THESIS
Presented to
The University of Edinburgh
For the Degree of
Doctor of Medicine
by
James G.S. Jamieson,
M.A., M.B., Ch.B.,
April 1902.
Pyloric Tumour: Inflammatory and Malignant; Pathology, Diagnosis, and Treatment; with Illustrative Cases.
As the term inflammatory tumour may appear somewhat vague and unfamiliar it may be well to state definitely at the outset what is meant by that term. Inflammatory tumour of the pylorus means a tumour such as sometimes forms round a chronic ulcer of that region, a tumour which under the microscope shows a connective tissue formation and leucocytes, but no malignant element, and which, under appropriate treatment, tends to disappear or at least to diminish greatly in size.

There can be little doubt that such tumours are commoner than is supposed and that many are diagnosed as malignant and that they are hopeless allowed to run their course with the result that sometime or other they take on a malignant character and when the patient dies the post-mortem examination confirms the original diagnosis. Again, many cases are on record, where, a diagnosis of malignant disease having been made, the abdomen has been opened and the diagnosis strengthened by the appearance of the parts and a palliative operation such as gastro-
: intestotomy performed with the result that from the day of operation the apparently malignant tumour has gradually lessened and finally disappeared, and the patient has remained well for years afterwards, proving that all the while the tumour was simple and inflammatory.

Pathology of Inflammatory Tumour

It is one of the characteristics of a freshly formed peptic ulcer that there is an entire absence of inflammation round it; but when it becomes chronic the case is different. The formation of a peptic ulcer is a passive process whereby a devitalised portion of the stomach wall is digested away, but in the chronic stage of the ulcer, an active inflammatory and proliferative reaction takes place in the tissues forming the base and sides of the ulcer. Commencing with the more acute inflammatory change, such as hyperaemia, transudation of lymph and emigration of leucocytes, with cloudy swelling of the cellular elements and proliferation of the connective tissue elements, the process gradually becomes more chronic, partial organisation takes place,
and in the different strata of the stomach wall the following changes are found. In the mucous membrane there is thickening of the adenoid tissues between the tubules. In the submucous coat the greatest change is seen for here there is great increase of connective tissue, with a more or less copious supply of leucocytes according to the amount of active reaction present at the time the section was cut. In the muscular coat there is increase of the interfibrillary connective tissue, causing more or less atrophy of the muscle fibres. The peritoneal coat is thickened. The slower the process of formation, the coarser and more densely packed are the connective tissue fibres, and the harder and firmer is the resulting mass.

The size of the inflammatory mass depends upon various factors: (1) the amount of irritation to which the ulcer is subjected, whether this is due to the position of the ulcer in the stomach, or to the habit of the patient e.g. alcoholism. The pyloric region is subject to more irritation than the rest of the stomach and an ulcer here,
more than elsewhere, is apt to have built up around it a mass of inflammatory tissue. Before an ulcer can heal, it must have rest; at the pylorus, it gets little chance of that. It is an absorbing surface for many irritating materials which entice leucocytes to emigrate from blood vessels and encourage connective tissue cells to proliferate and lay down connective tissue fibres; and thus the inflammatory structure is built up.

(2) A second factor is the adhesion of the base of the ulcer to neighbouring viscera, such as pancreas, liver, and omentum. After adhesion has taken place, the inflammation of the serum base of the ulcer — which brings about the adhesion — spreads to the organ in question and, in time, causes a similar hypertrophy of the fibrous elements in it and a consequent increase of the tumour mass.

Further, perforation of the ulcer may occur into any of these organs, but by the rapid and marvellous plastic power of the peritoneum, the locality of the perforation may become shut
off from the general peritoneal cavity and encapsulated, forming a distinct tumour.

3. In the case of pyloric ulcers with stenosis near of the pylorus, hypertrophy of the muscular coats of the stomach is sometimes added as a factor in producing tumours. A chronic ulcer of the pylorus may heal up with hard base and callous edges; this may or may not be palpable through the abdominal wall; but, as time goes on, the effect of stenosis of the exit of the stomach begins to show itself. A stricture of the alimentary canal at any point is followed by hypertrophy of muscle above the stricture and atrophy below. In this case the muscle of the stomach is engaged in a continuous effort to force material through (at a narrowed orifice) a narrowed orifice, and, as it is the pyloric portion alone which acts as ejaculator of stomach contents, the hypertrophy of muscle is confined to that region. This, then, added to the inflammation, matry mass round the ulcer may give rise to a palpable tumour, and, in a carefully watched case may lend a
suggestion of increase of growth.

Thus it will be seen that an inflammatory mass around a chronic ulcer may be of the most varied size:—it may be consist simply of a hardened edge to an ulcer, not palpable through the abdominal wall and even attracting little notice after the abdomen has been opened; or, on the other hand, it may form a large tumour easily palpable through the abdominal wall and closely simulating cancers of the stomach.

The situation in which an inflammatory tumour of this kind attains to its largest size is the pyloric region. At the pylorus, various factors contribute to the production of a tumour mass, the constant irritation to which the pylorus is subjected, the possibility of adhesions to liver, gall-bladder, and omentum, the hypertrophy of the muscle of the pyloric portion and the fact, pointed out by Greenfield, that the presence of constriction at the pylorus, by delaying peristalsis, and thus, by increasing irritation, tends to promote other ulcers near to, and mostly posterior to itself.
The other point regarding the morbid anatomy of inflammatory tumour must be mentioned, and that is, the presence of enlarged lymphatic glands. The surgeon at a laparotomy or the pathologist at a section is confronted with a hard tumour of the stomach and with enlarged glands in the omentum in the vicinity; and the question arises, is the tumour malignant? How, even if the tumour were undoubtedly malignant, it does not follow that these glands contain malignant elements, but may simply be inflammatory enlargements due to the absorption of toxic products from the ulcerating surface of the tumour. Pathological proof of this is furnished by microscopic examination where, though the tumour is malignant, the glands may be absolutely free of malignancy. And clinical proof is occasionally forthcoming. In a case attended by the writer, after operation, of cancer of the tongue with an enlarged gland in the neck, the surgeon was so thoroughly satisfied that the gland was inflammatory that he made bold to leave it untouched, with the result that
after excision of the tongue, the enlarged gland decreased and disappeared and had not returned at the end of six months. Without the microscope, the most reliable guide in differential diagnosis between malignant and simple inflammatory enlargement of lymph glands is palpation. Glands enlarged due to inflammation have a soft, fleshy feel while malignant glands are hard and shorty under the finger. But after all this has been said the presence of enlarged glands in addition to a tumour of the stomach gives grounds for uneasiness and adds complexity to the diagnosis; and in many cases it is impossible to say macroscopically whether the tumour in question is inflammatory or malignant.

Pathology of Malignant Tumour

To discuss this at length would be to repeat what is found in every textbook. Briefly, according to Waldeyer, its formation consists of two processes: 1, an atypical proliferation of the gland cells of the mucous membrane, rupturing muscular mucosae and proliferating in the sub-mucosa; 2, proliferation of
connective tissue, the amount of which determines whether the carcinoma becomes scirrhous, medullary, or colloid. The cancer spreads chiefly in the submucosa and is apt to run up the lesser curvature from the pylorus (vide Case 117).

The muscular coat long resists the advance of the cancer, but it too at last gives and the serous coat is attacked, and adhesions may form to other organs, as in purely inflammatory cases.

The form of cancer most commonly found at the pylorus is the scirrhous. It often grows very slowly with a large and dense proliferation of connective tissue stroma and very few cancer cells, so that even after microscopic examination the pathologist may be in doubt as to whether the tumour is malignant or a mass of dense inflammatory tissue.

**Relation of Ulcer to Cancer.**

The possibility of chronic ulcer or inflammation of the submucous layer taking on a malignant character is of the greatest interest. The fact that while ulcers are commonest on the post-siniv wall and lesser curvature cancers are
mostly at the pylorus does not at all mitigate this possibility, for while few of the ulcers on the posterior wall and lesser curvature may become malignant, many of the ulcers at the pylorus, owing of the greater irritation to which they are exposed, may undergo malignant degeneration.

Chronic irritation, we know, is one of the most recognised of the exciting causes of cancer, and old scars form a not uncommon site for the commencement of malignant growth, and a very good combination of chronic irritation and scar is to be found in an old pyloric ulcer.

Schuchardt believes that "a chronic hyperplastic condition of the connective tissue of the mucous membrane", though perhaps not the cause of cancer, forms a highly suitable nidus for its growth and development.

And when this hyperplasia is concentrated as it sometimes is, round an old ulcer, circumstances are even more favourable than usual for malignant growth. The Vienna school teach that ulcer is not only a possible but a common starting point of
cancer. There is a considerable literature on
the subject but it was a recent need not to
give here. In his own case the writer has
only seen one case where histologically there was
little doubt that carcinoma had commenced
in the site of an old ulcer. The patient
was a man aged 64, with a history of stomach
trouble, pain, and vomiting of blood in his
youth, and an eight weeks' recent history
of severe pain, vomiting, and loss of flesh.
Hb (free) was present in small quantity
in the stomach. Pyloroplasty was performed
and the excised portion examined. The base
of the scar was firm and round; it the
edges were thick and hard. Was it a malignant
tumour which had recurred, or the scar of a
chronic ulcer with surrounding inflammatory
tumour? On section the base was found to be
composed of old fibrous tissue. The edges, owed
their bulk to a hypertrophy of connective tissue
chiefly in the submucosa, and at the edge of
the scar and situated in the submucosa
were epithelial cell nests—a commencing
malignant degeneration round an old ulcer.

If it be granted that a chronic ulcer
May become the site of a malignant tumour. A grave responsibility is placed upon a medical man in charge of a case, say, of a middle-aged person, where, with a former history of gastric ulcers, stomach symptoms have set in which do not within a short period disappear under suitable medical treatment. Abdominal surgery has made rapid strides in late years and there is no doubt that in the near future chronic gastric ulcers will come more and more into the hands of the surgeon (with efficiency) and an earlier laparotomy will effectually cure the case and avert the more serious disease.

Clinical Relationship and Diagnosis:

It is a grave injustice where after careful examination and observation the diagnosis is still doubtful and where under suitable medical treatment the condition is becoming worse, to deny to the patient the privilege of operation or to delay it until he is asthenic; but, on the other hand, it is poor science to abandon all attempts to diagnose between malignant and non-malignant affections of the stomach and fly at once to laparotomy.
It is unnecessary to emphasise how very closely many cases of non malignant affection of the stomach simulate malignant disease in history and clinical appearance. You may find in both, a history of pain, with vomiting of blood, melena, loss of weight; a sallow look and a palpable tumour; and (here) even the surgeon, with the stomach actually in his hands and the history and symptoms of the patient in his mind, cannot, in some cases, definitely say, "This is malignant", "That is not". Yet there are some points in differential diagnosis which may be worth studying.

1. History - Before passing on to the results of clinical examination there is one point in the history of the case which deserves notice and that is, the length of time during which symptoms of stomach trouble have manifested themselves. If the symptoms date back more than two years the likelihood is that the trouble is inflammatory. Malignant cases shew a shorter history generally; and a short history, say six months, of stomach trouble in a middle aged person which has
defied medical treatment in, to say the least, suspicious. In the cases seen by the writer (necessarily a limited number) this fact has been evident. In the cases noted below the average duration of symptoms in inflammatory tumour was 6 years, in malignant tumour 9 ½ months. Taken generally, then, as between inflammatory and malignant tumours, a short history points rather to the former disease and a long history excludes it.

But here there is a possibility of fallacy which must be borne in mind, and that is, when after the persistence of chronic ulcer for many years malignant disease is super-added, with rapid advance of symptoms. In case 1 this was thought to have occurred for after 2 years and 4 months of moderate suffering he had had 5 months of increased pain, vomiting, and rapid loss of flesh, and came to the hospital looking like a typical case of malignant pylorus. The conclusion that the tumour here was probably purely inflammatory is supported by the presence of free HCl in the stomach (though this does not exclude cancer), the soft feeling of the tumour and the
absence of enlarged glands at the laparotomy, and the fact that 15 months after the palliative operation of gastroenterostomy the patient is alive and well and three stones heavier than he was on admission to Hospital.

2. Age of Patient. If 40 be taken as a dividing line, it may be said that, if the patient is under 40, the chances are in favour of simple, if over 40, in favour of malignant disease.

3. Loss of weight would appear to be more rapid as a rule in cancer. The presence of malignant disease in the stomach seems to have an emaciating effect apart from the secondary gastritis and atrophy of mucous membrane that accompany cancer, and this is probably due to some product of the metabolism of cancer cells circulating in the blood.

4. Fragments of Growth. There is one clinical sign, rarely obtained, which absolutely differentiates the two diseases and which declares the case malignant, and that is, the discovery of fragments of detached growth. We in this country do not think it justifiable to pass
a stomach tube for the express purpose of trying to knock off a portion of growth or catch it in the eye of the tube. But, if, in vomit or in the process of lavage which the patient may be undergoing, a fragment of growth is discovered, diagnosis is complete. Unfortunately, it is only when the cancer is far advanced that it is likely that fragments of it will become detached and by that time the diagnosis is probably all too certain from other symptoms. Further, no reliance is to be placed on finding of isolated epithelial cells or even groups of cells, but only cell nests are to be considered pathognomonic.

Apart from this, there is no crucial test between inflammatory and malignant tumour, but the totality of evidence makes the physician lean to one diagnosis or another.

The other points that will be discussed here are the presence or absence of free HCl in the stomach, the presence or absence of lactic acid, and the condition of the blood.

5. Free HCl in the Stomach.

In about 90% of cases of carcinoma of the stomach free HCl is absent; hence,
if HCl is present in the stomach contents, the chances are strongly against cancer. Its absence is not due to anything specific in cancer but to the accompanying gastritis (cachectic or interstitial) and atrophy of the mucous membrane. The 10% of cases in which HCl is present, are made up of:

(i) Cases of ulcus carcinomatosum,

(ii) Cases where the cancer is localized and the mucous membrane intact. (Robson).

Many other diseases, e.g., chronic gastric catarrh, may cause absence of free HCl but, as cancer is the commonest cause of the disappearance of HCl, the absence of that acid is strong evidence in favour of cancer. The writer has examined many scores of suspected stomachs for free HCl and in every case in which HCl was absent after repeated trials has proved to be cancer. On the other hand, in two of the cases noted below, of undoubted malignant disease, HCl was found present but in very small quantity, one at least of these was probably a case of ulcus carcinomatosum, while, as stated above, HCl is usually found...
In the cases of inflammatory tumors examined by the writer, HCl-free, was found in every case, and in one patient there was marked excess as in gastric ulcers.

Gingburg's test was used in every case. Are peptones formed in the stomach?

Ewald, in answer to Riegel, says they are.

"The other components of the gastric juice, pepsin, and the rennet ferment, do not keep pace with the failure of free HCl. Peptone, the product of peptic action is found almost without exception even where there is neither free HCl nor lactic acid; pepsin must therefore have been secreted and at one time there must have been enough free HCl in the stomach for the formation of peptone."

On the other hand, the writer heard it taught in Vienna that peptone are not formed in gastric carcinomen and that their absence accounted for the absence of digestion leukocytosis in the blood.

6. Lactic Acid is present in over 70% of cases of cancer of the stomach. Anything that brings about fermentation of stomach contents may cause lactic acid
to appear, hence the presence of lactic acid proves nothing; yet if it is present at the same time as HCl is absent, it adds to the probability of cancer. In the two cases of pylorectomy for undoubted cancer detailed below, lactic acid was absent.

7. The Blood.

In carcinoma of the stomach the blood presents the picture of a secondary anaemia, and is characterised by a diminution in number of Red Blood Corpuscles, and alterations in their size and shape, a diminution of the amount of Haemoglobin, and by a leukocytosis which seems to affect the mononucleated cells most of all. In some cases of dilatation of the stomach following pyloric tumour the blood may be very concentrated and the R. B. C. may in these cases exceed the normal number. To determine, if possible, the difference between the blood in inflammatory tumour and the blood in cancer of the stomach, blood films were made in most of the cases given
in illustration of this paper. Though not absolutely differentiating the two diseases, certain results were got which in a doubtfull case might aid diagnosis.

(1) In carcinoma, there was (a) more affection of the red cells, more diminution in number, and more alterations in size and shape.

(2) In both there was a leucocytosis, but, while in inflammatory conditions the polymuclears were most augmented, in carcinoma the increase was most evident in the mononuclear variety.

The following is one of the tables made, from a case of carcinoma, with leucocyte count, and it is fairly typical of the others examined.

Reds - no rouleau formation. Diminution in number - vary in size and shape.

Haemoglobin diminished - (Eosine, Hæmatoxylie stain).

<table>
<thead>
<tr>
<th>White Blood Cells</th>
<th>Total 15,500</th>
<th>Carcinoma</th>
<th>Normal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polynuclear</td>
<td>45.7</td>
<td>64</td>
<td></td>
</tr>
<tr>
<td>Mononuclear (large)</td>
<td>25.8</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td>Mononuclear (small)</td>
<td>28.5</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>Eosinophile</td>
<td>nil</td>
<td>1-4</td>
<td></td>
</tr>
</tbody>
</table>
Other points to be noted about the Blood in Carcinoma of the Stomach are the following:

1) Absence of digestion leucocytosis.
   This leucocytosis appears normally 1–2 hours after a meal and is said to be due to the chemotactic action of the peptone formed in the stomach during digestion. In cancer, it is said, no peptone is formed hence no leucocytosis occurs. This is the teaching at Vienna and the writer saw this absence of digestion leucocytosis demonstrated last summer in actual cases of cancer of the stomach.

2) Presence (occasional) of nucleated Reds.
   In Vienna it is taught and demonstrated that in the blood of patients suffering from cancer of the stomach an occasional nucleated red corpuscle is found. This is the case apart from secondary deposits in bone. When metastasis in bone has occurred nucleated reds are frequently present in the blood. But in many films which the writer has taken from patients suffering from cancerous stomach he has been unable to confirm this observation.
Treatment of Pyloric Tumour.

When a patient presents himself with tumour of the pylorus, the duty of the medical man is to determine if possible whether it is of a simple or malignant nature. Yet the treatment of both conditions should fall into the hands of the surgeon.

Inflammatory Tumour. In these days of safe abdominal surgery, the only treatment of this condition should undoubtedly be surgical. Rectal feeding and lavage may for a time lessen the bulk of the tumour but it is sure to enlarge again as soon as the patient returns to his old life (again). Delay is dangerous for, besides the error in diagnosis which even the best diagnosticians may make, there is the perhaps rare but very possible risk of the simple becoming malignant.

Gastroenterostomy is still a young operation but every day it is becoming more and more freed of risk and its results, while in almost all cases highly satisfactory, are in some cases actually marvellous. In the series of cases which have come under the
supervision of the writer the result of gastroenterostomy have been so striking and gratifying that they could not fail to impress him with the value of the operation. Pyloroplasty may be needed in some cases but it is not so safe an operation, while pyloroplasty is only applicable to cicatricial cases where there is little or no tumour.

The rationale of gastroenterostomy is that by providing easy and unimpeded exit of the food from the stomach to the bowel, the pyloric region is allowed to rest; it is no longer irritated by acid passing over it or by the foul decomposed contents of a dilated stomach; and the stomach is no longer in a state of continual turmoil ever striving to force its contents through a narrowed opening. The stomach contents lose the hyperacidity which often characterises them in such cases; they no longer decompose; the dilated stomach returns to its normal size, and, lastly, the resting ulcer heals and the inflammatory tumour shrinks and disappears.

In non malignant tumour of the pylorus
Gastrectomy is practically a curative and radical operation for the tumour disappears and is heard of no more, and the patient regains and retains his former health. It has been urged against the operation that it diminishes the secretory power of the stomach and lessens the absorption of fats and carbohydrates. In spite of this, the continued increased weights of the patients after operation speak for themselves.

The mortality of the operation is variously stated. Mayo Robson in the University lectures gives 36.4%. The mortality in his own 78 cases was 20.4%, and a further point is that the mortality is decreasing steadily every year. The mortality of Gastrectomy for non-malignant disease of the stomach is very small. The record of the cases which have been under the direct supervision of the writer is as follows:

- Ten Gastrectomies - one death
- For inflammatory Tumour - three cases - no death
- For malignant Tumour - seven cases - one death

Points in technique -

While it is not intended to describe the
operation in full, some points in technique which commend themselves in hospitals (R.F.B.),
may be set forth here.
Before operation the stomach should be washed out once a day for several days, to cleanse the mucous membrane and to accustom the patient to the use of the stomach tube. On the morning of operation the stomach should be washed out with weak Lundy's fluid. This lessens the chance of contamination of the peritoneal cavity during operation, for the stomach is emptied and thus a gush of fluid on opening the stomach is avoided, and the mucous membrane is rendered, at least, less septic. The best incision in the abdominal wall is medial.

The posterior operation is usually preferred because of the more dependent position of the opening when the patient lies on his back and because regurgitant vomiting of bile is less frequent.
The anterior operation is employed when the posterior is impracticable whether owing to the presence of adhesions or great
Vascularity of mesocolon or posterior stomach wall, or, (in malignant cases,) the advance of the disease posteriorly.

In the posterior operation the omentum and transverse colon are drawn up over the stomach or kept warm with hot cloths. The posterior double layer of peritoneum forming the mesocolon is incised opposite the posterior wall of the stomach and thus, the stomach is reached. The method of simple sutures is probably the best. Robson's bone button to prevent contraction of the orifice, was not found necessary and the Murphy button is only needed if great speed is required.

It is better to snip a triangular piece out of the stomach aperture in order to allow for contraction subsequent to operation and so ensure the continued patency of the new communication.

After operation, if there is much vomiting, wash out the stomach. Twenty four hours after operation this is quite safe as by that time firm union of the two organs has occurred. The cause of the sickness apart from the anaesthetic is the outpouring of
blood and serum into the stomach. If this is washed away there is usually no further trouble.
The bowels should be moved two days after operation. Calomel, gr. vi., followed by
hidrargyry Powder in three or four hours proved itself the most efficient purge. If
movement of the bowels is delayed the poured out serum becomes decomposed in the bowel,
the products of decomposition are re-absorbed, the urine becomes full of residua, and the
patient is thus suffering from auto-intoxication and his chances of recovery are greatly
lessened.

Malignant Tumours of Pylorus: Treatment.

In malignant tumours of the pylorus, the serious nature of the disease should be explained to the patient and the alternative
of medical and surgical treatment put before him, with the probable results in each case.
If the patient is obviously dying or if there is evidence of (widespread) secondary growth,
treatment consists in making the patient as comfortable as possible. By suitable diet,
by morphia, the full blessings of which need
not be denied to the sufferer, and by careful
much may be done to brighten the last
days or weeks, and under such treatment
many patients actually gain weight.

A cure for cancer is unfortunately not
yet known. Several drugs have at various
times been credited with that power, but
mention need only be made of one, namely,
Condurango, and that because of the theory
advanced by Bogdewicky and Riechsen who
said that it destroyed cancer cells by causing
an overgrowth of connective tissue. But
results have not borne out this belief.

Apart from Condurango, the overgrowth of
connective tissue may in certain cases
cause atrophy and destruction of cancer
cells and so explain the disappearance
of apparently malignant tumours.

The curative and radical treatment of
malignant disease of the pylorus lies in
the hands of the surgeon. That treatment
consists of the removal of the pyloric end
of the stomach including the growth
and cutting wide of the disease.

The duty of the physician is to diagnose
Cancer of the stomach before a tumour is palpable, malignant disease tends to remain local for a longer time in the alimentary canal, perhaps, than in any other part of the body. It tends to run in a ring round the canal before entering the lymphatics to any great extent, hence an early diagnosis and removal are more hopeful of permanent cure here than elsewhere.

The radical operation should not be attempted if the patient is very weak, if there are secondary growths, or many enlarged glands, or adhesions, along which malignant elements are almost certain to have passed. In those cases gastro-enterostomy is to be preferred. Though a widespread enlargement of lymph glands is a contra-indication of pyloroplasty, a few enlarged glands should not deter the surgeon even if are hard and shotty. These and the incisions round them should be incised by a process of clamping, cutting, and ligation of stumps.

Some surgeons, among whom are Czerny and Kravke, hold that when a gastric malignant tumour is palpable secondary
Growth have already occurred and operation is useless. Yet, though in such cases the radical operation of partial gastrectomy may be impossible, yet gastro-enterostomy may be of great value, and that for the following reasons: the tumour, no longer irritated, tends to advance more slowly, the patient's life is prolonged and he spends his lengthened days in comparative ease, free, to a large extent, from the terrible sufferings that preceded operation. And we must never forget that an error in diagnosis is possible and that a tumour which, after every means has been used to come at its nature, has been thought to be malignant may be all the while simple, and authentic cases are on record of apparently malignant tumours disappearing after gastro-enterostomy and of the patients remaining well for years after the doom of cancer has been pronounced over them. Where, therefore, the surgeon thinks the tumour is too widespread for the radical operation of removal, gastro-enterostomy should be performed. If the disease is localised or secondary growths
and enlarged glands absent, pylorectomy is clearly indicated. In a case where, though the disease is localized, the patient’s strength has been so reduced as to render the operation of pylorectomy highly dangerous, gastro-enterostomy should be performed, and, at a later date, when the patient’s strength has returned, the radical operation may be attempted.

In every case pylorectomy is the ideal treatment for it means removal of the disease. With it is removed the metabolism of cancer cells, the products of which cause the well known cancerous cachexia. It lengthens the life more than any palliative operation can do, and the objection urged against gastro-enterostomy that it disorganizes digestion cannot be advanced against it.

Points in technique.

Gastro-enterostomy – The technique (for) of gastro-enterostomy for malignant disease of the pylorus is the same as for simple tumour of that region. The choice of position for the junction of the stomach and intestine is often more limited
Pyloric end of stomach double clamped with Brunner's clamps above and below. Incising cut along dotted line. p.33.
owing to the advance of the malignant disease along the coats of the stomach. As this advance frequently takes place posteriorly, the operation of anterior gastroenterostomy is often indicated in malignant than in simple tumour.

**Pyloroplasty.** For several days previously to operation the stomach should be washed out, and this should also be done on the morning of operation. After entering the abdominal cavity by the usual median incision the pylorus is brought out at the wound and the portion to be excised is isolated with gauge swabs. On the cardiac side of the tumour and well clear of it the stomach is clamped by a pair of strong clamp forceps, then, beyond this, by another pair placed parallel to the first and with a clear space between. Then the duodenum is clamped in the same way. Then the rectum opposite the affected portion of the stomach is clamped, cut, ligatured in the usual way (see dotted line in diagram) and including any enlarged glands in the portion left attached to the stomach.
The best clamps to use are an invention of Conrad Brunner, of Münsterlingen, Switzerland, not yet commonly employed in this country. In profile they are bayonet-shaped (as in diagram) so that when two pairs are opposed they allow room between the handles for the operator to work. A useful and important modification to prevent the slipping of one blade past the other was added by Mr. Caird, Edinburgh. This consists of a steel flat pin in one blade fitting into a foramen in the other.

The excised portion having been removed, the cut ends are touched with aodoform wetted with 1:20 Carbolic acid. Then the cut ends are approximated. If they come together easily and without great tension, the surgeon proceeds to unite. Union is performed by simple suture, by Murphy's button (for speed), by suture + Robson's bone button (to prevent contraction after operation). Of these, simple suture is the best. The stomach aperture, being larger than the duodenal, is sewn up partially until it is of a size equal to the duodenal. This is done with a layer of ordinary silk sutures through all
the coats, covered by a layer of Lembert silk sutures through peritoneal and muscular coats only. The two ends, now being equal, are united by three guizing sutures placed equidistant from each other, round the lumen of the canal, then a layer of ordinary sutures through all the coats, then a layer of Lemberts through peritoneal and muscular coats only, and finally the guizing sutures are cut short and buried with one or two Lemberts.

If, however, on approximating the cut ends, it is seen that owing to the large size of the piece removed, there would be too great tension after operation if the stomach were sewn to the duodenum, it is better to sew up both cut ends and join the stomach to the jejunum by posterior gastro-enterostomy.

After-treatment is the same as after Gastro-enterostomy. Washing out the stomach on the day after operation of much sickness supervene is most necessary and, if not delayed, often saves the patient's life.

In such cases where an inexcusable negligence to washing out exists on the part of the patient
and to facilitate after treatment, Mr. Caird in one case detailed below performed a preliminary Witgel's Gastrostomy. This does not add to the risk of the operation and it places the stomach in the position of a bladder with continuous drainage for them at any time, with no fatigue to the patient and even when he is asleep, the stomach can be washed out. The case in which this method was tried unfortunately died, owing, the writer believes, to delay in the administration of a purgative, so that the patient was poisoned by decomposing alimentary contents. Yet there is no doubt that he would have succumbed sooner had it not been for the frequency and ease with which his stomach was washed out through the Witgel tube. When the patient was very restless, washing out gave him great relief and often made him sleep. Further, through the Witgel tube, the patient could be quietly and regularly fed even during sleep.

While not to be recommended in every case this method is worthy of mention as a departure in gastric surgery, and as an aid in the after-treatment of some difficult cases.
Illustrative Cases.

The cases described in this paper came under the writer's notice when Resident Surgeon in the Royal Infirmary, Edinburgh, and as chief assistant at all the operations, save one he was in a good position to note the pathology, condition present and the technique of the operation. Notes of history, operation, and progress are made by himself. In every case the surgeon was Mr. F. H. Card.

Three cases of Gastroenterostomy for inflammatory tumour, all recovered and are alive and well at the time of writing, symptoms quite gone.

Case 1.

A. G., age 48. Admitted from medical side Dec. 25, 1900. Complaint: "Indigestion" for 3 yrs - worse for 5 months. Began with feeling of flatulence after food; later, more definite attacks of fulness and distension; 2 or 3 hrs after food; some night vomiting, eructations, heartburn; no vomiting of blood. Since July 1900 much worse - great discomfort, increased vomiting (which gave relief). Lavage tried with some benefit. A multitude of medicines found useless. Steadily lost weight.
June 1900 weight 11 1/2. Dec 25, 1900, 7 1/2 lb.

Examination. Stomach dilated, peristaltic waves seen in epigastrium, palpable tumour in pyloric region. FREE HCl in small quantity in the stomach.

From the rapid loss of weight & dirty sallow look combined with his age and the presence of a tumour, malignant disease was suspected.

And from the long history ending up with a few months of increased symptoms and rapid loss of weight, and from the presence of free HCl, the diagnosis of ulcus carcinomatous might have been made.

Dec 26, 1900. Operation. A tumour of size of small orange found at pylorus, well defined, smooth and much softer than is usual in the case of cancer or even ordinary inflammatory tumour; absolutely no enlarged glands. There appeared to be no doubt that it was simple and inflammatory. Anterior Gastroenterostomy performed because of extraordinary vascularity of posterior wall of the stomach and of the mesocolon.

Recovery uninterrupted. Left hospital Jan 26, 1901 - no symptoms, no tumour or resistance even to be felt.
Weight. Jan 16, 6 lb. 6 at 11½ lb.; July 1901, 9 at, feeling very well; Nov. 1901, 9 at 2 lb., still well, no palpable tumour.
March 31, 1902. Letter says, "Have gone on steadily gaining till now I am 9 at 6 lb. Can feel no lump in my stomach. Am occasionally bothered with wind."

The gastrectomy caused immediate relief of symptoms, gain in weight, and the rest afforded the pylorus, caused the disappearance of the tumour mass.

Case II.

Complaint - "Pain in stomach with vomiting of blood," Long history of ten years' stomach trouble. Began with pain in the epigastric region, passing through to the shoulder, coming on one hour after food. For 6 yrs vomiting has accompanied the pain and relieved it. For 3 years repeated attacks of haematemesis.

Examination - Patient was very pale and emaciated. Weight 7 st 10½ lb. Gastric movement very evident in the epigastrium. Epigastric region very tender - no palpable tumour, but examination
difficult owing to tenderness. Stomach dilated 2½" below umbilicus.

Operation 31.7.01. Near but not quite at pylorus was found a hard, wooden-like, flattened circular area. On inquiring the stomach wall a finger could not be passed through the lumen. It simulated a peptic malignant tumour with contraction of pyloric end. Stomach greatly dilated. Some glands found enlarged in the great omentum, but they were soft and almost certainly inflammatory.

Posterior Gastrectomy — simple suture.


This is a most satisfactory result as for 3 years previously patient was practically an invalid and had frequent attacks of haematemesis. Now she is able to attend to her domestic duties and is free of all stomach trouble.

Case III

Mrs. Mary, aged 35. Admitted from Red Cross
after food. Duration - 4 years. In 1896 he had pain & vomiting after food; sometimes blood in the vomit; and tenderness on pressure over the stomach. Was treated at Royal Infirmary, Edinburgh, as an outpatient; he got better and remained fairly well for two years. The diagnosis then made was 'ulcer of the stomach'.

In 1899, he began to have heartburn, eructation, stabbing pain in stomach aggravated by food, vomiting with no subsequent relief of pain. Symptoms continued during 1900 and he was treated as a medical inpatient at R.I. S., leaving in September. He came back on Dec 28 with severe vomiting, worse at night, pain, waterbrash, and heartburn. Had been getting thinner for three months.

For ten years he had drunk beer in excess.

Examination - Patient was pale and thin, weighing 9 st. (though 6 feet high). Epigastrium and hypochondriac regions distended and tender, with special tenderness at the tip of the region, where a rumour could be felt, movable on respiration. Though the lower border of the stomach did not reach lower than 3/4" above umbilicus, yet respiration sounds could be
elicted at any time. Glands of groin enlarged and hard - nothing genital.
Abscess of foot still in vomit.
Dec 31. Operation - usual mesial incision.
Adhesions found in quantity along small curvatures between stomach and liver, dense and in fact shutting off the peritoneal cavity at that part; they were very vascular. To have freed them would have been a matter of too great difficulty and they were left alone. At the pylorus, which was adherent to the liver, a mass was felt of the size of a golf ball. It felt wood-like and not stony and gave the impression of a simple and not malignant tumour. An enlarged soft gland was found in the omentum, which was cut away and afterward found to be inflammatory.
Posterior Gastrostomy performed.
Jan 21, 1901. Went to Convalescent House.
Feb 12. Went home. Weight (in clothes) 114 lb. 3 oz. No trace of tumour to be felt & no tenderness on palpation. Feeling and looking well.
April 1902. Weight 11 st 6 lb.; very well; no tumour.

Malignant Tumour.

Radical Operation - Pylorectomy. Two cases. One death; one recovery; patient well 13 months after operation.

Case IV.

J.W., age 64. Admitted Oct. 26, 1900.

Complaint - Pain in stomach and vomiting.

Duration - 8 weeks. Began with loss of appetite and loss of weight. Then vomiting every 2nd day about 2 hrs. after supper. Vomit coffee-ground. Later, vomited blood freely, had burning pain in the epigastrium. Very little HCl in vomit; lactic acid absent. Constipation.

Examination. Tumour felt to R. of umbilicus and rather above it. Stomach moderately distended. Had washed out prior to operation, because of bleeding.

Oct 30. Operation. Stomach much distended. Pylorus under liver, not visible. Hard mass felt at pylorus and pulled out. A hard ring found at pylorus, defined as towards...
the duodenum, indistinct passing off to body. Diagnosed as hard cancer of pylorus. A hard nodule A beyond pylorus, on the duodenum with mass of matted omentum round it.

To empty the stomach and further the after treatment, Metzen's gastrostomy was done and 10 3/4 "coffee grounds" material removed. Omentum cut at 6 o'clock and ligatured. Clamps applied at B

C to cut & turned back. B divided, then the clamp forceps slipped - one blade passing the other but there was only a slight escape.

(Later this little mishap, a pin was added on one blade to fit into a frame in the other and so a recurrence was prevented in future operations). Upper 3/10 of B cut up and then stomach and duodenum were seen together in the usual way. There was some troublesome haemorrhage from the stump area.

3 pieces of iodiform gauge were packed round the site of operation.

The great advantage of Metzen's tube was seen after operation. Oct 31, stomach washed out through W's tube, much black fluid and flatus came away - relieving the discomfort patient had felt in the stomach. Washed out
again at night when it caused the patient to fall asleep. He was also fed through the tube without waking him up and of course neither washing nor feeding involved any exertion on his part. Nov 2. Passed flatus: felt well till evening when pulse began to rise. Complained of fulness in abdomen and some pain. 10-15 Z brown fluid with acid reaction withdrawn through the tube and then stomach washed out with weak Condy's fluid. Tongue dry and he began to slur his words. Iodoform was present in the urine but not in sufficient quantity, it was thought, to warrant the suspicion of iodoform poisoning. As the gross quantity of iodoform used in any case is not so important a question as the individual susceptibility of the patient, no more iodoform gauge was put into the wound. Nov 3. Pulse fast - 130, - and inter-mittent and he began to look collapsed. The use of strophanthin hypodermically and nutrient enemata improved the pulse in character and rate (108) so the day went on. Stomach again washed out - still a considerable quantity of brown fluid. Foot of bed was raised. Pulse at 3 p.m.
began to fail. Strachan's ice give hypnotically given. 6 p.m. For the first time he returned a nutrient enema — always a bad sign in an abdominal case. Rectum washed out with soap and water enema — result a very offensive motion with small pieces of hard feces and much flatules. Patient had done thoroughly. Pulse grew weaker in evening but regular ~ 108. All this time perfusion milk and brandy was given by the mouth.

Nov 4. Patient grew restless, pulse weaker, unconscious and faint. Pulse imperceptible; patient seemed to be dying. 45/4 normal saline solution injected warm into vein of left forearm. At once pulse improved and patient was able to speak to his relatives. At 8 p.m. infusion of 36/4 normal saline performed because of weakness of pulse but the improvement was only temporary and patient died at 10:15 p.m.

Postmortem. In abdomen everything satisfactory — no pus — no peritonitis — pyelone patient. Cardiac failure the cause of death.

A good purge on Nov 2 or even Nov 1 would have done much to save this case but it was delayed to Dec 3 by authoritative advice from the medical side.
Dotted lines indicate limits of portion excised.

To indicate application of clamps.

After removal of the affected portion and the membranous sac of each side.

Case V. p. 47.
Case V.

R. S. aged 56. Admitted March 12, 1901. Complaint—Pain in stomach. Duration 8 weeks. In youth had indigestion but no trouble for 15 years. Weight 9 st 11 lbs. Illness began with pain in stomach—worse after food. Pain gradually got worse but he never vomited or had other symptoms. He lost much weight during these 8 weeks. Pain was referred to the epi-gastric region. Tumour (hard) felt to R. of mid line movable with respiration.

Test meals. Stool almost absent—no turinase, yeast cells, or lactic acid.

Operation—March 16. At pyloric extremity of the stomach a hard tumour of the size of an orange was found going round the whole lumen of the stomach reaching contraction of that portion of the organ. Its limits were fairly definite. One enlarged gland in omentum near it. Decided to excise at pylorus and portion of stomach affected. This was done. To have been left end to end the stomach and duodenum would have caused too much tension so both cut ends were sewn up and a
posterior gastrojejunostomy was done between the remaining part of the stomach and the jejunum in the usual way.


Mar. 21. P. 86 - Fast 6 dinners. In evening pulse went up to 118 and he began to go "off his head." Pulse came down again.

Gradually he got better but remained "off his head" and suspicious. Apr. 16. He went home and his wife told him she would stand none of that nonsense and there was no more of it! His weight then was 7 at 1 lb.

April 1902. Enjoy good health. Fit for work. Occasionally, if indigestion in diet, has touch of indigestion. His rumour to be felt and no tenderness over epigastrium. Weight 10 at 12 lb which is considerably above his normal weight before operation.

In connection with post operative insanity,
Dr. Clowton says that in nearly every case it is found that iodoperine has been used as a dressing. In this case iodoperine was used.

Malignant Tumour of the Pylorus.
Palliative Operation: Gastrotomopy.
One Death: Four Recoveries.

Case vii.

Mr. L., aged 68, Admitted, Dec. 10, 1900.
Complaint: "Lump in the stomach, pain and vomiting after food." Duration 1 year 9 months.

In Spring 1899, illness began with pain after food, and vomiting, and this condition remained and increased in spite of medical treatment. He vomiting of blood. Gradually grew thinner — before illness weighed 12 ft. 7 lb. On admission, 5 ft. 7 at 2 lb. As she grew thin, she noticed and felt a lump in her stomach which was painful on pressure. Great constipation. Previous health good. Strong family history of probable cancer — father, mother, and twin brother all having died of tumour of alimentary canal at advanced ages.

Examination — Emaciated anxious look. Sallow
Anterior Gastrectomy
Case VI. p. 50.
earthy complexion - oral swelling of about size of duck's egg, felt lying transversely in epigastricum slightly more to R. than L. side, moves with respiration. Lymphatic glands in R. groove enlarged and hard; in L. group hard and shotty but not enlarged.

Test meals. HCl absent.

Dec 14. Operation. A large, hard, irregular tumour found occupying the pyloric end of stomach, affecting especially the lesser curve. A large indurated gland found in the omentum. Tumour considered malignant. Pylorectomy not thought of because of advanced stage of disease and the extreme weakness of the patient. Anterior Gastroenterostomy done, and with great expedition, as patient's pulse went up to 140 and became somewhat irregular, was slightly sick after the union of stomach and bowel had been made and fluid was seen to pass freely from stomach to intestine. 3 hours after operation patient was sick but never again.

Recovery rapid and uninterrupted.

Jan 8. Weight 7 at 5 3/4 lb. Jan 10. Went home, free from all symptoms and no
tumour was palpable after repeated examination at all times and in all positions — though before operation tumour had been both easily palpable and easily visible.

Jan 16. Returned to town to report. Weight 7st 7 lb.

Patient was living & well two months after operation. Then lost sight of. But it is certain she is dead.

This patient had but a few weeks to live at the time of operation. Her symptoms were so distressing that though she was very weak operation was carried out with the utmost satisfaction to everyone. This case shows that gastro-enterostomy rapidly and skilfully performed produces little shock, for her pulse, though it was rapid at operation, fell in the afternoon to the normal 75 and was never disturbed later.

Case VII

J. M. aged 59. Admitted Aug 7, 1901. Complained of pain in stomach; night vomiting; loss of weight; duration 12 months — worse for six weeks. In Aug 1900, began to have pain after food, heartburn 1 hr after food, flatulence, constipation.
Tumors of Pyloric Glands -
Case VIII - p. 52.

Park. Gastric ulceration - Macule -
Color turned up on stomach. Dotted line x indicates change into less.
Site of puncture - V. Vascular knockdown. Through the change x
It appears to exist under stomach.

Previous health and family history good.

Examination - Patient was pale and jaundiced, with very cold extremities. Epigastrum prominent, pulsations occasionally seen in it. Resistance felt in R. Hypochondrium and sometimes a movable tumour was palpable. Lower borders of stomach came 1" below umbilicus.

No free HCl in stomach after repeated test meal.

Aug 17, 1901. Operation, much free fluid in peritoneal cavity. A large tumour of peritoneum found, to all appearance malignant, and also many enlarged hard glands along the lesser and greater curvatures. Stomach fixed even at cardia end. Duodenum and jejunum found to left of middle line. Posterior Gastrectomatomy done. The mesocolon was very vascular and the stomach wall very thick.

murmur. Sept 6. Got up but feet began to swell. Oedema of feet and the cough gradually disappeared and he went home.

Nov 6. Called at R. I. E. feeling well — no swelling of feet but cough had returned. No palpable tumour. Weight 94 at 7 lb.

Phthisis rapidly developed at home and he died of this disease on Dec 6, 1901. He had no gastric symptoms of any kind and up till death no palpable tumour. A section, which would have exceedingly interesting, was refused.

Case VIII.

I. M. L. aged 44. Admitted Dec 19, 1900. Complainant: "Windy pains in stomach." Duration 15 months. Began in August 1899 with pain in stomach 3 or 4 hrs after food, much flatulence. Intermittent pain with alternate constipation and diarrhoea continued till July 1900 when water retention began followed in September by vomiting 1-12 hrs after food. Vomit sometimes "brown." Powders relieved the symptoms, but his doctor, detecting a tumour in the epigastric region, sent him to R. I. E.
During illness lost 3 stone weight.

Examination, healthy colour of countenance. Hard irregular lump felt in mid line of epigastrum movable with respiration and of the size of a duck's egg, the long axis lying transversely.

Previous health and family history satisfactory. Weight 8½ stones. Feces contained no free HCl.

Dec 22, 1900. Tumor, firm and hard, found occupying pyloric third of stomach. Stomach much narrowed at that part. Omentum was crumpled and from hard nodules with cicatricial contraction round them were found (A. B. C. in diagram). Tumor thought too extensive for removal. Anterior gastroenterostomy preferred because of tacked down condition of omentum. Patient was sick on day of operation and day following.


Jan 24. Returned to P. I. B. desiring radical operation. Since he left he had lost 4½ lb.

No stomach trouble except once when he vomited after red broth.


Feb 1. Fistula from small intestine developed. Discharge alkaline and bilious. Dressed very frequently. Feb 9. Was very cheery all evening but during the night took sudden heart failure and died.

Lecture: Omentum, small intestine, covered with small nodules of secondary growth. In the stomach the cancer had completely blocked the pyloric exit from the stomach. Death due to cardiac dilatation.

Case 78.

to be made out, small in extent, merging with
dive, and disappearing under the left costal arch.
Tumour is nodular, hard, tender, causing nausea on
pressure, moves with respiration. Traumatic
perforation. Stomach — lower border 1" above
umbilicus.

31 Aug. 1901. Operation. Hard mass felt in
stomach occupying pyloric third but leaving
pylorus free. Tumour ran up on front wall
hence, in posterior Gastro-enterotomy which was
performed, the opening was made higher up
than usual.

Very sick that afternoon and next day.
Sept 1. Stomach washed out; sickness stopped.
Pulse continued rapid; patient sank and died
on Sept 2.

Sectio — Absolutely no peritonitis. Junction of
stomach and intestine perfect and patent.

This was the only death among all the
cases of Gastro-enterotomy. At the time of
operation, patient had at most only a week to
live, and it was her own wish that she should
have an operation, with the chance of recovery
which it offered.
Percussion of Abdominal wall.

Case II. p. 87.
Case X.

J. A. Admitted, Jan 28, 1901. Complaint. Pain after food. Duration 4 months. General health good. Began with pain in stomach just below right sternum and slightly to left of mid line. At first pain was relieved by food; later, food increased the pain. Pain appeared about 1 hr. after food. No vomiting. No helicemia. Had been getting thinner. Jan 28, weight 82 1/2.

Hard nodule of size of walnut felt in epigastrum 1 1/2" below tip of right sternum, movable with respiration, somewhat tender. Leading from it was a hard, flat, nodular mass, about 1 1/2" in diameter, in the left costal margin. A triangular area of resistance and tenderness (see diagram) extending upward into the left axilla.

Test meal - no helc.

Feb 13. Operation. Hard tumour found occupying the pyloric third of the stomach and running up near the small curve of the oesophagus. Post. wall of stomach more invaded by disease than the anterior. Rest of stomach not dilated. Liver normal. Enlarged glands found in great numbers alongside the vessels of the omentum and one or two at the very fringe of the omentum.

Recovery slow and characterized by considerable vomiting and diarrhoea. Weight came down.
to 72 lbs. on March 8. Then patient gradually gained weight and on March 14 weighed 74 lbs. and on March 18 went home. Patient was lively and getting fatter, but since then he has been lost sight of.

Note on the Absence of Malignant Tumors of the Abdomen after Operation.

An article appears in a Swiss Journal, March 1902 (über chirurgische hülle bei mage-krankheiten), which says, certain operations indicate how slowly some cancers progress. There are already a series of such cases described in literature. Stendel tells of 4 such patients from Gernysklinik, in whom the tumour on account of adhesion to the pancreas or on account of metastatic glands appeared inoperable and who enjoyed the best of health 22, 4, 5, and 5½ years respectively after operation. The quote among other authors Ahlberg, on whose case an autopsy was held 3½ years after operation, and that of Körneken whose patient survived 7 years (after operation) in spite of the fact that at operation there was a tumour of the pylorus, of the size of a walnut and another and larger in the gastro-colic ligament.

Stendel throws out the suggestion that there may be a special form of cancer whose metastasis may be non-malignant and which like Peritoneal Tubercle...
may have a tendency to quiescence after laparotomy.

Though unconnected with the stomach a case may be mentioned which came under the writer's notice in Nov. 1900. Mrs. S. aged 60 came to R.I. E. complaining of swelling in the R. lumbar region, constipation, loss of weight. On opening the abdomen, a mass as large as a coconut was found in the retroperitoneal tissue behind the Ascending Colon.

Dr. Bruce who was present, and Mr. Baird had no doubt that it was retroperitoneal sarcoma. Nothing was done but the wound was sewn up. From that date the tumour began to disappear and in one month patient left hospital with no palpable trace of it, feeling well, and weighing half a stone heavier.

The theory that connective tissue has the power of causing atrophy of cancer cells has already been mentioned. And in this may lie the secret of the quiescence of malignant tumour after gastroenterostomy. In many cancers there is, besides the malignant elements, an amount of inflammatory connective tissue surrounding these elements. The sudden relief from irritation afforded by gastroenterostomy may cause rapid organisation and contraction of this connective tissue with resulting atrophy or at least paralysis of cancer cells. Thus the cancer stops for a time ceases to grow.
When, after gastrectomy, a tumour of the pylorus disappears and is no longer palpable, the explanation may be that it gets adherent which drag it out of reach of palpation e.g. up under the liver, or it may be that, the inflammatory part of the tumour having collapsed, the remaining malignant portion is too small to be palpable.

But is it not possible that in certain cases, an actual cure takes place and that the cancerous cells are killed by the firm grasp of a resolute connective tissue?

I hereby declare, on soul and conscience, that the work for this thesis was done by myself, and that the thesis is my own composition.

James G. S. Jamieson

Westwood, Brechin,
April, 1902.