

possibilities of our branch and are keen to start in practice. Very shortly there will not be a town of any size that has not one or more specialists—and they must be specialists, for if they are in general practice, their brother practitioners will not send them cases. In other words, there is now healthy competition which will ensure suitable candidates for any post that falls vacant. We have suffered in the past from men who have either taken their posts as a side line or because nothing else was available to keep them out of general practice.

#### *Responsibility for Inefficient X Ray Work.*

There is another factor also that has been a very strong deterrent to men taking up this work. I have said that their position, if granted at all, was granted grudgingly, and it is the consultant surgeons and physicians who have been to blame for this. They did not realise the importance of placing a first-rate man in the post and *making the post worth holding*. Personally, I have never suffered in the latter way, so that my remarks are based entirely on what I have seen and heard of in other towns, particularly in London, where the consultant staffs have often ignored the man whom they nominated and who spent a full half of every day in working for them at hospital. All their private work (except doctors' wives) they have sent to other men, or more often to laymen, leaving the man who, even if paid £100 a year, is their colleague, to pick up a living as best he could. The gross unfairness of this is manifest, for having only a half of the day left for private work, the radiologist cannot make a sufficient income to warrant the purchase of expensive apparatus, which must be kept up to date, unless he is loyally backed up by the men for whom he works in his hospital. I have often heard the other side of the question from surgeons who have told me they could not send their cases to their colleague because his technical work was so bad, or that they were bored by lengthy reports when they asked for radiographs. Even if this happened to be the case, as one has to admit it sometimes was, the fault lay in large measure, if not entirely, with the surgeons and physicians themselves on a two-fold charge. Firstly, by their lack of perception in appointing a second-rate man to the charge of a department that must inevitably grow to first-rate importance; secondly, by not backing up their nominee and placing his finances on a sound basis.

#### *The Housing of the X Ray Department.*

A few words as to the department itself, and then I am done. In almost every hospital in this country the X ray department has been housed in any place that happened to be available, often in a cellar, on the theory that a dark room was more easily made light-tight in a cellar than elsewhere, and that anything would do. In spite of this these X ray departments have grown as best they could, and many of them, including my own, are quite past praying for. To attempt to alter them is sheer waste of money—most of them cannot be altered to meet the necessities of present demands—to say nothing of the expansion of the work that must take place.

What are the requirements in a large hospital? In the first place the radiographic department should be either close to the wards and operating theatres or else on the way to them, so that surgeons and physicians may see things for themselves. We must get out of our hole-and-corner departments, out of our cellars or attics, for the importance of our work, to say nothing of our health, demands ample space and air in which to do our work—not just four hours a week, but a half of every day. For the radiograph work at least three rooms of ample size are needed: (1) for surgical X ray work; (2) for routine medical X ray work; (3) for demonstration purposes. There must also be an office with a thoroughly sound index and cataloguing system, a store-room, which will become an X ray museum, and ample dark rooms and photographic rooms. In addition, a number of rooms are necessary for the therapeutic side of the work.

#### THE DEMONSTRATION-ROOM.

The demonstration-room is the only one of which I wish to speak in detail, because I do not know of such a room in any of our hospitals. The demonstration-room, as I picture it, should be the place where the radiologist spends most of his time. In it all the X ray plates are examined and reported on. The walls are covered with viewing boxes and stereoscopes filled with interesting cases

for demonstration, and a card-index catalogue gives the location in lantern-slide cabinets in which will be found a series of pictures to illustrate any subject on which the radiologist, or any of his colleagues, wishes to lecture, either with the lantern that is installed or in one of the lecture theatres. The office where the clerk works, and the store-room with its wealth of material, open into this room, so that everything is readily available for demonstrations.

A powerful X ray plant is provided with an upright screening stand and a couch to be used for demonstration and also for any special work that may be going on. Such a room would be a great attraction to his colleagues and to students, and would make available the enormous wealth of material that is at present wasted. His colleagues could bring the students to such a place without feeling that they were interfering with the routine work of the department. The radiologist, although maintaining his supervision, would depute more and more of his routine work to his medical assistant in the medical X ray room, and his radiographer and photographer would carry on their routine work in their rooms, unhampered by the intelligent but time-absorbing student.

#### *A Social Centre.*

There is another purpose that such a demonstration-room might well serve—i.e., as a social centre for the staff, where they could meet and perhaps have a cup of coffee while they discussed cases, football, or politics. The absence of social life which has resulted from the growth of hospitals, especially on the unit system, has been disastrous, and members of the staff may go from year's end to year's end without meeting their colleagues. I suggest that the radiologist has a great opportunity if he builds a room of this type and introduces such a tone into it that he can draw together the scattered forces and interests.

#### CONCLUSION.

In conclusion, ladies and gentlemen, the future, with its vast possibilities, is in our hands, and it is for us to rise to the great occasion the war has brought us in bringing our arts into the prominence that is their just due. Let us be worthy of it, and show that the confidence that is being timidly entrusted to us is not misplaced.

## THE ADJUSTMENT OF THE REACTION OF BACTERIOLOGICAL MEDIA.

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It has been usual for some time now to adjust the reaction of bacteriological media by chemical titration. In this country Eyre's technique has generally been followed with considerable success, but every now and again one came across batches of media which gave poor bacterial growths. Subsequent investigations frequently showed that the reaction of the medium was at fault and mostly on the acid side, and accordingly an analysis of the whole process of the preparation and titration of media was made in order to determine on what this variability of the reaction depended. At the same time an attempt was made to overcome the objection that the chemical titration method does not indicate the true reaction—i.e., hydrogen-ion concentration. The procedure adopted below is the result of this investigation, and, if followed, will be found to overcome most of the difficulties. Full details of the experiments on which these recommendations are based will be published elsewhere.

#### (1) *Adoption of the Sørensen Logarithmic Method of Expressing the Reaction of Media.*

The adjustment of the reaction of bacteriological media by chemical titration does not indicate the true reaction of the medium. That the true reaction should be indicated is of the highest importance, as it is the ionic concentration that influences bacterial growth. Since the titration method was introduced great advances have been made in our knowledge of

the reaction of fluids. Acidity means excess of H ions over OH ions, and alkalinity the converse. Neutrality is merely the presence of equal numbers of H and OH ions. Such a state exists in samples of pure re-distilled water. This water is found experimentally to have a hydrogen-ion concentration corresponding to a dilution of approximately 1/10,000,000. In order, however, to express the reaction of biological and other fluids it was recognised that a simpler means of expression was desirable. Sørensen suggested that the logarithm of the degree of dilution should be used (with the negative sign dropped). Thus an N/100 solution would be designated 2. Now 1/100 is  $10^{-2}$ , and the logarithm is therefore -2. If we drop its sign and speak of its value as  $P_H = 2$ , then there is a definite fixed value to the reaction of the medium. So every medium has its own  $P_H$  value.

On this scale pure water has a  $P_H$  value of 7.07. It has now become universal to use these values when speaking of the reaction of any medium, and for bacteriological media we have adopted a reaction of  $P_H$  7.60, corresponding to that of plasma.

### (2) Titration of Media at Room Temperature.

The ordinary routine practice has been to titrate media at the boiling point. The idea was that by this procedure the dissolved  $CO_2$  was driven off and a more accurate estimation of the acidity obtained. But bacteriological media contain many complex organic compounds which are dissociated at the higher temperature, with a resultant increase of acidity. This increase is more than sufficient to counteract the loss of  $CO_2$ . This explains the deepening of the colour of the indicator when broth, titrated at the boiling point, cools down. There is less dissociation then, or may we say that some of the dissociated molecules at the boiling point have reunited to form un-ionised molecules? In the case of simple solutions of inorganic salts titration at the boiling point or at room temperature makes only a slight difference. It is therefore obvious that one should titrate at room temperature.

### (3) Adoption of Thymol-phthalein as Indicator in the Titration.

We found that the most frequent cause of error in the reaction of media arose from an incorrect judging of the indicator "end-point" selected. This trouble exists with most indicators, but is much more apparent in some than in others. The selection of an arbitrary shade of colour, as is the usual practice, allows of considerable latitude. Out of a series of indicators tested in broth and controlled against the hydrogen electrode, phenol- and thymol-phthalein proved the most suitable for the titration of media. With both of these the change is from a colourless to a coloured solution, while more important still is the fact that the change takes place within a slight range of hydrogen-ion concentration. In the case of thymol-phthalein the reaction is well within a half  $P_H$ , and the blue tint developed is distinct.

A series of observations showed that with thymol-phthalein exceedingly accurate estimations can be obtained. This is due to the ease with which its "neutral point" can be judged. The "neutral point" is taken as the first perceptible darkening of the medium on the addition of N/10 soda. The titration is carried out at room temperature. The change in the medium occurs quite sharply. Two factors are probably at work—namely, the sensitivity of thymol-phthalein and the change from a yellow to a blue colour.

The titration we find is best carried out in the following way. Measure 10 c.cm. of broth into a porcelain evaporating dish. Add 25 c.cm. distilled water. Have a control dish alongside prepared in exactly the same manner. As is well known, dilution with pure distilled water to the above extent does not interfere with the estimation of the reaction (hydrogen-ion concentration). Add 5 drops of a  $\frac{1}{2}$  per cent. alcoholic solution of thymol-phthalein to the first dish. Then run in N/10 NaOH from a burette. Stir continuously and look for a slight but definite darkening of the liquid. This might be more aptly described as the disappearance of the yellow tint and the development of a faint blue tint.

The relative ease with which this end-point can be reached is well shown in the following results, obtained by different observers.

Sample A.			
N/10 soda required.	E.M.F.*	$P_H$	Observer.
3.6 c.cm.	0.775	9.08	J. G.
3.5 "	0.771	9.00	J. G.
3.4 "	0.770	8.98	J. M.
Sample B.			
4.2 "	0.776	9.08	J. G.
4.1 "	0.771	9.01	J. G.
4.1 "	0.768	8.96	J. M.
3.8 "	0.760	8.80	J. M.
3.9 "	0.762	8.85	M. H.
3.8 "	0.760	8.88	M. H.
4.1 "	0.778	9.12	L. G.
3.8 "	0.764	8.89	L. G.

\* Saturated calomel—KCl half electrode.

This gives an average  $P_H$  of 8.95.

Objection may be raised to the use of thymol-phthalein as an indicator, in that it necessitates the addition of excess of alkali. In the preparation of bacteriological media, however, this degree of alkalinity is necessary, as it leads to a precipitation of phosphates. Thus, one is not troubled by a constant deposition of these phosphates in the finished media. Moreover, the degree of alkalinity is only slightly above that of phenol-phthalein, which has been much used in the titration of media. A series of experiments showed that the addition of 10–12 c.cm. of N/1 HCl per litre was sufficient to correct the excess of alkalinity and bring the final reaction to that of plasma  $P_H$  7.60, a reaction which we have found to give maximal bacterial growths.

Phenol-phthalein may be used to titrate media at room temperature, but it is not so satisfactory. With our so-called neutral "end-point"—i.e., first perceptible darkening or rose tint with no actual pink colour—the reaction obtained is about  $P_H$  7.8. No acid need be added, and the medium after sterilisation will have a reaction of about  $P_H$  7.6. We have decided, however, not to use this procedure, as it did not lead to a sufficient precipitation of phosphates. The maximum precipitation of these occurs at about  $P_H$  8.0. A higher degree of alkalinity is not desirable with this indicator, otherwise one has to deal with the indefinite pink of phenol-phthalein, the estimation of which has been such a fruitful source of error.

### Preparation of Ordinary Broth.

In the preparation and standardisation of ordinary broth we use the following formulæ:—

1. Mince 1 lb. of meat, free from fat, and then macerated in cold water (1000 c.cm.) over night, or as an alternative the mixture may be macerated at 40° C. for half an hour.
  2. Boil for  $\frac{1}{2}$  hour over a gas-ring, filter through muslin and then through paper. Add 10 g. peptone and 5 g. of salt; make, up to 1000 c.cm., dissolve, and steam for 45 minutes. The medium is now ready for standardisation.
  3. Measure 10 c.cm. of the broth into a porcelain evaporating dish, add 25 c.cm. of pure distilled water. Have a control dish alongside prepared in exactly the same manner. Add 5 drops of a  $\frac{1}{2}$  per cent. alcoholic solution of thymol-phthalein to the first dish. Then run in N/10 NaOH from a burette, stirring continuously, and looking for a darkening of the colour as compared with that of the control dish. Just before this point a precipitate of phosphates occurs. The point may be more aptly described as the disappearance of the yellow tint and the development of a bluish. Note the quantity of N/10 soda required to produce this change. In practice it is best to make four estimations, and the first in which a distinct blue has been produced is rejected. With the average data a calculation is made as to the amount of N/1 soda necessary to produce the same reaction in the rest of the broth. This amount of soda is then added and the flask shaken.
  4. The alkaline broth is now brought to the boil to deposit the phosphates, and then filtered free from them. The reaction is now adjusted by the addition of 10 c.cm. of N/1 HCl per litre of broth. This will give a final reaction corresponding to that of plasma, or  $P_H$  7.60.
  5. Control reaction with cresol-red and phenol-phthalein.
  6. Lastly, place in tubes or flasks and sterilise in the autoclave for 20 minutes at 115° C.
- Double-strength broth.*—The double-strength broth indicated on the chart is prepared, except that all ingredients (meat,

peptone, salt) are doubled, in a similar manner to that described above. Before use the medium is diluted with an equal volume of distilled water, tubed and sterilised.

Control of the Reaction of the Finished Media.

As already indicated, in the majority of instances one aims at producing an end-reaction which will correspond to that of the tissues. In our case we have adopted the reaction of plasma,  $P_H$  7.60, as the most suitable. After the titra-

tion and adjustment of the reaction by the addition of N/1 acid it is advisable before sterilisation to control by some simple procedure the reaction of the medium in bulk.

To check the reaction it is not necessary to titrate out the broth again, but only to show that the reaction lies between two points. This can be done most conveniently by a suitable choice of indicators. Theoretically, the indicator points should lie as near as possible to  $P_H$  7.60, but the lack of suitable indicators rather prevents this. Comparison against a known colour shade might be used, but the technical difficulties in preparing the necessary solutions and their non-permanence make them impracticable for ordinary routine practice. As a quick and reliable procedure one cannot do better than use two indicators with reaction points sufficiently near  $P_H$  7.60. After a series of tests we have found that cresol-red and phenol-phthalein give satisfactory results.

In order to carry out this control two small samples (3 c.cm.) of the medium are diluted in test-tubes with an equal bulk of distilled water. To the first tube are added 2 drops of 0.5 per cent. alcohol solution of phenol-phthalein and to the second 2 drops of 0.02 per cent. solution of cresol-red. (Watery solution, to which 15 per cent. alcohol may be added as a preservative.) If the reaction is correct no colour change should occur in the first tube, while a rose to a pinkish colour should be noted in the second. Thus the reaction of the tested sample will not be as high as  $P_H$  7.90, the point at which phenol-phthalein first shows a trace of pink, but will be over 7.6. Cresol-red developing a rose-pink (weak permanganate colour) at  $P_H$  7.60. If this

rose colour does not appear, but only a brown shade, the medium is on the acid side, while if a pink is obtained with phenol-phthalein the medium is too alkaline. The error in either direction can be adjusted by the addition of a few drops of N/1 NaOH or HCl to the medium in bulk and the reaction again controlled.

Before use it is, of course, necessary to sterilise the medium by heat (auto-claving or steaming), but the increase in acidity at this stage is slight (less than  $P_H$  0.2), and is sufficiently allowed for. The above procedure we have found quite satisfactory as an ordinary routine.

Quite recently it has been claimed that very exact evaluations of the reaction of media can be made without the use of the elaborate solutions of standard hydrogen-ion concentrations. This method was recently introduced by Barnett and Chapman,<sup>1</sup> and is based on the work of Salin. It consists in superimposing the extreme colours of a particular indicator. All that is necessary is weak acid and a weak alkaline solution. Barnett and Chapman advocated the use of phenol-red, which gives a range of reactions between  $P_H$  7 and 8.

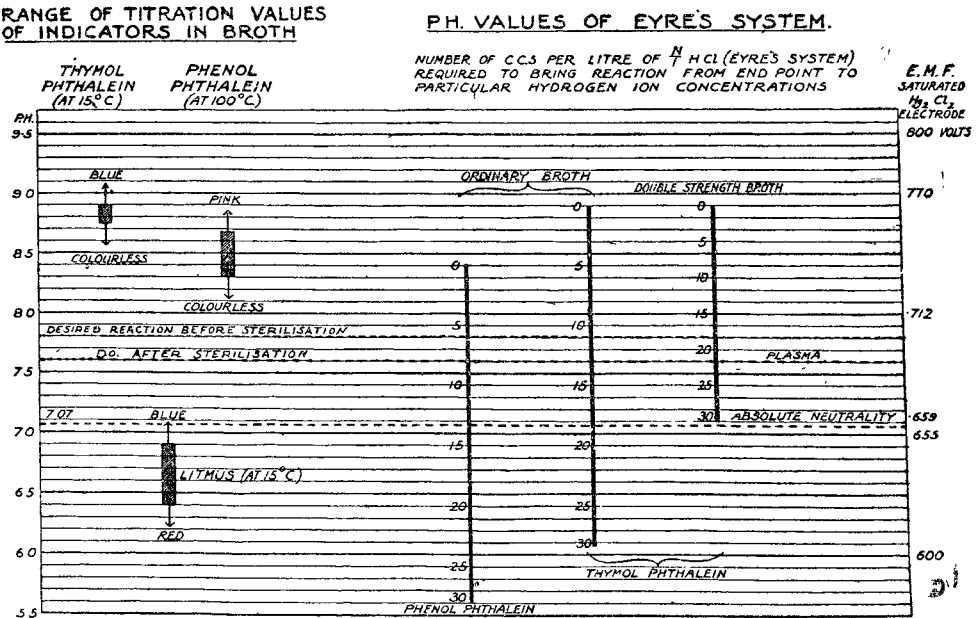
The test is carried out much as follows: Two rows of six test-tubes are placed in a double rack and into the tubes in the front row are measured 5 c.cm. of dilute acid (1 drop of concentrated HCl in 100 c.cm. of water) and into the other row 5 c.cm. of dilute alkaline (N/20 of NaOH). A solution of the indicator having been prepared (phenol-red 0.01 per cent. watery solution), drops of it are added to the various test-tubes in the amounts indicated below.

Series No.	Front row (acid series).	Back row (alkaline series).	$P_H$ values.
1	9	1	6.9
2	8	2	7.2
3	7	3	7.5
4	6	4	7.7
5	5	5	7.9
6	4	6	8.1

To test media with this colour scale 1 c.cm. is placed in a tube and diluted with 4 c.cm. of distilled water. Then 10 drops of the indicator solution are added and the shade of colour compared with that of the above couples when viewed together. The reaction of the medium can be corrected by addition of weak acid or alkali, and a simple calculation will then give the amount necessary per litre. Although this procedure overcomes the difficulty of preparing complicated standard solutions, we have not found the method as accurate as has been stated. In the first place, there is the old difficulty of matching shades; secondly, the scale colours do not completely match those of the colours in broth; and thirdly, the scale is not permanent. The reaction obtained was never nearer than 0.2  $P_H$  as found by the hydrogen electrode.

(5) Relation of the Eyre Notation to the Hydrogen-Ion Concentration.

The chief defect of the Eyre system is that it expresses the chemical titration values and not the ionic concentration. A series of observations, however, showed that the Eyre system could be made to indicate  $P_H$  values. These values are obtained by means of a graph, but the graph is only true when the medium is prepared in a constant manner and the neutralisation reaction known. The  $P_H$  values were obtained by adding increasing amounts of acid (0 to 30 c.cm. of N/1 acid per litre) to broth whose neutralisation reaction was known exactly. If the medium is prepared according to a different formula then a special graph has to be constructed.



The experiment given below shows the change, in the case of broth prepared according to our formula, in hydrogen-ion concentration on the addition of increasing quantities of acid. A parallel series was made, in which one sample had been titrated with phenol-phthalein as indicator and the other with thymol-phthalein.

A. Ordinary Broth (Thymol-phthalein as indicator at 15° C.).  
N/1 acid per litre in c.cm.  
Reaction... 8.73 8.32 7.84 7.35 6.94 6.44 60.8

B. Ditto (using Phenol-phthalein as indicator at 100° C.).  
Reaction... 8.48 8.00 7.60 7.13 6.65 6.15 5.70

It would therefore appear that with ordinary broth prepared in the manner already described there is a constant relation between the  $P_H$  values and the amount of acid added.

<sup>1</sup> Jour. Am. Med. Assoc., 1918, lxx., 1062.

In fact, the addition of 1 c.cm. of N/1 acid per litre produces a change of about 0.1  $P_H$  in the reaction. In addition, by means of the graph here shown it is possible to prepare media of almost any desired reaction.

#### (6) Other Media.

Sugar containing media, owing to the great production of acid during sterilisation, cannot be prepared in the manner described. The sugars should be sterilised separately in water and then added to the sterile broth.

Agar media are best prepared by dissolving the agar in the neutralised broth. The error in this is small, as for all practical purposes agar can be regarded as neutral.

Gelatin media can be prepared and standardised in a manner similar to that described for broth.

#### Conclusion.

In conclusion, it may be said that failures to adjust the reaction of bacteriological media correctly arise chiefly from the use of unsuitable indicators, difficulty in judging the indicator "end-point," titration at the boiling point, and the hydrolysis which occurs during the process of sterilisation. The chemical titration method has been found to be quite a reliable means of adjusting the reaction in routine practice, and by the procedure described above it is quite easy to adjust with considerable accuracy the reaction of a batch of media to the desired point. By means of a specially prepared graph the Eyre system will, with certain precautions, indicate  $P_H$  values. In the colorimetric method

the preparation of the accurate standard solutions required is much more difficult than is usually believed, and the error in the reaction is often quite appreciable when tested against the hydrogen electrode. The ideal method of adjusting the reaction would be by the hydrogen electrode, but the use of this apparatus requires a technical skill and knowledge which places it at present beyond ordinary laboratory application.

## FOUR CASES OF TRAUMATIC RUPTURE OF INTESTINE WITHOUT EXTERNAL INJURY.

BY E. GERALD STANLEY, M.S. LOND., F.R.C.S. ENG.

THE interesting article by Mr. W. H. Battle in THE LANCET of July 19th induces me to record four further cases of traumatic rupture of the intestine without external lesion which came under my care during the war.

#### Account of Cases.

CASE 1.—A convalescent soldier of a native Indian regiment was missed from his cot, and was eventually discovered in a well some 15 ft. below the ground, his progress having been arrested by an iron strut. He was sitting on this iron bar complaining of pain and was withdrawn with difficulty. In all probability he was thrown into the well by a friend, but the whole story was a mystery and is irrelevant in any case. I only saw this patient a day after the accident (probably at least 14 hours after the infliction of the injury). He lay in his blanket quietly, and even when he could be induced to speak his replies were meaningless; he had vomited once. Pulse was 100, full, and of plus tension, and temperature 97° F.

My immediate impression was that he had fractured his skull and that there was much blood between the cortex and skull. (This was quite wrong, but first impressions are apt to bias the diagnosis.)

On examination I found no localising signs of cerebral compression, but abdominal examination revealed a picture I shall never forget. There was no external sign of injury whatever. The abdomen was bulging, did not move on respiration, and the black skin was stretched so tightly that it appeared ready to burst. The fullness was most marked on the left side of the abdomen. The abdomen was dull to percussion except for a small area in the right iliac and lumbar region and the dullness did not shift. The whole abdomen appeared to be occupied by a solid mass; the muscles were quite lax and the patient was lethargic; and whether his movements on palpation indicated pain or resentment at being disturbed I cannot tell. Nothing abnormal was discovered per rectum, and faeces were passed normally. A catheter drew off about 8 oz. of clear urine. There was a past history of malaria but no note of splenic enlargement. I hardly think this clinical picture would

suggest rupture of the intestine, unless the patient was in the last stages of peritonitis, but even then dissolution is not preceded by a full-bounding pulse of 100. My impression was that the man had ruptured his liver or spleen, or both, probably the spleen only, and that the abdomen was full of blood; yet the pulse-rate and temperature puzzled me, as well as his curious lethargic condition and the solid mass that apparently occupied most of his abdomen. I opened the abdomen some two and a half hours later through a long incision to the left of the middle line. The patient showed but slight signs of shock. A very large quantity of dark red blood poured out and a truly enormous spleen occupying most of the abdomen was seen. The organ was ruptured in a stellate manner, and split into seven or eight pieces, one extending right into the hilus. Bleeding recommenced, and the vessels were found and clamped, a difficult manoeuvre as the pedicle could be felt but not seen. The organ was removed piecemeal, and when the pedicle was now inspected it was seen that the clamp had seized a small part of the fundus of the stomach and a part of the extreme left edge of the great omentum.

To prevent sloughing of the stomach and perforation, a small portion of the greater omentum was removed and the stomach area enfolded by a purse-string suture. A small quantity of turbid fluid was now noticed in the left renal pouch and obvious commencing peritonitis in the upper left quadrant of the abdomen, this observation leading to the discovery of a tear 1 in. long in the anti-mesenteric border of the jejunum 6 in. from the flexure. This was closed by a single line Connel suture of thread. The left kidney pouch having been mopped dry, the abdomen was closed and drained. The operation lasted 43 minutes and the patient showed no undue amount of shock, but died from general peritonitis two days later.

CASE 2.—An Australian private, seen eight hours after the accident, stated that something struck him violently in the abdomen after a shell burst in a house close by. (The missile was probably a piece of masonry, as his clothes were full of brickdust and rubbish.) On admission to C.C.S. he had a good colour and was rapidly recovering from slight primary shock. Temperature 98° F., pulse 80. He vomited once immediately after admission, and complained of pain in the epigastrium. On examination there was slight tenderness and rigidity just above the umbilicus and across the abdomen, but no dullness in the flanks, and liver dullness was normal. I decided, after consultation with Colonel G. E. Gask, C.M.G., D.S.O., who happened to be in our operating theatre at the time, to do a laparotomy, Colonel Gask being so kind as to assist me. We found a tear three-quarter way across the jejunum about 18 in. from the flexure, and some turbid fluid round the intestine. There was no sign of peritonitis or other lesion. The rent was closed by a single layer Connel suture of thread, the surrounding peritoneum was gently cleansed, and the abdomen closed without drainage. The anaesthetic was gas and oxygen, most ably given by Capt. A. V. Maybury, R.A.M.C.(T.), and local infiltration with novocaine.

The patient made an uninterrupted recovery.

CASE 3.—The patient, a private in a British infantry regiment, convalescent in India from Mesopotamia, had attempted suicide by a 20 ft. leap from a window. I first saw him six hours after. He was shocked, pale, restless, and excited. Pulse 120 and of poor volume. Temperature 98.2° F., and he complained of much suprapubic pain. No external injury was found. Six ounces of quite clear urine were obtained by catheter, and the patient felt no desire to micturate. The lower abdomen moved little on respiration, was rigid, and markedly tender. A spot of cutaneous hyperaesthesia was marked in the mid-line just above the umbilicus; the patient had not vomited.

Here again I did not suspect the rupture of the intestine revealed at operation, and though I guessed the patient had an intraperitoneal rupture of the bladder, I unwisely delayed operation. The man's condition improved under morphia, but at mid-day his pulse-rate had risen to 130 and he complained of severe pain in the lower abdomen. By this time some bruising was visible above the pubes. On the basis that the bladder was ruptured I proceeded to open the abdomen in the middle line below the umbilicus. The bladder was collapsed and contained a few ounces of clear urine, and a tear 3 in. long was found on the postero-superior surface and extending into the peritoneal cavity. The tear was sutured and a large quantity of bloody urine mopped out of the pelvis. The urine was dirty and turbid and had a marked faecal smell, caused by an oblique half-inch tear in the small intestine 3 ft. from the caecum; this was sutured, while a small rent in the parietal peritoneum over the sacral promontory was not interfered with. A tube was left in bottom of the pelvis and another to drain the bladder. Dark faecal fluid continued to come through the pelvic tube for six or seven days; this tube was removed on the tenth day and that in the bladder a few days later, after which