

This liability has been urged as a disadvantage, and certainly the necessity for repeatedly renewing the supply of the solution is a practical inconvenience; but the very liability of the hypochlorites is probably the essence of their efficacy in wound treatment, as contrasted with antiseptics of known stability; and it still remains to be proved that the application of hypochlorites through other than watery media is equally efficacious, as in their application by means of the oily media now undergoing trial, and which it is hoped may act as reservoirs parting slowly with the active ingredient and therefore not requiring frequent renewal.

The other substances as tested are devoid of this solvent action on dead tissue, which, unless of the highly delicate and easily balanced nature characteristic of Dakin's solution, may readily be dangerous as in the case of the ferments. The abdominal wall of a living mouse is rapidly digested by 1 c.c. of a 1 per cent. suspension of Fairchild trypsin, so that the intestines lie free from the cavity in a quarter of an hour, whereas 30 times this quantity of trypsin is borne without any evident effect when injected intravenously.

Secondary Hæmorrhage.

I have heard different opinions expressed as to the manner of action of Dakin's solution. The foregoing observations seem to make it clear that in a septic wound it acts both as an antiseptic and as a cleansing agent or remover of dead tissue liable to serve as a nidus for micro-organisms. The latter are caught, as it were, between two fires, the antiseptic action of the hypochlorites, on the one hand, and the natural defences of the living tissues with which they are brought in direct contact on the other. It may, of course, be a disadvantage to remove, say, all healthy fibrinous exudate from the surface of the wound, but this is more than counter-balanced by the removal of all dead tissue. The removal of dead tissue is extremely well exhibited in a case brought to my notice by Captain F. L. A. Greaves, R.A.M.C. The anastomotic magna had been ligatured in an open wound and the visible free end, under the action of Dakin's solution, began to show signs of disappearing, so that the occurrence of secondary hæmorrhage was feared. Nothing of the kind happened, however, the erosion stopping just before the point of ligature was reached.

Were the erosion of sound vessels the usual cause of secondary hæmorrhage this accident would occur in practically all cases. The evidence adduced above to the effect that erosion of the delicate epithelial membrane covering the abdomen of the tadpole is resisted by its local vitality may legitimately be taken as evidence that the same holds for man in view of the experience gained in the treatment of wounds. Part of the frequency of secondary hæmorrhage may be due, not to the action of the solution, but only to its improper application, say by pressure of the point of the Carrel's instillation-tube badly applied, and thus leading to injury. Where, however, secondary hæmorrhages are common or gross, or obvious septic thrombosis can be excluded, the accident should be regarded rather as an indication that the surgeon to-day can preserve wounded limbs damaged to such a degree that earlier in the war either the wounded man died or the limb was amputated. Even the most careful cleansing now habitually carried out may fail to detect small injured or infected vessels with or without thrombosis, from which the bleeding apparently almost always arises. The position in regard to secondary hæmorrhage appears to me to be very similar to that attending the occurrence of local tetanus or the more familiar post-diphtheritic paralysis. Both the latter accidents are met with as a result of successful attempts in saving life.

During the war much has had to be learned as to dressing or treating septic wounds as contrasted with those of intentional surgery, and although the goal has not yet been reached great progress has been made so far as one who is not a surgeon, although constantly observing wounds at a general hospital and a surgical observation hut, can judge.

Victor Hugo, writing of events supposed to have taken place in 1832, tells us: "The dressings were complicated and difficult and it was not without difficulty that chloruretted lotions reached the end of the gangrene" ("Les Misérables"); and perhaps had the beneficial eras of antiseptic and aseptic surgery not for the time banished such wounds as Victor Hugo alludes to, we should have been better prepared for the proper application of the hypochlorites, or have already obtained improvements on them.

(Continued at foot of next column.)

THE RETRACTION OF BLOOD-CLOTS,

WITH TWO METHODS FOR SECURING A LARGE YIELD OF SERUM.

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I. THE EXTERNAL FACTORS.

IN spite of the large amount of work that has been directed to the study of the coagulation of the blood, comparatively little attention has been attracted to what is in reality a part of the process—namely, the retraction of the clot by which the serum is squeezed out. The question is of much theoretical interest, and now that so much use is made of serum in diagnosis and treatment, of some practical importance. In this and a subsequent article I propose to discuss the theory of the process, and to describe two methods by which a very full crop of serum may easily be obtained.

The Process of Retraction of the Clot.

The main phenomena are well known.

Blood when drawn from the living body, and collected in a non-living vessel, clots after a longer or shorter time. At first the clot is a uniform, soft, mass. After a period which varies from a few minutes to several hours, it usually begins to contract, and in doing so squeezes out from itself a larger or smaller amount of serum, mixed, in most cases, with red corpuscles and leucocytes. This serum usually makes its appearance in two situations—between the clot and the sides of the vessel, and on the surface of the clot—where at first a few small drops of serum appear, which, by their coalescence, form ultimately one or more large drops, or a complete layer of fluid. The clot is heavier than the serum, and tends to sink, so that when the process is completed it forms a dark purplish mass, having approximately the shape of the containing vessel, lying at the bottom of a greater or smaller amount of serum.

When clotting takes place a fine network of filaments of fibrin is formed, enclosing within its meshes serum, red corpuscles, and leucocytes. This is the first stage of the process, or coagulation. In the second stage, or retraction, each filament tends to contract, and, when it can do so successfully, the serum and some of the red corpuscles are squeezed out, and a firm mass of fibrin containing a comparatively small number of red corpuscles is left. The leucocytes, I may add, almost certainly make their way through the clot by their own active movements: the serum and red corpuscles are, of course, squeezed out mechanically.

A little consideration will show that the effects of this contraction of the fibrin filaments will differ fundamentally in the centre and at the periphery of the clot. If we consider a point in the centre of the clot (say a red corpuscle surrounded by a network of fibrin) we shall see that it is exposed to equal and opposite tensions in all directions, and as a result there is a general raising of the pressure in the mass, but no tendency for the movement of the serum or of the corpuscles in any one direction rather than in another; just as a sponge lying at the bottom of the ocean and permeated with water under high pressure will be neither compressed nor expanded. Retraction, therefore, must commence at the periphery—either at the sides of the vessel or at the surface of the clot. Here the conditions are quite different. Consider the case of a point lying in contact with the wall of the vessel. It also will be pulled on by fibrin filaments, but not in all directions. Those filaments which lie parallel to the surface in their contraction will have exactly the same effect as would be exerted by a stretched membrane surrounding the clot, tending to compress it and make it smaller. Those which are not parallel to the surface are either vertical thereto, in which case they tend to pull the clot away from the containing vessel, or at an angle, in which case they can be divided into their horizontal and vertical components, one tending to make the clot contract, the other pulling it away from the glass. At first these tensions are balanced by the adhesion of the

(Continued from preceding column.)

It would have been impossible for me to perform the numerous simple but tedious experiments, of which examples are given, without the able assistance of Private T. C. Reynolds, R.A.M.C. In conclusion, I have to thank Colonel H. E. Cree, A.M.S., for granting me facilities for carrying out this investigation.

clot to the wall of the vessel, and if this is sufficiently firm retraction will never take place; if not, the clot first detaches itself from the surface, and then continues to contract. At the upper surface there is no such counterbalancing pull, so that it is more easy for contraction to take place; hence we see, as a rule, that serum appears first on the free surface, especially in large clots. As a rule, however, not much fluid appears in this situation. It is noteworthy, also, that there is usually a decided difference between the serum which appears on the top and at the sides of the clot, that in the former situation being turbid from red corpuscles, that in the latter being quite clear. The reason for this difference is obvious. When the blood is drawn the corpuscles immediately begin to settle, and by the time clotting has taken place (unless this is very unusually rapid or unless the corpuscles sink with unusual slowness) there is a layer of corpuscle-free plasma on the surface, and when this clots it interposes a barrier which allows the escape of serum, but not of corpuscles.

Under certain circumstances (rapid settling of the corpuscles or slow coagulation of the blood) a thick layer of plasma may be formed before coagulation occurs. In this case the clot that forms may be so firm that not even serum is squeezed out. But here, I think, other factors may come in.

A similar process takes place in the walls of the lower part of the clot as retraction proceeds. The fluid that is squeezed out at the beginning of the process contains very many corpuscles, but as it continues these become less and less numerous, until at last only pure serum escapes. This is obvious on careful examination, and I have corroborated it by actual count. Here it is easy to see that the corpuscles which have been entangled near the surface will escape very easily, and in doing so leave a relatively firm mesh impassable to corpuscles, though permeable to serum. After a time all the corpuscles which have passages open to them will have escaped and the sides of the clot will become to all intents and purposes similar to the non-corpuscular layer at the top of the clot. That this is the case may be shown by cutting a section of a clot in which complete retraction has taken place.

Consideration of External Factors.

I will now consider the factors which cause a difference in the retraction of different clots—why some retract quickly and give an abundant crop of serum, and some do so slowly, giving a smaller crop, or fail to retract at all.

Two sets of factors have to be considered. The first, which I shall call the internal factors, are those which differ in different specimens of blood. The second, the external factors, which I shall consider are the size and shape of the containing vessel, the nature of its walls, temperature, and gravity. These are the main factors which we can alter more or less at our disposal, and in doing so cause great alterations in the process. This paper deals with these external causes alone.

(1) The Shape and Size of the Vessel.

Reverting to our idea that the contraction takes place at the surface of the clot, which behaves as if it were enclosed in a slightly stretched elastic membrane, theory shows what experiment clearly proves, that these factors are of prime importance. This has not, I think, been previously recognised. In dealing with ordinary surface-tension, such as is always present at the surface of a liquid, it is a well-known law, based on simple mathematical considerations, that in the case of curved surfaces the smaller the sphere of which they form part the greater the tension, the tension per unit being constant. Thus if two soap-bubbles of different size are connected the one with the other by means of an open tube, the smaller will continue to contract (blowing out the larger one as it does so) until it forms a flat diaphragm across the tube.

The force tending to draw the clot away from the surface is largest in small tubes, and gets progressively less in larger tubes, reaching its minimum in a vessel with flat walls, in which the retraction commences and is most marked at the angles.

In these experiments I have used human blood drawn directly from the veins. This has been collected in a tube lined with paraffin, in which it will keep unclotted for a sufficiently long time for the experiments to be made. Measurements, where necessary, are made with paraffined

pipettes. The following may be quoted as a proof of the effect of the size of the tube on the process. The same specimen of blood was divided into eight tubes, two capillaries having an internal diameter of a little more than 1 millimetre, two narrow tubes having an internal diameter of about 4 mm., two "Wassermann" tubes with an internal diameter of 9 mm., and two test-tubes of 17 mm. The results were as follows:—

Diam. of tube.	$\frac{1}{2}$ hour.	1 hour.	2 hours.	4 hours.	24 hours.	Yield of serum.
17 mm.	No retraction.	No retraction, a little serum on the top.	No change.	No change.	No change.	0% except for a little at the top.
"	"	"	"	"	"	
9 mm.	No retraction.	No retraction.	No retraction, a little serum on the top.	Slight retraction.	Marked retraction.	21.5%
"	"	"	"	Nil.	Slight retraction.	6.3%
4 mm.	No retraction.	Retraction just obvious. No retraction.	Much.	Much.	Much.	30.7%
"	"	"	"	"	"	29.2%
Capillary, rather more than 1 mm.	Abundant retraction.	Abundant retraction.	No obvious alteration.	No obvious alteration.	No obvious alteration.	56.0%
"	"	"	"	"	"	59.6%

Room temperature throughout.

As a result of a considerable number of observations I can make the following statements with regard to specimens kept at the room temperature. 1. Blood collected in capillary tubes always contracts completely, yielding the full theoretical amount of serum. In most cases it commences in less than 15 minutes and is complete, or nearly so, in another 15. 2. In the tubes such as I use for Wright's collecting capsules, which have an internal diameter of 3-4 mm., retraction almost always takes place and is usually complete, or nearly so, but it is occasionally only partial and is always decidedly slower than in capillaries. 3. In Wassermann tubes retraction is the rule, but there are occasional exceptions. It is much slower, and not as a rule complete in less than 12-24 hours. 4. In large test-tubes it is very frequently absent, and is always slow and often incomplete.

The practical application of this is that where a good crop of serum is required the blood should always be collected in tubes as small as is convenient.

(2) Influence of the Nature of the Walls of the Vessel.

If this is of such a nature that the fibrin filaments can attach themselves firmly thereto, much of the force of their contraction (which I believe can only act for a limited time) may be expended in tearing the clot from the wall, with the result that but little serum will be squeezed out. In dealing with glass vessels of ordinary cleanliness I do not find this is a factor of any great importance, and I have never yet found any medium which is sufficient to prevent the retraction of the clot from the walls of small tubes, provided the proper temperature is employed. In general the cleaner and newer the vessel the easier and quicker is the retraction; it takes place best of all in tubes that have recently been drawn out, and in a tube that has been dry sterilised whilst not quite clean it may be appreciably delayed.

In the course of a search for some material from which the clot would not detach itself at all I have had the best results with paraffin. A tube lined with hard paraffin and allowed to set will often show no trace of serum long after complete separation has occurred in an ordinary tube. I shall show subsequently how this fact is used in procuring a large and quick yield of serum.

I do not think a clot formed in a living vein retracts from the walls. I have never seen any unmistakable indication of this in sections of thrombosed veins, and have not found it to occur in some observations I made in vessels in amputated limbs. When separation of the clot, with resultant embolism takes place, I believe it is always due to a partial

liquefaction of the clot by the trypsin given off by the polynuclear leucocytes—or, of course, it may be separated by violence.

(3) Effect of Gravity.

If a freshly-formed clot be suspended in air, the process of expression is very rapid, the contraction of the fibrin being assisted by the weight of the serum, which tends to run out, just as water would do from a suspended sponge. But if the clot remains in the serum this assistance from gravity is very much less, and at first sight it may not be apparent how it is brought about at all, for the serum within and that outside the clot have, of course, exactly the same specific gravity, and that within will have no tendency whatever to drain away.

Two cases may be considered. In the first, which usually occurs in comparatively narrow test-tubes, the clot remains adherent by a "rim of attachment" at its upper angle of contact with the wall of the tube; retraction always begins at some point on the side, and extends until every point except this rim of attachment has detached itself from the glass. If we study such a clot (Fig. 1) we shall see that it has a wide top, a comparatively narrow neck, and a wider base, which is often almost or quite as wide as the tube, and may in some cases be almost spherical. The shape is due to the action of gravity on a soft mass, originally cylindrical, which is lifting itself up by the contraction of its surface membrane. The narrow neck is, of course, due to the stretching by the weight below, whilst the rounded shape of the base is due to the fact that all stretched membranes tend to assume a spherical form.

It surprises many to whom this phenomenon is first pointed out to realise that the very delicate rim of attachment should support the whole weight of the clot, but a little consideration will show that this is not really remarkable. When the clot is first formed it has, of course, the specific gravity of the whole blood (about 1056). As soon as retraction commences it begins to rise; some of the serum, which is lighter (sp. gr. 1030), escapes. At first the pull on the rim of attachment is practically nil. As the clot shrinks its specific gravity gradually rises, ultimately reaching something just under 1100. At this point it will only weigh, whilst in the serum, as much as if it has a specific gravity of 1100—1030, or 70. The force of gravity which helps to squeeze out the serum is never more than would be exerted on a cylinder of this specific gravity, suspended in air. It does help the process somewhat, as is shown by the narrow neck of the clot, from which the serum must be pretty thoroughly expressed. The slight weight of the clot whilst

suspended in serum may be understood when we realise that the contraction of the fibrin filaments will be quite sufficient to lift a large clot bodily from the bottom of the tube.

If we cautiously insert a narrow pipette, doing as little harm to the rim of attachment as possible, and pipette off the serum, the clot will regain its full weight, so that the upper part will be forcibly stretched, and there will, in addition, be the direct action of gravity on the serum in the clot. The most efficient method by which we can assure gravity is by pipetting or drawing off the serum as fast as it is formed.

In the second case, which usually occurs in large vessels, the rim of attachment will not hold, and the clot sinks to the bottom. This is because the length of the rim increases only proportionately to the diameter of the vessel, whereas the weight of the clot rises in proportion to its cube. Here gravity helps, in that the upper part of the clot presses on the lower, and tends to press out the serum; but the conditions are much less favourable, for, firstly, the clot may be pressed against the walls of the vessels, and the serum be thus prevented mechanically from escaping; and, secondly, the compressing force exerted by the upper part of the clot tends to counteract the contraction of the lower part. Of course, if the clot does not separate itself from the walls of the vessel at all it may be necessary to separate it mechanically by means of a sterile wire, but where it can be avoided

it is best not to do so; it is much better to leave the clot attached at the upper rim as long as possible and to pipette the serum off as soon as it appears.

(4) Effect of Temperature.

This is of the highest importance, and in general terms it may be stated that the nearer the temperature of the vessel to that of the body the quicker and more complete will be the retraction. I have stated that every specimen of blood that I have ever seen has retracted at room temperature when kept in tubes about 3–4 mm. in diameter, though the retraction is not always complete and is usually slow. Retraction at incubator temperature is always rapid and complete. In tubes about 1 cm. in diameter retraction always takes place in the incubator, and is usually complete; at the room temperature it is sometimes absent and usually slow and incomplete. In larger tubes this is very frequently the case, and even in the incubator there may not be anything like the full theoretical yield even after 12 hours. In the ice-chest retraction is usually absent or but very slight in anything larger than a capillary tube, and may be incomplete in these.

Another point of very considerable practical importance is this: it is the temperature to which the blood is exposed when first drawn that is of chief importance in determining the rate and completeness of the retraction, and in some cases the effect of exposure to an unsuitable temperature at this period cannot be afterwards undone.

One or two examples must be quoted:—

(1) A specimen of blood in a paraffined tube was divided into two Wassermann tubes. One was placed at once in ice-water, kept there for half an hour, and subsequently kept at the room temperature. It showed no retraction in $1\frac{1}{2}$ hours, and next day the percentage of serum present was 13. In the control tube, which was kept at room temperature throughout, retraction was well marked in a quarter of an hour and in 48 hours the crop of serum was 34.6 per cent.

(2) In a similar experiment four tubes were used, two of which were incubated 1 hour, and then kept at the room temperature. These gave 56.6 per cent. and 50 per cent. of serum. (The blood was from a slightly anæmic person.) Two other tubes were kept at the room temperature throughout. They gave 41.6 per cent. and 34.6 per cent. respectively.

(3) In this experiment two Wassermann tubes of blood were incubated from the first, two kept at room temperature for 1 hour, then incubated, and two kept on ice for 1 hour, and then also incubated. The following table shows the rapidity and completeness of the retraction:—

—	$\frac{1}{2}$ hour.*	1 hour.	.2 hours.	Yield of serum after 3 hours.
Incubated from the first.	Retraction nearly complete.	Apparently complete.	No change.	53.3 %
" "	"	"	"	56.6 %
Room temperature 1 hour, then incubated.	No retraction.	No retraction.	Much retraction.	51.7 %
" "	"	"	"	51.7 %
Ice-water, 1 hour, then incubated.	No retraction.	No retraction.	No retraction.	10.0 %
" "	"	"	Marked retraction.	18.1 %

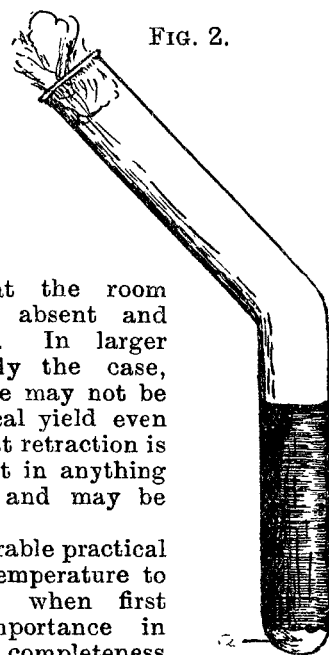
* Not counting the first hour.

Hence when we wish to collect as much serum as possible we ought to collect our blood in warmed tubes and incubate it as soon as possible. After an hour or two it may be kept at the room temperature if desired, but the ice-chest should be avoided until complete retraction has taken place. I should add that this fact was first pointed out to me by Dr. Cartwright Wood.

FIG. 1.



FIG. 2.



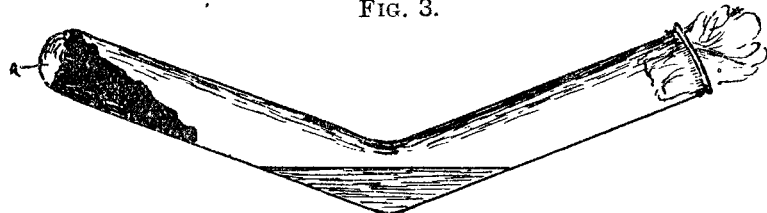
In Figs. 2, 3, 4, and 5, *a* represents the paraffined surface.

I will conclude by giving two methods by which a very full crop of serum can be obtained in a very simple manner, and one which does away with any chance of contamination or the addition of foreign substances. They are based on the power that a clot has of adhering with some tenacity to a paraffined surface.

Description of Methods.

1. Bend a test-tube (as long as possible) about the middle to an angle of 135° or thereabouts. After sterilising it pour in a small amount of melted paraffin, heat it, and keep the tube upright until it is cold. When set the paraffin will form a layer at the bottom of the tube; it is an advantage to let it run along the side of the tube away from which the upper limb is turned (that which is lower when the tube is placed on its side, as in Fig. 3). A tube thus prepared will,

FIG. 3.



of course, keep indefinitely. To use it, fill with blood short of the angle and keep it upright until coagulation has taken place—of course in the incubator. (Fig. 2.) Then put it down on its side, slightly tilted so that the serum may drain down into the angle. With a tube of the ordinary test-tube diameter and containing 8–10 c.c. of blood retraction will usually be complete in two hours or less, and it will be seen that the clot has stuck to the paraffined surface of the tube, whilst it has retracted elsewhere, and has allowed the serum to collect in the angle of the tube. (Fig. 3.)

Workers may like to compare this method with that described by Dr. Gardner in THE LANCET of July 14th. Beside the advantage that the tubes can be kept ready for use, I find it more efficient. Thus in one experiment in which a sample of blood was divided between one of my tubes and one of Dr. Gardner's, and the crop of serum examined after two hours' incubation, I got the following results:—

In the paraffined tube. Total volume of blood, 7.7 c.c. Volume of serum, 3.3 c.c. Amount, 42.9 per cent.

In the agar tube. Total volume of blood, 12.6 c.c. Amount of serum, 3.1 c.c., or 23.8 per cent.

The experiment was a little unfair in that the paraffined tube contained rather less blood, so that a relatively larger crop might have been expected. Retraction in the agar tube is, as Dr. Gardner states, decidedly better than in ordinary tubes.

2. In case the angled tube is objected to, and only ordinary laboratory apparatus preferred, I have modified the method by paraffining the side of a flask.

The blood is allowed to clot in contact with this surface, the flask being kept on its side: the paraffined surface should not be so large that the blood does not touch the glass, or coagulation will be unduly delayed. When this is complete, turn the flask round so that the blood is uppermost. The serum will be very rapidly expressed, and form a pool on the opposite side of the flask. In one experiment the blood took one hour to clot, and gave 42.8 per cent. in another half-hour. (Figs. 4 and 5.)

I have to thank Mr. H. T. Rymer for his kindness in drawing me the illustrations which accompany this article.

GASTRIC ATONY AND WAR NEURASTHENIA.

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I SHOULD like to begin this short paper by an extract from Cannon's article on the Nature of Gastric Peristalsis.¹

"Tonus as an essential factor of gastric peristalsis is first given by vagus impulses and later maintained by the stomach itself—for (1) severing the vagi before feeding results in inactivity; (2) severing the vagi after digestion is started causes no change in gastric movements or in the rate of discharge. Probably a psychic tonus is developed by the taking of food. The method of maintaining the tonic state locally as digestion proceeds, and of increasing it as the stomach empties, is not yet determined; it may be the result of a 'contraction remainder' after each rhythmic pulsation.

"The above results account for the functions of the vagi and the splanchnics. They are nerves which increase or decrease the tonus of gastric musculature, and thereby affect peristalsis. The absence of stomach movements, for example, in states of exhaustion can be explained by the failure of vagus impulses, and in emotional states by the presence of splanchnic impulses. Both conditions result in absence of gastric tonus."

It seems to me that this physiological observation may throw some light on a condition which is at present a source of considerable trouble to those who are dealing with war neurasthenics.

Description of Condition.

I have seen in the past two years a large number of soldiers suffering from neurasthenia, either with or without a definite history of shell shock, who, in addition to the physical exhaustion and psychasthenia common in these cases, have suffered definitely from sensations referable to the abdomen, such as aching in the left hypochondrium, pain in the epigastrium, a sensation of constriction in the lower sternal region, and a general feeling of sinking referred not only to the epigastrium but perhaps to the whole abdomen. Many of these show disordered cardiac action, particularly in the direction of intermittent tachycardia, extrasystoles, or persistent rapid action. The systolic blood pressure is usually low, between 110 and 120. Many of them have suffered also from slight but definite pain in the right hypochondrium and right and left iliac regions. They are, for the most part, listless, suffer from loss of appetite, and complain of a feeling of distension after eating, which persists for some hours, and indeed may not pass off before the time for the next meal. Most of them are constipated, and some suffer from alternate constipation and diarrhoea.

All these men have been subjected, apart from definite shell shock, to experiences which are exhausting physically and mentally trying. Vigilance, anxiety, responsibility, and lack of sleep, together with exposure to noise, have all contributed to produce a condition of physical and mental exhaustion combined with severe emotional disturbance. One has to remember in dealing with such patients at the present time that in the case of the bravest man the emotion of fear, or if we choose to call it so, of anxiety, is a contributing factor in the production of any condition of muscular and nervous weakness.

The progress of such cases is in most instances unsatisfactory. They improve after rest in hospital up to a point—that is to say, they get stronger, sleep better, lose their fears, and are able to take an interest in their surroundings and in the general topics of the day. They may even be able to take up serious reading with interest. But the abdominal symptoms remain; although pain may disappear, uneasiness may persist either in the epigastrium or in the right or left hypochondrium, and under excitement or worry the feeling of sinking in the abdomen and the general muscular feebleness are apt to recur.

In the vast majority of such cases, in my experience, auscultatory percussion of the stomach reveals the fact that the upper border of clear percussion is unusually high, associated in many cases, but not invariably, with some spreading to the left of tympanitic percussion. An X ray examination after an opaque meal shows a high air bubble and a stomach slightly more capacious than normal and rather slow to empty. There may or may not be an undue amount of ileo-colic stasis.

¹ Cannon: The Nature of Gastric Peristalsis, Am. Journ. of Physiology. 1911–12, xxix., p. 264, &c.