. & Post. N. roots. (see diagram 4)

Which is the site of the lesion?

A) ? lesion? I ?

This could not be the case as there is:

a) no spastic paralysis etc.
b) laminectomy performed in lumbar region, where there is no spinal cord.
c) Laminectomy could have had no purpose, as once the cord is divided there is no chance of regeneration of any of its component parts.

Therefore section of the spinal cord involving one or two segments was not the lesion here.

B Possible lesion "2" ?

It is most unlikely that this is the lesion.
Which Is The Site Of The Lesion? (contd)

B) Possible lesion "2"

It is most unlikely that this is the lesion, as I- Vertebral arches of two vertebrae would be quite an unlikely fracture, and also to produce a complete destruction of the spinal cord.

2- even if they did, some of the fibres of the Th 12, & L I. Ms. would have been damaged in their course through the vertebral foramina (see diag. 4)

3- Laminectomy was performed in the lumbar region. This lesion would have required thoracico-lumbar incision, and would have been purposeless.

Therefore the lesion was not caused by a complete destruction of all lumbar & sacral & coccygeal spinal cord segments below L I.

C) Possible Lesion "3"

This lesion is undoubtedly the one which occurred as 

a) It would produce the clinical features of a lower neurone lesion

b) It accounts for the difference in segments affected on either side, both sensory & motor. The roots are destroyed, not the segments.

c) Both Cauda Equina & laminectomy are situated in the lumbar region.

d) Laminectomy is an essential operation for lesions of the Cauda Equina, since the ant. & post. roots which are affected are peripheral nerves, and so are capable of regeneration. Laminectomy is performed to relieve pressure on N. roots, and to allow regrowth of these peripheral nerves (Price).

D) Possible Lesion "4"

That of a ruptured disc between L 2, & 3. vertebrae. This would produce similar, but not identical signs, as the ant. roots would be more affected than the post., &
QUENCKENSTD'S TEST

Q in incomplete block
Q above block (normal)
Q below complete block

Time →

Jugular compression.
What Is The Site Of The Lesion (contd)?

Possible Lesion (contd) "4"

and the paraplegia would not have been so complete.
Also the man was involved in an accident—Rupture of a
disc occurs on undue strain.
The nerve roots would not have been sectioned.
Operation would have brought probable cure.

The Actual Site of the Lesion

The lesion is in the Cauda Equina. (see diag. 4)
The Cauda Equina extends from the lower half of L2,
vertebra to the sacral canal & coccyx.
The determination of the actual site can be done by
injecting lipiodol into the subarachnoid space. It is
injected through the occipito-atlantoid ligament, and
falls downwards. On X ray exam, the position of the
block can be seen clearly. Lipiodol is relatively
harmless, and can and will remain at the lowest level
of cerebro-spinal fluid indefinitely.

If there is a complete block in the region, and a
lumbar puncture is done below the lesion, then
Quenckenstæd's test sshow the existence of a block, but
not the actual site.

The Roots affected are:- On Right Side-
1) All ant Nerve roots from L 5. downwards, & parts of
L 2, 3, & 4. (as only portions of the Femoral N.
(L 2, 3, 4,) are intact; while part of that nerve & the
Obturator N. are completely destroyed- diag. 2)
The Sciatic N. (L 2, 3, 4, 5, & S 1, 2, 3, 4, 5,) also is
completely destroyed
2) Post. Nerve roots—completely destroyed from L 3,
downwards, and part of L 2, destroyed (see diag. 3)
**Probable Lesion 3**

Longitudinal section.

- Probable site of lesion
- Area damaged and neuropathic
T.S. of CAUDA EQUINA AT LEVEL OF LOWER PART OF L.2. & WHOLE OF L.3. VERTEBRAE.

R.  L.

Post. nerve roots.

L.2.
L.3.
L.4.

Elium Terminale

Ant. nerve roots

\[= \text{area damaged at this level}\]
\[O = \text{sectioned nerve roots}\]
\[\bullet = \text{intact nerve roots}\]
\[\text{Part of Oburator Nerve}\]
\[\text{Part of Removal neuron}\]
The Actual Site of the Lesion (contd)

The Roots affected are:—On Left Side—
1) Ant. Nerve roots—completely destroyed from L 2, down.
2) Post. Nerve roots—completely destroyed from L 2, down.
(diag.3)

Therefore in order to involve these fibres the lesion must be oblique, higher on the left side than on the right. It is also incomplete on the right, as there is evidence of some fibres of the ant. N. roots of L 2,3,4, being spared. Also the Obturator N. arises from the post. divisions of L 2,3,4,— and the Femoral N. from the ant. divisions of L 2,3,4. The Obturator N. is completely destroyed, but part of the motor fibres of the Femoral N are still intact (see diag.8). So the Ant. N. roots of L 2,3,4. are only partially affected, i.e. the post fibres are destroyed, but only part, of the ant fibres of these roots.

If the lesion was caused by a crush fracture of L 3, Vert., then fibres of L 2, N. would have escaped damage.
If the lesion was caused by a crush fracture of L 2, all L 2. N. fibres would have been damaged.

Therefore the injury was probably a crush fracture of the lower part of L 2, Vert. on the Left side, & of L 3, Vert. on Both sides (diag 3), and was caused by a prop falling on the patient's back.

In such a fracture the Nerve roots may be
a) completely severed.
b) crushed.

If laminectomy can be performed immediately, the pressure on the nerves can be relieved, and the nerves suffer from only a transient block. If the operation is delayed, the portion of nerve distal the trauma degenerate whether nerve is sectioned or crushed. If the nerve roots have only been crushed, the Neurallemma, which is essential for N. regeneration, persists, and if pressure is relieved the nerve root can regenerate. This process of regeneration
REGENERATION OF MOTOR NERVE ROOTS

REGRESSION OF SENSORY NERVE ROOTS
is very slow, especially where the injury is a long way from their termination in muscle, joint, skin, etc.

If the nerve is sectioned then the proximal neurilemma proliferates, and the distal degenerates. Should the Nerve fibre grow again, it may take any path, i.e., motor down the sensory fibres' track, and vice versa. It may go almost anywhere, and results are poor.

As it is impossible to tell clinically whether the root is sectioned or crushed, a laminectomy should be done in all cases. In this case there has been definite improvement in the 10 years since the operation, so that some of the injured nerves were probably only crushed.

The left leg shows no improvement in either sensory or motor conditions, and probably all its N. roota were severed.

The right shows improvement in both motor & sensory functions, and there is evidence that parts of L 2,3,4. ant. roots are functioning.

Possibly the small area of delayed cutaneous sensibility on the medial side of the foot (near termination of Saphenous N. L 2,3,4.) is due to regeneration of fibres of L 2, which have mistaken their path in the Saphenous N., and instead of supplying skin over the upper part of thigh, have grown down the whole length of the Saphenous N. to its termination, where they have resumed their duties, and become cutaneous again.

There are no signs of regeneration in L 4., which usually supplies this area, and the above explanation would explain this clinical sign.

When Nerve regenerates it grows at an approximate rate of 1 millimetre a day.
PROGNOSIS

Prognosis for the Right leg is that increasing muscle power may be obtained, and larger areas of skin may regain their sensory supply.

Prognosis for the Left leg is guarded, since no improvement has taken place in 10 years. Still nerve regeneration is a very slow process.

The findings of examination of bladder & bowels supports the inferences already drawn, and the prognosis is also guarded, but slightly hopeful.

TREATMENT

a) In early stages:
   1) Treat shock.
   2) Immobilise, so as to prevent further damage.
   3) Examine legs periodically, so as to ascertain the type of lesion (upper or lower neurone).
   4) Strict attention to bladder & bowels
   5) Attention to skin, especially over bony points
   6) Change position of patient regularly.
   7) If any evidence of contractures occurring in spastic cases, splint the limbs.
   8) Passive movement.
   9) Exact localisation of injury.
   10) Adequate diet, sleep, etc.

b) Operative:
   1) Laminectomy, as soon as stage of shock has vanished, and diagnosis certain.
   2) Removal of all fragments of bone pressing on nerves, or lying in vertebral canal.

c) Late Treatment:
   1) Rehabilitation, and training for a suitable occupation.
   2) Remove financial worries, if possible.
   3) Physiotherapy & massage. Active & passive
TREATMENT (contd)
movement to try to regain muscle power, and to try to prevent extensive wasting.

4) Possibly electric treatment, aiming at preventing extensive wasting.

5) Provision of brace, micturition bag, and supports for legs.

6) Conveyance, which he can manipulate himself.

7) Maintain general health by fresh air, diet, & adequate sleep.

8) Adequate treatment of traumatic lesions in the paralysed areas. Remember the anaesthesia hiding any trauma symptoms.

9) Occupy the patient mentally. Make him realise that he is of use. Prevent introspection.
CASE No 6

CARCINOMA of RECTUM treated by COLOSTOMY

John Boyd age 65. Whiteford house; Canongate

Occupation: labourer

Born in Edinburgh. Married, but separated from his wife since last war.

Admitted 16.1.44.

Discharged 25.2.44.

Complains of pain in left groin: also diarrhoea for the past 8 months.

HISTORY of present illness.

A. Pain in the left groin, first noticed 8 months ago, after stooping to lift a 50 lb. wgt of coke. He had no sensation of anything giving way. This pain was unlike any previous hurt. It came on intermittently, caused by coughing at times; at others by walking, and again when sitting still. After 3 months he saw his doctor about the pain, whom found a hernia, & shewed him how to reduce it. Previously he had not associated the pain with a swelling. He was sent to R.I.E. in Sept. 1943, and put on the waiting list for operation for hernia.

Since Sept. he has had intermittent pain mostly brought on by coughing, with the bowel coming down each time. Pain ceased immediately he reduced the hernia.

The worst attack of pain & herniation occurred on 14.1.44 just before admission. He has had no pain since admission.

B. Diarrhoea: up to 3 months ago patient has had regular motions, one daily. Then suddenly he began to have attacks of diarrhoea. At first there were 3-4 stools a day; but recently these have increased to 9 in the day, & 2 or 3 at night. He went to his doctor as soon as the first attack started, and was given medicine, which he continued taking steadily. The stools were just loose motions at first, but 2 months ago he noticed blood in them for the first time. It was dark purplish
History (contd.,)

red in colour, and copious in amt. Bleeding has persisted ever since. His doctor told him to continue with his medicine, but after it had persisted for 3 weeks, the doctor suggested an X ray. As he was awaiting admission for his hernia operation, the X ray was postponed. In the last few weeks his motions have consisted of blood, slime & flatus only. There has been no intermission of the diarrhoea for the last 3 months. His appetite is excellent, and he has no discomfort apart from his hernia pain.

Neither he, nor his doctor seem to have associated the two symptoms and the diarrhoea was not mentioned in the doctor’s letter to the hospital, and this was only found after admission.

HISTORY of PREVIOUS HEALTH.

This has been good, and he has worked steadily. Apart from colds, the only other illness was Rheumatic fever 35 years ago.

SOCIAL HISTORY.

Is that of a working man, living in a hostel, as he is separated from his wife. All his children are grown up with homes of their own. His hostel expenses are 11 shillings a week inclusive.

Specimen diet:- Breakfast- Porridge, 1 pint milk, bread & margarine, 1 pint tea.

Dinner- Soup, sausage or meat, & potato.

Tea- Bread & jam or cheese, and occasionally an egg, tea.

Supper- Tea & bread.

He says he has a healthy appetite, and always eats up his food, and sometimes other folks food as well. His appetite has been on the increase in the last few months. Potatoes are the only vegetable he gets; he never has green’vgs., and only at Christmas is there mashed turnips for a treat.
Family history. Wife separated for the past 30 years.
Children - 7. All alive & well
Grand children all alive & well
He gets on well with his children & grand-children, and visit them, and is visited by them.

STATE on EXAMINATION & GENERAL HEALTH
He is intelligent & co-operative, interested in people, & anxious to be helpful. He is not worried abt his condition, believes what he is told, requires assurance that treatment is not painful.

His body is fairly well nourished, and skin not unduly lax for age 65. It is smooth, dry & slightly wrinkled. His arms & legs are thin, and he says they became like this when he stopped work last Sept., being retired with a gratuity. His thorax & abdomen are normally developed, and muscular tone seems good throughout the body. He says he has not lost weight recently.

In general appearance he looks rather tired, and is quite pleased with rest in bed. He has a contented look. Face & nose are slightly cyanosed, the rest of his body being pale in colour.

About 8 months ago Boyd began to be easily tired, to lack energy, and not to be bothered with life. So he was quite glad to be discharged with a gratuity, last Sept., when the staff was reduced. He was a gardener.
He lives on this gratuity and an old age pension. He has grown more tired recently, and spent his mornings in the library, reading papers & magazines. Then a saunter to the hostel for dinner, bed after dinner, and only sometimes gets up for tea, and even then early to bed before supper. In hospital he lies propped up in bed, but always cheerful and gracious when spoken to.

Temperature: - 97.8 F.
A detailed examination of the alimentary & haemopoetic systems are indicated. Since the diarrhoea is the most urgent, it will be considered first.

**ALIMENTARY SYSTEM**

**SYMPTOMS**

He has a good appetite, and no troubles with eating & digestion.

Until 8 months ago his bowels were regular. Since then he has constant & increasing diarrhoea. (see history). He has never had either diarrhoea or constipation before. No pain on defaecation, and no tenesmus

He is surprised that he has lost no weight in spite of the constant diarrhoea.

He c/o intermittent pain associated with his hernia, always assoc. with descent of hernia, and lasting till it is reduced. Bulging of the rupture is not assoc. with diarrhoea.

**SIGNS**

*Mouth:*– Lips are purplish.

He is edentulous, as all teeth were extracted in 1914; he had very bad teeth as a boy.

Gums & fauces are healthy.

Tongue extruded without deviation.

Is furred (white), tinged with brown centrally.

*Abdomen:*– Inspection.

Abdomen is rounded; the outline of Recti easily seen. Skin is pale, and slightly wrinkled.

No visible peristalsis.

Palpation.

No tenderness. No rigidity.

The skin could be easily pinched btw. fingers, and there seemed to be little subcutaneous fat.

Stomach not palpable.

Liver normal in size (palpation & light percussion) Smooth contour.
Palpation (contd)

Spleen not enlarged (Palpation & percussion).

Intestines: - No peristalsis seen or felt.

Pelvic colon could be felt as a tube-like structure, rather resistant, in the left iliac fossa, but not more protuberant than normal. Tympanic note on percussion.

Kidneys not palpable.

No fluid found, either encysted or free (tidal percussion).

Exam. of Rectum: - High up on the post wall of rectum an ulcer crater was felt, admitting the tip of the examining finger. It was tender, and made the patient wince. Edges were raised, rolled & very hard.

The base of the ulcer had involved all coats of the bowel, and had spread to the perirectal tissues. It was firmly attached to sacrum, and could not be moved either from side to side, nor up & down.

The lumen of the bowel at the site of the ulcer was narrowed, and the whole wall of the rectum (at this site) was thickened & hard, and much less mobile than the rest of the rectal wall.

Prostate was not enlarged.

Sigmoidoscope Exam. (by Mr. Millar): - The ulcer could not be seen owing to debris in rectum.

Faeces: - On naked eye exam. faeces were very loose, dark brown, & with very little solid content. Odour was unpleasant. Mucus present, but no free blood seen. Benzidine test for occult blood Positive.

Number of stools On 17th 3/day 5/night. 18th 2/day 2/night. 19th. 0/day. 20th nil day & night (oper)

Diagnosis: - An ulcer of rectum is present, causing diarrhoea, & containing occult blood.
HAEMOPOIETIC SYSTEM

SYMPTOMS:- Nil.

SIGNS:- No evidence of any lymphangitis
Lymph glands:- Normal in all areas, Groin, Axillae, & Neck, (especially supraclavicular group)
Spleen not palpable & not enlarged.

The BLOOD.

Hb. estimation 19.1.44, 88% considering that patient had been bleeding for 2 months, per rectum, and diet was with minimal iron content, the anaemia was less than might have been expected.

Conjunctiva healthy, and not anaemic to look at.

ENDOCRINE SYSTEM

SYMPTOMS:- None found in any endocrine organs.

Pancreas:- No thirst, polyuria, glycosuria, coma, emaciation found.

Thyroid:- Not enlarged, no nervous symptoms, no loss of weight, no exophthalmos, no tremors; no lethargy, no falling out of eyebrows & hair, no deposits of subcutaneous tissue near wrists and supraclavicular regions, no incr. of fat, no constipation. Cool hands.

Parathyroids:- No spasms, negative Trousseau sign, no Chvostek's sign.

Suprarenals:- No signs of Addison's dis. (bronzing of skin, lethargy)

Pituitary:- No changes in the skeleton or in the sex characters were found.

Gonads healthy. (7 living children).
CIRCULATORY SYSTEM

SYMPTOMS: Nil.

VESSELS: ARTERIES.

Pulse rate varied btw. 84-88 per mt. Regular rythm. The character of the wave was normal, tension incr. to a maximum (acme), and then falling more slowly.

Artery walls palpable, & slightly calcified (mild arterio-sclerosis) Arteries not visible, and not rigid.

B.P. 120/78

VEINS: Slight cyanosis of face & lips. No oedema off dependent parts. No capillary pulsation No distended veins seen on trunk. Small varices along the line of long saphenous veins of both legs, present since last war, mostly in knee & leg regions, and producing no symptoms.

HEART: Inspection- Apex beat not seen. No pulsation in neck or epigastrium.

Palpation- Apex beat in 5th.L. intercostal space, 3/4" inside nipple line. It was well localised, and easily palpable, but not over forcible. No thrills felt.

Auscultation- Sounds regular, and synchronous with pulse. No extrasystoles. Sounds easily heard in all areas. No murmurs.

So circulatory system is normal.
RESPIRATORY SYSTEM.
SYMPTOMS:— Nil. History:— Nil.

SIGNS:— Breathing— Rate 20 per Min. is effortless and regular. Voice is low pitched, no hoarseness, can phonate well (normal high & low pitch) Larynx healthy and muscles normal (Vagus N. intact).

Thorax:— Asthenic type. Sternum symmetrical with a slight depression in lower 1/3. Ribs do not stand out unduly. Abdomino-thoracic breathing. Thorax moves normally, but the accessory muscles of respiration (mainly trapezius & sterno-mastoids) are brought into play, suggesting some degree of emphysema. There seems to be also some widening of intercostal spaces.

On palpation the chest movements had only small excursion thorax tending to move up & down (accessory muscles) more than by lateral expansion (intercostal muscles). Ribs were a little more horizontal than normal. Vocal fremitus slightly reduced.

On percussion a slightly hyper-resonant note was obtained over whole thorax. No fluid present.

On auscultation, the breath sounds were faint, and vesicular in character. No accompaniments found.

So there seems to be some degree of emphysema, shewn by

1) Hyperresonance
2) Broadening of intercostal spaces.
3) Ribs being more horizontal than normal.
4) Use of accessory muscles of respiration.
5) Diminished breath sounds, vocal fremitus, & fremitus.

INTEGUMENTARY SYSTEM.
Symptoms:— Nil.

Signs:— Skin is dry, slightly pigmented, wrinkled, & not pigmented. No eruptions. No scars. Hair is normal in amount and distribution. Nails shew no abnormalities; are dry but not brittle. They are slightly convex (no abnormality).
URINARY SYSTEM.

SYMPTOMS: - Has had a "weak bladder" all his life, micturating frequently (every 2-3 hours), passing only a small quantity each time. At night 2-4 times as a rule.

SIGNS: - Kidneys not palpable
Bladder not palpable, and no dullness on percussion of suprapubic region.

Urine: - Appearance Orange
S.G. 1022.
Reaction acid
No albumen, blood, sugar, ketone bodies, bile, & pus. A trace of mucus

No abnormality (except frequency) in urinary system.

NERVOUS SYSTEM

Intelligence, a good average. He is co-operative, interested, kindly & friendly, and is fond of a joke.
Emotionally stable. Memory good, never hesitates in answering questions, and gives a clear and orderly history.

For the past year he has slept badly, wakes up in the night (N.B. frequency micturition), and is not refreshed in the morning, and still tired.

Speech well articulated, clear & to the point.
Cranial nerves were normal
Cervical sympathetic system normal.
Motor functions normal.
Sensory functions normal.
Upper & lower limbs Normal.
Reflexes normal
No Vaso-motor disturbances.

So nervous system shews no abnormality.

LOCOMOTARY SYSTEM

Bones normal
Joints normal
Muscles normal.
THE NERVOUS SYSTEM

MENTAL FUNCTIONS

Intelligence is average. He takes an interest in his surroundings & treatment, and co-operates well. History was fairly well given & in good chronological order.

Emotionally he appears stable, contented & well-balanced.

Memory is moderately good.

Speech shows no abnormality.

CRANIAL NERVES

Olfactory nerve:- Normal smell at all times.

Optic nerve:-

a) Visual acuity normal.

b) Fields of vision normal.

c) Ophthalmoscope:- N.A.P.

d) (associated with oculomotor N.)

Pupils:- normal in size, shape reactions to normal & consensual light

Accommodation:- normal

Oculomotor N. Medial, Inferior & Superior recti and Inferior oblique & Levator palpebrae muscles normal.

Trochlear N. Superior oblique normal

Abducens N.: Lateral rectus normal.

Ocular movements were normal in all directions, in both eyes. There was no squint, no nystagmus, no diplopia, & no ptosis of upper eyelids.

Trigeminal N.:-

a) Ophthalmic division:-

Supra-orbital N. & Supra-trochlear N. intact. Corneal reflexes present. (this can be affected by the Facial N.)

b) Maxillary division:-

Intra-orbital N. Sensation normal to skin of upper eyelids, lateral sides of the nose, cheek, upper lip, and to teeth of the upper jaw and to palate.
Trigeminal N. (contd.)

c) Mandibular division.

Motor power:— Normal movements of mouth & jaw. i.e. muscles of mastication (temporalis, masseter, medial & lateral pterygoids) working normally & with good co-ordination.

Sensation:

Mental branch of infraorbital N. (to lower lip) intact.

Sensory branches of infraorbital N. (to gums & teeth of lower jaw) intact. The lingual branch intact. (supplies the ant. 2/3 off tongue with ordinary sensation)

Chorda tympani N. supplies branches through the submaxillary ganglion from the Facial N to the ant 2/3 of the tongue intact.

Facial N. — — — — — — — —

Tests used were a) wrinkling forehead
b) screw eyes up tightly
c) retract lips & smile

If a lesion of the Facial N. after it had left the brain had been present (L.M.N. lesion), complete paralysis of ½ of the face would have occurred (Bell's palsy). If a supra-nuclear lesion were present, the lower ½ only of the affected side would have been paralyzed, as the upper motor fibres neurone fibres of each side give branches to the opposite half of the upper face.

AUDITORY N.

Intact as there is no difficulty in hearing, and no pain, tinnitus nor other ear symptoms.

GLOSSOPHARYNGEAL N.

Intact as there is no interference with sensation & secretion of posterior ⅓ of tongue, as supplied by this nerve.

VAGUS N.
Trigeminal N. (contd.)

c) Mandibular division.

Motor power:— Normal movements of mouth & jaw. i.e. muscles of mastication (temporalis, masseter, medial & lateral pterygoids) working normally & with good co-ordination.

Sensations:—

Mental branch of inf. dental N. (to lower lip) intact.

Sensory branches of inf. dental N. (to gums & teeth of lower jaw) intact. The

Lingual branch intact. (supplies the ant. 2/3 off tongue with ordinary sensation)

Chorda tympani N. supplies branches through the submaxillary ganglion from the Facial N to the ant 2/3 of the tongue, intact.

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AUDITORY N.

Intact as there is no difficulty in hearing, and no pain, tinnitus nor other ear symptoms.

GLOSSOPHARYNGEAL N.

Intact as there is no interference with sensation & secretion of posterior 1/3 of tongue, as supplied by this nerve.

VAGUS N.
VAGUS N.

Is motor for the palate, larynx & pharynx, and is sensory & motor for the respiratory passages, the heart & most of the abdominal viscera. There is no regurgitation of oral contents into the nose. There is no difficulty in voice production.

SPINAL ACCESSORY N.

Is motor for sternomastoid & trapezius. Intact.

HYPOGLOSSAL N.

Is motor to the intrinsic muscles of the tongue, and to all the extrinsic muscles also except the palatoglossus (spinal-accessory N.) is intact. The tongue is protruded to the midline & does not deviate.

CERVICAL SYMPATHETIC N. SYSTEM.

No evidence of disturbance.

REFLEXES

A. SUPERFICIAL

Conjunctival intact. depends on intensity of fifth (sensory) & seventh (motor) Pharyngeal & palatal present intact. - depends on integrity of ninth & tenth Ns.

Abdominal intact. - depends on integrity of motor & sensory Ns. of segments seven - twelve

Plantar reflex normal. - depends on integrity of L. five & S. one Ns. segments
REFLEXES

B. SUPERFICIAL DEEP

Knee jerk:— depends on integrity of segments
L. 3. 4. Present.

Ankle jerk:— (depends on integrity of segments
S. 1. 2.) Present.

Biceps jerk:— (depends on integrity of segments
C. 5. 6.) Present

Triceps jerk:— (depends on integrity of segments
C. 7.8.) Present.

C. ORGANIC.

Micturition normal
Defaecation normal.

MUSCLE POWER IN THE LIMBS.

A. ARM

<table>
<thead>
<tr>
<th>Muscle</th>
<th>Nerve</th>
<th>Segment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deltoid</td>
<td>Circumflex</td>
<td>C.5.6.</td>
</tr>
<tr>
<td>Biceps</td>
<td>Musculo-cutan.</td>
<td>C.5.6.</td>
</tr>
<tr>
<td>Triceps</td>
<td>Radial</td>
<td>C.7.8.</td>
</tr>
<tr>
<td>Wrist flexion</td>
<td>Median</td>
<td>C.7.8.</td>
</tr>
<tr>
<td>Wrist extension</td>
<td>Radial</td>
<td>C.6.7.8.</td>
</tr>
<tr>
<td>Finger flexion</td>
<td>Median</td>
<td>C.(7) 3.</td>
</tr>
<tr>
<td>Finger extension</td>
<td>Radial</td>
<td>C.7.</td>
</tr>
<tr>
<td>Little finger ext.</td>
<td>Ulnar</td>
<td>Th.I.</td>
</tr>
</tbody>
</table>

All these muscles had good power, & each segment in the arm is tested in these movements. Thus the Cervical cord segments (motor) 5,6,7,8, & Thoracic I. are intact.
**B. LEG.**

<table>
<thead>
<tr>
<th>Muscle</th>
<th>Nerve</th>
<th>Segment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iliopsoas</td>
<td>Branches of</td>
<td>L.2.3.4.</td>
</tr>
<tr>
<td>Adductors</td>
<td>Obturator</td>
<td>L.2.3.4.</td>
</tr>
<tr>
<td>Gluteus maximus</td>
<td>Inf. gluteal</td>
<td>L.5. S.I.2.</td>
</tr>
<tr>
<td>Gluteus med. &amp; min.  &amp; T.P.L.</td>
<td>L.4.5. S.I.</td>
<td></td>
</tr>
<tr>
<td>Knee</td>
<td>Sup. gluteal</td>
<td></td>
</tr>
<tr>
<td>Quadriceps</td>
<td>Femoral</td>
<td>L.2.3.4.</td>
</tr>
<tr>
<td>Hamstrings</td>
<td>Sciatic</td>
<td>L.5. S.I.2.</td>
</tr>
<tr>
<td>Ankle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tibialis ant.</td>
<td>Ant. tibial</td>
<td>L.4.</td>
</tr>
<tr>
<td>Long extensors</td>
<td>Ant tibial</td>
<td>L.5.</td>
</tr>
<tr>
<td>Short extensors</td>
<td>Ant tibial</td>
<td>S.I.</td>
</tr>
<tr>
<td>Gastrocnemius</td>
<td>Post. tibial</td>
<td>S.2.</td>
</tr>
<tr>
<td>Tibialis post.</td>
<td>Post tibial</td>
<td>L.4.</td>
</tr>
<tr>
<td>Peroneal</td>
<td>Peroneal</td>
<td>L.5. S.I</td>
</tr>
<tr>
<td></td>
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<tr>
<td><strong>Toes</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extensors</td>
<td>Ant tibial</td>
<td>L.5.</td>
</tr>
<tr>
<td>Flexors</td>
<td>Post. tibial</td>
<td>L.5.</td>
</tr>
</tbody>
</table>

All these muscles have good power. Thus cord segments L.2.3.4.5. & S.I.2. (motor) are intact.

**SENSORY FUNCTIONS.**

Subjective sensations are normal.

**SENSATION in ARM.**

a) **Sensément Drill examining segments C.8 A.8 A.7.6 & Th. I.** These were all intact.

b) **Main Nerves intact.**

- **Median N.**: index finger pulp is sensitive.
- **Ulnar N.**: little finger pulp is sensitive.
- **Radial N.**: proximal parts of dorsal surface of Ist. interosseous space is sensitive.
SENSATION in ARM (contd.)

c) Stereognosis: Movements of thumb, gripped on its lateral and medial aspects with steady, constant pressure were appreciated. Stereognostic sense is intact.

d) Co-ordination: Normal. So cerebellar function is intact.

SENSATION in LEG.

a) Segmental Drill: covering segments L.I.2.3.4.5.
& S.I.2.3.4.5. are intact.

b) Main Nerves are intact

Saphenous N.: medial border of foot sensitive.
Musculo-cutaneous N.: lateral, border foot is sensitive.

Post. tibial N.: pulp of great toe is sensitive.
Ant. tibial N.: the skin between the heads of the Ist. & 2nd. metacarpals (dorsum) is sensitive.

c) Stereognosis: Similar movements of great toe are appreciated correctly. So stereognostic sense of legs is normal.

d) Co-ordination: Moving one heel up & down the other shin. This was well performed. Co-ordination intact.

VASC-MOTOR and TROPHE disorder are absent.

The Nervous System shows no abnormality.
Diagram (section) of the lesion.

Appearance of wound at the closure of operation.
**DIAGNOSIS**

He is suffering from a carcinoma of rectum, which has ulcerated. There is no evidence on external exam. of metastatic spread.

**TREATMENT**

Laparotomy, to explore pelvis & abdomen, to find out

1- Extent of primary lesion.

2- Possible extension to mesentery and lymph area (glands & metastases)

3- If liver involved with secondaries.

According to findings

1) a colostomy

2) a radical excision

3) a 2 stage operation can be done.

**OPERATION**

Anaesthetic: premedication Morphia gr $\frac{1}{2}$ & atropine gr. $\frac{1}{100}$ Induction & maintenance by gas oxygen & ether, an air way being inserted.

Surgeon Mr. Millar, on 20.1.44. opened abdomen by a left McBurney incision. The ext. oblique aponeur. was split obliquely in the line of its fibres, & retracted. The int. oblique aponeuresis & fleshy fibres were incised in the line of its fibres, & retracted. The peritoneum was opened, and the pelvic colon bulged thr. the incision.

The exam. of the pelvis confirmed the rectal exam. A mass was felt on the post. wall of the rectum, about $\frac{1}{2}$" proximal to the rectal peritoneal reflexion. It was firmly adherent to the sacrum, and had infiltrated the rectal wall in a circular manner, so that the rectum, at this spot bulged anteriorally into the pelvis as a rigid cylinder. To the left of the rectum a small hard nodule was felt (a local metastasis). The mesentery and the sup. rectal & inf. mesenteric As. were examined for enlarged glands, which were found.

The liver was found free of any nodules. So there were no signs of metastases by lymph of blood spread.
OPERATION (contd)

The para-colic gutter was closed by a purse string suture.

The pelvic colon was again found, its direction ascertained, and then, in the proximal part of the mesentery, an avascular part was chosen for the insertion of the colostomy rod, and a hole made by a closed blunt-nosed forceps, the rod drawn through, and fixed by rubber tubing slipped on each end. Next, using No. 00 catgut, interrupted sutures were inserted, joining the chosen pelvic colon to the peritoneum. Int. & ext. obliques were separately closed at each end of the wound by interrupted sutures. Finally the skin wound was closed by interrupted sutures, and a dressing of vaseline gauze covered by elastoplast was put on.

PROGRESS NOTES

Post-operative pain was relieved by morphia gr.1/6 at 2-30 & 3-30 p.m. on day of operation (20.I.44). Further similar injections were necessary to relieve pain at 9 p.m. on 21.I.44, and again at 2-30 a.m. on 23.I.44, and also on 24th, 25th Jan, & 5th Feb. Pain was localised to wound area, and made worse by coughing.

Temperature was slightly raised & swinging, but rapidly subsided, and has been uniformly subnormal since 26th Jan.

Pulse rate 84-88:- Respiration rate 20 per mt.

The patient suffered increasing flatulent discomfort, which was immediately relieved when colostomy was opened by a crucial incision (in the long & trans. axes of the bowel) on 25.I.44. Since then all real pain has ceased, leaving only local tenderness.

He passed a small slimy motion per rectum on 21.I.44 and since colostomy was opened, one or two small daily colostomy motions, and a few small slimy actions
Management of Colostomy.

A transverse colostomy is usually more difficult to regulate than a pelvic colostomy owing to the more fluid nature of the stool.

Most patients obtain greatest comfort by modifying their diet so as to produce a certain degree of constipation, often combined with a regular routine washing of the bowel once or twice daily.
The trans. section of the colostomy was completed (by diathermy) on 10.2.44.

He was allowed up for a short time next day, but a small haemorrhage from the wound sent him to bed again. Three days later he got up again, and further progress was uneventful.

He is able to manage his colostomy toilet quite well. After operation he rapidly returned to normal diet, and has a good appetite, eating everything he is given. He enjoys his pipe, his visitors, & his surroundings.

His sleep was poor at first after operation, but this gradually improved, and now his sleep is better than before admission.

A slight cough was relieved by M.amm. carb.

On discharge, he was feeling much better, and more rested, and had learned to manage his colostomy well.

DISCUSSION

I) Differential Diagnosis.

2) Aetiology.

3) Treatment.

4) Prognosis.

I) DIFFERENTIAL DIAGNOSIS OF RECTAL CARCINOMA.

From the patient's point of view, & history the conditions to be fulfilled are those that cause

a) diarrhoea, & b) blood (seen by the naked eye) in the stools. Lesions of the large bowel are the only ones fulfilling both conditions.

I Ulcerative Colitis:— occurs usually in young adults. Pathologically the colon is covered with ulcers in the mucous memb. These vary greatly in size, are multiple, have raised irregular edges, with bases covered with granulations, to which shreds of mucous memb. adhere. And the vessels
DIVERTICULITIS

Fistulas
+ hemorrhages

Filling defect

CARCINOMA OF COLON

BARIUM ENEMA, X-RAY APPEARANCES.
of mucous memb. adhere, and with engorgement of vessels in surrounding mucosa.
Clinically the patient becomes rapidly emaciated, in marked cases, has constant diarrhoea consisting largely of mucus, pus & blood, and are very offensive. There is tenderness along the line of the colon.
This patient was not emaciated, had no pain, had no pus in stools, and on sigmoidoscope examination had a very different lesion present

2) **Diverticulitis**: occurs in stout men over 50 years of age, typically. Pathology is of the mucous membrane herniating through the weakened defective muscle wall of the colon. In these diverticulae faeces can stagnate, and even obstruct the lumen of a diverticulum, producing a condition analogous to an acute appendicitis. Clinically this condition is not discovered until inflammation develops (diverticulitis) with a leak of toxins through the walls to the peritoneum producing a peridiverticulitis, characterised by adhesions to the surrounding bowel etc., and condition may progress to formation of faecal fistulae between loops of bowel or the bladder. History is that of subacute appendicitis in L.I.Fossa, accompanied by incr. constipation, or alternate constipation and diarrhoea, the stools containing mucus & blood.

The patient has colic; on palpation the pelvic colon stands out as a firm swelling, tender on pressure.

X ray helps to differentiate this condition from carcinoma of colon. (25% of diverticulitis cases finally develop carcinoma of colon).

4) **Amoebic Dysentery**: Characterised by small yellow or gray multiple ulcers eroding & undermining the M.M. of the desc. & pelvic colon. The intervening M.M. is healthy. Adhesions may form in relation to the ulcers. Liver abscess may result (venous spread).
Amoebic Dyentery (contd)
Clinically amoebae hystolitica are found in the loose stools; also a history of residence in the tropics

5) Bacillary Dysentery—Pathologically involves all the mucous membrane, which is acutely congested, and has many irregular shallow ulcers on it. The disease runs an acute course, and the causative bacillus can be isolated & cultured from the stools. It often occurs in epidemic form.

6) Polyposis of the colon—Pathology: Multiple adenomata (often a sequela of ulcerative colitis) of the colon. Clinically it is familial. It produces diarrhoea, haemorrhage & tenesmus, and sometimes acute intussusception. It is a frequent precancerous lesion. It can be excluded by sigmoidoscopy and family history.

7) Carcinoma of the Colon—Pathologically is confined to a small segment of the bowel. It may be an adenocarcinoma (filling defect on X ray), or more commonly a scirrhus carcinoma, encircling the bowel wall and producing stenosis. It may infiltrate neighbouring coils of bowel, and ultimately perforate into them causing int. fistulae.

The scirrhus type produces progressive obstruction of the bowel by stenosis, and to overcome this the proximal bowel hypertrophies. Later this hypertrophied bowel may pass into a state of paralytic distension. If an extra strain (e.g. purgative) be put on this area, it may perforate. This type of growth metastases slowly, and so liver enlargement & ascites come on after the condition has lasted a serious time. It may cause an acute intussusception.

Clinically there is frequently visible peristalsis in the proximal bowel.

1) Palpable lump (mostly obstructed faeces).
2) Dullness on percussion over large intestine (faeces).
3) Depressions in skin through faeces.
4) Acute obstruction is often the first sign that calls the patient to the doctor.
X-ray appearances of carcinomas of colon.

Peri-proctitis → ischio-rectal abscess → only diarrhoea if a fistula forms. This should be only a transient disease, but accompanied by local & general signs of pyogenic infection.
Carcinoma of Colon (contd)

due to the impaction of a faecal concretion in the stenosed area. This is differentiated from other acute obstructions by the relief afforded by enemata.

5) Distended abdomen, due to faecal accumulation.

6) Hiccough often present.

7) Blood in the stools.

The Site of the growth is shewn by the stools. In the proximal colon the stools are liquid, and the irritation of the growth produces diarrhoea. (semi-solid faeces) In the distal colon the stools have become more solid before the growth area is reached, and constipation is the sequela, sometimes interspersed with bouts of spurious diarrhoea. Such a lesion may be visible on sigmoidoscope exam., and even palpable on bimanual exam. In the lowest part of the pelvic colon a carcinoma often produces alternate diarrhoea & constipation. Owing to the proximity of the bladder there may be frequency of micturition & dysuria, and later infection of the urine from the adherent bowel.

An X-ray should always be done.

8) Sarcoma of the caecum:— is recognised clinically by the palpation of a rigid tube in the right iliac fossa

(In this case the constant diarrhoea, unaccompanied by constipation did not correspond with the classical symptoms of the ulcerative lesion found on rectal exam.)

9) Foreign Body:— Produces transient diarrhoea, with mucus & blood in the stools.

10) Proctitis:— Produces diarrhoea, mucus (only tinged by blood), and often irritation of the bladder. The rectal M. M. is hot and swollen.

11) Non-malignant Ulcers:— Usually situated on the posterior wall, the diarrhoea consisting mainly of blood-stained pus. These may be dysenteric in origin (vide previous notes on these conditions) associated with pulmonary & subcutaneous inflammation.
Non-malignant Ulcers (contd)

b) Tuberculous:- Infrequent;
associated with advanced pulmonary tuberculosis. The ulcer edges are undermined & irregular.

c) Gonorrhoeal:- History & culture.

d) Syphilitic:- Characterised by multiple moveable submucosal gummata which later ulcerate; the ulcers are typical punched out lesions. A positive W.R. is present.

e) Radium necrosis:- Present only in women, following radiation for carcinoma cervix.

In all these ulcerative conditions there is typically massive diarrhoea, tenesmus, and one normal motion a day.

13) Strictures:- Usually a sequela of Lymphogranuloma inguinale, infection being by the rectal mucous memb. Ulceration may follow the stricture (angular or tubular) Constipation is more frequent than diarrhoea.

14) Haemorrhoids:- Internal or external or mixed, when associated with inflammation, have been mistaken for carcinoma rectum. Usually easily diagnosed by rectal exam.

15) Adenoma of Rectum:- a) Rectal Polypi.

b) Papillary adenoma, with villous processes
Probably caused by irritation. Usually single, often pedunculated. Produce tenesmus, mucus, and occasional haemorrhage, plus irritation of peri-rectal anal skin. They can be a precancerous lesions.

16) Fibrous Polyp:- Possibly a fibrosed thrombosed int. pile. Not associated with haemorrhage.

17) Sarcoma of Rectum:- Diagnosed by biopsy.

18) Melanoma:- Charactised by its dark brown or black colour, and by micr. section.

19) Epithelioma of Anus:- Causes mainly pain & haemorrhage, and great distress. It grows out and invades skin.
(Section) - Diagram showing local spread
Carcinoma of Rectum: Affects men & women in equal proportions. Pathologically the tumour is usually an Adeno-carcinoma, bulging into the lumen of rectum. The tumours, which are most highly differentiated are the least malignant, and this type tends to proliferate mainly into the rectal lumen. Those with less differentiation tend to remain flattened against the bowel wall, and tend to be highly invasive & penetrative. Ulceration of the growth occurs when 1) it becomes infected. 2) when the blood supply becomes insufficient, so that the central part of the growth undergoes necrosis, leading to ulceration. The ulcer has the typical elevated, rolled, projecting edges, and is usually situated on either ant. or post. walls of rectum.

Mode of Spread

I) Local spread begins by invading the submucosa, then later the muscle wall, sending processes between the muscle fibres. Thus the whole thickness of the bowel wall becomes involved. Then the malignant cells invade the neighbouring bowel wall in a circular manner, so that finally a circular ring of growth is produced, spreading out from the original ulcerated growth. More rarely the tumour spreads longitudinally along rectal wall. This local spread tends to produce stenosis of the lumen from a) projecting tumour & ulceration, b) cicatricial contraction of the fibrous stroma in the encircling portion of the tumour. This is most effective in the pelvi-rectal part of the rectum than in the wider ampulla.

The tumour may become adherent to neighbouring organs, and invade them, e.g. bladder, (perforation leads to recto-vesical fistula), prostate, and sacral nerve roots (pressure symptoms)

2) Lymphatic spread along lymph vessels to glands.
Rectal Carcinoma, Mode of Spread (contd)
lying alongside the sup. rectal art. If the anus is involved the inguinal lymph glands may be involved.

3) Blood spread occurs if the tumour involves the wall of a vein, tumour cells being carried in the Portal system, till arrested in the liver, forming metastatic growths.

4) Spread in the peritoneal fluid after the growth has reached the peritoneum. Secondary growths usually occur in the pelvis, but may be found anywhere.

Clinically symptoms are usually absent till ulceration occurs, when there is an offensive discharge of a haemorrhagic-mucopurulent type. The separation of a necrotic area is often accompanied by brisk haemorrhage, attributed to piles.

Less commonly, the complaint is of increasing constipation, alternating with periods when there is a lot of mucus in the stools, accompanied by a persistent desire to pass mucus & flatus.

When the growth has ulcerated, the tendency towards diarrhoea increases, and the stools consist mainly of blood, mucus, and a little faecal material. There are repeated calls to stool, with little result, and little relief.

The growth has usually progressed far before there is pain, as the rectum is insensitive, and pain occurs only when the perirectal tissues are attacked.

On Rectal Exam, the ulcerated surface is felt, with the typical edges. If stenosis is present this will be evident to examining finger. The degree of fixation to surrounding structures, and the amount of involvement of the rectum can be estimated.

On Sigmoidoscope exam, the elevated congested edges, & the ulcerated surface can be seen.

The stenosis is rarely so marked that acute obstruction is produced.
Carcinoma of Rectum (contd)

The General Effects on health are those of carcinoma in general, m 1) Loss of weight (often rapid)

2) Sunken eyes, hollow cheeks, and loose skin (from loss of subcutaneous tissue)

3) Secondary anaemia

4) Easily tired, and breathless.

5) Poor appetite,

6) "Rheumatic" pains from secondaries in vertebrae

7) Age period 50-63 yrs.

Though symptoms are atypical in this case, the whole picture shows that Mr. Boyd is suffering from Carcinoma of Rectum.

2) AETIOLOGY of CARCINOMA RECTUM

Very little is known about this. Heredity may play a part. Identical twins have developed carcinoma in the same area of the body (lip) at the same time

Trauma is often an aetiological factor. Continual irritation will finally provide cells with the necessary stimulus for overgrowth. This may have been protective to begin with, but the cells continue to grow & multiply long after the stimulus has been removed. Whether the continual passage of faeces may stimulate a sensitive mucous mem? Precancerous lesions are common in the rectum, e.g., papillomata, polyps etc.

Age. Cancers occur in different organs at different ages, corresponding to the age they reach maturity and undergo involution.

Many factors are involved in all cases. Cancer research is finding out many new facts, and a solution of the problem lies in the future. In this case there are no signposts to point the way to the cause.
3) TREATMENT

Rectal examination is vital in all cases of recurring haemorrhage in middle life. The earlier the diagnosis is made, the better chance is there for cure.

A palliative colostomy is invaluable, even in advanced cases, as it reduces the diarrhoea (due largely to the passage of faeces over the growth), lessens pain, and prolongs life. The laparotomy enables the surgeon to make a thorough int. exam. for metastases fixation etc., and to decide the possibility of complete removal of growth. Generally this is decided by:

a) Fixation to neighbouring structures. Should the sacrum be attached to growth, it may be possible to peel off the tumour with fair hope of complete recovery.

b) Metastases by lymph, blood, or peritoneum. Local infiltration need not necessarily be a contraindication to removal.

Excision of the rectum is usually done about a fortnight after the colostomy.

Radiation may be helpful, a) for direct curative action, b) to reduce the growth, and render excision possible.

In this case, the gross local infiltration of the rectal wall, its fixation to the sacrum, and the local peritoneal metastasis indicate that it is unlikely to be cured by excision. There is a high mortality (20%) attached to this operation, the man is not well enough to stand this easily, and the palliative operation is the wise course to take. He may later be advised radiation should his health improve and so give a chance for reconsidering radical treatment.

Post-operative treatment includes training in the care of his colostomy, cleanliness, regular bowel actions, and of his lower bowel. General health must be maintained:

- Convalescence in the country.
- Extra diet...
(milk & eggs). adequate sleep, if necessary with a hypnotic from time to time.

He seems very happy at his hostel, and keeps himself occupied mentally, by reading & games. It is very important that he should not get depressed; he should be encouraged to live a normal life, and not to regard himself as an invalid.

Persolate gr. 3 t.i.d. will be needed to counteract his secondary anaemia, and to help the iron deficiency of his diet.

If pain should become severe morphia may become necessary, under strict medical supervision.

Precautions taken at Colostomy operation

1) Incision should not be too near the ilium, otherwise the colostomy cup would press on the bone, causing leakage, pressure sores, & discomfort.

2) The proximal part of the colon (pelvic) should be used for the colostomy a) to allow of plenty of free bowel for a possible excision later.

b) to guard against prolapse of the mobile pelvic colon (proximal)

3) Prevent haemorrhage by extra care of ligatures.

4) Suture para-colic gutter to prevent a possible int hernia.

Later Dangers following the operation

a) Hypostatic pneumonia

b) Pulmonary emboli, producing infarction, haemoptysis, or death (if massive).

c) Mucus plug in bronchi, producing atelectasis and secondary infection, leading to a lung abscess.

The cause is often the patient's fear of coughing after an operation; mucus is retained, and may form a serious plug.
PROGNOSIS

Inoperable cases of rectal carcinoma may expect an average of 2 years of life. Many live for 5 years or more. Rectal carcinoma is one of the slower growing forms of cancer, with slower metastasis formation. The removal of the constant soiling of the ulcer by faeces must be an important factor in prolonging life. This removes one form of irritation, and so, one inducement for spread of growth. The general health is improved, and resistance is thus raised.

A truss was advised in this case for the hernia, as prolongation of the operation was inadvisable; he will lead a sedentary life, and suffer little discomfort.