REPORT
AND
COMMENTARY
ON
CERTAIN CASES
TREATED IN
THE UNIVERSITY SURGICAL WARDS
DURING
THE ACADEMIC YEAR
1900 - 1901.

John Saffley

EDINBURGH
6th July 1901.
Contents.

1. Two Cases of Odontoma. ........................................... 1.
   I. Odontome obstructing Right Nasal Cavity; Removal of Tumour; Cure. 1.
   II. Odontoma with Squeezetum of Frontal Bone and Extradural Abscess; Removal of Tumour and Squeezetum; Cure. 9.
   Odontomata (Tooth Tumours) .................................... 16.
2. Fracture of the Spine with Complete Motor Paralysis of both Lower Limbs; Laminectomy; Complete Recovery. 33.
   Fractures of the Spine ........................................... 44.
3. Hour-glass Contraction of the Stomach; Gastroplasty; Complete Cure. 59.
   Hour-glass Contraction of the Stomach ......................... 69.
4. Notes and Analysis of a Series of Twenty Cases of Appendicitis. 78.
   Table of Analysis ................................................. 114.
   Appendicitis ..................................................... 116.
5. A case of Dry Senile Gangrene affecting both Feet; 134.
   Senile Gangrene .................................................. 148.
6. Two Cases of ankylosis of the Elbow Joint resulting from Injury

| I. Fracture-dislocation at Elbow Joint; ankylosis; Excision; | 156 |
| II. Fracture-dislocation at Elbow Joint; ankylosis; Excision; | 165 |
| Ankylosis of the Elbow Joint resulting from Injury. | 171 |
Two Cases of Odontoma.

I. Odontoma obstructing Right Nasal Cavity; Removal of Tumour; Cure.

On 13th November 1900 a young unmarried man, aged 19, employed as a Spade maker, was admitted to ward VII, Royal Infirmary of Edinburgh, under the care of Professor Annandale, complaining of obstruction in his right nostril.

The history obtained was as follows. About a year before the date of admission he began to feel the right nostril slightly stuffed up. This gradually increased. There was no pain. About the same time his right eye became slightly "swollen," and continued so. He never had any difficulty with his eyesight.

He continued at his work and had nothing done for the condition. At times there was a little thin discharge. About three weeks before admission he began to feel a soft thing in his right nostril. He felt throbbing in this when he tried to blow it out. He then saw a medical man who said he was suffering from polypus, and advised him to come to the Royal Infirmary.
Edinburgh, for treatment.

On admission the following symptoms and appearances were made out. On the right side of the nose near its root there was a hard swelling, not tender to the touch. The nose was broadened, especially on the right side. The right eyeball protruded considerably and the eyebrow was arched up. Both the eyelids drooped somewhat, especially that of the right eye. The sight was found to be unaffected. Through the right anterior nares a mass of mucous tissue was seen blocking up the nasal passages. Respiration could be carried on only through the left nostril, which was not affected so far as patient was aware. The palate was normal, as also were the teeth and the full number of these was present. On passing the finger behind the soft palate a mass of tissue of medium consistence was felt projecting backwards. A slight deviation of the septum could be felt and it seemed a little thickened. There was no pain. The condition was not worse in wet weather so far as patient was aware. His family and social history was good and he had previously enjoyed good health.
The diagnosis arrived at was that the condition was a tumour—probably a sarcoma, but not of a very malignant type, for then progress would have been more rapid,—gradually extending from the nasal cavity, and pushing up or rather breaking through the bone into the orbital cavity so as to displace the eyeball. With regard to the probable origin of the tumour, though often difficult to say from what point such a tumour originates, it was thought that in the present case it might probably have arisen in connection with the right nasal cavity, from the mucous membrane or one of the turbinate bones. Against its growing from the base of the skull was the fact that the condition was unilateral, whereas when such tumours originate from the base of the skull the nose is usually equally flattened on both sides at its root. Against it being a case of ordinary fibrous polypus was the entire absence of haemorrhage, which is invariably present in fibrous polypus. The possibility of its being an odontome was not denied, though, being a compar-
a perfectly rare tumour, it was not thought likely to be that.

Operative interference was decided on, and on 20th November, the patient being under chloroform, Professor Annandale, employing the incision commonly used for excision of the upper jaw (Fig. 1.), and reflecting a flap outwards, exposed a hard bony tumour which at first looked as if it were adherent. On separating the nasal bone from the superior maxilla, the tumour protruded between and was found to be movable, but not to any
extent, the anterior part of the superior maxilla was removed and an attempt made to extract the tumour. This was unsuccessful. The canine tooth on the right side was drawn and the right middle incisor; the superior maxilla was split and a small wedge-shaped piece of it on the inner side of the alveolus removed. The tumour was then levered out. The parts of the upper jaw were wired in position and the wound sutured. Patient lost a good deal of blood during the operation on account of the vascularity of the parts.

The progress of the case was very satisfactory and rapid. Temperature chart for the first fortnight is subjoined. (Fig. 2). For some time after

<table>
<thead>
<tr>
<th>Nov. 19</th>
<th>20</th>
<th>21</th>
<th>22</th>
<th>23</th>
<th>24</th>
<th>25</th>
<th>26</th>
<th>27</th>
<th>28</th>
<th>29</th>
<th>Dec. 30</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>98</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>98</td>
<td>98</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>99</td>
<td>100</td>
<td>101</td>
<td>102</td>
<td>103</td>
<td>104</td>
<td>105</td>
<td>106</td>
<td>107</td>
<td>108</td>
<td>109</td>
<td>110</td>
<td>111</td>
<td>112</td>
<td>113</td>
<td>114</td>
<td>115</td>
<td>116</td>
</tr>
</tbody>
</table>


Fig. 2. - Temperature Chart.
the operation the mouth was frequently washed out with boracic lotion and kept clean.

"The skin wound healed by first intention, without any sloughing at all. On 10th December the wire stitch in the palate was removed. Under that date is the following entry, - "The hole in the palate is still of considerable size and will need an obturator."

On the 11th patient was sent to the Convalescent House at Coasterpolnie for a fortnight.

Thereafter he returned and had an ordinary tooth-plate fitted to the palate, thus closing the hole in it and holding teeth in place of those removed.

He returned home perfectly cured, able to breathe freely through the right nostril, and with very little scar indeed on the face as a result of the operation wound. The right eyeball, however, still protruded slightly, though not nearly so much as previously.

The tumour was regarded by Professor Annandale as a compound or composite odontome. It was very hard, ivory-looking,
flattened on one side and with rounded, knob-like encrencences on the other side (Fig. 3).

Fig. 3.— Odontoid tumour removed by Professor Anandale on 20th Nov. 1900.
[Considerably under natural size]
(Photo by Mrs. J. Buine, 3-7-1901)

Its length was three and a half inches, width in the middle two and a quarter inches, greatest thickness an inch and a quarter and average thickness about one inch. It weighed fully four ounces.

The tumour was of so large a size and the parts around it were so much displaced that
its exact position was difficult to define accurately. It was lying external to the \textit{vomer}, directed obliquely upwards and outwards behind the eye.

There was no sign of where the tumour had grown from. It lay loose and the inner surface of the cavity in which it lay was smooth. It did not press on the brain so far as could be discovered. There were no cerebral symptoms but in the frontal region, it appears, that even when pressure exists there may be no symptoms present.

No section of the tumour was made.

\textbf{Fig. 4} - Sketch of tumour (natural size)
II. Odontoma with Sequestrum of Frontal Bone and Extradural Abscess; Removal of Tumour and Sequestrum; Cure.

On 10th December 1900 a married woman aged 37, was admitted to Ward XIV, Royal Infirmary of Edinburgh, — under the care of Professor Chiene, — complaining of an unhealed wound over the left eye.

Twelve years before she suffered from inflammation over the left eye and felt as if "there were a bean in her eye." She came to the Eye wards of the Infirmary, but was told that nothing should be done, unless the condition yet worse, as the operation was too dangerous. She was advised to wear spectacles. This she neglected to do.

The condition does not seem to have seriously troubled her further until two years before the date of admission, when she began to feel pain over the left eye. Poultices were applied to the part and soon afterwards a discharge came from the left nostril and the pain was relieved. The discharge continued. It was purulent and was frequently tinged with blood. It flowed readily on blowing her nose or when she
stooped at her work. About a year later, after a chill, a lump appeared over her left eye accompanied by great pain in the temple. This swelling was drained and had not healed since.

On admission, there was a sinus in the forehead about an inch and a half external to the middle line and half an inch above the left eyebrow. On probing, bare bone was felt and the probe passed through the bone into the frontal sinus. Except on pressure there was no pain in the wound. A sulcus was felt below the inner part of the superciliary ridge. There was a hard swelling about the size of a sixpence between the inner canthus of the left eye and the root of the nose. This had displaced the eyeball outwards and caused strabismus. The left upper eyelid was swollen and the lower one markedly wrinkled. The eyeball protruded somewhat. No optic neuritis was present and the sight seemed to be unaffected. Except during cold weather no pain was felt in the eye. Patient's social and family history was good. She had been subject to severe headaches while young.
From the appearances and history of the case the diagnosis arrived at was a sequestrum of the frontal bone with the formation of new bone around it.

It was decided to remove the sequestrum and to carry out any further treatment which an exploration of the parts might show to be necessary. Accordingly on 18th December the patient being under chloroform, Mr. Wallace (in the absence of Professor Chêne) operated. He made an incision from the inner canthus of the left eye upwards in the middle line and then curving outwards above the sinuses in the forehead(Fig.5)

Fig. 5 - Incision used.

A flap of skin and superficial tissues was turned downwards. Bleeding was somewhat free as the angular artery was cut at the lower part of the
incision. On stripping the periosteum off the frontal bone an opening was found just below the inner part of the superciliary ridge. The opening in the bone corresponding to the sinus was also exposed. Supposing that the two openings might communicate a gouge was used to make a gutter and lay the communication open, but after gouging away about half an inch of bone no communication was found. The bone was very much thickened and sclerosed. Then the bone around the upper opening was gouged deeper and yellow pus was seen to be welling up. To get free access gouge-forceps were employed and a considerable area of bone was entirely gouged away inferior to the upper opening and extending down to the suprorbital ridge. Two pieces of necrosed bone belonging to the inner table were removed. (Fig. 6). There was

Fig. 6 - Pieces of Necrosed Bone (Natural Size).
also an extradural abscess with a considerable amount of pus. The whole cavity was thoroughly washed out with hot boric lotion, at the same time the opening of the sinus in the skin was scraped with a sharp spoon. Attention was then turned to the hard bony swelling on the inner aspect of the orbital cavity, which displaced the eyeball outwards. Mr. Wallace enlarged the opening which had been found below the inner part of the superciliary ridge and exposed a bony mass which was comparatively free and seemed to extend from the superior maxilla. It was situated external to the ethmoid bone and was bounded above by the orbital plate of the frontal bone. Considerable difficulty was experienced in removing it. The opening had to be further enlarged by means of bone forceps. The mass was eventually got away in two pieces, - the smaller one first. The whole tumour was the size of a walnut (Fig. 1). It was

Fig. 1 - Site and general outline of the tumour.
hard and very irregular. The cavity in which it lay was
tined by mucous membrane and was smooth and
communicated with the left nostril. The cavity
was washed out and stuffed with iodoform worsted,
introduced through the left nostril so that it
might drain thereby. The cavity above the super-
orbital ridge also was stuffed with iodoform worsted,
the ends of which were left out at the upper part
of the wound. Finally the flap was stitched in position
with fishing-gut and horse-hair sutures.

Mr. Wallace regarded the tumour as an odontoma,
and the sequestrum of the frontal bone as having been
produced by pressure.

The prognosis given at the time of the operation
was somewhat unfavourable owing to the possibility
of paranasalitis.

Patient stood the operation very well, but was
somewhat sick afterwards. This sickness continued for two
days, but evidently was not cerebral as thereafter she
made an uninterrupted recovery. The incision healed
by first intention and the stuffing of the gap in the
frontal bone was soon reduced to a single thread
introduced through the sinus-opening in the skin.
The worsted was removed from the nostril on the
second day after the operation, and the discharge
then drained through the open nostril, but soon ceased entirely. Patient left the hospital on 12th January 1901 feeling very well. The left eye was still displaced outwards, but not to the same extent as before the operation. The sinus opening had almost closed. There was entire absence of any symptoms, such as headache, or pain anywhere.

**Fig. 8 — Denticles. (See page 20)**
A. From Willander's Case
B. ✆ Sinus Case
C. ✆ Mathias' Case.
[From Sutton's 'Tumors' p. 37]

**Fig. 9 — Follicular odontome (page 15)**
(Edentulous cyst). The tooth has a truncated root. (Nat. size) Sutton's 'Tumors' 52.
Odontomata (Tooth Tumours).

Amongst the group of Connective Tissue Tumours odontomata form a small but well-defined class. "An odontome is a tumour composed of dental tissues in varying proportions and different degrees of development, arising from teeth-germs, or teeth still in the process of growth." The tooth formation gives rise to a tumour instead of a tooth and many of them thus seem to be congenital. These tumours are comparatively rare.

They are classified according to the part of the tooth-germ in connection with which they originate. The following varieties are commonly described.

1. Epithelial Odontome: from the enamel organ.
2. Follicular Odontome
3. Fibrous Odontome
4. Cementome
5. Compound Follicular Odontome
6. Radicular Odontome: from the papilla
7. Composite Odontome: from the whole germ.

1. Epithelial Odontomes. — These occur as encapsulated tumours in the mandible and less frequently

A. J. Bland Sutton; 'Tumours, Innocent and Malignant' p.31.
in the maxilla. They are made up of congeries of cysts of various shapes and sizes, the boluli rarely exceeding 2 cm. in diameter. The thin fibrous septa separating the cysts are sometimes ossified. The cavities contain mucoid fluid of a brown colour.

They occur most frequently about the twentieth year. When the overlying mucous membrane ulcerates they somewhat resemble epithelioma. The growing portions have a reddish tinct and are sometimes mistaken for myeloid sarcoma. When large they erode and destroy the surrounding bone.

They probably arise from persistent portions of the epithelioma of enamel organs.

2. Follicular odontomes.—This species includes those tumours commonly called “dentigerous cysts.”

They are usually, but not invariably, associated with the permanent teeth, especially the molars and sometimes attain very large proportions and produce great deformity. Occasionally they are multiple especially when connected with the maxillary teeth. The tumour consists of a wall of varying thickness. Thus it may be thin and crepitant or measure 2 cm. in thickness. The cyst wall represents the follicle of an unerupted tooth. The cavity of the cyst is occupied by viscid fluid and the crown of an
unerupted tooth. Exceptionally the tooth is loose in the cyst. It may be inverted; usually the root is truncated - incompletely developed, due to non-eruption - and rarely the tooth is absent. The cyst wall contains calcareous matter and usually bone. Follicular odontomes rarely suppurate.

They are most common between the seventh and twenty-fifth years. The clinical signs vary with the size and situation. They may be bilateral, and as many as four may be present; when small and impacted between the plates of the mandible diagnosis is sometimes difficult, but the key to the nature of the case is furnished by detecting the absence of a tooth as they only arise in connection with unerupted teeth. In the early stages they are liable to be confounded with myeloid sarcoma. Later, when the tumour has emancipated itself from the jaw, its walls expand and form a globular fluid containing tumour, which may give rise to fluctuation and egg-shell crackling.

When these tumours arise from the follicles of maxillary teeth they quickly invade the antrum; when bilateral they hideously distort the face. Several cases have been recorded in which tumours
fully two and a half inches in diameter have occupied both antra.

3. Fibrous odontomes.—Every tooth before its eruption is enclosed in a capsule of fibrous tissue, the tooth sac. This capsule occasionally becomes thickened and so thoroughly encrypts the tooth that it is never erupted, and is sometimes completely suppressed. These tumours are made up of many laminae of fibrous tissue, intermixed with calcareous matter. This species has in the past been confounded with myeloid sarcoma.

These tumours occur impacted in the mandible or occupying the antra of children from the commencement of the second dentition to puberty. They are often bilateral and when associated with the 6-year-old molar produce a curious and characteristic appearance of the face; such patients usually exhibit traces of rickets, and there is good reason for the belief that rickets is responsible for some of these thickened capsules. These tumours may attain the size of harem's eggs; as the child gets older they dwindle. They are absolutely painless.

4. Dentomes.—When the tooth sac becomes enlarged, as in the preceding species, and the fibrous
tissue ossifies, the tooth becomes embedded in a mass of hard tissue identical with cementum. An odontome of this nature is called a cementome. At present they are unknown in man, but are met with in horses, and in these animals grow to a very large size. Specimens are known weighing 50, 60, and 70 ounces.

5. Compound follicular odontomes. - When the thickened capsules of one or more unerupted teeth become confluent and ossify sporadically, a tumour is produced containing one or more denticles and fragments of cementum. Such tumours are known as compound follicular odontomes. Several examples in the human subject have been carefully recorded. Some of these tumours have contained 20 and others 40 denticles. In a few of the recorded cases some of the denticles erupted and stood above the gum, on their removal other ill-formed teeth appeared and then a thorough search revealed the existence of a collection of denticles within a capsule. Compound follicular odontomes occur in the maxilla as well as in the mandible.

6. Radicular odontomes. - This species arises after the crown of the tooth has been completed, and while the roots are in process of formation.
As the crown of the tooth when once formed is unalterable, it naturally follows that should the roots develop an odontome, enamel cannot enter into its composition. The tumour consists of dentine and cementum in varying proportions. (Fig. 10, 11)

Radicular odontomes are occasionally met with in man; they occur equally in maxilla and mandible. In rodents they are very common and occur in multiples; four may be present in the jaws of the same animal.
Composite Odontomes.—This is the variety of odontomes to which the above recorded cases were regarded as belonging and accordingly it has a special interest.

These tumours bear very little resemblance in shape to teeth, but consist of a disordered conglomeration of dentine, enamel and cementum, and may be considered as arising from abnormal growth of all the elements of a tooth-germ. They are composite in another sense, for the majority of specimens consist of two or more teeth germs indiscriminately blended.

To the present time upwards of thirty composite odontomes are known; of these two-thirds were situated in the mandible and the remainder occupied the maxilla. Those growing in the maxilla are often far larger than those found in the lower jaw, as they are able to invade the antrum. Composite odontomes in the mandible rarely exceed a pigeon egg in size; those in the upper jaw are sometimes as big as a bantam's egg, and occasionally exceed this size. Some large odontomes from the antrum have been described as exostoses, but careful histological examination shows that they are composed of dentine, cementum and enamel. In
some of the cases recorded, the clinical facts were very extraordinary.

A typical case of a composite odontome in the lower jaw was recorded by Professor Annandale in the Edinburgh Medical and Surgical Journal, 1873 (p. 379). The patient was a girl aged 17 who had never had any lower molar teeth on the left side. Nine months before she was seen by the Professor, she observed a swelling of the jaw on the left side, and began to suffer pain in the part. An abscess soon after formed in connection with the swelling, and burst internally into the mouth. Thereafter the swelling somewhat increased in size and the abscess continued to discharge small quantities of pus.

A careful examination determined the presence of a tumour connected with the left side of the lower jaw. The tumour was the size of a hen's egg, hard to the touch, and included the entire thickness of the bone for an extent of about two inches immediately in front of its left angle; the affected portion of bone being expanded by the growth. On investigating the internal aspect of the jaw from the mouth, the absence of the lower molar teeth on this side was noted; but in their situation, and showing itself only just above the gum, was a nodulated
osseous mass which somewhat resembled a piece of necrosed bone, but was more irregular on its surface than the latter usually is. A small quantity of pus could be pressed out from the gum in the neighbourhood of the growth. On seizing the projecting portion of the mass with the fingers, it appeared to be perfectly fixed and embedded in the jaw. Before resorting to division of the bone for its removal it appeared right to make an attempt to extract the growth entire through the mouth, and having therefore placed the patient under chloroform Professor Annandale laid hold of the mass with a pair of strong molar-tooth forceps. On the first attempt the forceps slipped, but having forcibly pushed the blades down between the gum and the tumour he was able to get a firm hold of it. After pulling for some time he could not feel that it was at all loosening and was about to desist when it slightly moved and with a little more perseverance the whole mass was drawn out. After its removal the introduction of a finger determined the existence of a cavity in the expanded portion of the bone, which cavity was lined by a smooth membrane. The bleeding after the extraction
of the growth was slight, and was readily controlled by stuffing the cavity with a little lint soaked in a weak solution of carbolic acid. The patient's progress was all that could be desired, and she left the hospital at the end of a fortnight. The swelling was steadily diminishing in size when she left.

The external appearance and section of the tumour are shown in Fig. 12. It weighed 300 grains. Careful sections were made. The examination of these showed that a cap of enamel, varying in thickness, was arranged over a portion of the irregular surface of the tooth mass. Beneath this, well-formed dentine, possessing a considerable thickness, was met with; and still deeper in the substance of the mass, true bone, containing
lacunae, canaliculi, and haversian canals, was seen to be intermingled in a confused manner with portions of dentine, so as to form the substance called by histologists "osteodentine."

Mr. Heath has recorded a case somewhat similar to the above. A

In forget's case where the tumour occupied much the same position, a considerable portion of the lower jaw seems to have been excised to get the mass away. The tumour consisted mainly of dentine, the surface of which was in places covered with enamel dipping into the crevices, at the bottom of which cementum was found. B

In Mr. Rushton Parker's case the tumour originated in connection with the second left lower molar of a young lady aged 19. An effort was made to extract the tooth, but it broke, leaving the tumour behind. Subsequently an attempt made to extract the mass failed, a few fragments only being detached; about two years later it issued spontaneously from the alveolus. It weighed 136 grains.

Mr. Jordan Lloyd removed a composite dentine from the right upper jaw of a young man.

The case was regarded as one of necrosis, but when removed from its bed was recognised as an odontome. The tumour weighed 279 grains, and was composed of osteo-dentine, with cementum here and there. Opaline, furry patches were studded irregularly around the edge of the cut surface. The mass occupied the space of the second, and probably the third, right upper molars; it could be felt to be slightly loose before attempts were made to remove it. After its extraction a deep, round, smooth, velvet-like cavity remained, and the exposed part with its crater-like hollow and surrounding ridge bore a certain resemblance to a molar tooth crown.

The largest odontome known to have grown in the human antrum, and which for many years was regarded as an exostosis, is preserved in the museum of Guy's Hospital. It has an extraordinary clinical history which was recorded by Hilton.

The patient, a man aged thirty-six years, had a large osteous tumour occupying the antrum. The pressure of this tumour had caused the front wall of the antrum, with the integument
and soft tissues covering it, to slough. The trouble was first noticed thirteen years before; as the cheek enlarged, the eyeball became displaced and finally burst. For a long time the surface of the tumour was exposed, the suppuration being copious, and occasionally pieces of bone circular in shape came away; at last, to the man’s astonishment, the bony mass dropped out, leaving an enormous hole in his face. The

Fig. 13.—Large odontoma spontaneously shed from a tumour; weight, nearly 15 ounces. (Hilton’s case)

general appearance of this tumour is shown in Fig. 13. It weighed nearly fifteen ounces and measured eleven inches in its greatest circumference. It was remarkably hard, presented on
section an ivory-like surface and, on close scrutiny, a number of closely arranged concentric laminae. (Fig. 14.) Thin sections showed large numbers of lacunae and canaliculi arranged in a very regular manner. Dentine was not detected.

As the tumour had no bony connections, occupied the antrum, and in the structure of its peripheral parts was so closely identical with odontomes which occur in horses it was believed to have originated in one or more enlarged tooth follicles and to be in fact an odontome.

Composite odontomes resemble teeth in that for a time during their development they remain hidden below the gum; in due course they enter on an eruptive stage when in a number of cases the suppuration and constitutional disturbance dependent thereon,
draw attention to them. In some cases the eruption of an odontome has placed life in jeopardy.

The cause of odontomes, like the cause of most other tumours, is still obscure, but the fact that so many odontomata appear to be congenital might at any rate be taken as an argument in support of cochleas's theory of 'tumour-gums' or residues of tissues, some of which may be due to faults or embryonic irregularities, which sooner or later rapidly or slowly develop into tumours.

Most odontomes grow very slowly. As regards the composite odontomes it is often difficult to tell exactly how they grow and where they extract their nourishment from, as frequently they are found lying quite loose in a cavity lined by a smooth membrane. Lord Lister was of opinion that some of the cartilages which are met with in the knee-joint increased in size and extracted their nourishment from the fluid of the joint, and the development of odontomes when lying loose may, perhaps, be explained in a similar manner, namely, that they get their nourishment from the fluid.
secreted by the mucous membrane lining the cavity in which they lie. They probably originate in connection with a cyst or from the mucous membrane. In Case I above the tumour evidently originated in the nasal cavity, the tooth sac protruding into the nose.

The symptoms and appearances that usually present themselves are well illustrated by the cases recorded above.

Most cases of odontomes when they come under observation are regarded as tumours of the jaws or seccessed bone. The absence of teeth in any case is suggestive; and a long history (as in Case II above) of any tumour of the jaws points to the possibility of some form of odontome being present.

As regards treatment, odontomes being encapsulated tumours merely require excision. Before their exact nature was ascertained serious operations were performed for their removal, such as e.g. the removal of a large portion of the lower jaw. Sometimes they protrude naturally and often by chipping away a part of the bone they can be got out quite easily.
Odontomes are very gratifying and with care many tumours can be enucleated from within the mouth and leave no external scar or disfigurement - a matter of special importance in the case of females.

References: - 1. 'Tumours, Innocent and malignant' by J. Bland Sutton (Cassell 1893), 69.

Additional note. Several other cases of large composite odontomes have been recorded besides those already mentioned. Mr. Michon removed from the antero of a Frenchman, aged 19 years a large odontome weighing 1080 grains, which was composed of tissue presenting many parallel tubules having the appearance of exaggerated dental tubes.

Dr. Duka also removed a large odontome from a Mahomedan woman, aged 26 years, who had for six years before suffered from a muco-purulent discharge from the right nostril.
Fracture of the Spine with Complete Motor Paralysis of both Lower Limbs; Laminectomy; Complete Recovery.

On 14th December 1900 there was admitted to Ward VII, Royal Infirmary of Edinburgh, under the care of Professor Annandale – a strongly built man, 24 years of age, a plumber by trade, suffering from paralysis of both lower limbs, the result of a fall from a height.

Half an hour before admission while working on a scaffold, a rope gave way and he fell a distance of 25 feet and landed on his back. He was unconscious for ten minutes. On recovery he found his legs were paralyzed. He was removed to the Infirmary in a cab. The jolting of the cab caused him great pain.

On admission his temperature was normal. He was suffering from shock but was conscious. The spine of the 11th dorsal vertebra projected half an inch and there was a hollow above it. Both lower extremities were paralyzed from below the lumbar region downwards ("Fig. 15") but the sensibility was retained completely. There were no knee-jerks or plantar reflexes. There was retention of urine. He complained of pain across the
abdomen a short distance below the umbilicus.

The diagnosis was fracture of the spine with displacement, and pressure on the cord. At first, however, there was some doubt as to the exact cause of pressure. The fact that the paralysis was only motor pointed to some condition affecting the anterior columns only. If the posterior columns also had been pressed on the sensibility would have been lost. There was a possibility that the condition might be due, not to displaced bone, but to the temporary pressure of blood
or effusion.

As in the event of the condition depending on the pressure of blood or effusion the symptoms ought to have improved in a short time on absorption taking place, it was decided not to operate at once, but to wait a few days and see whether any such improvement took place. Meanwhile the patient was put on a water-bed and kept clean and dry, and his urine was drawn off at frequent intervals with a soft catheter.

At 10 P.M., on the day of admission there was an involuntary evacuation of faeces. On the 15th patient complained of much pain in the thighs and opium was given to relieve this. On the 16th he passed urine and faeces voluntarily. On the 17th and 18th his condition remained the same, the motor paralysis still continued and there was no change in the sensibility. On the 20th the prominence of the 11th dorsal spine was to a large extent gone, but there was great tenderness over the last dorsal and first lumbar vertebrae.

As no improvement had taken place it was decided to operate. The patient being under chloroform and in the prone position
Professor Annandale reflected a flap corresponding to the lower dorsal and upper lumbar vertebrae. The long incision was made not directly over the spinous processes of the vertebrae, but a short distance to the right of the middle line, one advantage of this being that the scar is then not.
subject to the direct pressure of the long points.
A considerable amount of effused blood was
found in the muscles outside the canal, showing
that the injury was due to a direct blow. The
muscles were reflected from the laminae and spikes.
The spine of the 12\textsuperscript{th} dorsal vertebra was thickened
and bent towards the right side. This spine
was removed. The laminae of the 10\textsuperscript{th}, 11\textsuperscript{th}, and
12\textsuperscript{th} dorsal vertebrae were more prominent than
those of the vertebrae below and the last dorsal
vertebra slightly overlapped the first lumbar.
By means of a chisel the laminae of the 10\textsuperscript{th} and
11\textsuperscript{th} dorsal vertebrae were removed. Some fat
projected through the opening and was removed
exposing the cord. The lamina of the 12\textsuperscript{th}
dorsal vertebra was then removed also and the
cord further exposed. Slightly to the right side
there was a small projection of bone over the
cord about the level of the 10\textsuperscript{th} dorsal vertebra.
Rigidity had taken place. This small fragment
of bone was removed. No blood was found in
the canal and no special injury had been done
to the cord; there was no laceration of the
membranes, the dura mater, which was dull gray
in colour, being apparently intact. The wound
was closed up, the muscles being united with catgut and the skin with silk woolgut.

The progress of the case was remarkably rapid and satisfactory. The temperature charts are subjoined.

\[\begin{array}{cccccccccccccc}
<table>
<thead>
<tr>
<th>Date</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
<th>19</th>
<th>20</th>
<th>21</th>
<th>22</th>
<th>23</th>
<th>24</th>
<th>25</th>
<th>26</th>
<th>27</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temp</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
\end{array}\]

\[\begin{array}{cccccccccccccc}
<table>
<thead>
<tr>
<th>Date</th>
<th>28</th>
<th>29</th>
<th>30</th>
<th>31</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temp</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
\end{array}\]

\(\times D = \text{Dressed.}\)
Fig. 17. — Temperature charts of the case.

The pulse was 95 in the evening after the operation, 92 the following day, and thereafter normal.
The respiration remained steadily at 20 all the time. Soon after the operation a tray was placed over the bed to enable the patient to slightly raise himself, as e.g. when the bed pan was being used, or to turn on his side when dressed.

At 9.30 A.M. after the operation, the dressings were changed as the bed was wet. The urine was drawn off. He moved his toes slightly—extension only.

At 10 A.M. on the 21st, his urine was drawn off. He moved his toes and also his feet at the ankles—extension only; he could not voluntarily dorsiflex them. There were no knee jerks.

On the 22nd he complained of shooting pain in the legs. The wound was looking well and a gauge-drain was put in. Patient was able to move his hips, knees and ankles,—all weakly.

By the 28th these movements were getting stronger, though the muscles of the parts affected were still flabby. He was now able to turn his legs over, but could not raise them in the air.

On the 29th he could move his right knee.
slightly off the bed.

On the 31st, he was able to raise both knees equally, and to lift his feet off the bed.

On 4th January 1901 he was able to move both his lower limbs, extending them, and could raise himself on the trapeze.

The wound had healed well and left a fine scar (Fig. 16).

On the 14th January, the Galvanic and Faradic currents were applied to the affected limbs, and about an hour of this treatment was given daily till patient left the hospital. It had a very good effect and greatly improved the condition of the muscles of the affected limbs. The parts were massaged also on several occasions.

On the 18th, the thermal sensibility was tested by means of two test tubes containing hot and ice-cold water respectively. Though in parts, especially over the dorsum of the foot, there seemed to be slight dullness, the patient taking some time to make up his mind as to which of the tubes was touching his skin and once or twice making a mistake, yet the response in most parts was good and rapid and showed no impairment of function.
Under the 19th January is the entry, "Reaction getting stronger. Beginning to move legs freely."

On the 23rd the knee-jerks moved the patella visibly, but not the leg. There was slight tremor and ankle clonus.
The condition of the reflexes from time to time is noted in the temperature charts.

On the 31st January patient sat up and had a poroplastic jacket fitted as a support for the spinal column.

On the 4th February he got up and on the 9th was able to walk a little by himself.

On the 11th he walked along the ward by himself with the aid of a walking stick.

On the 13th February he returned home, wearing the jacket. There was no spinal deformity present at all. He could walk perfectly erectly.

I saw him on 25th May in his own home. He had been for a holiday in Abersteinshire and one day walked nine miles. The poroplastic jacket had become too loose and accordingly did not fit properly and he was then wearing corsets instead as a slight
support to the spine. He could stoop down and raise himself without any difficulty.

On 30th May he came up to the Infirmary and was photographed. (Figs. 16 and 18.)

Fig. 18 - Photograph of Patient (case of fracture of the spine) five months after the operation of Laminectomy.
Fractures of the Spine.

Fractures may occur in any part of the spinal column, but are most commonly met with (1) in the lower dorsal or lumbar regions, and (2) about the junction of the cervical and dorsal vertebrae. In the cervical region dislocation may take place without a fracture, but this very rarely happens in the rest of the spine, and even in the cervical region fracture and dislocation are frequently associated. In the case recorded the situation of the fracture was a common one.

Fractures of the spine are usually caused by direct violence; occasionally by indirect violence, especially in the lower cervical and upper dorsal region, as, e.g., by a fall downstairs with the head doubled up.

Two main classes are described, (1) Incomplete fractures of the spine where the continuity of the column is not destroyed. (There may, however, be slight displacement of bone causing partial paralysis from pressure on a part of the cord.) (2) Complete fractures, often called -- rather inaccurately -- fracture dislocations as they are usually associated with displacement and loss of continuity of the spinal
column. A piece of the body of a vertebra has been pushed back into the canal and is seriously pressing on the whole cord or may have totally destroyed it, and the paralysis is complete. (Fig. 19)

**Fig. 19** - A specimen of fractured spine (5th dorsal vertebra) showing the ordinary position of the fractured bone. The cord is completely divided. (From the Lancet, vol. II, 1899, page 47.)

In each of these groups the condition of the long parts may vary considerably. Partial fracture through the bodies of the vertebrae may occur as fissures with little or no displacement of bone. The laminae are frequently fractured and may overlap each other (as in the case described above). When both laminae of one vertebra are fractured, these fractures may, of course, also be associated with a dislocation.
there is likely to be depression of the fragment causing pressure on the cord. The spious processes are sometimes fractured from direct violence, especially in the dorsal and lower cervical region. Blood or inflammatory effusion may be present either within or outside the membranes and may affect the cord.

The signs and symptoms vary greatly according to the situation and extent of the injury. In all cases there is a certain amount of shock at first. There are signs of a local trauma and local pain. There may be irregularity in the spine of the spine, when any of these is fractured. Displacement when present may or may not be evident. Cephalus should not be sought for as this may further injure the cord. When there is displacement paralysis is usually present to a greater or less extent according to the amount of pressure being exerted on the cord. The area of paraplegia depends, of course, on the situation of the injury. The sphincter ani is usually paralyzed for a time at least and there is also frequently retention of urine. When the injury is in the upper region of the spine the muscles of respiration may be affected, so that breathing is diaphragmatic. Symptoms of paralysis may appear later from haemorrhage or inflammatory
To make an accurate diagnosis of the condition present is often very difficult, if not impossible, both on account of the risks of moving the patient and for some time after the injury the actual state of matters is obscured by shock, which may inhibit certain functions for a time. The deformity present is often no guide. If the cord is completely divided or crushed there is an absolute loss of all functions below the seat of injury. The muscles are powerless and the limbs are limp and motionless. Sensation of all limbs is abolished. Control over the sphincters is lost and no deep reflexes are to be obtained. If the lesion is incomplete, the knee-jerks are exaggerated except when there is injury to the reflex centres in the lumbar region. When the fracture is in the lumbar region the loss of the knee-jerks of itself does not contra-indicate operation for it may be due to direct injury to the reflex arc on which they depend and not on complete division of the cord. The knee-jerks can be lost also from a transverse lesion of the cord situated above the lumbar region. The presence of the knee-jerks indicates that the lumbar centres have escaped destruction. In some cases it
might be possible to get a sketching of the parts (ten to fifteen minutes exposure) which would assist the diagnosis.

A condition with similar symptoms (and somewhat resembling concussion) which might be mistaken for a fracture of the spine is where there is no fracture but simply some effusion of blood into the dura mater. In such cases, however, generally some slight improvement takes place soon, and then further improvement if the cord does not become disorganised.

The prognosis in such cases depends entirely on the amount of injury done to the cord and the situation of the injury. The mortality is high. The situation of the injury in the case described was the most favourable for recovery, for the fatality is as a rule greater the higher up the column the fractures are situated, when fractures occur in the cervical region patients who do recover are generally crippled to a greater or less extent by permanent paralysis. In the cervical region the fatality is greatest of all. Still, where the cord has not been totally destroyed, even in the cervical region, some remarkable partial recoveries have taken place and the patient has lived for years.
All cases where there are symptoms pointing to a fracture of the spine require very careful handling from the first. If necessary the patient’s clothes may be cut away from him, and a gentle examination of the parts made. The shock from which the patient is usually suffering should be treated in the usual way, but where any paralysis is present hot bottles should be used carefully. When reaction has set in a more careful examination may be made. The further treatment will depend on the diagnosis arrived at and the conditions present, but in many of these cases the difficulty of arriving at an accurate diagnosis hampers active treatment.

(1) Where there is no paralysis and no evidence of any displacement, rest and general treatment are all that are necessary and some support to the spine may be given for a time if thought advisable.

(2) Where there is partial paralysis but no evidence of complete crushing of the cord, either of two courses of active treatment may be adopted, namely, – (a) operation – laminectomy, or (b) an attempt at reduction – or more correctly replacement of the bony fragments.
may, of course, be a true dislocation present as well as the fracture, but the term "reduction" is often applied loosely to the fracture.)

(a) There is still some difference of opinion among surgeons as to whether operative interference should be adopted in such cases; but there can be no doubt that in suitable cases such as the one recorded above operation is highly advisable and satisfactory. The method of operating is described in the notes of the case.

One inducement to operate in the case described above was the fact that the paralysis was not complete, showing that the cord was not all pressed on. In some cases, however, there is difficulty in locating accurately the site of lesion and in doubtful cases there is the possibility of the cord being so seriously injured that no good could be done by operation, and, moreover, this difficulty in diagnosis presents itself just at the time when operation would do most good. In a number of cases, as, if not operated on early, destructive changes in the substance of the cord are apt to ensue.

Where partial paralysis is present with the possibility of its being due to the pressure of
blood it is well to wait a few days and keep
a careful look-out for any signs of improve-
ment taking place. In the event of there being
no improvement in the course of a few days
it is a good rule to operate at once; if operative
treatment is to be adopted at all. This will
give the best chance of a successful issue, as,
with the usual antisepctic precautions the risks
of the operation are not great.

It is remarkable, however, what good results
sometimes follow operative treatment adopted even
at a late period. A case which illustrates this
has recently been published by Professor Amunds
and Dr. Alexander Bruce. The case was one of
traumatism of part of the cauda equina complicated
by alcoholic neuritis in an upholsterer aged 28.
He fell down stairs on February 1897. There was
complete paralysis of the left lower extremity
with an area of anaesthesia corresponding to the
distribution of the 12th dorsal, 5th lumbar and
1st sacral nerves. To this condition was super-
added later paralysis of the right leg and foot,
hyperesthesia to pressure upon the muscles of the
right lower extremity and of the muscles underlying

the still aesthetic areas of the skin of the left lower limb. The case was operated on by Professor Amundali on 15th July 1908. There was a marked contraction of the spinal cord at a point corresponding to the 12th dorsal vertebra due to a narrowing of the spinal canal. This was evidently due to a thickening of the lamina from chronic periosteal irritation, whether the result of not of a fracture it was not possible to determine definitely. His progress was satisfactory. On the day following the operation the motor power and sensibility of the left foot were observed to have improved. A steady, if slow improvement of motor power followed, but only a very slight diminution of the anaesthesia. The slow improvement of the lower extremity was accounted for by the fact that the muscles had undergone atrophy to a large extent. On leaving hospital the movements at the hip joint were almost normal. Thereafter the strength considerably increased, but movements of the foot and ankle were still imperfect. The fact that the recovery of motor power was greater in extent than that of sensation was probably to be attributed to the circumstance that the pressure of the affected lamina must have been exerted to a greater extent on the posterior than on the anterior roots and had caused damage of a permanent nature to these roots.
The following case recorded by Mr. Mansell Moullin also illustrates the benefits of operation performed nine weeks after the accident. A patient had a fracture-dislocation of the 2nd lumbar vertebra with paralysis of motion below the seat of injury. There was considerable displacement in the lumbar region. When he was seen some after the accident the doctor succeeded in reducing the displacement. A few days later in carrying the patient down stairs to bring him to the hospital the displacement occurred again. Nine weeks after the accident, improvement having ceased, laminectomy was performed. Symptoms of recovery commenced almost immediately after the operation and he gradually regained power over his legs. A year after the accident he could walk up and down stairs without a stick and could stoop down and lift himself up without the least difficulty.\(^A\)

Mr. Noble Smith also records a case of his where the patient was operated on four years and nine months after the accident. He was paralyzed below the seat of injury. The laminae of the 10th and 11th dorsal vertebrae were found to be pressing on the cord and were removed. Extensive bed sores

\(^A\) "Lancet" Vol. III. 1899, p. 480.
from which the patient had previously suffered quickly healed up. The functions of the bladder and bowels improved so that in six weeks he had regained so much control over the bladder that instead of the urine constantly dribbling away he was able to retain it for half an hour at a time and was conscious when he wished to pass it - a condition which had not previously existed since the accident. He steadily improved and a year later could move about the ward supporting himself on chairs and was able to retain urine for three-quarters of an hour but still suffered from paralysis of the sphincter.

Even without active treatment a certain amount of recovery may take place in some of these cases. This is shown by a case of Mr. Carr Jackson's in which although the man lived for 26 years the deformity of his spine greatly impeded his progress. There was a fracture of the upper lumbar region with complete loss of power in the lower limbs, but sensation remained and the control over the bladder and the rectum was normal. The patient recovered so far as to be able to walk with a stick, but with a peculiar waddling gait, the toes being turned inwards and the body slightly bent. He had no treatment

A 'Penet,' vol. II, 1897 p. 482. B Id.: loc. cit. p. 480
by operation or reduction. This case is interesting inasmuch as the condition present seems to have been very similar to that of the case described above on which Professor Annandale performed laminectomy and shows up by contrast the benefits of operative interference in such cases.

(b) Some surgeons recommend that an attempt at replacing the displaced fragments of bone by extirpation should be made as a preliminary treatment in suitable cases or where operative interference is not considered advisable. "Where there is reason to believe that the cord is not irretrievably injured this method may be adopted." (W.E. Noble Smith). But it is often very difficult to tell the extent of the injury. If the laminae are fractured any attempt at extension is very risky as the cord is apt to be injured and in addition where the fracture is an extrinsic one some rotary movement at the seat of fracture may take place.

In applying extension, if the patient is not slung up, a double sand-bag may be used so arranged that the hollow between the two sides lies along under the spinous processes and so prevents pressure on them.

In the whole such attempts at replacing the fragments have not proved satisfactory, and should
not be tried in the upper cervical region where there is a risk of causing sudden death from interfering with the phrenic nerve. In the cervical region, rest and fixation may be tried and sometimes give very good results.

Mechanical support, such as a porous plastic jacket is sometimes advisable, but not as a rule in the early stages. Mr. Noble Smith recommends the use of Chance's splint (Fig. 20) as a suitable fixing apparatus. This apparatus might prove useful where a patient had to be moved some distance or where the fragments had been replaced and the patient was restless as, in such a case as that described by Mr. Arbuthnot Lane. There was displacement of the 10th
and 11th dorsal vertebrae. The cord was apparently squeezed rather than crushed. The dislocation was reduced partly by extension of the patient's body and partly by traction by low forceps upon the spinous process of the displaced bone, and reduction was kept up by wiring the spinous processes of the 10th and 11th dorsal vertebrae together. Good results followed but the patient was uncontrolable. He kept constantly rolling about so that the vertebrae became displaced again and the cord was completely divided. A rigid fixation of the spine by means of a suitable apparatus might in this case have prevented such an untoward result happening.

In all cases of fracture of the spine where there is paralysis, partial or complete, temporary or permanent, particular attention should be paid to general treatment, for certain complications are apt to occur unless such care is taken. There is great risk of ulcération and bed-sores. The patient should be kept clean and dry and a water bed employed. Cystitis may occur from paralysis of the bladder. The bladder therefore should be emptied frequently with a soft catheter. In very severe cases where the cord is completely crushed such complications are unavoidable.
able and the patient generally dies sooner or later of septic poisoning.

In regard to after-treatment once the patient begins to get up, it is advisable to give some spinal support as e.g., a paraplastic jacket.

(3) Where the cord is completely crushed, very little can be done beyond keeping the patient at rest and attending to the general treatment described above.

In addition to the complications already described where the cord is injured myelitis may set in. It commences early and extends upwards and downwards with great rapidity and gives rise to thickening or disorganization of the cord itself. This is another reason for early operative interference when practicable, for once these changes have occurred nothing can be done.

Fig. 21. - Disseminated Haemorrhage into the Spinal Cord from Injury. [Med. Rec., 1900, vol. 57, p. 577]
Hour-glass Contraction of the Stomach; Gastroplasty; Complete Cure.

On 26th April 1901 there was admitted to ward VII, Royal Infirmary of Edinburgh, under the care of Professor Annandale, a married man aged 47, employed as a gardener, complaining of pain in the region of the stomach accompanied by frequent vomiting.

About Christmas 1898 he began to be troubled with indigestion. He had a feeling of pain over the stomach. His bowels were constipated. The pain gradually got worse. Towards the end of January 1899 attacks of vomiting began to trouble him. These generally occurred twice a day — just when he got up in the morning and about 7 o’clock in the evening. Each time he usually brought up about a small cupful of a dark brown colour "like coffee-grounds." What he brought up in the morning as a rule was not quite so dark. About the beginning of February there was a fortnight during which he had no motion of his bowels. He gradually got weaker. All this time he had been getting various kinds of medicine from his doctor, but these seemed to have no effect on the condition.

About the end of April 1899 he had to
take to his bed where he lay for the next three months. The pain was constant and there were times when it was especially severe. It was felt principally to the left side of the stomach. He was troubled with sweating especially when the attacks of severe pain came on. At times he felt quite exhausted. His food was principally bread and milk, but he frequently vomited it. He would "keep it for a certain time, and then it had to come up. If not, the pain increased." What he vomited occasionally had a foul smell. He lost two stones in weight while lying in bed, from 8 stone 6 lbs. to 6 stone 6 lbs.

Thereafter feeling rather better he went for a change to stay a short time with a friend in the country. On his return his doctor put on four fly blisters to the left of the stomach, and he continued to take the medicine, but his condition remained much the same. In August 1900 what he vomited began to be not so dark in colour and seemed to consist chiefly of the food he took. Sometimes he had slight difficulty in making his water and felt pain in doing so, and occasionally the urine was thick, very dark in colour, and had a disagreeable smell.
like the material he vomited. He felt easiest
when lying in bed and generally had something
warm put over the part where he felt the pain,
such as a tile heated and wrapped round with
flannel, which did not make him perspire so
much as hot cloths.

Early in January 1901 he began to have his
stomach washed out once or twice a week by his
medical man. After about a month of this treatment
his doctor began to have some difficulty in passing
the stomach-tube, and he thought there was an
obstruction between the throat and the stomach,
as the passage of the tube was causing him pain
patient stopped having the washing out of the
stomach done, at first the fluid had come out
quite muddy, but latterly, though muddy and dark
at first, it was clear toward the end of the washing.

Since the end of 1900 he had taken no
medicine except cascara occasionally to keep his
bowels regular. If he did not take this the
bowels tended to be constipated.

His condition remained much the same
till about the beginning of April 1901 when
he again became worse and lost flesh. He
felt very weak. It took him about three quarters
of an hour to walk half a mile and he had sometimes to sit down and vomit by the way. He felt "as if the food just went a certain distance and then it had to come back again." One day he would keep his food all right; the next day, perhaps, he would keep it till late at night; the following day again he might keep it, and then next day vomit it about dinner time, either before or after; and so on. The pain came on first and gradually got more severe and patient felt that if he got up his food the pain would go away, and vomiting generally did relieve it considerably.

The patient had previously enjoyed good health, and his family and social history was good. He was not alcoholic.

On admission he had an emaciated appearance. His temperature and pulse were normal.

He complained of pain of a stabbing character from the umbilicus to the left costal margin and extending through to the back.

On inspection the anterior abdominal wall was somewhat shrunken and the costal margin stood out. Epigastric pulsation was visible.
There was no bulging at any point but the recti muscles were prominent.

On palpation the parts were felt to be poorly nourished. There was tenderness over the region of the stomach, but no tumour could be felt. The lower border of the liver was just palpable at the costal margin. Pulsation was felt over the position of the aorta. A mass resembling faeces and freely movable was made out in the left iliac region. On percussion the stomach was not enlarged. The note was tympanitic all over.

The arteries were thickened considerably but the heart sounds were normal.

His urine was of specific gravity 1020 and neutral in reaction. It was very light in colour and there was a white flaky deposit. There were no abnormal constituents.

The stomach tube was found to pass readily without the stomach being obstructed. It was washed out till the fluid came clear. After waiting a short time on washing out again muddy fluid returned. The diagnosis was accordingly arrived at that the case was one of hour-glass contraction of the stomach.

Operative interference was decided upon, and on 3rd May 1901, the patient being under chloroform
Professor Annandale exposed the stomach by a vertical incision down the outer side of the left rectus abdominis muscle. The stricture was found near the pyloric end of the stomach and was caused by the contraction of the cicatrix of an old ulcer. There were evidences of sagging in the upper compartment of the stomach. An incision was made in the long axis of the stomach over the cicatrix through the whole thickness of the gastric wall. Then the incision was carefully closed by stitches in the transverse direction making the incision appear as if made vertically. (Fig. 22). The omentum was

---

*Fig. 22. - Gastroplasty*

1. Line of Incision.
2. Line of Suture.
stitched over the nature as an additional precaution against leakage. The external wound was closed in the usual way.

The progress of the case was very satisfactory considering the weak condition in which patient was to begin with. From the day of the operation he had no more of the old pain in his stomach. The temperature charts of the case are subjoined (Fig. 23). His diet was carefully regulated. For the first
two days after the operation he was fed by nutrient enemata. Then he began to get a little milk by the mouth and in about ten days porridge. On the 18th he became restless and vomited a considerable quantity of blood. Hypodermic injections of morphia were given and a saline enema. Ice was applied over the region of the stomach. Professor Amandale regarded this vomiting as due to some irritation from a stitch. Thereafter patient was fed on iced milk for a while and then gradually his diet was increased.
and varied. Olive oil enema were given several times, as being nourishing.

The wound healed by first intention and left a fine firm scar. (Fig. 24). Patient slowly

Fig. 24. — Cæsarean of Incision used to expose stomach for Faschioplasty. (26. 6. 1901)

but steadily regained his strength and was discharged cured on 29th June 1901.
Hour-glass Contraction of the Stomach

Hour-glass Contraction of the stomach or Hour-glass stomach is that condition in which the stomach is divided into two cavities. These cavities are generally of unequal size.

There are two main varieties of hour-glass contraction of the stomach usually described, namely (1) congenital and (2) acquired.

It has commonly been asserted that the congenital variety is the more frequent; but in a recent paper on the subject Mr. Moyrsmoan of Leeds throws considerable doubt on this assertion, and his evidence seems to show that the congenital form is by no means so common as it is frequently stated to be. Several cases which appeared to belong to the congenital group have been shown on more careful investigation of the conditions present to belong in reality to the class of acquired hour-glass contractions. Still it is believed that the congenital form exists with the condition more or less clearly marked.

"Though there seem to have been comparatively few cases recorded the acquired form is not

infrequently met with in hospital practice and in the experience of the post-mortem room. Hour-glass contraction of the stomach is by no means a rare phenomenon to be met with.

The main causes which may give rise to this condition are, (1) perigastric adhesions; (2) ulcer with local perforation and anchoring to the anterior abdominal wall; (3) circular ulcer with subsequent cicatricial contraction and induration; and (4) cancer.

1. As regards perigastric adhesions various conditions give rise to these, e.g. perforated gastric ulcer. The adhesion is usually in the form of a thick cord sharply pressing into the anterior wall of the stomach. It sometimes runs downwards from the ulcer.

2. Ulcer with local perforation and anchoring of the stomach to the anterior abdominal wall. As a chronic ulcer approaches the anterior wall of the stomach adhesions are formed between that part of the stomach and the parietal peritoneum. As the ulcer heals and cicatricial tissue is formed contraction occurs and then the stomach bulges out above and below the contracted point.

3. Circular ulcer with subsequent cicatricial con-
traction and induration. The circular ulcer extends transversely to the long axis of the stomach and consequently as cicatricial tissue forms a considerable degree of narrowing must take place. This stricture may be placed at any part of the stomach, but is usually near the middle, or rather to the pyloric side of the middle. The calibre of the orifice varies from that of a no. 4 or no. 5, catheter to that sufficient to allow three fingers. The greater curvature is generally puckered up towards the lesser.

4. Cancer. - This is not an infrequent cause. Sometimes the cancer originates in connection with a chronic ulcer. Cancer, however, usually tends sooner or later to involve the whole stomach.

The contraction may take place at any part of the stomach. (Fig. 25) The constriction

---

**Fig. 25.** - Forms of hour-glass stomach  
(From the *Lancet*, April 27, 1901.)
may be near the cardiac end or near the pylorus or at any intermediate position. One or other compartment may be hidden by adhesions. There may be a lot of induration around the stricture. The channel between the two pouches may be very narrow or comparatively wide, and in association with the width of the orifice usually goes the amount of dilatation of the two pouches. If the communication is fairly free, if the stomach is dilated at all the two pouches will be equally enlarged. If the orifice is a narrow one there is apt to be marked sagging of the upper compartment only. Sometimes the condition called "trifid stomach" is met with, in which one of the pouches is subdivided by an adhesion. As already mentioned the stomach may be anchored to the anterior abdominal wall. There may be a certain amount of stenosis of the pylorus and this will cause dilatation of the lower power even though the orifice be a narrow one. Malignant disease, may, of course, be present and sometimes a perforated gastric ulcer is found.

The symptoms naturally depend on the part of the viscus affected. If the contraction is near
the pylorus the symptoms will mainly be those of dilatation of the stomach as the cardiac pouch will distend and this is the diagnosis not uncommonly arrived at. If the stricture is near the cardiac end the symptoms will be somewhat similar to oesophageal obstruction. In the early stages the symptoms are frequently those of chronic ulcer of the stomach.

Several methods of diagnosis have been suggested. One of the best is the following, which was adopted in the above-described case. The stomach is washed out with the stomach tube until the fluid returns clear, then after a few minutes it is washed out again. If the fluid then returns muddy at all this is a sign on which a confident diagnosis may be made. The phenomenon is characteristic and seems to depend on this, namely, that the first washing out empties the upper pouch. During the few minutes of waiting some of the contents flow from the lower pouch through the narrow orifice and the second washing brings them up.

Another phenomenon sometimes observed in washing out the stomach and from which
a diagnosis may be made was pointed out by Wölfler. The fluid introduced into the stomach
seems to disappear altogether "as though it had flowed through a large hole" and is not
returned through the tube. In such a circumstance
the fluid obviously passes from the one compartment
to the other.

In one of Eielberg's cases, upon injecting a quantity
of fluid into the stomach, there was a bulging
and distension of the left side of the epigastrium;
after a few moments this gradually sank and
subsided and simultaneously a swelling of the
right side of the epigastrium slowly developed.

Another method of diagnosis which has been
successfully employed is that of distending the
stomach with CO₂ when the bubbling and gush-
ing of fluid through a narrow channel can be
heard with a stethoscope.

Jaworski noticed in one instance that after
apparently emptying the stomach by passing the
tube, a splashing sound could still be obtained
by palpation over the gastric area. The pyloric
cavity which is not drained by the stomach tube,
came this suggestion of dilated stomach. The condition
is sometimes described as "paradoxical dilatation".
The differential diagnosis between a case of contraction at the cardiac end and one at the pyloric end may be accomplished by noting the distance which the oesophageal tongue passes.

The particular form of operative treatment adopted depends largely on the exact conditions found to be present when the parts are exposed. In these cases it is a good rule to carefully examine the whole of the stomach.

In an uncomplicated case like the one recorded above due to circular ulcer gastroplasty is most likely to prove successful provided there is no stenosis of the pylorus as well, nor active ulceration going on. In the latter case gastroplasty alone is likely to afford only a temporary relief and in the former no relief at all. Gastroplasty may be performed with or without resection of the ulcer. As a rule, however, it is not necessary to excise it.

Where stenosis of the pylorus is present also a gastroplasty and a pyloroplasty, or a gastroplasty and a posterior jejuno-stomy (which is perhaps better still) must be done.

Where there is a gastric fistula surrounded by adhesions the ulcer may be excised or
its edges may be trimmed and a gastroplasty performed.

Where the stricture is due to new growth, if the tumour is limited it may be excised; but where it is extensive little good can be done except in some cases where gastro-enterostomy may give relief for a time.

Gastro-gastrostomy or gastro-anastomosis as introduced by Wölfler is sometimes done for the relief of hour-glass stomach. Incisions are made into the independent pouches on each side of the constriction and the two openings are united by an end to end suture.

Where the ulceration is extensive or active and there are many adhesions and much induration, probably the best operative procedure to adopt is gastro-enterostomy. This is the operation preferred by Engelberg, who has had considerable experience in these cases and it is advocated by Mr. Mayo Robson as the operation to be relied on where there is ulceration of the stomach. It acts by securing physiological rest by means of drainage, thus allowing the ulcer to heal without being subjected to the irritation of

acid secretion, accumulation of food, or frequent stomach movement. It also, while remedying the hyperchlorhydria, relieves pyloric spasm and while preventing stagnation of fermenting fluids materially diminishes gastric dilatation."\textsuperscript{a}

Various other benefits follow the operation of gastro-enterostomy. These have been worked out by D. Fantius.\textsuperscript{b} The operation improves the peristaltic power of the stomach; as a rule, after gastro-enterostomy, the stomach will be found practically empty in from three to five hours after a meal. Generally the stomach decreases in size. A sphincter is developed at the new opening and its power increases with time. In cases where there was formerly hyperacidity this condition is lost, and though the degree of acidity in any individual case varies from time to time, yet those variations do not depart from physiological limits. Regurgitation of bile into the stomach takes place, but it is of no importance so long as the outlet from the organ is sufficient.

After operation careful dieting is required in all cases for a considerable time.

\textsuperscript{a} \textsuperscript{b} F. Fantius; \textit{loc. cit.}
Notes and Analysis of a Series of Twenty Cases of Appendicitis.

Case 1. - A boy of 13, employed on a farm, was admitted on 3rd October 1900 with a history of three different attacks of pain in the right iliac fossa. The first attack occurred about a year before and lasted for three days. The pain was severe. He had no treatment beyond resting in bed. Four months later he had another similar attack also lasting three days. He was seen by a doctor who ordered the application of hot fomentations and turpentine, which relieved the pain. Six months later he had a third attack of pain and was confined to bed for three weeks. Treatment was the same as in the second attack and in addition pills were administered. In the intervals between the attacks he felt in his usual health and was fit for his work on the farm. He had had measles two years before. On examination nothing of importance could be made out. On 4th October the appendix was excised by Professor Annandale. The tip was redder than normal and there was a white constriction near the base as if it had cicatrised. He made a good recovery.
Case 2. - a sawmiller, aged 35, was admitted on 8th October 1900 with the following history. He was suddenly seized with acute pain in the right iliac region on September 12th. There was slight sickness and some vomiting. The bowels were fairly regular. The temperature was 102°F, and the pulse 100. The temperature gradually declined and a fortnight after patient was first seized his temperature and pulse were normal. The temperature remained normal for three days when it suddenly ran up to 102°F. Since that time it had never returned to normal. After the first few days the pain was never acute, but there was slight tenderness on pressure. The bowels as a rule operated once daily, the motion having a semi-solid consistency. The treatment adopted was poultices externally and once three leeches were applied. Patient had morphine for the first few days when the pain was acute. After that he had salol - 10 grains - night and morning till the date of admission. He had always been healthy.

On admission he was under the influence of morphia. There was no local tenderness. He was flushed, his temperature was high, and his pulse and respiration rapid. There was no
distension of the abdomen. There were regular movements of the bowels. The temperature did not come down, and on 11th October, Professor Armandale operated. He made the usual incision for exposing the appendix and opened into an abscess cavity containing about two ounces of pus and a faecal calculus the size of a small nut. The cavity was swabbed out and drained. The discharge continued for a fortnight, and then the wound healed up gradually. He got up on 12th November. The ultimate result was excellent.

Case 3. In the evening of 11th November, 1900, a waitress, aged 28, was admitted, complaining of severe pain, "almost unbearable," in the right iliac region and sometimes shooting to the left side of the abdomen. Early in the morning of that day - about 3 A.M. - she had been suddenly seized with sharp pain in the right iliac fossa which gradually got worse and for a time the patient had been delirious. About a fortnight before she had felt some abdominal pain.

On admission her temperature was 102.8 F. The usual operation for appendicitis was at once performed by Mr. Hoodston. The abdomen was
found to contain a considerable quantity of serous fluid. The appendix which was inflamed was slightly adherent to the sheath of the right common iliac vein. It was perforated at the tip and a little faecal matter had passed through and peritonitis was beginning. Next day the temperature was nearly normal. She made an uninterrupted recovery and left the hospital with a very admirable scar.

Case 4. — A young man, aged 18, a barmen, was admitted on 19th November 1900, suffering from appendicitis and general peritonitis. On 11th November he had been seized with pain in the abdomen. This was treated with hot compresses. On the 13th his temperature was 102°F. Calomel was administered. The diagnosis was influenza. On the 14th the condition was diagnosed as typhoid fever and bismuth powders were given. On the 18th his temperature was normal in the morning. At 5 P.M. he had retention of urine. Medicine was given and the bladder emptied. He felt great pain and was suffering from shock and sudden collapse. A quarter of a grain of morphia was given and he was brought to hospital at 12:40 A.M.
on the 19th. On admission his temperature was 101° F. The abdomen was rigid and tender all over the lower half. The rectum was tender and very hot and a bulging from the pelvis could be felt. The patient was pulseless and very collapsed, sighing and motionless. He was operated on at 1 A.M. under chloroform by Mr. Hodson. On opening into the peritoneal cavity purulent fluid gushed out and was allowed to escape freely. The cæcum was found. Below it and posteriorly there was a very foul, collection of pus with a faecal odour. There was some pus in the pelvis. The appendix was found down in the abscess cavity and was removed. There were thick patches of lymph on the cæcum and adjacent tissues. The whole cavity was washed out with hot boric lotion. The wound was closed and drained after packing off the cavity of the abdomen. Patient omitted all food and rejected all nutrients. He was kept alive on whisky and Stephania hypodermically. Transfusion was done twice and he rallied wonderfully each time. On the morning of the 23rd he was much worse and his pulse was very weak. He died suddenly at 8 A.M., next morning.
Case 5. - On 27th November 1900 a married woman, aged 21 was admitted suffering from recurrent appendicitis. She had had three previous attacks. The first occurred three and a half years before and was treated by linseed and mustard poultices applied at first to the whole abdomen and later to the right iliac region. The second attack occurred 5 months before admission and was treated with poultices and morphia injections at first; afterwards iodine was painted on the part. Three weeks before admission she had a third attack, which lasted for three days. Poultices were applied locally. The symptoms in each attack were sickness and vomiting and continuous pain in the right iliac fossa. The last attack commenced on 25th November with sharp pain shooting upwards and to the left from the right iliac region. There was sickness also. Hot fomentations were applied locally and 5 grain doses of salicylate of soda were administered thrice daily. On admission there was a slight feeling of resistance in the right iliac region and some tenderness on pressure midway between McBurney's spot and the umbilicus.

On 30th November the appendix was amputated. The tip was slightly inflamed. The wound healed very well and an excellent firm scar was left.
Case 6. — On 17th December 1900 a girl, aged 16, was admitted complaining of violent pain in the lower part of the abdomen which had lasted for four days. She had had similar pain at her last 'period' but had missed a period, which was due four days before admission — just when the pain commenced. The pain had become very intense. On admission her temperature was 102.5°F., her pulse 126, and respiration 60. The right thigh was flexed on the abdomen. There was dullness over the area shown in Fig. 26. There was constipation, but no urinary trouble.

On the 18th December Professor Annandale operated employing the usual incision for exposing the appendix and afterwards prolonging it upwards. The cæcum was inflamed and a hard mass was felt behind it and extending upwards towards the liver. The external retro-
cecal fossa was packed off and an attempt made to reach the mass extraperitoneally. This was unsuccessful. The fossa was opened up, very foul pus escaped in quantities and was swabbed up. The base of the appendix was found, ligatured and divided. Then the appendix was followed up and was found to end in the afore-mentioned mass, from which it could not be detached and accordingly it was again ligatured and the free part of it cut away. A posterior drain was established through a special opening made down to the mass. The wound was also drained in front. There was a free discharge at first from the wound, but this gradually diminished and ceased on the 31st December. She made a good recovery and when she left there was no pain on pressure.

Case 7. — On 3rd January 1906 a shepherd, aged 48, was admitted. A month before he had an attack of severe pain which began on the left side of the abdomen, shooting across to the right, and eventually settling down in the right iliac region. The pain was acute for about 30 hours and then went away gradually. For a fortnight previous to admission he had felt no pain.
On admission the abdomen was soft, but showed no swelling. There was no pain on palpation, but on deep pressure slight pain was felt midway between the umbilicus and the middle of Poupart's ligament and some thickening could be made out.

On the 18th January he was operated on. On opening the peritoneum a mottled mass of omentum was met with below and to the inner side of the caecum. This mass was found to be adherent to and twisted round the appendix which was small and adherent to the caecum. The whole was removed. There was a tubercular deposit in the omentum, sections of which showed giant-cell system. The wound healed by first intention and the patient was discharged with a fine scar which was drawn in on coughing.

Case 8. — On 10th January 1901 a schoolboy, 12 years of age, was admitted. He had had an attack of pain over the abdomen accompanied by vomiting on 30th December. Castor oil was given but without effect. He got worse and suffered great pain shooting across the lower part of the abdomen. He had had slight attacks of a similar kind before.

On admission he was very much pinched and
obviously very ill. The whole abdomen was very prominent and distended and was very tender all over, pointing to general peritonitis being present. It was tympanitic all over except on the right side where it was slightly impaired and there was intense tenderness on pressure. The pulse was very feeble and rapid. Twenty-five minutes after admission Professor Annandale opened the abdomen and foul pus at once rushed out. It was creamy in consistence and was present in great quantity. There were so many adhesions that the appendix could not be found. The abdominal cavity was thoroughly washed out with warm ipecac solution and stuffed with iodoform gauge. Free drainage was provided for by means of a glass tube.

At first he improved slightly. Thereafter he was very sick and vomited bile. At 3 P.M., the stomach was washed out and that stopped the vomiting. In the evening his temperature rose rapidly. He died next morning at 5 A.M., his temperature having risen to 105°F, and his pulse being "suggestive of rippling water."
Case 9.—On 11th January 1901 a married woman, aged 23, employed as a washerwoman, was admitted a fortnight before she had been troubled with pain of the left side, apparently pelvic. There was some fullness in the left fornix. No rise of temperature occurred. The pain and the general condition improved in a day or two. Then a little red discharge was noticed. She was ordered rest in bed for a few days. She neglected to do this, feeling quite well. On 9th January she again felt some pain in the abdomen. During the following night the pain was very severe. At first it was felt in the left side of the abdomen, but soon passed to the right side. Next day her temperature was 101° F., and the pulse 104. Per vaginam there was tenderness chiefly in the region of the appendix. She complained of severe pain chiefly in the right iliac fossa, but also in the epigastric region. She had been vomiting a good deal. Poultices were applied and a quarter grain morphine suppository was given.

On admission patient was collapsed, pale and anxious-looking. Intense pain was felt in the lower part of the abdomen, the whole
of which was fixed in respiration. There was tenderness on pressure, especially severe about an inch and a half above the middle of Poupart's ligament. There was dullness over the area shown in Fig. 27.

She was at once operated upon. The incision was made rather lower down than usual, and the caecum, which was considerably inflamed presented, there was a slight escape of dirty serum. The appendix was found and was followed down into the pelvis. It was slightly adherent and much inflamed and contained concretions. It was amputated, the mesentery tied, and isoleum rubbed into the stumps. The wound was closed up entirely. The patient made an uninterrupted recovery and left with a firm scar.
Case 10. — A railway porter, aged 46, was admitted on 16th January 1901. On the morning of Sunday, 13th January, he felt a pain over the region of the stomach, and this lasted — though not very severe — more or less during the whole day. Next morning he went to his work as usual, but could not stay more than three hours as the pain became very severe. It was general now — not localised definitely — a doctor was called who ordered the application of hot fomentations and poultices and administered morphia which dulled the pain for a time. For some time previous to this he had been troubled with constipation.

On admission there was tenderness over the lower half of the abdomen, more marked on the right side. The abdomen was rigid and motiousless. Per rectum there was great tenderness. He had pain on micturition and when enemata were given. His temperature was 98° F., and his pulse 100. He was at once operated on.

An abscess full of putrid pus and surrounding the appendix and a portion of the caecum was opened into. The pus seemed to be diffuse throughout the pelvis. The cavity was thoroughly washed out and drained. He gradually got worse and succumbed on the 18th January.
Case 11.—On 23rd January 1901 a policeman, aged 28, was admitted. About 2 years before he began to be troubled with attacks of pain usually lasting about two days at a time. The pain at first was felt generally all over the abdomen, but gradually settled down to a particular spot in the right iliac fossa. These attacks—of which he had had at least five—occurred at intervals of from two to three months. At first he was given medicine for catarrh of the stomach and linseed poultices were applied locally. Treatment relieved the pain for the time and between the attacks he felt in his usual health and was able for his work. The last attack occurred on 23rd December 1900 and was treated as appendicitis. A different kind of medicine was given and poultices were applied locally. The pain was relieved in about three days. He was advised to have an operation done during the quietest period. He had had typhoid fever about four years before, which kept him from his work for 5 months.

On admission there was slight fullness over the right iliac fossa, on deep pressure some thickening could be felt and pain was elicited. There was also slight dullness over that part of the abdomen.

The operation was performed on 26th January. The patient being under chloroform Professor Annandale made an
oblique incision parallel to Poupart's ligament over the usual situation of the appendix and carefully separated the muscles by stretching rather than by cutting through them. An opening was carefully made through the transversalis fascia, which looked very like the peritoneum. The peritoneum, now exposed, was carefully opened. The cæcum and the lower end of the ileum were found to be very much inflamed. The cæcum was bound down by adhesions and it was found necessary to enlarge the opening in the peritoneum. Great difficulty was experienced in finding the appendix; at last it was discovered behind the cæcum, covered over and bound down to the cæcum by adhesions, so that it could not be distinguished from the walls of the cæcum by inspection, but on grasping with the fingers a somewhat hard, cord-like structure was felt which was rightly surmised to be the appendix. The appendix was then exposed, ligatured at the neck, and cut through while pulling gently on it to free it from the adhesions around it, it ruptured and a little pus escaped, but was at once swabbed up. The stump was touched with tincture of the peritoneum and muscles of the abdominal wall were brought together with catgut sutures and the skin with silkworm-gut. The wound healed by first intention and the patient made an excellent recovery.
Case 12 - A young man, aged 21, was admitted on 20th February 1901 complaining of intense pain in the lower half of the abdomen. Three and a half years before he had had a sharp attack of pain in the right side of the abdomen accompanied by vomiting and trouble in making his water. Hot fomentations were applied and gave relief. Since that time he had had four similar attacks. Three days before admission he was seized with a sixth and more severe attack. It became very acute and he was sent to the Royal Infirmary for treatment.

On admission his temperature was 101°F., and his pulse 116. The abdomen was swollen and tense and tender, especially over the site of the appendix. The right thigh was drawn up. Patient had an anxious look and was feverish and collapsed. He complained of pain in the lower part of the abdomen, especially in the right side.

He was operated on at once by Professor Armandale. On opening the peritoneum fluid escaped, serous at first and then purulent and foetid. The caecum was exposed. It was much thickened and inflamed and was firmly bound down by adhesions, as a result of the former attacks. There was a matted mass like the knob of a stick projecting from the caecum. This
mass on being separated from the surrounding adhesions was found to be the appendix, thickened and covered by adhesions, and just where the appendix joins the cæcum gangrene had taken place and the base of the appendix had become obliterated. In consequence of this it was found necessary to cut away a piece of the cæcum corresponding to the attachment of the appendix. Great care was taken not to allow any faecal matter to escape. The hole in the cæcum which was fully the size of a half crown piece was carefully stitched with Lumbric's sutures, a few stitches first being put through all the coats and then joining the peritoneum, surface to surface. Then the omentum was drawn down and stitched over all as a further security against leakage. As there was a very pustular abscess the wound was not closed up entirely, a gauge drain being put in. Next night he was very flushed and restless and bromide was given as a sedative, on the following day—the 21st—his temperature was lower and the pain was greatly relieved. For a time there was a fetid discharge, which kept up the temperature. The wound was douchcd with peroxide of hydrogen with good effect. Steady improvement was made, the temperature returned to normal, the discharge ceased, and the wound granulated up. The ultimate result was very satisfactory.
Case 13.—A boy of 15 years of age was admitted on 22nd February 1901 suffering from recurrent appendicitis. He had had two previous attacks. The first occurred seven months before. He had been troubled with constipation for some time. The attack, which seems to have been a mild one, lasted about four days. He was under treatment in one of the Medical wards. Two months before admission he had a second attack which lasted three days. It was not severe. Pain was felt all over the abdomen. He was treated with hot fomentations at home. In all the attacks there were shiverings, sickness and vomiting. The third attack which was very severe, commenced on 26th February. He was admitted to the Medical side at 4 P.M. on the 22nd. Hot fomentations and "nippy stuff" were applied. About 9 P.M., the pain grew worse and settled down; very sore, in the right iliac region and his right thigh was drawn up. He had difficulty in making his water. He was immediately sent over to Ward X for surgical treatment.

On admission his temperature was 102° F., and his pulse 150 and feeble. He complained of pain over the lower half of the abdomen. There was tenderness
especially on the right side and extending up to the liver. Both thighs were drawn up. The abdomen was tympanitic all over.

He was operated on about 11 P.M. by Mr. Hodson. On opening the peritoneum purulant serum escaped in considerable quantity. The appendix lay in a large and ill-defined cavity behind the cæcum. It was ligatured and amputated and was found to be thickened and acutely inflamed and just beginning to suppurate. The wound was stitched up and drained.

At 2 A.M., on the 23rd, patient's pulse and respirations were more rapid. He looked pinched and the abdomen was distended with flatus. Calomel was administered.

Next night he was very restless and was given bromide—2 doses of 45 and 60 minims respectively. On the 24th he had improved considerably and the wound was looking well. At the end of the month though he seemed fairly well and felt no pain his temperature went up and continued high till the 2nd March when he passed a considerable quantity of pus per rectum. Thereafter the temperature returned to normal and he made a good recovery; the wound healing well.
Case 14. - On 28th February 1901 a housemaid aged 30 was admitted complaining of attacks of pain in the right iliac fossa. She had had four of these attacks within a year. The first attack occurred about a year before and lasted a week. In the middle of the night she was suddenly seized with pain which was localised from the first to a spot in the right iliac fossa, but later on there were shooting pains from that spot. For a day or two she continued at her work though the pain was severe. She felt like to faint and was feverish and sick and vomited. She was then seen by a doctor who gave her medicine and ordered her to stay in bed and take no solid food for a time. The pain gradually left and she was soon entirely free from it. The second attack occurred about 3 months after the first and lasted three days. She was not so feverish this time. She had a third attack about six weeks before admission. It lasted two days and was similar to the previous attacks and was treated in the same way. In all the attacks there was sickness and vomiting. The last and worst attack occurred fully three weeks before admission. She was suddenly seized with very severe pain during the night and "shivered awfully" at
first. The right thigh was drawn up. She could not lie still in bed, but had to sit up. The attack lasted two days. She was given medicine but the sickness rather increased. The pain was always in the same spot, namely, in the right iliac fossa, which was always tender during the attacks. She had not been troubled with constipation, but during the attacks diarrhoea was always present. She felt no pain during the interval between the attacks, but was then troubled with sick turns, especially after heavy work. Indeed, these sick turns had lasted for practically the whole year, though previous to the first attack of pain she was not subject to them. While they lasted she did not take any solid food and on her doctor's advice was careful at all times with regard to what food she took.

On admission there was tenderness in a restricted area, low down, just above Poupart's ligament (Fig. 28).
Vomentations were applied locally which relieved the pain. She was operated upon on 5th March. The patient being under chloroform Professor Annandale made a short oblique incision parallel to Poupart's ligament over the usual site of the appendix. The abdominal muscles were separated and held apart with blunt hook retractors. Then the transversalis fascia was opened and a small opening carefully made in the peritoneum and the edges grasped with blunt-pointed pressure forceps. The intestine protruded through the opening and the appendix was at once discovered. It was a small one, 2 inches long and in appearance seemed quite normal. It was drawn out and packed round with gauge, with a blunt-pointed aneurism needle a silk ligature was passed round the base of the appendix and tied tightly. Then the appendix was grasped with forceps close to the place where it was ligatured. It was then clipped through between the forceps and the ligature and the stump was touched with isoform. The mesentery of the appendix was ligatured with silk and the appendix cut away. (Fig. 29) On squeezing it after removal a drop of pus oozed out of the cut end. The stump of the appendix was carefully stitched up with fine
Fig. 29. - Method of Removing Appendix.

catgut. The parts were examined for bleeding points and as there were none, the gut was at once returned to the abdominal cavity. The peritoneum and fascia were brought together with five catgut stitches, then the muscles with stronger catgut, and last of all the skin surfaces with silkworm gut.

The wound healed by first intention. The patient made an excellent recovery and had no more attacks of pain or sickness.
Case 15. - A miner, aged 17, was sent over from the medical side on 1st March 1901. On 14th December 1900 he felt very cold while at work in the pit and in the evening was suddenly seized with pain in the abdomen which he thought was from the stomach. He had been somewhat troubled with constipation before this. Next day he went to his work but had pain in the abdomen all day. The pain was general. He took castor oil and salts. On the following day - Sunday - there was very severe pain localised in a spot, very tender to the touch, below and slightly to the right of the umbilicus. He was sick and vomited and was slightly feverish and the right thigh was drawn up on account of the pain. He consulted a medical man who gave him medicine and pills and fomentations were applied locally. The pain gradually got better though it was present for a fortnight. During that time he remained in bed and was at home from work for the next month. He felt some pain at times. Thereafter he returned to his work though still feeling pain occasionally. About a fortnight later he had another attack similar to the first but not so severe. This attack was treated in the same way as the previous one. He was confined to bed for two days.
and thereafter was at home for a while. On returning to work the pain gradually came back again and was intermittent. About a fortnight before admission he had another similar attack. There was constant pain all day and he was unfit for his work. Since the first attack he had had no trouble with constipation. The pain gradually disappeared again and he was advised to come to the Royal Infirmary for treatment, but went by mistake to the medical side from which he was sent over.

On admission there was slight tenderness on deep pressure about one inch below and to the right of the umbilicus and passing vertically down towards the pubis (Fig. 30). There was well-marked dullness over the usual site of the appendix and distinct thickening could be felt.

He was operated on on 5th March. The method of operating was the same as described in
the previous case (No. 14). The peritoneum was carefully opened—the necessity for this carefulness in opening being specially well shown in this case by the close manner in which the gut was approximated to the under surface of the peritoneum. The part of gut exposed was slightly congested. On drawing forward the cæcum the appendix was discovered behind it and lying rather to its left side. It was a long one—fully 3 3/4 inches—and was inflamed. It extended down into the pelvis and was adherent. While pulling on its deep attachment to remove it slight bleeding occurred, but the bleeding points were all speedily secured and ligatured. The wound was closed in the usual way. He made an uninterrupted and rapid recovery.

Case 16. — On 14th March 1901 a schoolboy, aged 10, was admitted. Nine weeks before he was suddenly seized with an attack of pain in the right iliac fossa. He was not sick and did not vomit. The pain came in spasms every quarter of an hour or so and was very severe. Patient was very restless and could not keep still in bed while the attack lasted. His bowels were not constipated. Poultices were applied locally and medicine was administered.
The pain was soon relieved, lasting only about five hours. He was kept in bed for a week. Then he returned to school and had no more trouble till five weeks later when he had a second attack of a similar kind but more severe. Treatment was the same as in the first attack and he remained in bed for about a fortnight. He had no difficulty in making his water during the attacks. He had previously enjoyed good health.

On admission there was slight fullness over the site of the appendix with decided dullness over that area. There was no tenderness on pressure, but slight thickening could be felt.

On 16th March the usual operation for appendicitis was performed by Professor Annandale. There was a tuberculous deposit in the peritoneum. The appendix, which was fully three inches long, was found at once in its usual position. It was very much inflamed at the tip and also along the line of attachment of its mesentery. It was ligatured with silk and removed in the usual way. The peritoneum and muscles were stitched with catgut and the skin with silkworm-gut. After removal the appendix contracted rapidly and a small calculus - evidentlyecal - was
expressed from its cut end.

For a day or two he was troubled with sharp spasms of pain in the abdomen, to relieve which morphia was administered hypodermically. The wound healed by first intention and the patient made an excellent recovery.

Case 17. — On 23rd May 1901 a tallowmaid, aged 22, was admitted suffering from an acute attack of appendicitis with suppuration.

Nearly three years before she began to be troubled with pain in the right iliac region, especially after taking food. Her bowels were regular and she had no sickness. She continued at her work three or four months. Then she was at home for five months. She was not confined to bed, but was unable to do any work on account of the pain. After returning home she began to attend a hospital in Lancaster ("for chest diseases") as an out-patient and was given medicine and carbolic pills which "settled her for a while." Eventually the pain entirely left her and she went to another situation. About a month later she began to feel the pain again especially after meals. The pain was always in the same place - the right iliac region. When
these attacks came on she got capsules from a chemist which gave her relief for the time. She had these attacks about once a month and each lasted from four to ten days. They did not keep her from her work.

About 2 A.M. on 14th May 1901 she was suddenly seized with very severe pain in the right iliac region accompanied by vomiting and sickness. She was seen by her medical man about noon and he gave her medicine and ordered the application locally of hot bottles. In the evening a mustard poultice was applied, but the pain got worse and the sickness and vomiting continued. Next morning (15th May) as she was no better her doctor sent her to the medical side.

For about two days hot fomentations were applied and then ice. The pain was not relieved and on 23rd May she was transferred to the Surgical side for treatment.

On admission her temperature was normal. The abdomen was swollen and tender especially over the site of the appendix, and distinct fluctuation could be made out.

On 24th May Professor Annandale operated. He made the usual short incision for
exposing the appendix. The muscles were thick and there was a good deal of fat. The peritoneum was separated with the fingers, but no abscess was found behind it. On opening the peritoneum the intestines were found to be very adherent and thick fecal pus escaped in large quantity. A fecal calculus the size of a cherry stone was removed. The appendix which was gangrenous and lying loose was picked out with forceps. It was fully two inches long. The abscess extended down into the pelvis. As much of the pus as possible was swabbed out, and then a glass drainage tube was inserted and iodine form gelatine stuffed in at the sides of the tube. The wound was closed in the usual way. The peritoneum was just beginning to be involved.

The patient made excellent progress. The discharge soon diminished and ceased and the wound healed well.
Case 18.—On 25th May 1900 a young man, aged 23, a grocer by trade, was admitted, complaining of repeated attacks of pain in the right iliac region.

The first attack occurred in July 1900. It came on gradually. At first he felt as if it were "a stitch in his side" when walking and in the evening began to feel pain over the region of the stomach, and eventually the pain settled down in the right iliac fossa. Next day he was sick and vomited. He took castor oil and mustard poultices were applied locally and he kept in bed for about four days. The attack was not severe and he soon got relief.

Thereafter he felt in his usual health till 18th December 1900 when he had another attack which commenced in the same way as the first, but was much more severe. He awoke about 3:30 A.M. with pain in the right iliac region. This pain gradually got worse and continued to be very severe for a good many days. He was sick and vomited a little. He occasionally felt pain shooting upwards from the affected area. He had the same treatment as in the first attack and in addition powders and opium pills were given. His diet was milk and soda water.
after the second attack he never was free from
pain for more than a fortnight though the pain
was not severe. He felt it also after over-exertion
or on exposure to cold. His previous health had
been good though he had been troubled with
constipation for a long time.

On admission thickening and hardness could
be felt and there was tenderness on pressure at
McBurney's point, on percussion there was a
considerable area of dullness.

On 27th May Professor Annandale operated.
The parts were found to be very adherent, the muscles
and peritoneum being bound together by adhesions.
The peritoneum was carefully opened and the appendix
was found to be adherent to the anterior abdominal
wall. A needle with a ligature was passed round
the base of the appendix about half an inch from
its attachment to the caecum and the appendix
ligatured, then the incision was tied, the appendix
removed, and the wound closed in the usual way.

The appendix was about three inches long and
contained a fecal concretion.

The patient made an excellent recovery.
Case 19. - On 27th May 1901 a mason, aged 24, was admitted complaining of attacks of pain in the right iliac region.

The first attack occurred two years before and lasted about six days, at first he felt a dull pain over the stomach and then across the abdomen, and eventually the pain settled down in the right iliac fossa. He had been constipated for three days before the attack and blamed a chill caused by a wetting for bringing on the attack. He was sick and vomited. He was treated by ice bags applied locally.

Thereafter he felt perfectly well and was fit for his work until ten days before admission, when he got a chill and had to keep in bed for a day. On resuming his work he was suddenly seized with intense pain in the right iliac region. He thought he must have overstrained himself. His doctor injected morphine and gave bain chloroform vapour to inhale to relieve the pain. The attack gradually passed off, but he kept in bed for a few days. On the 25th May while at work he felt a dull pain in the same region and fearing a recurrence he consent
ed his medical man who advised him to come to the Royal Infirmary for treatment. On examination there was distinct fullness over the region of the cæcum and dullness for a considerable area around. On palpation fluctuation could be detected.

On 28th May Professor Aramandal made a short oblique incision over the usual site of the appendix. The transversalis fascia and peritoneum were found to be oedematous. The intestines were inflamed and very adherent. In searching for the appendix with the finger an abscess was opened and striking pus escaped. This was thoroughly swabbed out. The appendix was not found. The abscess cavity passed back behind the cæcum and to drain it a counter opening was made between the last rib and the crest of the ileum. A rubber drainage tube was inserted and stitched in position and the general peritoneal cavity packed off with iodoform gauge the ends of which were left out of the wound. The wound was closed in the usual way.

The discharge gradually diminished and though the wound was slow of healing the ultimate result was good.
Case 20. - On 28th May 1901 there was admitted a married man, aged 47, employed as an under-manager at a colliery, with a history of four attacks of pain in the right iliac region.

In July 1900 he felt a very severe pain in the left iliac fossa which gradually worked across the abdomen to the right side. The attack lasted about a fortnight, during which time he kept in bed and had a milk diet and opium was administered daily. The second attack which occurred in December 1900 lasted about ten days and was not so severe. In March 1901 he had another slight attack. The fourth attack which began early in May was rather more severe than the previous one. Patient had never been troubled with constipation. In the second attack he was sick and vomited, but not in any of the others. He was treated by the local application of ice and castor oil and enemata of soaps and water were also given.

The pain did not always start in the right side, but always settled down there eventually. His previous health had been good.

On admission there was some fullness in the region of the appendix and distich
thickening could be felt.

On 31st May the patient being under chloroform, Professor Annandale made the usual incision for appendicitis and carefully opened the peritoneum. The intestines were congested and very adherent. Considerable difficulty was experienced in finding the appendix, on account of the adhesions. Some of the adhesions were carefully separated and at last the appendix was found passing deeply down towards the pelvis. It was very adherent. It was ligatured and cut through near the base and the stump was touched with iodoform. In removing the rest it broke and had to be taken out in two pieces. It was inflamed and thickened, but there were no signs of suppuration. The wound was closed in the usual way, the muscles with strong catgut and the skin with silk worm-gut and horse-hair.

Patient made an excellent recovery.
<table>
<thead>
<tr>
<th>No.</th>
<th>Sex</th>
<th>Age</th>
<th>Occupation</th>
<th>Date of Operation</th>
<th>Result</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.</td>
<td>F.</td>
<td>28</td>
<td>Waitress</td>
<td>11th Nov. 1900</td>
<td>cured</td>
<td>Serous peritonitis; appendix inflamed and slightly adherent to right common iliac vein and perforated at tip.</td>
</tr>
<tr>
<td>4.</td>
<td>M.</td>
<td>18</td>
<td>Barman</td>
<td>19th Nov. 1900</td>
<td>Died</td>
<td>General septic peritonitis; a large quantity of fetid pus.</td>
</tr>
<tr>
<td>5.</td>
<td>F.</td>
<td>21</td>
<td>Housewife</td>
<td>30th Nov. 1900</td>
<td>cured</td>
<td>Tip of appendix slightly inflamed.</td>
</tr>
<tr>
<td>6.</td>
<td>F.</td>
<td>16</td>
<td></td>
<td>16th Dec. 1900</td>
<td>cured</td>
<td>Abscess with foul pus; tip of appendix adherent to hard mass behind cecum.</td>
</tr>
<tr>
<td>7.</td>
<td>M.</td>
<td>48</td>
<td>Shepherd</td>
<td>8th Jan. 1901</td>
<td>cured</td>
<td>Omentum twisted round appendix which adherent to cecum; tubercular deposit in omentum.</td>
</tr>
<tr>
<td>8.</td>
<td>M.</td>
<td>12</td>
<td>Schoolboy</td>
<td>10th Jan. 1901</td>
<td>Died</td>
<td>General septic peritonitis; abdomen full of pus with many adhesions; appendix not found.</td>
</tr>
<tr>
<td>9.</td>
<td>F.</td>
<td>23</td>
<td>Washwoman</td>
<td>11th Jan. 1901</td>
<td>cured</td>
<td>Peritonitis: parts inflamed and adherent; appendix contained concretions and pointed down to pelvis.</td>
</tr>
<tr>
<td>10.</td>
<td>M.</td>
<td>46</td>
<td>Railway porter</td>
<td>16th Jan. 1901</td>
<td>Died</td>
<td>General septic peritonitis; abscess with large quantity of pus.</td>
</tr>
<tr>
<td>No.</td>
<td>Sex</td>
<td>Age</td>
<td>Occupation</td>
<td>Date of Operation</td>
<td>Result</td>
<td>Remarks</td>
</tr>
<tr>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>------------------</td>
<td>-------------------</td>
<td>--------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>11</td>
<td>M</td>
<td>28</td>
<td>Policeman</td>
<td>26 Jan. 1901</td>
<td>Cured</td>
<td>Parts very adherent; appendix behind omentum with suppuration in canal.</td>
</tr>
<tr>
<td>12</td>
<td>M</td>
<td>21</td>
<td></td>
<td>20 Feb. 1901</td>
<td>Cured</td>
<td>Appendix thickened and in form of a mass like the knob of a stick, and gangrenous at base; fetid abscess.</td>
</tr>
<tr>
<td>13</td>
<td>M</td>
<td>15</td>
<td></td>
<td>22 Feb. 1901</td>
<td>Cured</td>
<td>Large abscess; appendix thickened and acutely inflamed and suppuration beginning; purulent serum.</td>
</tr>
<tr>
<td>14</td>
<td>F</td>
<td>30</td>
<td>Housemaid</td>
<td>5 Mar. 1901</td>
<td>Cured</td>
<td>Suppuration in lumen of appendix.</td>
</tr>
<tr>
<td>15</td>
<td>M</td>
<td>17</td>
<td>Miner</td>
<td>5 Mar. 1901</td>
<td>Cured</td>
<td>Parts slightly congested; appendix long and inflamed.</td>
</tr>
<tr>
<td>16</td>
<td>M</td>
<td>10</td>
<td>Schoolboy</td>
<td>16 Mar. 1901</td>
<td>Cured</td>
<td>Appendix inflamed at tip and along line of attachment of mesentery and contained a small calculus; tuberculous deposit in peritoneum.</td>
</tr>
<tr>
<td>17</td>
<td>F</td>
<td>22</td>
<td>Tablemaid</td>
<td>24 May 1901</td>
<td>Cured</td>
<td>Large abscess with thick fetid pus and extending down into pelvis; appendix gangrenous and loose; a fecal calculus the size of a cherry stone.</td>
</tr>
<tr>
<td>18</td>
<td>M</td>
<td>23</td>
<td>Grocer</td>
<td>27 May 1901</td>
<td>Cured</td>
<td>Parts very adherent; appendix adherent to anterior abdominal wall; inflamed and with concretion.</td>
</tr>
<tr>
<td>19</td>
<td>M</td>
<td>24</td>
<td>Mason</td>
<td>28 May 1901</td>
<td>Cured</td>
<td>Large abscess with sticking pus; appendix not found.</td>
</tr>
<tr>
<td>20</td>
<td>M</td>
<td>47</td>
<td>Under manager at colliery</td>
<td>31 May 1901</td>
<td>Cured</td>
<td>Appendix thickened and inflamed.</td>
</tr>
</tbody>
</table>
Appendicitis.

Anything like a detailed account of the "protean" subject of appendicitis is far beyond the scope of this paper, and only the more outstanding clinical features of the disease can be referred to here.

An exact classification of appendicitis which would be of any clinical value can hardly be given. Any single case may within a short period of time exhibit quite a number of diverse phases. A case which at first appears to be of a simple nature may suddenly develop more acute symptoms and general peritonitis set in, or a large fluctuating swelling may unexpectedly appear. "At the beginning of an attack, indeed, for the first forty-eight hours, it is impossible to foretell what will be the outcome. A patient presenting at the commencement of illness little local and constitutional disturbance may die on the third or fourth day with an abdomen full of pus. The attack may begin in a more marked manner, and the severity of the symptoms gradually or suddenly increase until a large circumscribed abscess is formed or general peritonitis ensues. Again, the
attack may come on with extremely acute symptoms and the early appearance of a large swelling, yet all disturbance subsides rapidly, and the patient is well on to recovery by the fifth or sixth day or the initial symptoms may be so severe as to induce the belief that acute general peritonitis is present, yet the symptoms subside as rapidly as they began. Cases doing perfectly well apparently, have been known to terminate suddenly and fatally owing to invasion and complication of the whole general peritoneal cavity, or the evacuation of an abscess fails to relieve the local and constitutional disturbance, and it is not for many days that a further pocket of pus between the intestines is discovered to be the cause of the persistence of symptoms.

Still, there are certain fairly well defined clinical varieties or phases met with, and the following simple classification may, for descriptive purposes be taken.

A. - A simple attack ending in resolution.

B. - An attack with the formation of a local circumscribed abscess.

C. - An attack with perforation or gangrene.
ending in acute general peritonitis as e.g., the 'sublimating' form.

D. - Relapsing or Recurrent appendicitis.

The symptoms and appearances vary very greatly according to the nature of the attack or the stage which it has reached. The majority of cases seen in hospital are (1) either those of the recurrent type seen in the 'quiescent period' or (2) very acute cases, frequently with general peritonitis present and demanding immediate operative interference. It is cases of the latter variety which are sent to the surgeon at the eleventh hour that bring up the mortality percentage in appendicitis. Without exception general septic peritonitis has been present on admission in all fatal cases treated in Professor Amundale's wards during the last nine months.

The following are the chief symptoms. Occasionally there are premonitory symptoms in the form of vague abdominal pains (e.g. case 3). The most characteristic symptom is pain in the right iliac fossa in the region of the appendix, and sometimes shooting upwards and to the left. In the first place, the pain is usually felt
generally all over the abdomen, but it may commence in the left side and gradually pass across to the right (e.g. Cases 7 and 9). Sometimes, however, it is localised from the first (e.g. Case 14). A rigor often ushers in the attack, and vomiting and nausea are frequent. Constipation is not infrequently present; on the other hand, there is sometimes diarrhoea (e.g. Case 14). But the bowels may be quite regular even in a severe attack. The temperature in acute cases varies from 101°F. to about 103.8°F., but it is not always to be depended on as even with a normal temperature there may be a serious state of matters present, such as a large abscess, (e.g. Cases 10 and 17). The temperature after being high for a time may come down gradually to normal and then suddenly rise again as more acute symptoms develop (e.g. Cases 2 and 4). In the more severe cases the pulse and respiration are usually rapid and there is often complete collapse. In the acute cases recorded above the pulse varied from 100 to 150 per minute and was often very feeble, and the respiration was as high as 60 a minute.

In recurrent cases seen during the "quiescent"
period" some fulness may be noticeable over
the right iliac region and on palpation
some thickening is generally felt from adhesions
due to the previous attacks; and there is
usually tenderness on deep pressure, but not
invariably, as sometimes there is no tenderness
whatsoever (e.g. Case 5). On percussion dullness
— generally well marked—may be made out over
the site of the appendix and cecum.

In the more acute stages distension and rigidity
of the abdominal wall with a tympanitic note
and great tenderness in the right iliac fossa are
present. In general peritonitis the tenderness is
felt all over the abdomen. The right thigh
often is drawn up,—sometimes both thighs—
on account of the pain, and there is costal
breathing. & Great tenderness is felt per
rectum when there is pus in the pelvis (e.g.
Cases 4 and 10). Case 2 is interesting from
the fact that though there was an abscess
present, yet there was no distension of the abdomen
and no local tenderness, but the temperature re-
mained high and the pulse was rapid.

The 'fulminating' form in which acute
diffuse septic peritonitis soon supervenes may commence
in the same way as an ordinary attack. Then there comes a lull in the symptoms followed immediately by a violent and sudden increase and in a few hours the abdomen is full of pus. The appendix is found to be acutely inflamed without any surrounding adhesions and to have a gangrenous perforation.

In the intervals between the attacks in recurrent cases sometimes there are no symptoms at all and the patient feel in their usual health; in others there are occasional pains; in Case 14 there were frequent attacks of sickness.

As regards the age, appendicitis is in the main a disease of young life. In the cases recorded the maximum age was 48, the minimum 10 and the average 25.

Appendicitis is said to be four times as common in the male as in the female; in the above described cases the numbers are, 14 males and 6 females.

With regard to diagnosis in the earlier stages of an attack there may be some uncertainty; but once the attack is fairly established the appearances and symptoms are usually
pretty characteristic. Of course, when the appendix and caecum are not in their normal position the diagnosis is complicated considerably. The main conditions from which a differential diagnosis has to be made are, (1) Intestinal obstruction, (2) Renal and Biliary colic and (3) Tuberculous peritonitis. But in each of these there are distinguishing features which a careful examination will reveal. In at least three of the recorded cases mistakes of diagnosis appear to have been made in the earlier stages, in one of them—Case 4—which was mistaken first for influenza and then for typhoid fever, with fatal consequences, as operative treatment was sought too late. In Cases 11 and 14 the condition seems at first to have been treated as gastric in nature.

To form an accurate prognosis in any case of appendicitis is difficult, but a great deal depends on whether purely medical or surgical treatment is adopted and in the case of surgical treatment when it is adopted without careful consideration of these points as well as the evident symptoms and appearances
of the case no prognosis worth anything can be given. In mild cases treated medically the prognosis for the time being is good, but the difficulty is to be sure that the case is going to be a mild one, and again, there is the risk of recurrence which is very considerable. On the other hand in the more acute cases and in all recurrent cases with early surgical interference carried out under the usual antiseptic precautions the prognosis is extremely good for a permanent cure.

"The treatment of appendicitis is still a much debated question between physicians and surgeons; but there is no doubt that for all practical purposes this disease is passing more and more out of the hands of the physician into those of the surgeon for treatment. A distinguished American physician - Professor Osler - goes the length of writing, "There is no medicinal treatment of appendicitis. There are remedies which will allay the pain, but there are none capable in any way of controlling the course of the disease." That this is so, is un-
doubted. Medical treatment, however, should be adopted in the early stages, but if there is not improvement in all the symptoms within from twenty-four to forty-eight hours the sooner surgical interference is sought the better.

The following is the medical treatment usually adopted. The patient is kept in bed and hot fomentations or ice-bags applied to the right iliac region. A copious emulsion of soap and water may be given. Measures should be adopted to allay the vomiting when it is present. If there is much vomiting no food is given by the mouth till it has ceased, and then only fluid, hot and in small quantities.

The majority of surgeons believe that it is better not to use opium in any form because it hides the tenderness and masks the facial changes which are the only safe indications of the course which the disease is running. Some surgeons recommend the use of saline purges, but these should be employed with care since in any given case the pain and tenderness at the outset may mean perforation of the appendix and the life of the patient may depend upon whether a limit
rig adhesive inflammation is set up. Under these circumstances anything that will stimulate active peristalsis of the bowel wall throughout its extent is certainly contra-indicated. 

The patient must be kept in bed until the swelling and all the tenderness have left the right iliac region and he must be fed upon food which is easily digested, that neither constipates nor forms massive stools.

Operative treatment is undertaken either during the quiescent period of a relapsing case or during an acute attack which refuses to yield to medical treatment and where there may be (a) localized abscess or (b) diffuse peritonitis.

The methods of operating usually employed by Professor Annandale have been described in the notes of the cases (e.g. Case 14). Professor Annandale employs a curved incision and turns back a flap of skin. He also recommends a formal amputation as a safeguard against leakage. The muscular bands on the large intestine form a ready guide to the position of the appendix when there are not too many adhesions present.

A. Osler; Id., loc. cit.
when the appendix is difficult to find or account
of the adhesions it is often better to leave it
alone rather than break down the adhesions
in an attempt to find it. Where there
is evidence of the presence of an abscess it is a
good rule before opening the peritoneum to pass
the finger down behind it and separate it.
By doing so it is sometimes possible to open
and drain an abscess without opening the
peritoneum at all.

The question of when to operate is much
debated. In recurrent cases the sooner operative
intervention is carried out after a second attack the
better. In any case if there is no improve-
ment in all the symptoms within from 24
to 48 hours the rule should be to operate at
once. If this rule were strictly adhered to there
would be many fewer cases of abscess formation
and septic peritonitis. Amongst American
surgeons the rule almost invariably followed is
to operate once the case is "diagnosed".
As regards the complications met with many of these depend on a displaced or very long appendix. The following urinary troubles have been found complicating attacks of appendicitis, namely, prolonged retention, dysuria, pyuria, and pyelonephritis. These have been noted even where the appendix did not communicate with the bladder, the latter being infected through intervening tissues. A. In case 12 there was a history of urinary trouble.

Acute general septic peritonitis may be regarded as a complication of appendicitis, and with that there may go intestinal obstruction arising from paralytic of the intestinal walls.

Pyelophlebitis, hepatic abscess and pyaemia are rare. Thrombosis of the right iliac vein is sometimes met with.

When an abscess has been present for some time unhealed, it may be followed by intestinal fistula which may be external or internal according as the abscess opens externally or into some part of the intestinal canal.

As regards the etiology of appendicitis, various factors have been put forward as predisposing causes. Amongst others the anatomical structure and situation of the appendix are believed to play a part. It has also been stated that the shortness of the mesentery causes shrinking of the appendix and so sets up cystic dilatation from retention of the secretion, but in none of the cases recorded was this observed.

A very important predisposing cause and one on which Professor Chiene laid special emphasis in treating of the subject in his systematic course, is chronic constipation and deranged conditions of the digestive system. The presence of hardened feces both irritates the mucous membrane and also affords a suitable nidus for the development of those microorganisms which are the active cause in every case.

Attention has recently been drawn to the action of intestinal worms, more especially in children, in predisposing to appendicitis. Injuries such as a strain or the like has sometimes been blamed, but in none of the cases recorded was there any such history.

and it seems highly probable that when such attacks do follow an injury the real state of matters is, the injury merely "lights up" a chronic condition which has been present for some time undetected.

The active cause is, of course, the presence of bacteria, especially the bacillus coli communis.

"In sixty-one cases of general peritonitis or perityphlitic abscess consequent on disease of the appendix, the colon bacillus was found in the exudate of fifty-seven, and in fifty of these it was the only microbe present." (H.P. Hawkeim).

So long as the appendix is healthy the bacillus coli communis is benign. But once the state of the fluids in the appendix is altered, such an alteration is conducive to an acquired malignancy on the part of the bacillus. In some cases pyogenic cocci are found both inside the appendix and in the exudate around it. Streptococci, pneumococci, and staphylococci pyogenes aureus have been met with, and possibly in some cases a pyogenic coccus may be the agent which excites peritoneal inflammation.
various morbid conditions of the appendix are found. In what is often called the 'catarrhal' form of appendicitis, the epithelium is shed and the submucosa and muscular coats infiltrated with leucocytes and plasma cells. This may lead to permanent thickening of the mucous membrane, submucosa, and muscular tissue of the organ, with the formation of strictures or if the process be extended over the whole appendix complete obliteration of the lumen may follow. Once the epithelium is damaged or shed the bacillus coli communis finds an entrance into the tissues, and then disastrous results follow. The secretion is mucoid or mucopurulent, with an evil odour, and a culture of the colon bacillus found therein proves to be extremely virulent. A necrotic process may start in the tissues of the appendix and then spread, eventually involving the peritoneum. To take a concrete instance,—in a case of so-called 'appendicular colic' where to the naked eye the appendix seemed normal Mr C.B. Lockwood found on microscopic examination of sections that the lumen

A. 'British Medical Journal' vol 1, 1900 p. 192.
was filled with epithelium, mucus, granules, and crystalline bodies. The fluid was crowded with cocci, diplococci, small ovoid bacilli, single and in pairs, small clumps of staphylococci and streptococci in chains from four to six, also some long slender bacilli. The mucosa was ulcerated and these various bacteria had penetrated a short distance into the substance.

In another case of simple cecal appendicitis besides the bacteria already mentioned there were found leptothrix and spores and spore-bearing bacilli and shreds of organic matter in the lumen. Many of the tubular glands had shed their epithelium, which had been replaced by plugs of bacteria projecting from the lumen. In some cases these bacteria were penetrating the lymph canalicular system of the mucosa. In one case the appendix was found engorged with blood and felt very hard.

A cystic condition of the appendix may arise from a constriction from changes in the mucous membrane—occurring usually near the caecum—or from kinking of the appendix due either to adhesions or to the shortness of its mesentery, and giving rise to stenosis.
Cysts are usually found at the caecal end of the appendix and there may be one or more of these. Sometimes these cysts are found to contain merely colourless mucus; but if once septic changes occur in the contents, the epithelium being already damaged either permits absorption giving rise to ulceration or necrosis, or gives way causing localized abscess or general peritonitis. In a case where there was a constriction near the caecum, examined by Mr. Lockwood, the lumen was found to contain pus full of streptococci.

Ulceration of the appendix is usually associated with the presence of faecal concretions, these are found to consist mainly of phosphate and carbonate of lime and carbonate of magnesia coloured by the bile salts. They vary in size, being usually about the size of a cherry-stone and are frequently very hard. These faecal concretions, however, often contain large numbers of bacteria. So long as the epithelium remains undamaged these concretions occasion little or no harm as a rule, but once the epithelium is destroyed or denuded either septic absorption takes place from causing a breaking down of the tissues or the ulcerated surface with the escape of foul mucus.
Gangrene of the appendix may be either distinctly localized, as e.g. in the form of a necrotic patch in the tip of the appendix, with or without perforation, or a necrotic patch in the mesentery, or there may be a ring of gangrenous tissue completely around the circumference of the appendix, or, lastly, the whole appendix may be gangrenous and detached, and be found floating about in the pus of an appendicular abscess. (Case 17).

Foreign bodies, such as e.g. a pin, have occasionally been found in the appendix.

Primary tuberculosis of the appendix is probably rare. General tuberculous peritonitis is sometimes met with in association with appendicitis (Case 96).

Primary carcinoma of the appendix is occasionally met with. (Lancet Feb 2, 1901 p. 319).

Fig. 31. - Section of Normal Human appendix.
A Case of Dry Senile Gangrene affecting both Feet;

On 17th June 1901 there was admitted to ward IX, Royal Infirmary of Edinburgh, under the care of Professor Annandale, a shepherd, aged 64 years, complaining of inability to walk as parts of both his feet were black and stiff and there was occasional pain in them.

About 7 o'clock in the morning of 13th February 1901 he was going to look at some sheep and had walked fast for fully half a mile up a steep hill when he suddenly lost consciousness. On recovering his senses he was lying on his back in the middle of the road. He did not know exactly how long he had been lying there, but was sure it could not have been long. He felt "sore at the heart" and had a feeling of dizziness. When he tried to walk he felt feeble about the legs and had to sit down for a while. There was an inn at the other side of a field. He tried to reach it, but had to sit down many times — in fact, every few steps. He had got halfway across the field and was feeling quite exhausted when a man saw him and came to his assistance and supported him to the
irritation. There he was put on a sofa and although he himself did not feel his feet cold, the people said they were "as cold as lead" and put hot bottles to them and also to his back, and he was given brandy internally. He was seen by his doctor who said he could hardly feel his pulse. He was removed home and put to bed and was given medicine. In the afternoon he vomited a lot and thereafter felt better. The pain soon left his chest but his feet felt cold for three days. Then he felt all right again and was able to resume his work.

On 11th April after walking half a mile with a farmer patient suddenly dropped down on his face but did not lose consciousness. He got up at once and walked on for fully a mile though he felt a pain at his heart and did not feel right. Then he was driven home in a trap and acquaintances who met him on the way remarked that his face was "blue as it were from cold." He got into bed and was treated somewhat similarly as in the first attack. His feet felt cold. He had pain at his heart which became pretty severe and he had also difficulty in breathing. Next morning he began to feel pain in the middle of the sole of his left foot which he
described as being like "the storn of a corn," at first. It gradually got worse and became almost unbearable so that patient was almost mad with the pain. In three or four hours time the other foot was similarly affected. About this time the pain left the region of his heart and his breathing became all right. The severe pain continued in both his feet for about 24 hours and then became "more bearable." The pain was principally felt along the soles and in the toes. Next morning the soles of his feet near the roots of the toes were swollen and feet "as cold as lead" and were of a bluish colour. The affected parts rapidly darkened in colour and became quite black. At the same time he lost the power of moving the toes and the sensation of touch in the dark area. Along with the pain there was a feeling of heat in the feet. From his doctor it was learned that during the early stages of the attack patient's face was livid and his ears black and his heart was hardly perceptible and the heart's action remained feeble for some time.

His medical man dressed the feet almost every day with cotton wool. Patient was
given medicine and pills also were administered to relieve the pain. The pain had never entirely left his feet since and at times it was very severe. At first he could not sit up in bed without a feeling of faintness, but that passed off. About a year before he had once or twice had a feeling of faintness, but it speedily passed off. He had noticed during the winter before the first attack that his feet got very cold in the evenings and he usually put them near the fire to warm them. "There was no history of frostbite. Before the second attack he had been troubled at night with strange dreams and he did not sleep well. His previous health had been good. He did not remember lying over a week in his life." In the performance of his work he was a good deal exposed to the weather and often had long hours. From his doctor it was learned that he was alcoholic. His family history was satisfactory.

On admission his temperature was normal, his pulse 92 and his respiration 24. He was a stout florid-looking man.

He complained of feeling great heat in both feet from the ankles to the toes and occasionally
a "stinging" pain was felt, sometimes at the heel, sometimes along the sole, and sometimes, patient thought in the toes. The pain was felt chiefly in the left foot and principally at night. Some nights it was very severe and kept him from sleeping when the pain was not present he felt fairly comfortable.

On inspection the whole of the plantar aspect of the left foot and also that part of the dorsum distal to a line drawn from the tuberosity...
of the scaphoid to the point of the heel passing about an inch and a half below the external malleolus and the continuation of the same line on the internal side to the point of the heel was dark in colour—almost jet black and somewhat glistening, except for a small part—about one inch in diameter—on the dorsum near the roots of the toes, which was purplish in colour. The nails were of a white silvery colour. Immediately above the dark area there was a red hyperaemic line between which and the dark part there were particles of pus appearing. For a distance of three inches above the red line and extending as far as half an inch above the malleoli the parts appeared slightly swollen and reddened and were covered in places with thin flaky crusts of desquamating epithelium. The muscles of the leg appeared slightly wasted. The veins were not injected. There was a marked absence of the lanugo hairs from the outer side of the leg.

There was no smell from either foot.

On palpation the dark area on the left foot described above was pulseless, cold, and insensible to touch. The purple part had a silken feel, while the rest was hard and stone-like.
Above the darker area the parts felt slightly raised in temperature and the swollen area was slightly tender and oedematous and pitted on pressure. Slight pulsation could be made out in the posterior tibial and anterior tibial arteries and the walls of these vessels felt slightly thickened. The muscles of the calf were flabby, there was complete loss of movement in the toes and movement at the ankle joint was.
restricted but not painful.

In the right foot the heat was not quite so great. He felt no pain along the dorsum but sometimes a "stinging" pain in the sole of the foot. He was unable to move the toes.

The black area included the toes and extended up the dorsum about half an inch and the line of demarcation in the sole extended on the outer side from the head of the 5th metatarsal bone towards to three-quarters of an inch above the ball of the great toe. The affected area on the dorsum between the roots of the toes and the line of demarcation was not so dark but purplish in colour. There was a similar red line on this foot from which pus exuded, but much less in amount in this case. There was a similar area covered by desquamating epidermis, but more extensive and involving the whole of the plantar surface. The swollen area extended to immediately below the malleoli. This area was also reddened, increased in temperature and the veins were markedly injected. There was the same absence of lanugo hairs on the outer aspect of the leg.

On palpation similar phenomena were to
be made out as in the case of the other foot. Movement at the ankle was not restricted in any way, but there were no movements in the toes.

On careful examination his urine was found to be normal, — of specific gravity 1.020, neutral reaction and there was an absence of albumen, sugar and other abnormal constituents. His pulse was 92 per minute and of high tension. A tracing taken from the radial artery with a Dudgeon’s sphygmograph (kindly lent to me by Dr. H. W. Reibey of the Physiological Department of the University) showed fairly well-marked atheroma. (Fig. 34a). A normal pulse tracing.

![Pulse Tracing (Radial Artery) in Case of Senile Gangrene of Both Feet. Atheroma fairly well-marked. (10-6, 1906)](image1)

![Normal Pulse Tracing (Radial Artery)](image2)

**Fig. 34.** — **a.** Pulse Tracing (Radial Artery) from case of senile gangrene of both feet. Pressure 45y. **b.** Normal Pulse Tracing (Radial Artery). (Both tracings obtained by Dudgeon’s sphygmograph.
obtained by the same instrument is added for the sake of contrast. (Fig. 34 B.) "Tracings taken by the sphygmograph from patients whose arteries are atheromatous show a low upstroke, with a blunt apex, and very little tendency to any oscillations during the descent of the lever. The limited range of movement during the ascent of the lever, and the blunt appearance of the summit, are due to the rigidity of the wall, which also causes the absence of the usual waves seen on the descending line of the tracing." A slight thickening was felt in the walls of the radial and tibial arteries.

Dr. R. C. Affleck kindly examined the condition of the heart for me. On auscultation both sounds were closed in all the areas, but the sounds were weak. In the aortic area the second sound was accentuated relatively to the second sound in the other areas. On percussion slight enlargement was to be made out.

His respiratory system was sound and his digestive system good. The liver was not enlarged.
The sensory and motor functions and the thermal sensibility were not impaired except in the affected areas (as noted). The special senses were unimpaired as also were the organic reflexes. The plantar reflexes were absent. The knee jerks were exaggerated, markedly so on the right side.

After admission the loose desquamating scales of epithelium were peeled off and the parts were kept clean and dry. Iodised bore and iodoform powder was dusted on the affected areas and the feet were kept wrapped up in thick layers of cotton wool.
Senile Gangrene.

Senile gangrene is met with in elderly people. One or both feet are usually affected; sometimes, however, the condition is found in the hand and arm. Last year there was a well-marked case in Ward IX of dry senile gangrene affecting the whole hand and forearm of an old man.

The history of the case depends in a measure on the causes which are at work producing the gangrene and the form of gangrene present. There are two main varieties of senile gangrene, namely (1) the moist, and (2) the dry. In the former there is inflammatory mischief present which spreads more or less rapidly up the limb; in the latter the parts affected simply shrivel up and die, almost ‘en masse’ in many cases. The difference between the dry form and the moist depend on the way in which the gangrene arises and whether or not sepsis is present later. Senile gangrene is generally dry for it usually arises in connection with disease of the arteries.

The case described above is a typical one of the dry form of senile gangrene and well
illustrates the method which Nature adopts in separating the living from the dead. The method is the same whether it be soft parts or bone that are affected or whether it be a large portion or a small portion of the body.

There was a red line of demarcation and slight ulceration was taking place at the junction of the living and dead tissues. It is not, however, necessary to have living tissue separated from dead by a process of suppuration; a part may die e.g., a piece of skin or a piece of bone, and Nature separates the dead from the living without the formation of pus — by granulation tissue forming new cells and blood-vessels which eat into the dead part and cause separation. But as a rule there is a certain amount of suppuration in these cases. The less suppuration present the less is the risk, but the longer is the time taken before the parts are separated. Where there is suppuration the slough is got rid of in a much shorter time, but there is greater risk of the gangrene spreading.
The causes of senile gangrene are mainly constitutional. Among them may be mentioned, (a) a weak heart, (b) atheroma of the blood-vessels (c) thrombosis occurring in some part of the blood stream, (d) venous congestion from pulmonary emphysema or sometimes from various veins, (e) malnutrition from an impoverished condition of the blood as e.g. by the presence of albuminuria. Supradded to these there may be some injury to the limb from direct violence, sometimes from cutting a corn, or from exposure to cold.

In the case described above several of these causes were certainly present. The patient's heart was weak and this weakness was probably due to some degeneration of the cardiac muscle (myocarditis). Atheroma was fairly well-marked as shown in the public tracing (Fig. 34) taken from the radial artery. Thrombosis had evidently occurred in the vessels of both feet and probably also in those of the lower part of the leg. There was no pulmonary emphysema. Patient had not suffered from recurring winter colds and his respiratory system was sound. Nor was there any appearance of varicosity in the venous
system, a careful testing of the urine excluded albuminuria as well as glycosuria. There was no history of frost-bite and it does not seem to be usual to get a history of local injury in the dry form of senile gangrene.

As regards the thrombosis the clot may have originated in the vessel or vessels affected or it may have been conveyed from a distant part as an embolus and given rise to the obstruction. There was feeble pulsation in both posterior tibials behind the ankles so that it was possible that the plug was pretty low down - about the bifurcation of the two plantars though as a rule the thrombosis occurs in the popliteal space in these cases, even although the foot only is affected. Pulsation could be felt in the popliteal - stronger than in the tibials, but as only the upper part of the popliteal artery can be felt it is possible that the obstruction was at its bifurcation. The part which dies depends on the freedom with which the anastomosis is established and the anastomosis again depends on the condition of the vessels. If the vessels are atheromatous it is not so free.
Gangrene tends to be arrested at certain places and may stop there permanently. If fresh infection takes place, the mischief may again go on spreading. The places where gangrene naturally tends to be arrested are where there is a free anastomosis as e.g., at the ankle and at the knee. If the gangrene spreads up the limb the patient may suffer from severe septic poisoning.

The symptoms depend almost entirely on whether the case is one of moist or dry gangrene i.e., the presence or absence of sepsis. The physical signs and symptoms present in the case described above were very characteristic of the non-inflammatory form of senile gangrene.

Amongst the symptoms of malnutrition present there were cold feet for some months before, also insomnia and troublesome dreams previous to the second attack, pointing to some cerebral anemia. The marked absence of hair from the outer aspect of the leg might also be taken as an evidence of malnutrition. The pain as usual was well marked. Before the gangrene actually makes its appearance there is usually a feeling of slight pain or tingling.
in connection with the toes; then the severe pain is felt when the gangrene actually occurs. The pain is due to the want of blood-supply to the nerves and is caused by the circulation gradually becoming feeble and then being actually cut off.

The dryness of the affected part was due partly to the fact that there was not much blood there when the gangrene set in and what moisture was there at the time had been got rid of by evaporation as the parts had been kept dry since, and mainly to the fact that the cause was some arterial obstruction. If the obstruction was in the arteries one would expect to find the part dry; but if it was in connection with the veins then the part would be sodden and soft and moist and in a more favourable condition for sepsis. Indeed, moist gangrene is very prone to become septic, if organisms are present at all. As already stated senile gangrene is generally dry since it usually arises in connection with arterial disease.

The black colour is due to the diffusion of the disintegrated haemoglobin. This takes
place slowly. Dry gangrene is usually black; moist may be purplish, or mottled, or livid.

In the case described the patient was carefully treated from the first. If the parts had been neglected or left alone the distal portion might have shrivelled up but the line of demarcation would not have been so marked and suppuration would have been apt to spread up the leg and given rise to more extensive gangrene.

If seen in the early stages the whole part should be carefully cleansed in methylated spirit and carbolic lotion or lysol, then thoroughly dried and packed round with cotton wool.

The patient should be kept at rest and in the dry form the affected part should be dusted with borie or iodiform powder and kept swathed in a thick layer of cotton-wool until a clear line of demarcation forms. Then amputation should be carried out well above the area in which thrombosis exists—generally in the case of the lower limb through the upper third of the tibia. If there is much pain opium should be given in half grain pills three or four times a day.
In the inflammatory form of gangrene and when the patient is being worn out by constant pain a high amputation should not be delayed if the patient has a sufficiently strong constitution to bear the shock of operation. In some of the more rapid inflammatory forms it is necessary to amputate at once to save the patient's life. In many cases of septic gangrene, however, any active treatment is apt to be unsatisfactory on account of the weak condition of the patient.

Fig. 35. - Septic Moist Gangrene of Leg [from Ross' 'Surgery']
Two Cases of Ankylosis of the Elbow Joint resulting from Injury.

I. Fracture-dislocation at Elbow Joint; Ankylosis; Excision;

On 19th June 1901 there was admitted to ward VIII, Royal Infirmary of Edinburgh, under the care of Professor Annandale, a young woman, aged 20, complaining of stiffness in her left elbow joint as the result of an accident.

On 26th April 1901 while driving along Maitland Street, Edinburgh, in a dogcart, the pony stumbled and fell and patient was thrown out, her left elbow striking the pavement. She was slightly stunned, but got up at once. She found that her left arm was "just hanging loose, as it were." It seemed to twist back when she got up and she had to grasp it with her other hand and hold it across her chest.

She was seen by her medical man an hour after the accident. Her sleeve had to be slit up to get the arm free. The whole limb from the wrist to the shoulder was much swollen.
and "all black and blue." The skin was slightly scratched on the inner aspect of the joint, near the internal condyle. Her doctor examined the arm, moved it about from side to side, and said it was dislocated. While moving it it suddenly gave a crack and then he said the bones were back in position again. The arm was placed across the chest and slung by a bandage round the wrist and neck. The elbow itself was not bandaged and no splints were put on. The doctor gave her ointment to rub on the discoloured area to take away the discoloration. He also advised her to get a leather rest for the elbow from Gardener, Instrument Maker. This she got and put on.

The limb was kept in this position for ten days. Then she was told by her medical man to gradually begin to use it, still employing the sling as a support when not using it. She was unable to bend it, trying to bend it caused pain. If the arm was left hanging down it got swollen and black.

Ten days later her doctor gave her chloroform to move the joint as it was so stiff. She did not know whether he succeed
ed in moving it to any appreciable extent or not, but the attempt caused the arm to be swollen up and very painful for two or three days and she was still unable to move it. She tried to move it and kept rubbing it, but to no purpose, any attempt at movement causing great pain.

Ten days later the doctor again gave her chloroform and tried to move the joint, but with just the same result as before. There was no improvement. Massage was ordered, but whenever the nurse she engaged to apply massage, saw the arm she at once brought patient to the Royal Infirmary.

On admission the left arm was held in the semi-flexed position. There was practically no movement of flexion or extension; pronation and supination, however, were fairly good. The fore-arm had been, as it were, rotated outwards thus modifying the normal carrying angle and giving rise to a form of cubitus valgus (Fig. 36). There was considerable thickening in the anterior aspect of the joint. The internal condyle was displaced forwards and outwards and there was another
small projection of bone about half-an-inch in front of it.

The condition of parts was well shown by the skiagram taken on the 21st June, - for the photograph of which (Fig. 37.) I am indebted to Mr. Hope Fowler, of the Electrical Department of the Royal Infirmary. There was marked backward displacement of the ulna and some thickening on the anterior aspect of the joint due either to an upward displacement of the coroid process or to the forward displacement of the internal condyle, - from the skiagram it was not possible to say which. (Callus is not distinctly shown on skiagrams.)
No other course of treatment was open than that of exercising the joint. Accordingly, on 22nd June, the patient being under chloroform and an Emmrich's elastic band having been applied to the upper arm after rendering the limb bloodless, Professor Annandale made a straight posterior incision over the olecranon down to the bones. The muscles and soft tissues were carefully dissected off the bones, and held apart with retractors. In these cases it is necessary to proceed with care as the internal condyle is often displaced and the ulnar nerve along with it. The lower part of the shaft of the humerus was sawn nearly through with a key's saw and then divided with a chisel. The forearm was forcibly flexed and the radius and ulna were sawn across just below the coronoid process. The tourniquet was taken off and all bleeding points secured and ligatured. The two halves of the trieps were stitched together, as this ensures better action of the muscle afterwards. An iodocare-gauge drain was inserted and the skin sutured with silver-wire and silkworm-gut.

The limb was put up in the fully extended
position in a lead-splint moulded to fit it.

The preparation showed backward and outward displacement of both bones of the forearm. The coronoid process was fractured and was lying in front of the articular surface for the head of the radius and was surrounded by callus. There was an oblique fracture involving the internal condyle and the trochlear surface of the humerus (Fig. 38).

The small projection of bone noticed in front of the internal condyle was found to be due to the margin of the trochlear surface.

On 6th July patient was progressing satisfactorily. The wound was looking well. The arm was now in a splint and was flexed to a right angle.
II. Fracture-dislocation at Elbow Joint; Ankylosis; Excision;

On 27th June 1901 there was admitted to ward IX, Royal Infirmary of Edinburgh, under the charge of Professor Anandale—a young man, aged 21, who had been a private in the "Royal Scots" regiment, complaining of stiffness in his left elbow joint, the result of an accident.

On 28th January 1901 he was leading a horse for watering to the river Vaal near Kroonstad, South Africa, when the animal took fright at a passing train and plunged into a donga, pulling patient in also. He fell a distance of about twelve feet and landed on his left shoulder.

The limb became much swollen and painful and was discoloured from the shoulder to the middle of the forearm. He was taken in a wagon to the hospital at Kroonstad where two hours after the accident the injury was attended to. The elbow joint was said to be dislocated and it was reduced. It went back fairly easily.
The limb was fixed up in a rectangular splint for three weeks. Then it was put in a sling and patient was told to begin to use it again. This he found to be impossible as the joint was so stiff.

He was sent to Winberg on 21st March. About 1st April a sketch of the elbow was taken, from which the diagnosis arrived at, according to patient, was, "dislocation of ulna backwards; fracture of humerus through trochlear surface; the whole embedded in hard callus."

He was sent home and after arrival in Edinburgh Castle was discharged as unfit for further service.

On admission the left arm lay in a position between full extension and semi-flexion at an angle of 45° with the axis of the extended limb. Movements of extension and flexion could take place only through a very small angle; pronation and supination were unimpaired. The external condyle of the humerus was found to be slightly higher than that of the opposite side, as if it had been pushed up and around it on the surface of the shaft.
of the humerus there was a hard mass extending downwards and forwards towards the joint immediately above the head of the radius. The internal condyle also was increased in size. The obliquity was more prominent than that of the right side and was rather nearer the external than the internal condyle. There was no pain in the feet, except slight tenderness on pressure over the external condyle. Some fullness could be made out on the anterior aspect of the joint. There was slight wasting of the muscles of the upper arm and there was slight loss of grasping power in the hand. There were no nerve symptoms or loss of sensation.

The condition of the bony parts was examined by means of the X-rays, and patient's statement of the results of the Skiagram taken at Winberg was verified. There was complete backward dislocation of the ulna and an oblique fracture through the lower end of the humerus with opacity around it due to the callus.

On 23rd July the patient being under chloroform Professor Annandale excised the joint, in a manner similar to that described in the preceding case. A peritoneum separator was push-
ed in at each side of the lower part of the shaft of the humerus and used as levers to hold the bone up and press the soft tissues down out of the way. The bone was then sawn nearly through with a fine saw and then cut across with a chisel. The arm was then forcibly flexed, the end of the shaft of the humerus trimmed and the operation completed as in the preceding case.

The actual condition of parts in the preparation was much obscured by the large amount of callus thrown out both on the anterior and posterior aspects of the joint.
Ankylosis of the Elbow Joint resulting from Injury.

Ankylosis is very apt to occur in connection with all severe injuries such as fracture-dislocations of the elbow-joint and may to a greater or less extent follow almost any dislocation or fracture implicating the joint if not carefully treated from the first.

Ankylosis may follow a transverse supracondylar fracture of the humerus if it is neglected or wrongly treated, but this is not common as the joint itself is rarely implicated.

Separation of the epiphysis is a common accident in children, but rare after puberty. If, however, it does occur then, as by this time the internal condyle is isolated, the main epiphysis is situated much nearer the joint and impairment of movement is more likely to follow. In many cases of separated lower epiphysis the mass of bone which is felt just above the bend of the elbow and which so much limits the movements of the elbow is not really callus, but the end
of the shaft which was originally displaced and never reduced.

Fracture of the external condyle is more common than of the internal and always involves the joint. Fracture of the internal condyle may be intra-articular. In both these cases there is great tendency to impairment of movement if sufficient care in treating the case is not taken.

In T- or Y-shaped fractures the joint is very likely to become stiff owing not only to adhesions within it, but also to the filling up of the fossae in the lower end of the humerus with callus. Except where the most perfect reduction has been obtained and maintained little or no movement in the elbow joint is likely to result. "The configuration of the elbow joint is such that very slight irregularity of the joint surfaces is sufficient to largely prevent movement" (Cheyne & Burghard).

In fractures of the olecranon process even when carefully treated some impairment of function may ensue owing to the callus encroaching on the articular surface which is always involved.
Fracture of the coronoid process does not usually give rise to any marked disability except when much callus is thrown out; this may form an obstacle to flexion. Occasionally ossification seems to extend upwards in the tendon of the brachialis anticus and a spur-like process is formed which greatly hampers movement, and may necessitate the removal of the offending portion of bone.

Fracture of the head of the radius is rare alone and is usually associated with other injuries to the elbow. When it does occur there is usually more or less impairment of function; sometimes there is excessive formation of callus.

Ankylosis may be due to an unreduced dislocation of one or other form.

Not infrequently, however, the condition is due to a complicated injury such as a fracture-dislocation as in the cases described above. The condition of parts in these cases is apt to be obscured more or less by the presence of callus on account of the swelling and haemorrhage; it is often difficult, if not impossible, to come to a correct conclusion as to the nature of the case in the early stages. In these
circumstances the x-raygram is found very useful in showing the conditions present and thus disclosing the probable cause of ankylosis.

Special care in the treatment of all fractures about the elbow joint lessens the chance of ankylosis occurring.

Once it has occurred—and in a certain proportion of cases it is quite impossible to prevent it occurring—the treatment depends on the condition causing it, and the state of the joint.

When the ankylosis depends on an unreduced dislocation an attempt should first be made under an anaesthetic to get the bones in position again by means of traction; and if too long an interval has not elapsed this will probably succeed. If, however, the attempt at reduction fails, then excision of the joint may be undertaken, unless there is some special reason against operative interference.

In all ordinary cases where the original injury has not been extensive a similar attempt should first be made by traction to get movement in the joint. If this fails, then recourse should be had to excision.
In more severe injuries — of which the cases described are good examples — where there is a large amount of callus thrown out the only treatment that offers any hope of a useful joint is excision.

The method of excising the elbow joint is described in the notes of the cases. It is necessary to remove the ends of the bones pretty freely or else the ankylosis is apt to recur again.

The after-treatment of all cases of excision of the elbow requires to be very careful. Early movement is most important and the fingers and wrist may be moved from the very first about the tenth day fairly free movement is commenced, — flexion and extension, pronation and supination.

With careful after-treatment the results are very satisfactory.