The Etiology and Treatment of Ulcer of the Stomach, with Special Reference to the Causal Relation of Anaemia.

By J. Rose M.A. M.D. C.M.
Various theories have from time to time been put forward to explain the origin of ulcer of the stomach. Some of these are fairly well supported by clinical and pathological evidence, while others may be said to be purely speculative. Indeed, I think it may safely be said that about the connection of no other disease has there existed a greater diversity of opinion than about the origin of gastric ulcer.

And yet if ulcer of the stomach is to be regarded as a disease per se, a specific disease, and not merely a combination of different pathological conditions, surely it is only reasonable to suppose that it must have some definite and constant cause. That so many different causes as have been adduced to explain the origin of gastric ulcer should each and all be capable of producing a pathological condition or result, the characteristics of which are, at least in the early stage of the disease, practically uniform and constant, does not satisfy the scientific mind of the present day; and to the skeptic who comfortably assigns a small
share to very different explanation that may be brought forward, and attributes the final result to the happy joint efforts of all combined, it must be explicit that it is no more probable than that each of the specific fevers is due to a multiplicity of causes.

Several other diseases which until quite recently were in an equally chaotic state as to their etiology, for instance, rheumatism, melana, and certain so-called constitutional diseases, have now found their proper place amongst the infective diseases, and although I do not wish from this comparison to be supposed to form the view of the bacterial origin of all of the diseases. I hope I may be able to suggest an explanation of the actual and immediate cause of the disease which would place it in an equally rational position as to its etiology.

This diversity of opinion as to the origin of clear of the stomach may perhaps partly be explained by the ideas that prevail as to the exact pathological nature of the disease itself. For instance, opinion is divided as to whether there
is an acute ulcer of the stomach as distinguished from a chronic form, that is, etiologically distinct, or whether the chronic is simply a later stage of the acute. This is a vital point, and in order to arrive at any rational explanation of the exact origin of the disease, one or other of these views must be adopted and adhered to, otherwise we are soon involved in a maze of confusion and contradiction. The view I adopt is that there are not two etiologically distinct forms of the disease, but that the chronic is simply a later stage of the acute, the acute from which it is the direct offshoot. This considerably simplifies the much vexed and debated question as to the immediate origin of ulcer of the stomach, for it will now only be necessary to find the cause of the acute or react ulcer. The circumstances or influences which lead to chronicity will be considered later. Holding this view as to the identity of origin of the acute and chronic ulcers, greater significance and importance than has hitherto been accorded them, will attach to certain factors which are generally agreed to act
as predisposing causes and these we shall now consider.

Sir. It is admitted by all that the disease is much more common in females than in males. Statistics on this point vary considerably chiefly on account of the want of uniformity in the methods adopted in dealing with the subject, acute and chronic cases being sometimes considered together, and sometimes separately. Taking all cases of ulcers together it is seen that the ratio of females to males is usually stated to be as 3 to 1, though Prunwell found a greater frequency in females than males than this, and in some hospital and private records which I have myself examined into, I find the proportion much higher.

Of 22 cases which came under treatment at the West London Hospital in 1900, 20 were females and 2 males.

Of 275 cases treated at the Edinburgh Royal Infirmary during the three years 1899-1902, 254 were females and 21 males, a ratio of 12 to 1.

Of 62 cases treated in D. Sandby's wards at the General Hospital, Rhone
in the last twelve years, 60 were females and 2 males, there being no restriction as to the number of males admitted.

In a series of 20 cases which have come under my own observation and treatment in private practice during the last four years, 17 were females and 3 males. Emmick, taking acute cases alone, from past medical records, found the proportion of females to males to be 10 to 1.

From these figures it will be seen that the proportion of females to males even when acute and chronic are taken together, is much higher than that generally allowed; and when acute alone are considered, which from my physiological standpoint is the only rational way of arriving at the correct estimate, the ratio is still higher.

Emmick's estimate in acute cases past menstrum, I think we may safely put the true proportion at 15 to 1 at the least, as many of the acute cases occurring in young women would probably heal, while a smaller number of the cases amongst males, occurring as they do about middle life, would be more likely...
to prove fatal.
Age. Here again statistics differ from kind
of similarity in the method of arriving at
sound conclusions. A distinction must be
drawn between the age at the onset of the
disease and the age when the case came
under treatment. On this point Byron
Bramwell gives some interesting and
instructive figures. In a series of 156
cases in private and hospital practice,
(13 males and 143 females) the age at
the time of the patient’s admission to
hospital in 16 cases was below 20 years:
110 cases between 20 and 29 inclusive;
25 cases between 30 and 39 inclusive;
14 cases above 39 and 1 case no notes.
At the onset of the disease the age in
37 cases was under 20 years: 83 cases
between 20 and 29: 16 cases between
30 and 39: 9 cases over 40 years: and
11 cases age not stated. Unfortunately
no distinction is here made between the
ages of the females and the ages of the
males, a rather important matter from
my point of view, but as only 13 of the
whole number are males, the conclusion
to be drawn from these figures is pretty evident, namely, that three-fourths of the whole number began before the age of 30.

Ponshick finds that out of 288 females, the disease began before the age of 30 in 75%, while out of 95 males, the disease commenced after that age in 60%.

Taking the age without the above distinction as to time of onset, which is often difficult to ascertain, the average age of the females in the West London Hospital series referred to is 27 and of the males 44.

In my own series the average age of the females is 25 and of the males 30.

The Edinburgh and Birmingham series show the average age of the females and males to lie about the same as those in the last two series given above.

Occupation. In his series of 186 cases, Bramwell finds that 103 were employed in domestic service or household work, while the remainder were variously employed. Of Dr. Yardley's 62 cases, 34 were employed in domestic work, and the remainder in factories, shops, and schools.

Of my own cases all the females were
Two exceptions, these being in comfortable circumstances, were employed in domestic service or household work. The preponderance of the disease amongst domestic servants is thus well attested, and is very striking and suggestive.

Before proceeding further, it will be well to bring together the points that have so far been established. They are: (1) that ulcer of the stomach occurs more frequently amongst females than amongst males, the ratio being, in the cases of acute cases, about 15 to 1; (2) that it occurs amongst females, that is, begins, in three fourths of all the cases, about the average age of 25, and in males about the average age of 45; (3) that if females affected with the disease, nearly two thirds are engaged in domestic service or household work, and the majority of the remainder in work which entails close confinement indoors. The significance of these points will be alluded to later.

Associated Diseases which may act as Predisposing Causes.

Tubercle. Ulcer of the stomach has been found in persons suffering from tuberculosis, but
The character of the ulcer is more specific of tuberculosis than of the true idiopathic ulcer of the stomach. When typical gastric ulcer does occur in phthisis it will probably be found to be due to the anemia induced by that disease or to some altered condition of the blood resulting therefrom.

Syphilis. Here also ulcers are met with, but when not directly associated with a gumma, they are probably due to syphilitic endarteritis or to some deteriorated state of the blood. These cases will be more likely to occur in middle life, and may help to explain the greater frequency of ulcer in men at the time when it has been noted ulcer of the stomach is most common amongst them. For the reason of the syphilitic poison in the blood need not occur at once, though the disease itself may be contracted early enough. Ulcer of the stomach is said to occur also in connection with heart disease. Bright's disease, anemia, and pyemia.

The sweet mode in which these various diseases may act in producing or predisposing to ulcer of the stomach, will
be shown when we consider the pathology of

Anaemia. This is the one disease more

than any other that can be shown to have

an undoubted etiological relation to ulcers

of the stomach. In order to prove any

causal relation, it must be shown that the

anaemia had existed for some time prior

to the appearance of the symptoms of

ulceration; for secondary anaemia will

almost always be found to be present,

as a result of hemorrhages, by the time

the patient comes under treatment.

On this point I have taken some pains

to obtain statistics. Most writers on the

subject of peptic ulcer, while admitting

the frequent coincidence of anaemia,

not to make any mention of preceding

anaemia, although it must in many

cases have been present; while others

who admit chlorosis to be a possible

precipitating cause, fail to give any

figures as to the frequency with which

it occurred, and I have found it
difficult to ascertain this from hospital

reports. It is surprising in view of the
admittedly close connection between anaemia and gastric ulcer, how seldom the question of an antecedent anaemia is referred to at all. I have however succeeded in obtaining some statistics which show the frequency with which the two conditions are associated, that is with the anaemia preceding the ulcer.

Of the 22 cases treated at the West London Hospital in 1970, there was a distinct history of antecedent anaemia in 15, a doubtful history in 5 and no history in 2. In both the males in this series anaemia had been present, the condition in one of them having previously been verified by blood count.

Of my own short series of 20 cases, the 17 females without exception had a history of chlorosis prior to the development of the ulcer, and one of the males.

Fennicke has noted a definite antecedent history of anaemia in 72% of acute or recurrent cases, while in a large proportion of the other cases, he says it was highly probable that the patient had suffered from chlorosis shortly before the occurrence of the haematemesis or perforation.
The further gives another very suggestive record.
Of 100 cases of severe anaemia in young women it had definite signs of ulceration while 9 had symptoms highly suggestive of the disease; while among 100 other soils suffering from various complaints 88 of the chronic was diagnosed in only 8.
In 75 of Bromwell's series of 156 cases the patient had suffered from anaemia or chlorosis before the ulcer developed.
In the Edinburgh Hospital Reports for the six years 1876-1882 anaemia is stated as an antecedent condition in only 15.9% (95 cases in a total of 576) but this percentage is probably much below the mark.

These are the only records of pre-existing anaemia I have been able to gather, but it cannot be admitted that they are striking, and I think, point conclusively to a very intimate causal relationship between the blood condition and ulcer of the stomach.
It may be urged against these statistics that the anaemia was a result and not the cause of the ulcer, but I think that
very care has been taken to eliminate that probability. Believing as I do that anaemia, or some other blood dyscrasia, is a necessary antecedent of gastric ulcer, there is one assumption that must be made before I can establish my point; and that is that those cases in which ulcer commenced on the anaemia, were either not treated for that condition (the anaemia) or treated unsuccessfully. Of course we know the difficulty there is to retrieve in those cases of anaemia, and also the dislike the patients of that class have to remain under strict treatment for any length of time. So I think we may assume that if they sought advice for their symptoms at all, they only submitted themselves to treatment in a half-hearted manner. If I could establish the converse of this proposition, namely, that no case of anaemia that had been appropriately and successfully treated, and that had suffered no relief, had ever developed ulcer of the stomach, I should be an absolutely safe ground. In my own experience of chlorotic cases, which
Naturally has only been limited, I have never known ulcer of the stomach to occur after the cholecystitis had been cured, and no relief had taken place. On this point also I have endeavored to ascertain the experience of others, but so far as I am aware no observations have been made on the subject.

From the foregoing considerations it will thus appear that ulcer of the stomach is much more common in women than in men, the proportion being about 3 to 1; that in the majority of cases in women the disease begins at an early age, the average being about 23 years, and that it occurs mostly in women employed in domestic or household work. It will further be noted that in addition to its greater frequency in women than in men, it occurs in the former for the most part at an age which coincides with that at which melancholia is most prone to develop, and under the environment that is found to be so closely associated with anaemia.

Finally, we have seen that the cases occurring in middle life are often
associated with diseases incident to that period, and that these diseases have a
Additional influence on the blood, and so
Underlying it capable, as the study of the
Pathology will show, of leading to ulceration
of the stomach.

The Situation of the Ulcer. According to
Fenwick, in nearly 76% of all cases the ulcer
is situated in the pyloric region of the stomach,
next the lesser curvature, and on its posterior
aspect "in relation closely in accord with
that of Welch. Taking acute cases, which
in my opinion alone afford the true histo-
logical index, it was found that they occurred
with almost equal frequency at any
point between the cardiac and pyloric
end, along the upper margin and more
frequently in the posterior than the anterior
surface, and that two thirds of the whole
number occurred along the lesser curvature,
the remainder along the pyloric, that is
in close proximity to the two main
vascular channels and not where their
branches enter the walls of the stomach.
This evidently suggests the site of the ulcer
to have some close connection with the
Distribution of the arteries of the stomach.

Now as it is known that the acute or recent ulcer of the stomach under appropriate treatment often heals rapidly and completely, sometimes without leaving a trace of its existence, the statement that the great majority of ulcers occur in the region of the pylorus may only be apparently true. For in that region they would be more likely to become chronic on account of the peculiar movement and irritation they would be subjected to, and also on account of the proximity of other organs to which adhesions are affected, while many which had existed in other parts may have healed.

Naked eye appearances of an acute ulcer.

An acute or recent ulcer usually presents the appearance of a circular opening in the mucous membrane, the diameter being about the size of a threepenny piece to a sixpence. It looks as if a hole had been punched out of the wall of the stomach with a wad punch. The depth of the ulcer varies, it may only involve the mucous membrane as far as the submucous coat,
so it may penetrate to the serous coat, the appearance in the latter case being that of a cone or funnel. The deepest portion of the ulcer is not actually in the centre, but directed towards the side from which the blood comes (Taylor). Thus when the ulcer is situated near the lesser curvature, the apex slopes upward towards that curvature, and when situated in the lower part of the stomach the apex points toward the greater curvature. The main vascular channels running along both curvatures. In this, the early stage of the ulcer, there is no sign of reactive inflammation, the edges of the ulcer being clean cut and smooth with no thickening. The base also is smooth. When the ulcer has become chronic the appearance is somewhat different. The opening at the mucous surface is generally much larger, and though generally circular is often irregular in outline, and the depth is considerable. the ulcer often penetrating into neighboring organs, for example, the liver, spleen, or pancreas. This, as already pointed out, is a probable explanation of the chronicity of the ulcer.
in these situations, the adherences formed prevent any communication with the pharyngeal cavity. Here there are signs of active inflammation with the formation of necrotic tissue, and numerous scars may be seen in the immediate neighborhood. Indications of old ulcers now healed.

Microscopically, in the acute form no signs of inflammation are seen, the process evidently having been a simple necrosis with solution of the dead part by the gastric juice. A section from the edge of a recent ulcer when seen under the microscope shows the tongue-shaped gland tubules ascending toward the base of the ulcer as if they were cut off. They are abruptly ended, that is, they are retracted to the point at which the tissue is able to resist the digestive action of the gastric juice (Wells).

The capillary vessels have been found to contain hyaline thrombi (Wells). In the chronic form the arterioles in the deeper part of the mucous coat and in the connective tissue beneath it usually show inflammatory changes of their inner and middle coats, which in
Some instances present complete occlusion of the lumen (Penwell, Correll, Runnich). Occasionally, the arteries, veins, and venules near the base of the ulcer are either blocked with blood clots or filled with thrombi of a hyaline character (Penwell). Hyaline changes in the walls of the vessels themselves have been noted by others. Thrombosis of the vessels is frequently found in the chronic form.

These constitute the chief naked eye and microscopic appearances.

Once established, unless the causal condition underlying has been successfully treated, the necrotic process either goes on to a fatal perforation or produces a fatal hemorrhage; or if the hemorrhage is not immediately fatal, acute inflammation acts in, and we get the formation fibrotic tissue and adhesions to adjacent organs; or these organs may actually be invaded and death result from the section of an important blood vessel in their substance.

Pathogenesis. We have seen that the characteristics of an acute ulcer are very definite and constant; this therefore suggests some definite and constant cause.
and to the consideration of this point we shall now turn more particularly.

In order to arrive at a sound and logical hypothesis, it will be necessary first to examine and review the hitherto commonly accepted theories as to the causation of gastric ulcers. Of these we shall consider first that which ascribes the cause to hyperacidity of the gastric juice. It has been found that in a great many cases, perhaps in the majority of cases of gastric ulcer a state of hyperacidity of the gastric juice has been present, and from the frequency of this occurrence it was naturally come to be looked upon as a cause of the ulceration. The advocates of this theory argued that pepsin some small erosion of the mucous membrane from any acute, traumatic, thermal, or chemical causes, the hyperacid juice acted on the eroded spot and started an ulcer which had a tendency to spread until it developed into a typical ulcer. But as ulcers of the stomach is usually single, and as there would probably be more than one erosion from the above-named
Causes, and as the gastric juice would be everywhere active, we should expect to find numerous ulcers. On this point the advocates of this theory are silent. Indeed their difficulty would seem to be not so much to find an explanation of the solitary ulcer as to explain why there was any of the organ left at all.

But that is not always the case if hydrochloric acid present, and Poulard and others have shown that there is even sometimes a diminution in the amount. This theory itself is therefore untenable as the determining cause of the ulcer.

It would be well however, before dismissing the subject, to inquire what the significance of the excess of hydrochloric acid really is, as it is so frequently present. Granted that there is this excess of hydrochloric acid, is there no other rational explanation that can be put upon its presence. Hydrochloric acid is a powerful germicide and disinfectant in destroying bacteria introduced with the food. Modern research has in fact led to the remarkable result, that the average amount of hydrochloric acid found in the gastric juice...
just about coincides with that which is found experimentally to be required to check the growth of most fermentative organisms and many pathogenic bacteria (Ckiefc). I suggest therefore that the access of hydrochloric acid if present is a provision on the part of Nature to inhibit these fermentative changes and to destroy pathogenic bacteria.

And in what condition is this rate provision needed more than in those debilitating states - anaemia, chlorosis, scurvy, syphilis, tuberculosis, septicaemia, pyaemia, Bright disease, and chronic valvular disease of the heart - in which protein lack is so common? In these diseases one of the most troublesome and one of the commonest complications is indigestion in which fermentative changes are so often present, and in which also, probably, various pathogenic microbes are present and likely to make a settlement and attack on any vulnerable spot. Is it possible, in this provision any more unreachable than that seen in any inflammatory process due to organisms, where takes place that pitched battle biochemically so intense.
by Professor Chirne between the leukocytes of the blood and the invading pathogenic organisms. It is chiefly an effort on the part of nature to resist a motile activity.

It is well known that organisms are very rarely found in the stomach in acute ulcers and this is no doubt due to the bactericidal power of the hydrochloric acid, and this is in accord with clinical manifestations, also, for in cases of acute ulcer of the stomach we get no pyrexia such as we should expect to find in acute ulceration. Hyperacidity, therefore, so far from being the cause of ulcer, is more likely the result.

Pneumococcosis has been said to cause ulcer of the stomach. That this does so by itself in persons to whom there is no alteration of the blood, is doubtful.

In this connection should make the case of an American sailor who, after seeing a juggler performing the trick of swallowing a knife tried to imitate the feat by swallowing his own pocket knife. He did so successfully and went on to eat three more, and suffering no
ill effects, he remained till he had swallowed sixty-five knives in a period of ten years. He died at Guy's Hospital, and at the autopsy although the stomach was found to contain thirty blades and various handles, no sign of ulceration or tear of any kind could be found. How it cannot be doubted but that these blades must at some time or other have inflicted wounds on the wall of the stomach, and yet no ulcer resulted. This shows how quickly and completely abrasions or wounds of the stomach heal.

Chemical and thermal irritants may conceivably set as causes of ulcer but as the number of instances in which they would set as causes is so small we need not inquire into their mode of actually producing the ulcer.

Ulcers is said to occur frequently in connection with rheumatism and syphilis, tuberculosis, Bright's disease and heart disease; but as I consider the means by which they actually induce ulceration is in effect the same as that by which it is brought about ni
embolism and thrombosis. I have the further consideration of this point till I deal with the latter theory.

The theory of Bacterial Necrosis has been strongly advocated by some and more especially recently. It has been pointed out that ulcer is most common where the bactericidal action of the gastric juice is least felt—along the lesser curvature and at the pylorus—but against this is the fact that the ulcer is usually simple, whereas if it were due to bacteria we would have expected to find multiple ulcers.

Having considered these various causes and having found them insufficient to explain the real origin of the ulcer we must now look in another direction for that origin.

In studying the pathology of the disease we saw that the process was not an ulcerative one in the strict sense of the term at all. There are no signs of inflammatory reaction. There is no granulation tissue and infiltration of the surrounding parts with all elements in a recent ulcer—and I make no distinction between the acute and chronic form as to actual cancerous, as already indicated.
the latter being merely a later phase of the acute. It is purely and simply a necrotic process with ulceration and digestion of the dead part by the gastric juice. Now a necrotic process in the stomach, as in any other part of the body, can only take place by a deprivation of arterial blood to the part. What causes the obstruction to the arterial supply, and what determines the shape of the ulcer we shall next endeavour to show.

An ulcer may be occasioned by embolism or thrombosis, or by direct pressure as by an aneurism or other tumour. That embolism or plugging up of a blood vessel might explain the immediate causation of a gastric ulcer is no new theory. Virchow having proclaimed it half a century ago. Although we refer to him, thrombosis is common enough in different parts of the body in cases in which ulcer of the stomach occurs, and embolic or embolic might well therefore, it is only in rare instances that embolism is the direct cause of the eroded ulceration, except perhaps in those cases, the rare, where septic dispersion
are said to constitute the emollient, although
from here it seems more probable that they
really lead to obliteration of the vessel by
setting up thrombosis. We are therefore left
with thrombosis as the immediate and
actual cause of the localised necrosis. the
so-called ulcer of the stomach.
In studying the pathology of gastric ulcer
we noted that hyperplasic thrombi are frequently
observed in the capillaries in recent ulcer,
as also in the chronic form, and Fermor
admits that the gradual obliteration of a
vessels leads to a thrombus in one of the
principal causes of the chronic form of
the complaint. Now if thrombosis acts as
an immediate cause, it must act at the
first formation of the ulcer, that is when
the ulcer is acute or recent. It is possible
that in the acute stage the thrombotic process
may not be so evident nor so disabling
as in the chronic condition, but this
might be explained by the extreme fact
of the short duration of the former.
But if thrombosis is to be accepted
as a cause of the increased blood supply
we should expect to find the capillaries
and arteries of the stomach well supply generally affected, and not only one vessel.

That many of the arteries are so affected, although the thrombotic process may not have reached the stage of complete occlusion, has been proved by Galland (Galland), Welch has drawn attention to the presence of hyaline in the capillaries and arteries in the walls of some fresh gastric ulcers. "At the edge of the ulcer the vessels are constantly found to have under some degree of hyper trophy of their walls and narrowing of their caliber. Very marked alteration of the gastric arteries has also been observed by ourselves and Bensel. 

This seems to be itself a sufficient cause of ulceration by the hindrance of the circulation which results." (Conrad-Penfield.) It is evident therefore that degenerative changes in the blood vessels referring in the walls of the stomach are common in cases of gastric ulcer and constitute one of the important conditions necessary to thrombosis.

Experimental evidence of the thrombotic or thrombotic theories is not plentiful, and
When we consider how difficult, perhaps impossible, it would be to induce in animals the exact state of blood which favors the development of ulcers, the results of evidence is not surprising. I will however mention one experiment of Silbermann's which is of some significance. It is known that if small pieces of the mucous membrane of the stomach are torn away by means of forceps the wound is treated locally without any difficulty, but Silbermann showed that if the dogs were bled until marked anaemia resulted, similar wounds of the mucous membrane produce ulcers resembling the peptic ulcer of man. The significance lies in the fact that these ulcers only resulted after an anaemic state of the blood had been induced. Silbermann has also produced typical peptic ulcers by causing artificial anaemia by means of chrome lead injected into the arteries.

Svart mentions an experiment by Lechle in support of the embolism origin of ulcer by microbes. He injected into a necrotic pig's a culture from ulcers.
found in ulcer of the stomach in a case of
perforating ulcer, and typical perforating
ulcers of the stomach resulted. Repeating
the experiment with different organisms
produced the same result.

Martin is of opinion that bacterial invaded
are the cause of duodenal ulcer and also
of gastric ulcer when each occurs in the
case of epithelium and staphylococci.

If these bacteria and certain poisons
circulating in the blood can be shown to
produce ulcers of the stomach either by
embolism or thrombosis—more probably
by the latter, the process being set up in
the vessel wall by the irritation of the organism
or by the altered state of the blood induced—
we may reasonably enough assume that
other methods of the blood might
predispose to thrombosis and similarly
lead to ulceration.

That the causes which lead to thrombosis
are present in anaemia or chlorosis, in
which disease ulcer of the stomach is so
common, I shall now endeavour to
show.

The three conditions which form thrombosis
are (1) slowing of the circulation, (2) impairment of the vessel wall, and (3) alteration in the blood.

In consequence of the diminution of haemoglobin in the blood and hence of the imperfect oxygenation of the tissues in anaemia, we find that certain degenerative changes in the heart and blood vessels result. The heart becomes fatty, and as a result, dilated, and there is fatty degeneration of the blood vessels also. The calibre of the vessels is smaller than in health. The stomach is usually dilated. Thus further hindering the blood flow. All the symptoms of slowed circulation are to be seen in any case of chlorosis or prolonged anaemia.

In connection with changes in the blood as a contributory cause of thrombosis, the fact that has the most important bearing on the subject is that the blood platelets are in excess in anaemia. The most recent investigations have shown that the blood platelets are the primarily essential elements in the formation of a thrombus (Moor-v-Wilch). Moor says that in thrombosis definitely occurring you may have degenerative thrombi or fibro-thrombi; but when it is of gradual onset, it is improbable
That the first phenomenon is a deficit of blood platelets. They are the first element of the blood to adhere to the vessel wall at its point of injury or irregularity of surface, and around them the thrombus forms. Assuming the vessel wall participates in the fatty change, and the endothelial lining is probably too altered as to become the adherence site of the blood platelets and thus lead to the formation of a thrombus.

An excess of blood platelets has been found in association with several diseases in which thrombosis is a common complication. According to Mouri they are markedly in excess in chlorosis and according to other authorities in pre-haemorrhagic anaemia, haemorrhage after childbirth and in other conditions, in all of which thrombosis occurs. Thus myself quite recently obtained several thrombi after a more post-partum haemorrhage in one case, and in another after confinement in a patient who had been very anaemic before pregnancy.

In serious anaemia the platelets are diminished (Bramwell & Wick).
and it is noteworthy that thrombosis and ulcer of the stomach are rare in this disease if they occur. We see then that there is a marked increase in the blood platelet, in those diseases in which thrombosis occurs, and we further see that these are the very diseases with which gastritis ulcer is most closely and frequently associated, the conclusion from which proceeds, is that thrombosis and gastritis ulcer are closely associated.

In considering the blood supply of the ulcer, we saw that the necrosed area corresponded in size and shape to the area supplied by one arteriole in the wall of the stomach. "An artery which sprouts from the posterior surface of the stomach and divides and subdivides in the muscular layers, the submucous coat and the mucous membrane has the form of a cone with its base toward the mucous membrane." We saw also that the blood vessels in the neighborhood of the ulcer contained hyaline thrombi and that the blood vessels in the stomach generally showed amyloid and other degenerative
Changes. The obvious conclusion to be drawn from these facts is that the so-called clear is the result of thrombosis (or occlusion by any cause) of the arteries supplying the affected area; that the chief predisposing cause of thrombosis is anemia, although the morbid blood clots may also predispose to it, the excess of the blood platelets in all being the all-important factor.

In my opinion we have a perfect analogy, except for the element introduced by the gastric juice, to ulcers of the stomach or the intestines which are met with in the heart, kidneys, spleen, lungs and brain. These ulcers correspond to those supplied by the constricted vessel and that occlusion is generally caused by thrombosis. There is still a further analogy in the fact that ulcers of the stomach and the intestines referred to generally occur in connection with the same diseases.

Having considered the etiology and pathology of the disease we now come to the question of treatment; and having ascertained the cause of the ulcer to be thrombosis
due to anaemia (except poisons) in this morbid blood state, our treatment must therefore be directed fundamentally against these morbid blood conditions. Here I must acknowledge my indebtedness to Dr. Snowdon for first suggesting a rational and successful method of heating gastric ulcer, although I claim the merit of having for a period of over four years most consistently carried it out in every case that came under my care. Indeed it was the striking and uniformly successful result of this particular line of treatment that led me to theorize on the exact origin of the disease, and having a considerable amount of clinical evidence of my own to bring forward in connection with it, I thought it might serve as a subject for my thesis, although I was only too well aware that the subject of gastric ulcer had already been made the subject of speculation almost ad nauseam. Still if my theory is no new one, I felt that I had some results of my own experience that would support the
Thrombotic view of the origin of the disease, and this view being disputed by many authorities, I need plead no excuse for attempting to add a little more evidence to the already existing pile in support of it.

About four years ago I brought to see Dr. Sandbly a female patient aged 33, in whom I had diagnosed ulcers of the stomach, and whose symptoms I had not been able to mitigate for any length of time by the usual treatment with bromide, alka
di et. The patient had suffered from the complaint for three years, and had frequently been under treatment for melancholy before the symptoms of ulceration developed. At the time of the consultation she showed all the signs of chronic ulcer of the stomach, and Dr. Sandbly further showed that there was marked dilatation of the organ. The patient was advised to have absolute rest in bed for a month. As there was no acute hemorrhage she was ordered milk and lemon water, 1 oz. every half hour.
to be tipped slowly. If no pain occurred after this the quantity was to be gradually increased each day and the intervals between lengthened. New through regular and easy stages as the patient was found to tolerate it. Soft bread and milk, custard and eggs, pounded chicken and fish with mashed potato and so on to ordinary diet. If hematemesis occurred all feeding by the mouth was to be stopped for twenty-four hours and nutritious sucreala feed.

For the pain a mustard compress over the stomach was ordered. A mixture containing Mag. Sulph. Zl., Fer. Sulph. Zl., Acox Sulph. del 2l. in Tinct. Ap. Mouth. Pf, Zl. to be taken three daily was prescribed. This line of treatment was rigidly carried out and the patient made a rapid uninterrupted and complete recovery.

She is now in the enjoyment of excellent health and has had no sign of recurrence.

The result of this case was so strikingly successful that I determined to try the same treatment in the next case I met with. The result again was
the same, and so it has been in my whole series of cases. In only three of my cases was it necessary to resort to nutriment
formula on account of hæmorrhæa. And within the 24 hours the patients were able to take the milk and lime water.
It was remarkable how soon the painful symptoms disappeared, and it was never necessary to prescribe an antidote.

Dr. Sundby, as will be seen from his prescription, recognized the part played by anaemia in the production of the
disease. The heat must was quickly the heat ment of the anaemia and the constipation without reference to the
local condition of the stomach, except that the diet was the least irritating and most easily absorbed that could be prescribed. Improvement in the
condition of the ulcer, as evidenced by freedom from pain on taking food and by absence of tenderness on
palpation, soon followed the improvement in the blood, which was speedily manifested. With two exceptions all my cases were well within six
weeks; and the other two cases through
taking aloes and cocoa the weeks respectively,
ultimately completely recovered from
all signs of active ulceration, although
I fear some deformity of the stomach
has resulted. In practice to the treat-
ment I should say that these two cases
were of long standing, and had baffled
every other line of heat meath.

All my cases recovered, even those
in whom there was alarming hemato-
mesis; in fact those latter recovered
more readily than some of others.

This is an argument in favour
of the heat meath of all such cases by
medical means. It is important to
emphasize this at a time when surgical
means are being so freely advertised for
the cure of the disease.

Unless the condition of the blood
is maintained at the normal level,
haemorrhages are likely to occur. So I always
advise my patients when cases are the
least sign of recurring anaemia,
I put themselves under heat meath.

If a surgical operation had to be
Undoubtedly for such ulcers, and there must be the same liability after an operation as after a medical cure. Surely the latter method is the one to be recommended.

Of course these must become instances, if they can be accurately diagnosed, such as claustra of the pylorus, adhesions to, or erosions of, the duodenum, the pancreas, which demand operative measures. But even after operation I should advise a sharp look-out to be kept for returning added sequelae and promptly treat it.

Reviewing all that we have hitherto considered, we see that disea of the stomach bears an intimate relationship to cancer, there being no antecedent history of gastritis in about 75% of all the cases I have been able to inquire into. When in the Jour. Amer. Med. Assoc. Sept. 20, 1902, goes even farther than this, and says that he believes that there is a local or general anaemia present in every case of gastric ulcer, and that when this condition of anaemia is corrected there is a marked tendency to heal. This points
The relation of the anemia to gastric ulcer: and on inquiring as to the exact nature of this relationship, we found that the anemia predisposed to thrombosis. Then we saw that thrombosis depended upon an increase in the blood platelets, on slowing of the circulation, and on injury or degeneration of the vascular endothelium, all of which conditions are present in anemia.

A vessel, usually an arteriole, supplying a definite area, which is irregularly, becomes occluded with a thrombus and death of the part results. This necrotic part is disposed by the action of the gastric juice, and we get the clean cut, purple, round perforating ulcer of the stomach.

When ulcer of the stomach occurs in connection with this disease, we found that the same conditions leading to thrombosis were present, and that the manner in which the ulcer was produced in them was precisely the same as that in anemia, the blood condition in them also being mainly
The of anaemia induced by the specific toxins of these diseases.

And finally we saw that the most successful, as it was the most rational, line of treatment, was that which was directed against the condition of the blood which gave rise to the thrombosis, namely, the anaemia.