PERFORATIVE PERITONITIS

I N

ENTERIC FEVER

With special reference to Early Diagnosis.

by

A N D R E W J O H N L A I R D

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Of the complications which may arise during the course of an attack of ENTERIC FEVER, Perforative Peritonitis is the most fatal. Jenner[1] stated that he had never met with a single instance of recovery after this lesion, and laid it down as a rule "to which nothing on record affords an exception, that ultimate recovery is never accomplished, and that sooner or later death is the consequence of intestinal perforation". Other Writers also, (Louis, Chomel, and Rokitansky), have expressed the opinion that death is the invariable result. Murchison[2] however was apparently of opinion that recovery was possible, and in recent medical literature[3] numerous instances of recovery have been recorded. It is now generally admitted that such cases may recover, and indeed, on anatomical and pathological grounds there seems to be no

1. Lecture on Fevers and Diphtheria 1893-pp 289 & 431
2. Contd Fevers of Great Britain 1884-p 572
3. M'Call; B.M.J. 1893- p 62
   Simon; Do., 1896- p 711
   Bronson; Lancet Vol II 1889-p 899
   De Souza Martius- Ann Univ: Med: Sciences Vol I H-p33

reason why they should not; but they are so extremely rare that while the chances of recovery after operation seem small nevertheless in surgical treatment lies practically the only hope of recovery. Keen's[1] collected statistics shew 83 operations with 16 recoveries, while Cushing[2] Dalziel[3] Handford and Anderson[4] each record one successful case. So remote is the possibility of saving life by any other than surgical means that every such success must be looked upon as the saving of a life which would otherwise have been lost.

The diagnosis in such cases as those recorded by M'Call, Simon, and others has been called in question, as not only is it frequently difficult to say whether perforation has actually taken place or not, but symptoms resembling those of perforation may arise from other causes. Barr[5] considered

1. Surgical complications & sequels of Typhoid Fever-p 234
2. John Hopkins Hospital Bulletin No 92- Novr 1898
3. Glasgow Med: Journal- June 1899
4. Brit: Med: Journal 1898- p 220
5. Brit: Med: Journal 1893- p 207

M'Call's case to be one of Appendicitis, but the fact that the Patient after nursing her Son through an attack of Enteric Fever, presented all the symptoms of that disease, goes far to support the original diagnosis. In Simon's case perforation was indicated by a great drop in temperature, by collapse, rapid distension of the abdomen, and loss of liver dulness. Two other medical men, who were present, agreed as to the diagnosis of perforation. The case recorded by Branson was that of a professional Nurse who contracted Enteric Fever from her patient. Symptoms of perforation set in at the end of the fourth week, and on the 38th day of the disease, several small offensive sloughs were found in the stools, and two days later a slough, six inches long and half-an-inch broad, was passed. Jenner's[1] experience in this connection would make one hesitate to accept even these as authentic recoveries after perforation.

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1. Ibid: p.303

The case recorded by him was that of a young woman who, after having had symptoms simulating those of perforation, recovered from the peritonitis, but died subsequently from erysipelas. At the autopsy the peritonitis was found to have resulted from the rupture of a suppurating mesenteric gland. His final comment was that "this case is particularly interesting as teaching the danger that surrounds the attempts to judge of the value of remedies while our means of diagnosis are imperfect."

Trousseau (1) also records a case where "exceedingly well informed physicians diagnosed peritonitis, the result of intestinal perforation" But at the autopsy "notwithstanding the most diligent search not the slightest intestinal perforation could be detected".

Dr Foxwell (2) however, has placed on record a case in which the diagnosis was "perfected" by post mortem examination

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1. Clinical Medicine Vol II New Syd: Soc: pp 320, 321
2. Brit: Med: Journal, Dec: 31st 1898.

The patient, a woman aged 40 was admitted to Hospital suffering from diarrhoea, abdominal pain, headache, and fever, and a diagnosis of Enteric Fever was made. Dr Foxwell first saw her on the 35th day of her illness and his diagnosis was one of "concealed suppuration; probably appendicitis". There was enlargement of the liver and spleen; The abdomen was natural in appearance and flaccid, but with some occasional rigidity, most frequently on the left side; Vaginal and Rectal examinations-negative; Widal's reaction was positive in a concentrated solution; and there was a history of Enteric Fever two years previously. Death occurred on the 52nd day, and at the necropsy there was found evidence of old, but none of recent peritonitis. "Deep down in the right pelvis the ileo-caecal valve with adjoining portions of ileum and caecum were firmly adherent to the pelvic wall by old fibrous adhesions." "In the ileum, one inch from the valve, was an old perforation with thickened walls

"a quarter of an inch in diameter." The case for the surgical treatment of this complication is well expressed by Mr J. F. R. Gairdner (1) who says- "A fair number of cases" (of recovery without operation) "may be found in medical literature, ~~may be~~ reported with more or less accuracy, but it is seldom that an individual experience includes more than one case, while many of large experience have seen no such case and even doubt the possibility of recovery after perforation of the intestine freely into the peritoneal cavity. Now Murchison at page 524 of the second edition of his work on Continued Fevers, states that in the ten years between the publication of the first and second edition of that work, he had attended "more than two thousand cases" of enteric fever: certainly he must have attended even more before the publication of the first edition; so that his personal experience up to that time may fairly be put down as at least five thous-

1. Peritonitis in enteric fever with regard to surgical interference; Glasgow Med: Journal- February 1897

thousand. In another place he estimated the occurrence of perforation of the intestine in his cases at a fraction over 3 per cent, so that in about 150 of these cases that accident must have occurred. Two only as we have seen recovered.

If then, the number of unsuccessful laporotomies published be trebled so as to make sure of including those unpublished, roughly this gives 54 unsuccessful cases and 5 successful cases."

"When it is remembered that little selection has been made in the cases operated on, (Van Hook's dictum is "the only contraindication is a moribund condition of the patient") it may be claimed that the "prentice hand" of surgery has considerably improved on the very best treatment by other means."

Again Keen (1) states that "when once physicians are not only on the alert to observe the symptoms of perforation, but when

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1. Ibid: page 222.

the knowledge that perforation of the bowel can be remedied by surgical means has permeated the profession, so that the instant that perforation takes place the surgeon will be called upon, and if the case be suitable, will operate, we shall find unquestionably a much larger percentage of cases than have thus far been reported." Assuming that practitioners are alive to this knowledge, it seems clear that in order that the patient may have the full benefit of any operative treatment, an early diagnosis is of vital importance. From Keen's analysis of 60 cases operated upon, with 13 recoveries, the chances of success seem to be in direct proportion to the shortness of the period between the occurrence of perforation and the time of operation, and it is stated by the same authority that "if the operation is not done within about twenty-four hours after the perforation there is practically no hope of a recovery."

It is not, however the object of the present paper to discuss the value of operative treatment, but an endeavour will be made by a study of the cases to be recorded to elucidate the following points:-

(1) Whether the nature of a case gives any indication as to the possibility of perforation occurring;

(2) In order to arrive at an early diagnosis, what are the symptoms upon which most reliance may be placed?

Before proceeding to a summary of the cases-(35 in all)- a short statistical account of them will be given under the following headings:-

FREQUENCY OF PERFORATION: This is shewn in the following Table (A) collected from the statistics of various Writer's and reports of the Metropolitan Asylums Board.

TABLE A

Authority	Cases	Deaths	Percentage
MURCHISON (1)	1580	48	3.04
SCHULCZ (2)	3686	44	1.2
LIEBERMEISTER (3)	2000	26	1.3
O S L E R (4)	389	13	3.3
METRO: ASYL: REPts: (5)	6634	206	3.1

The proportion which this complication bears to other fatalities in Enteric Fever is very high, and varies from 10 to 20 %. According to Murchison (loc.cit.) of 1721 autopsies the proportion was 11.38 %; Osler in six years had 34 deaths of which as many as 13, or 38 % were due to perforation; while in the history of the War of the Rebellion (6) the proportion was 12.9 % (42 perforations in 362 deaths).

1. Continued Fevers, Third Edition- p 568
2. Centralblatt fur Allegemeine Path: Anat: 1891 Vol II p 289
3. Ziemmsen's Encyclopaedia Vol I
4. Johns Hopkins Hosp: Repts-Studies in Typhoid Fever Vol V'95
5. An: Repts of Met: Asyl: Board for 12 yrs 1887-98
6. Med: & Surg: History of War of the Rebellion; Med: Vol part III

AGE: Four cases were under ten years of age, while twenty-one or nearly three-fourths of the cases were between the ages of 10 and 25. The eldest, a male, was 56 years of age, and the youngest, also a male, 7 years. The figures given by Murchison and Fitz shew that the liability to perforation is practically uninfluenced by Age (see Table B), the incidence being almost identical with that of the disease itself. Hawkins[1] statistics shew that in an equal number of cases of Typhoid Fever in children and adults (251 of each) 30 % of the deaths under 15 years of age were due to perforation, while in adults the proportion was 42 %. His figures therefore are in agreement with Murchison's statement that "of fatal cases as large a proportion seems to be due to perforation in children as in adults". As representing an extreme view of the

1. Perforation of the intestine in Typhoid Fever
Lancet 1893 Vol II page 245

frequency of the accident in children may be quoted the statement made by Eustace Smith(1) that "when children die from typhoid fever they die almost invariably from perforation of the bowel and general peritonitis". This is at variance with the experience of Henoch (2) who gives the results of post mortem examination of 21 children (age from 2½ to 13 years) who died from enteric fever. In not one of these cases did death result from perforation and indeed this Writer's experience seems to have included only one case, which occurred in a Boy, 11 years of age. It seems therefore that while this accident is by no means so common in children as Eustace Smith indicates, it is a not infrequent cause of death in Enteric Fever. Murchison saw one case in a child of 5 years and Taupin (3) met with two cases, while Osler (4) states that he has

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1. Disease in Children 1893 pp 76 & 81
2. Lectures on Childrens diseases. New Syd: Soc: Trans 1889 pp 318, 319 & 341.
3. Fièvre typhoïde chez les enfants-Journal des Connaissances Med: Chir: 1888.
4. Principles and Practice of Medicine 1897 p 32

seen it occur in a child five days old.

Table B- Shewing Age incidence of Enteric Fever and of Perforation

AGE	Percentage at each decennial period of		
	Cases of Enteric Fever *	Cases of Perforation	
		MURCHISON	FITZ
0 - 10 yrs	10.42	4.38	3.6
10- 20 "	45.02	18.98	23.8
20- 30 "	29.84	19.71	39.8
30- 40 "	8.76	7.3	23.3
40- 50 "	3.17	2.92	7.2
50- 60 "	0.93	-	1.0
60- 70 "	0.41	-	0.5

* Calculated from Table XXXIX of Murchison's Continued Fevers- Third Edition.

(Murchison's figures are based on 73 cases and Fitz's on 192 cases of Perforation.)

SEX: Twenty-four of the cases were Males and ten females. The marked preponderance of perforation among male patientsaggees with the observations of Murchison, Bristowe, Fitz, and others,

and contrasts strongly with the slightly greater total death-rate among females. The reason for this is difficult to find, unless it be attributed to the age-incidence of the disease being greatest at the working period of existence, and the natural reluctance of men to give in to what is probably considered at first to be only a trifling illness.

DATE OF OCCURRENCE OF PERFORATION: As might be expected on pathological grounds the majority of cases perforate during the third week of the fever. In 6 cases perforation occurred in the second week, 7 in the third week, 7 in the fourth, 7 in the fifth, 5 in the sixth, 1 in the seventh, and 1 in the tenth week at the end of a relapse. Two occurred as early as the eleventh day, the latest during the primary attack being on the forty-seventh day, while in one of the cases recorded below perforation took place in the tenth week during a relapse.

Osler (1) had a perforation occurring as early as the eighth day, and another during the sixth week, two weeks after the evening temperature had become normal, while the statistics of Fitz (2) shew that this complication may occur even as late as the sixteenth week.

SEAT AND NUMBER OF PERFORATIONS: As the characteristic lesion affects the solitary and agminated follicles, it follows that the usual seat of perforation is the small intestine, and more particularly the lower part of the ileum. This is a point of the first importance to the Surgeon as the success attending operation depends to a considerable degree not only upon the reduction of manipulation of the diseased bowel to a minimum, but also upon the preservation of any adhesions which may have formed.

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1. Principles and Practice of Medicine 1895 p 24
2. Trans: of the Assoc: of Amer: Physicians 1891 VI p 200

Post Mortem examinations were obtained in 25 cases. In 20 of these the perforation was in the ileum within 2½ feet of the caecum. In the remainder the distances above the valve were- 3 feet, several feet, 3½ and 5 feet, 5½ feet, and in one case in the caecum. In 21 cases there was only one perforation in 3 cases two perforations in each and in one case three perforations. In this last the perforations were within six inches of bowel and situated in the last fourteen inches of the ileum.

In the great majority of cases therefore the usual seat is the ileum, close to the caecum, this being the seat in nearly 85 % of the cases investigated by Hawkins (1), while out of 15 cases tabulated by the late Dr Bristowe (2) the ileum was the seat of perforation in 14, the position of the perforation in the remaining case not being determined. Cases have been recorded of perforation of the appendix (3) and

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1. Perforation of the Intestine in Typhoid Fever- Lancet 1893 Vol II p 245
2. Trans: Path: Soc: London Vol XI pp 116-121
3. Murchison Brit: Med: Jour: 1865 II p 581
   Rolleston Trans:of the Clin:Soc:Vol XXXI p 234
   Orton Brit: Med: Jour: July 1899 p 143.

large intestine(1) and one case is recorded by J. H. Galton(2) of perforation in Enteric Fever through a diverticulum ilei. A study of Hawkins' cases shews that if the perforations be not found in the ileum, the most likely seat is the colon, next to this the caecum, and lastly the appendix, while the proportionate frequency of ulceration and perforation in order is- appendix, ileum, caecum, and colon or, in other words, the appendix when ulcerated is more liable to perforate than any other part of the intestine.

TYPE OF DISEASE: The fact that the severity of the cases bears no relation to the frequency with which perforation occurs is undoubted, and although the attack in the majority of the Writer's cases was severe it seemed to have little or no bearing upon the occurrence of perforation. Thus Bennett (3).

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1. Brinton Trans: Path: Soc: Lond: 1857-8 IX p 199
2. Trans: Path: Soc: Lond: 1871-2 XXIII p 103
3. Trans: Path: Soc: Lond: 1865-6 XVII p 121-3

reported a case of "Perforation of the intestine in a case presenting no symptoms of typhoid fever during life", so also did Brittan (1) while it is no uncommon experience to meet with cases of enteric fever, among men especially, where the patient only took to bed after the onset of peritonitis. Case X (see Appendix) was in the third month of pregnancy and aborted on the twenty-second day, fifteen days before the occurrence of perforation. Perforation was preceded by haemorrhage from the bowel in nine cases, slight in six, repeated in two, while in one there was a single copious haemorrhage on the day before the occurrence of perforation.

MODE OF ONSET: In 18 cases the onset was sudden and the symptoms quite characteristic and unmistakeable. In 14 the exact time of perforation could not be defined, while in the remaining two the onset was obscured by delirium. In the majority of cases therefore the diagnosis is certain from the first

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1. Lancet 1873 Vol I p 909

This is a point of the greatest importance as the success attending operation appears from recorded cases to be in direct proportion to the shortness of duration of the peritonitis.

SYMPTOMS: Pain- Throughout the course of the majority of cases of Enteric Fever, pain is a common complaint. It is generally referred to the right iliac region, and may be severe in character. The mode of its onset, together with the other features of the case, enable us generally to exclude perforation or otherwise. The usual history is that a patient whose condition may have given rise to no particular anxiety, complains suddenly of agonizing pain, generally in the right lower segment of the abdomen. The onset in such a case is quite characteristic, and the diagnosis of perforation is never for a moment matter of doubt. But any complaint of pain, whether sudden or not, if occurring during the acute stage of the disease when ulceration is still going on, and if associated

with tenderness on palpation, should always be carefully considered, and the possibility of perforation having taken place always borne in mind. The pain may persist, but not infrequently it passes off or diminishes in intensity as the peritonitis becomes more advanced, and if opium is administered.

There are cases, however, (two of which are recorded later), in which this symptom is never presented at all, owing generally to the mental condition of the patients. The pain however may be of such severity as to rouse even a comatose patient to complaint. Cushing[1] of Baltimore attaches such weight to this symptom as to recommend a surgical consultation whenever there is any complaint of abdominal pain and tenderness.

In 18 of the cases there was complaint of abdominal pain of varying intensity. In 7 of these the occurrence of perforation was signallised by the sudden onset of abdominal

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1. Laparotomy for Intestinal Perforation in Typhoid Fever- John Hopkins Hosp: Bull: No 92 Nov: 1898

pain, while in 10 cases in which this symptom had persisted more or less from the onset of illness, there was no marked change in its character. In the remaining case the patient was almost constantly delirious from the date of admission to Hospital, though there was a history of abdominal pain at the onset of the Fever. In his short lucid intervals however, although for other reasons a diagnosis of perforation was made no evidence of abdominal pain or tenderness could be elicited. In 6 cases there was no complaint previous to the onset of peritonitis, while in 4, pain was only present for a short time before death, and in only one of those four cases was it at all severe. In the remainder of the cases the previous history shed no light on this point.

So far as this one symptom is concerned, its character and mode of onset are therefore the most important features, the seat of pain in only a small number being localised

at first, generally in the right iliac region.

Abdominal distension- was present in fully one-third of the cases, while in six only was it entirely absent as a previous symptor. The presence of slight or early abdominal distension in an otherwise favourable case would not in any way influence the prognosis, but when associated with abdominal pain, with rise of temperature, and especially is there is any sickness or vomiting, it is of considerable significance, for the probability then is that it is due to peritonitis and not to any reflex irritation.

Loss of Liver dulness although quite common after the occurrence of perforation, is not a sign to be waited for, as it means generally presence of gas in the peritoneal cavity. A distended colon may give rise to this diminution of dulness, but here as in all other cases it is impossible to pin one's diagnosis to a single symptom.

Sickness and voriting- as initial symptoms are most important but usually not prominent until after the occurrence of perforation. Where the onset of symptoms of perforation is sudden and death results from shock, sickness and voriting may der indeed be entirely absent. In the cases in which the other symptoms were not well marked, voriting and sickness occurred early and were of the utmost importance in guiding the diagnosis Voriting at the onset of the Fever is not here referred to but as it occurs from the second week onwards.

Diarrhoea and constipation: It has usually been taught that diarrhoea is the rule in Enteric Fever, but the Writer's experience is quite at variance with this; Nor as a premonitory symptom of perforation is it so valuable a guide as constipation, the former condition being generally in proportion to the extent of ulceration, whereas when ulceration has extended deeply constipation is the rule.

Sir William Jenner[1] has pointed this out very clearly, and states that "a single deep ulcer will paralyse the action of the bowel and so cause constipation, and this has to be kept in mind as a fact of the highest practical importance when it is proposed to relieve the bowels by an aperient." Jenner without doubt in writing these words had in mind the possibility of perforation occurring, and it would be difficult to imagine a patient suffering from Enteric Fever in a condition of more imminent peril,- a slight error in dieting, an injudicious movement, a particle of hardened faecal matter passing over the ulcer, and the worst has happened.

In 19 cases there was diarrhoea previous to the onset of perforation and in 6 of these it was severe; In 8 cases there was constipation throughout.

Collapse occurred as an initial symptom in 7 cases; two of these died without rallying. In only one case was late collapse

1. Lectures on Fevers 1893- pp 481 & 482

noted.

Rigor- In only one case did rigor occur, and in it the resenteric glands did not present any degenerative softening. In Jenner's case, already quoted, there were repeated rigors and the peritonitis was found to be due to rupture of a softened resenteric gland.

Temperature and Pulse- In 15 cases the temperature was high throughout the course of the illness up to the date when perforation took place. This may be taken as an index of the general severity of the cases. In 4 cases only had the temperature become normal or sub-normal; In one of these latter it had been subnormal for several days, when a relapse set in, perforation occurring on the third day of the relapse. The fact that this complication usually occurs while the fever is still running its course serves in itself to diminish the chances of recovery after operation, the patient being in the first place generally in an unfavourable bodily condition for a

major surgical operation, and having, secondly, still to combat the specific poison itself for an unknown period. It is interesting to note in this connection that out of nearly a dozen cases operated upon in Belvidere Hospital, the only recovery took place in a case in which the temperature had settled to normal. This case (No XII) came under the Writer's care and is recorded below.

In the majority of cases perforation was followed by a rise of temperature, and if the patient lived long enough this was again followed by a gradual fall. In those cases in which collapse occurred there was a sudden fall of temperature, but as the patient rallied again the temperature rose in some few cases to a considerable height. Dieulafoy[1] considered an abrupt fall of temperature as pathognomonic of perforation. "La perforation intestinale au cours de la fièvre typhoïde se traduit dans les grande majorite des cas, par une chute brusque de la température."

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1. De l'intervention chirurgicale dans les péritonites de la fièvre typhoïde. Bull. de l'Académie de médicine 1896.

The only exception made by him is in perforation of the appendix. The rise of temperature in these cases he explains by the fact that the appendix being limited in movement, allows of a certain degree of localised peritonitis before the occurrence of perforation, and the invasion of the general peritoneal cavity by bowel contents. Symonds[1] in discussing the value of temperature as a symptom in perforative peritonitis says- "these high elevations point to septic infection of the connective tissue of the appendix, for where the peritoneum alone is concerned absorption is slight, but if the connective tissue be involved the absorption may be as rapid as in any other part of the body."

Any continuance of the fever beyond the usual limits of the disease in the absence of any other discoverable lesion at once suggests the possibility of the invasion of fresh Peyer's patches, but when the perforation has actually taken place

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1. Brit: Med: Journal, March 4, 1899

the temperature can no longer be considered a reliable guide to the diagnosis of the condition. Indeed the absence of pyrexia weighs but little, all that can be said being that while the majority of cases shew some degree of elevation, the temperature in others may be normal or more frequently, sub-normal. Wunderlich[1] in discussing the temperature in severe cases of Enteric Fever which have reached what he calls the "amphibolic stage" or "period of changing fortunes" observes that "sudden and considerable falls of temperature are only observed with severe haemorrhages and perforations in this stage", and that "not infrequently recrudescence of the course takes place with a renewal of the symptoms in the fastigium, apparently caused by a renewal of the anatomical lesions. It is in these cases more particularly that dangerous and fatal haemorrhages and perforations are to be dreaded." The Pulse appears to afford a much more reliable indication of peritonitis, there being in practically every case a considerable

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1. Medical Thermometry. New Syd. Soc. 1871 p 316

increase in rate. The indication afforded by it indeed is of such importance that where there is any doubt as to the diagnosis any absence of acceleration of the heart's action would make one hesitate before pronouncing a case to be one of perforative peritonitis. As the septic peritonitis advances there is a steady increase in the pulse rate with a falling off in quality, until finally it becomes a mere thread and quite uncountable.

Leucocytosis: This is a factor in the early diagnosis of perforative peritonitis which has apparently not yet in this country received any considerable attention. Continental and American Surgeons and Physicians, however, attach considerable importance to an examination of the blood in such cases. The exact value of this leucocyte count we are at present unable to estimate, but the conclusions arrived at by Cushing are well worth quoting and are as follows:- (1) The "appearance(of leucocytosis)"in the course of typhoid fever points to some inflammatory complication in its early

"stage. (2) "If the complication be peritonitis and remain localised, associated possibly with a pre-perforative stage of ulceration, or with a circumscribed slowly forming peritonitis after perforation, it may be, and usually is, signallised by an increase of leucocytes in the peripheral circulation.

(3)"If however a general septic peritonitis follow the leucocytosis may be but transitory and overlooked, as it disappears concomitantly with the great outpouring of leucocytes into the general cavity."

SUMMARY OF CASES-

A- Cases in which the onset of symptoms was sudden:

Case 1. Enteric Fever. Perforation in 4th week. Death 3 days later.

Perforation found close to the caecum.-

George S. aged 30. Admitted Octr 28th 1897 in the fourth week of his illness. On admission patient did not appear to be very ill. Temperature 100.6. P. 96. R. 28. A few hours after admission he

suddenly cried aloud with intense abdominal pain. Shortly before this the patient had got out of bed to micturate during the absence of the Nurse in Charge. When seen shortly afterwards the face was drawn, eyes intensely anxious, and the skin was cold and wet with perspiration. Pulse 100, of fairly good quality. Respirations 24. There was very slight rigidity of the abdomen, but extreme tenderness in the umbilical and left iliac regions. He revived somewhat with stimulation and at 9.15 p.m. was given 2 grains of opium. The bowels moved shortly afterwards, three times, the motions being loose and yellowish. At 10 p.m. he had a rigor lasting a quarter of an hour, when the temperature fell to 99.6 deg F.

October 29th: Patient slept till 1.15 a.m. Was sick and vomited after administration of stimulant which was afterwards given per rectum. Says he feels much better and is mentally clear, although the pupils are very contracted. Pulse 134. Respirations 28. Tongue moist at tip and edges and fairly clean. The abdomen is

more rigid, but the tenderness is not so great. Urine passed contained a trace of albumen. Bowels have not moved again.

October 30th. Had a restless night. The skin is acting freely. Morning temperature 101.6. Pulse 160, very feeble and flickering. Respirations 40, and chiefly thoracic. Tongue moist and slightly furred in the middle. The abdomen is rigid but there is no tenderness on light palpation. No abdominal distension. Complains greatly of thirst.

October 31st: Had another restless night and is steadily sinking. Perspiring freely and is at times cold and clammy. Temperature 102.4 at 6 a.m. Pulse 140. Respirations 40 and thoracic. Abdomen distended now and tympanitic all over. No pain on palpation. In the evening complained of great pain in the abdomen and died at 7.45 p.m.

Post Mortem examination showed the presence of a general septic peritonitis with a perforation in the ileum close to the caecum.

2. Enteric Fever. Perforation on 26th day. Death 43 hours later.

Perforation found six inches above the ileo-caecal valve.

Nellie P. aged 9. Was admitted to Hospital on August 31st, on the fifteenth day of her illness, which began with headache, shivering, and sickness. There had been no abdominal pain, but for four days before admission there was some diarrhoea. Had been confined to bed for three days. Temperature on admission 99.4. P. 104. R 24. Patient was fairly bright and intelligent. The face was pale, with slight malar flush. Pulse firm and regular, Tongue clean but slightly dry and glazed. Lungs, Heart, and Urine, normal. No rash. No distension or tenderness of abdomen. Spleen enlarged and palpable. The case progressed without complication until September 11t the temperature falling steadily. There was no complaint, but the abdomen became slightly distended, and the bowels were constipated, and there was some slight hypostatic congestion of the lungs. At 2 p.m. on 11th September she became suddenly collapsed and shortly after complained of abdominal pain of moderate severity. When -

seen quarter of an hour after perforation patient was lying on her back,face pallid, lips livid, pulse small and rapid, and voice not rising above a whisper. There was very slight abdominal distension and slight general tenderness on palpation. Under stimulation the collapse passed off, but in the evening there was marked abdominal distension and slight rigidity of the parietes. Remained in much the same condition throughout the 12th, but at 1 a.m. on the 13th vomiting set in and continued more or less till death at 9 a.m. The temperature had reached its highest point (104.8) on the 6th instant (21st day) and thereafter fell. On the evenings of the 9th and 10th inst, it was 101.8. An hour after the occurrence of perforation it rose to 104.8 but fell a degree within an hour, thereafter not rising above 103.8. The pulse which had run at about 120 throughout immediately rose to 138 and increased steadily in rate, and just before death was nearly 180 per minute.

Autopsy. On opening the peritoneal cavity a small quantity of gas

escaped. The visceral peritoneum was slightly dull and there were some ounces of pus in the pelvis. No faecal odour. A perforation was found six inches above the caecum, and round about it was a plastic effusion of lymph. On opening the gut there was only one patch in the stage of active ulceration. It had a punched-out appearance, the perforation in the base just admitting a probe.

3. Enteric Fever. Repeated haemorrhages. Perforation on 39th day.

Death 23 hours later. Pin-hole perforation of the caecum.

Mrs R. aged 31. Was admitted on 2nd September, on the thirteenth day of illness, which began with sickness, diarrhoea, lumbar and abdominal pain. Temperature on admission 103.8. P 96. R 33. The pupils were slightly contracted. Tongue moist, but furred, and the abdomen considerably distended. The Heart and Lungs were normal, and the Urine contained a trace of albumen. The temperature remained steadily high until the 6th September, when after the administration of an anti-pyretic it fell from 104.2 to 100 deg F. The following morning there was a remission without an anti-pyretic.

The abdomen still remained distended and diarrhoea was present. On the 10th September the temperature began to fall and the abdominal distension was less marked, while the motions although still frequent were smaller. From the 14th September there were small repeated haemorrhages and at 1 p.m. on the 28th after using the bedpan she became sick and had a slight rigor accompanied by collapse but no pain. Shortly after there was a severe rigor with extreme collapse, the pulse being imperceptible and the temperature 96 deg F. The temperature then rose steadily during the night and on the morning of the 29th was 105 deg F. The pulse was very small and could not be counted at the wrist. Patient now lay on her back with legs extended. The abdomen was not rigid nor was there any apparent tenderness. There was occasional sickness. The tongue was small and dry, and urine was passed into bed. At noon the same day the pupils dilated, a large quantity of fluid was vomited, death occurring almost immediately afterwards.

Autopsy.- On opening the abdomen a large quantity of gas escaped.

There was a general peritonitis, the small intestines being lustreless and injected, while the whole intestines were adherent by plastic lymph. There was a small amount of puriform fluid in each flank. On separating the adhesions there was found a pin-hole perforation of the caecum near its lower part. On opening the gut the small intestine was seen to be ulcerated for three feet from the ileo-caecal valve, the floors of the ulcers being clean and presenting evidence of healing. In the caecum were two ulcers separated by a narrow bridge of mucous membrane, and it was through the floor of one of these that perforation had taken place. In the large intestine, three feet from the valve, was a circular ulcer about a quarter of an inch in diameter.

4. Enteric Fever. Perforation on 25th day. Death on 27th day. Male aged 16. Was admitted to Hospital with a history of illness of 9 days duration beginning with headache, sickness, shivering, and lassitude. Had been confined to bed for the last five days during

which time there had been severe diarrhoea. Temperature on admission 101 deg F. P 100. R 24. This was a sharp case of Enteric Fever, the temperature running about 103 deg F. from the date of admission. Except for the weakness incidental to the continued fever, his condition presented nothing noteworthy until the 25th day of the disease when very definite symptoms of peritonitis suddenly set in. This was accompanied by a critical fall of temperature to 98 deg F. and symptoms of collapse. He rallied somewhat on the following day and the temperature rose again, but the general improvement was transient, death occurring on the evening of the 27th day, two days from the first onset of peritonitis.

Unfortunately a post-mortem examination could not be obtained.

5. Enteric Fever. Perforation on 47th day. Death 30 hours later.

Mary M'C. aged 13. Had been ill for a fortnight before admission to hospital and had been confined to bed for eight days. Temperature on admission 104 deg F. P 124. R 30. This was a very sharp

case of Enteric Fever, there being diarrhoea, at times severe, throughout. The temperature remained high, running steadily between 100.4 and 104.2, the pulse varying from 118 to 142. No complaint was made until the morning of the 47th day when suddenly between 5 and 6 a.m. abdominal pain of moderate severity was felt. Two partly formed motions were then passed, and at 8 a.m. pain was no longer felt. Sickness and vomiting set in about 2 p.m. and shortly afterwards pain in the abdomen was again complained of. There was some distension, especially in the region of the transverse colon, and tenderness of the lower abdominal segment. Anteriorly liver dulness was gone, but was present in the axillary region. Abdominal respiration was slightly restrained and the face was pinched. Pulse 144. The symptoms of perforation became steadily more pronounced and death ensued at noon on the 48th day.

There was no post-mortem examination.

6. Enteric Fever. Perforation on 14th day. Laparotomy 36 hours after-

wards. Death 15 hours later. Perforation found 19 inches above ileo-caecal valve.

Charlotte A. aged 16. This patient was admitted to hospital on November 16th 1898, with a history of having been ill for a fortnight with pain throughout the body, malaise, vomiting and diarrhoea. At 7-30 on the morning of the 16th, before admission, severe abdominal pain suddenly set in followed by vomiting. On admission, patient, who was a stout well-nourished girl presented the cardinal symptoms of general peritonitis. The face was pale, eyes sunken, pupils dilated, tongue dry, and pulse of fair volume but very compressible; its rate exceeding 130 per minute. Temperature 102.8 The abdominal wall was rigid, respirations thoracic, and there was marked tenderness on pressure, most evident in the upper part of the abdomen. The percussion note was much diminished in the left flank, but clear in the right flank. There was no vomiting or retching, but patient complained of feeling sick.

Laparotomy was performed 36 hours after the onset

of peritonitis, but death resulted 15 hours later.

Autopsy. On opening the abdomen the small intestine was found lying in the pelvis and was the seat of well marked peritonitis. Nineteen inches above the ileo-caecal valve was found a stitched wound of the bowel measuring roughly 2½ inches. This part remained water-tight under considerable pressure. The ileum was ulcerated in its lower 19 inches, and several ulcers were present in the large intestine. The ulcers were not very numerous in the ileum; in several the floor was diaphanous and in some transverse muscular fibres could be seen. The affection of the gut above the perforation was slight; many mesenteric glands were enlarged, some on section exuding pus. The peritonitis was by no means wide spread.

Case 7. Enteric Fever. Repeated haemorrhages. Perforation on 23rd day. Death 3 days later. Two perforations present; one 3½" and the other 15" above the ileo-caecal valve.

Thomas S. aged 23. Was admitted to Hospital on January 4th 1899 with a history of illness, of nine days duration, which began with headache, anorexia, sickness and vomiting, pains in the right side, back, and abdomen. The bowels had been constipated. Had not been strictly confined to bed. On admission the temperature was 102. Respirations 30. no radial pulse felt, and the countenance was somewhat dusky. There was slight abdominal pain and the abdomen was soft and slightly distended. Tongue large, dry, and fissured, and covered with sordes, and there was some hypostatic congestion at the base of the right lung. Splenic dulness enlarged.

January 6th. Motion passed in the evening contained several almond sized blood clots, and a second motion passed later also contained a little blood clot.

January 9th. At 1-20 p.m. a large motion containing dark crimson blood and clots was passed. Patient improved slightly until January 17th when he complained of uneasiness in the region of the

transverse colon, which was irregularly distended with flatus. On the evening of the same day he complained of sudden severe pain all over the abdomen. Considerable peristaltic movement of the bowel was evident through the parietes, and shortly after a dark-brown partly formed motion was passed which gave the blood reaction immediately. The pain then abated considerably.

January 18th. At 9 p.m. a dark liquid motion, (in all 8 ozs), was passed. The left ear began to discharge pus on the same day.

January 19th. At 3-15 a.m. he passed some dark brown semi-fluid faeces which also gave the blood reaction. Abdominal pain then again became severe, patient becoming very restless, while the face was pinched, eyes sunken, hands and arms shrivelled and dusky. The abdomen was extremely tender on palpation, and hepatic dulness still present. He sank steadily and died at 10 p.m. on January 20th. The temperature which had been averaging 101 to 102 deg F. dropped slightly after the haemorrhages, 99 deg being the lowest registered, on the evening of 18th January, but before

death rose to 103 deg, there being also a rise in pulse-rate. Autopsy. The coils of intestine were united by soft fibrinous exudation and lying in the pelvis was some faecal-smelling serous effusion. The ascending colon had fully a dozen clean cut ulcers the majority being situated near the caecum. A perforation one-eighth of an inch in diameter was found 3½ inches above the ileo-caecal valve. About a foot higher was an ulcer in the base of which was some fibrin, which being removed, left a perforation about the size of a pin-head.

Case 8. Enteric Fever. Perforation on 2nd day of normal temperature. Death 12 hours later.

David A. aged 17. Was admitted to Hospital on December 22nd 1898 with a histroy of illness of 4 weeks duration, during the last two weeks of which he had been confined to bed. The case progressed favourably and at 10 a.m. on 29th December the temperature touched 98.6 and remained so on the 30th until 3-45 p.m. when perforation

occurred. He suddenly made loud complaint of abdominal pain and on examination the abdomen was found slightly rigid, but not at all distended. (Immediately before this a loose yellow motion had been passed). The pulse was good, and normal in rate and there was no sign of collapse. After the administration of opium, along with the application of hot fomentations to the abdomen the pain subsided, and in about two hours from its onset the patient fell asleep. The temperature taken shortly afterwards was found to have risen to 104 deg F. At 1-40 p.m. pain returned with great severity, and the pulse rate had considerably increased. The abdomen was rigid, moving little or none on respiration, tender all over on palpation, though still free from distension; the liver dulness was very small, its presence indeed being a matter of doubt. There was no sickness or vomiting.

By 4 a.m. on December 31st pain had subsided and the patient slept for 2½ hours. Vomiting set in at 10 a.m. and he continued frequently to bring up small quantities of greenish fluid. There was

little or no retching, the fluid apparently reaching the mouth without effort. The abdomen was still free from distension, but rigid and motionless, and while dulness was present along the course of the ascending colon there was no evidence of peritoneal fluid. The pulse had now become small, feeble, and rapid, and the extremities cold. Patient slept a good deal during that day and next night, becoming gradually weaker and died at 10-15 a.m. on January 1st.

There was unfortunately no post-mortem examination.

Case 9. Enteric Fever. Haemorrhage. Perforation on 34th day. Death 25 hours later. Perforation found 9" above the ileo caecal valve.

Elizabeth B. aged 12. Was first seen on December 14th on the 22nd day of the fever. This case was an exceedingly sharp one, there being profuse diarrhoea, the motions on 20th and 21st December being streaked with blood. The temperature was high throughout

the period of observation, the evening temperatures varying from 101.2 to 105 deg F. The pulse was small, soft, and rapid, and the patient's general condition gave rise to some anxiety. On Decr 25th there was some complaint of slight abdominal pain which soon passed off, but at 1 a.m. on the following day severe abdominal pain was complained of,- sudden in onset and lasting about 15 minutes. Patient lay on her left side with her knees drawn up. Respiration was rapid and chiefly thoracic. The abdomen which previously had been normal in shape, was now slightly distended and tense, with some muscular rigidity and tympanitis. The pain was referred to the umbilical region. The abdominal distension gradually increased, especially towards the costal region and by 11-30 a.m. liver dulness was gone. Death occurred at 2 a.m. on the 3rd th day of illness, 25 hours after the occurrence of perforation.

Autopsy. The abdomen was full of faecal smelling gas and contained a considerable quantity of liquid faeces. A perforation about an

eighth of an inch in diameter was found 9 inches above the ileo-caecal valve. There was a little adhesion about the seat of perforation but no general effusion of lymph.

The remainder of cases included in this group are not detailed as their histories differ but little from those already recorded. The main points of interest in connection with them are given in the Table of Cases appended.

B- Cases in which the onset of symptoms of peritonitis was gradual.

Case 10. Enteric Fever in third month of pregnancy. Abortion on the 22nd day. Perforation on the 37th day. Two perforations of ileum present.

Mrs O. aged 23. became ill three weeks before admission to Hospital on September 1st, with headache, sickness, shivering, and vomiting. Temperature on admission 102.2. P 114. R 26. Patient was in the third month of pregnancy, and was said to have had a flooding on the night before her admission. On examination the

placental mass was found in the vagina. The external os was patent, the internal os was closed but dilatable.

September 11th. Cervix contracting, external os much smaller and discharge no longer coloured.

September 17th. Shortly before midnight last night the Nurse noticed twitching of patients face, lasting about ten minutes, and stated that for half-an-hour afterwards the face was drawn to the right side. During the night she was heady and restless, but did not complain of any pain, and towards morning vomited several ounces of bile-stained fluid.

This morning she is much quieter and lies on her back with legs extended. Nothing special about the aspect and vomiting has not persisted. Pulse has been more rapid during the night and this morning is 140. There is no complaint of pain now, but during the night she says there was some abdominal pain. The abdomen is not distended, but there is slight rigidity and considerable general tenderness

Respiration is entirely thoracic.

September 18th. Had a fairly quite night but was slightly delirious for a quarter of an hour about midnight, and again at 2 a.m. Slight sickness this morning. The abdomen is rapidly distending and is extremely tender. In the left iliac region there is distinct fulness, which is somewhat dull, while the flanks are clear to percussion.

September 20th. Condition becoming gradually worse, face pinched and tongue moist. There is frequent sickness but little vomiting, and hiccough is a distressing symptom. The abdomen is more distended and the left flank is quite dull on percussion.

The temperature was remittent, running between 102 and 104 deg F., touching 105 deg F. on the evening of September 5th, and at 6 p.m. on the evening of her death reaching 106.6, and at death 107.2 deg F.

The bowels were moderately loose at the beginning of her stay in hospital, but were afterwards constipated.

Autopsy. On opening the abdomen the great omentum was found spread

over the viscera reaching down to and forming adhesions in the right iliac fossa. At the point of adhesion the great omentum was much thickened. The adhesions were easily separated and in doing so an escape of gas took place from a perforation in the small intestine at which faecal contents were presenting. The Pouch of Douglas was shut off by adhesion of the intestine to the Fundus Uteri, and in the pouch was found a purulent exudation with some admixture of faecal contents. Prior to the removal of the small intestine a second perforation was found. The affection of Peyer's patches was limited to the lowest 2 feet of ileum, and the floors of the ulcer were free from slough. Several ulcers were also found in the large intestine. Both perforations were present within the last two feet of the small intestine.

Case 11. Enteric Fever. Perforation in 4th week. Laparotomy- two perforations found. Death 16 hours after operation.

William R. aged 13. Was admitted to Hospital on November 19th 1898 with a history of having been ill for three weeks, and confined to

bed for five days. This was a typical case of Enteric Fever, the attack being quite uneventful until November 30th when the lad complained of slight abdominal pain. On the morning of December 1st the temperature dropped to 98.4, and at the same time he complained of abdominal pain with a desire to go to stool, the pain being increased by putting him on the bed-pan. A slight motion was passed and the pain was somewhat relieved. He was seen frequently during the day, the chief features of the case being-1. A progressive pinching of the face and sinking of the eyes;

2. Slight abdominal tenderness not referred to any one part;
3. Increase of pulse-rate (120 to 125 in the evening), and rise of temperature. The quality of the pulse diminished during the day;
4. Rigidity of the right Rectus Abdominis in its lower part
5. Thoracic respiration;
6. Marked diminution of liver dulness;
7. Slight sickness.

A diagnosis of peritonitis presumably perforative was arrived at, and laparotomy decided on. The operation was performed by Dr T. K. Dalziel on December 2nd. A pinhole perforation was found six inches from the ileo-caecal valve, and five inches higher was found a second perforation the size of a crow quill. The patient sank gradually and died 16 hours after operation.

Case 12. Enteric Fever. Perforation in tenth week during a relapse. Laparotomy- perforation found 8" above the ileo-caecal valve. Recovery.

Agnes E. aged 13. Admitted to Hospital on November 19th. The present illness began 9 weeks before admission to hospital with languor, headache, abdominal pain, diarrhoea, and cough. Patient was under treatment for ten days during the primary attack, but on becoming worse was sent to Hospital. On admission patient was thin, but not at all emaciated; the face was flushed and pupils dilated. Tongue moist and fairly clean, Lungs and Heart normal. The abdomen was slightly distended with slight pain and tenderness in the lower

segment. No gurgling. The spleen was easily palpable coming down to the costal margin and measuring 2½" in the mid-axillary line. There was no rash and the urine contained a trace of albumen. The case progressed favourably, the temperature having become normal, until November 25th. There was then some slight abdominal pain, but as this had been complained of before and had passed off, no great attention was paid to it at the time. The pain however became steadily worse, and at 1-30 p.m. when the patient was seen, was very severe and her general condition clearly critical. The face was pale and the expression anxious. Respirations thoracic, rapid, and shallow (72 per minute). Pulse small and rapid (170 per minute). There was also some sickness and vomiting. The abdomen was slightly distended, rigid and tender all over. Liver dulness normal.

A consultation was held with Dr. T. K. Dalziel, operation decided upon, and performed at 5 p.m. The abdominal cavity contained a considerable quantity of foul liquid faecal matter,

and on examination of the ileum a perforation about the size of a pinhead was found about eight inches above the ileo-caecal valve. This was sutured, the abdominal cavity irrigated and the wound closed. Patient made an uninterrupted recovery and was dismissed well on February 4th.

Note.- This is a case of extreme interest, the factors in it which contributed to the success of the operation being probably-

(1) A normal temperature when perforation occurred, patient apparently having reached the end of her illness;

(2) The operation being performed early, certainly within twelve hours after perforation;

(3) The general condition of the patient at the time of perforation being excellent.

Case 13. Enteric Fever. Peritonitis. Perforation and Death from Shock on the 35th day. Perforation found about 5½ feet above the caecum.

Mary M. aged 10. Admitted to Hospital on 21st November 1898.

Her illness had begun 16 days before, with anorexia and abdominal pain. There had been some diarrhoea and cough for a week. Condition on admission. This was a thin ill-fed looking girl, with pale face, dilated pupils and conjuctivae clear. The tongue clean but rather dry. Abdomen- Normal in aspect. No pain or tenderness. Spleen enlarged and easily palpable. There were two rose spots on the chest but none on the abdomen or back. Some slight bronchitis present, cardiac sounds feeble and rather dull. Temperature 102.5. Pulse 120 small and dicrotic. Respirations 32. Urine normal. The attack was only of moderate severity, and ~~pati~~ patient progressed quite favourably until December 4th. Early on the morning of that day slight abdominal pain was complained of and soon passed off, but returned again with steadily increasing severity. At 5 a.m. patient was sick and vomited, and then fell asleep. At 10 a.m. her condition was much worse; The face pale and pinched with a well marked expression of pain. Pulse 120 and

thready. The abdomen was distended but not greatly, and moved freely with respiration. The parietes were flaccid and there was no complaint or tenderness on palpation. Liver dulness normal. During the day her condition became, if anything, worse; pulse small and uncountable at the wrist; occasional sickness and vomiting; pain gone, but the coils of intestine became greatly distended giving the abdomen quite a billowy appearance. Rectal feeding was resorted to, the condition of collapse passed off, and for the next four days there was but little change except perhaps for the better. On December 10th at 5 p.m. however, patient sat up in bed and expired almost immediately.

Autopsy.- Body extremely emaciated, with entire absence of subcutaneous fat. Thoracic organs healthy. Abdomen greatly distended. On opening the abdomen a small quantity pea-soupy faecal matter escaped. The omentum and coils of intestine were adherent to one another, the adhesions being fairly easily broken

down. On lifting the omentum from a coil of small intestine to which it adhered, a large quantity of liquid bowel contents escaped from four perforations in the floor of a large ulcer 5½ feet above the ileo-caecal valve. In all there were 36 ulcers. The highest was 9½ feet above the valve, and fourteen were within the last twelve inches of ileum. In six inches of bowel which included the perforation were eight ulcers, two of which were down to the serous coat.

Note.- A diagnosis of perforation was arrived at on December 4th when abdominal pain was first complained of, but in the light of the subsequent history of the case it seems probable that this was a case of peritonitis by direct extension through the floor of an ulcer, and that perforation did not occur until patient made a violent effort to sit up just before death. The temperature chart of this case is particularly interesting.

Case 14. Enteric Fever. Perforation on 12nd day. Laparotomy 8 hours later. Perforation found 18" above caecum. Death

after 24 hours.

William T. aged 21. Was first seem on January 11th. There was a history of an illness of 14 days duration, which began with shivering, headache, diarrhoea and abdominal pain. He had been confined to bed for a week. Temperature on admission 103 deg F. P. 104. R 30. This was a typical and sharp attack of Enteric Fever, the most prominent features of which were insomnia and diarrhoea of moderate severity. By the end of the 4th week the temperature shewed some downward tendency, but this was not sustained. Recrudescence of the Fever associated with a recurrence of the rash followed, but the patient progressed satisfactorily notwithstanding the fact that the recrudescence was as severe as the primary illness. On the afternoon of February 7th however, he became restless and was not looking so well as usual. He was anxious and nervous, and could give no definite indication of the nature of his distress, but thought there was some abdom-

inal discomfort. There was no pain or tenderness and examination of the abdomen proved negative. Later in the evening the mental distress was still unabated. The breathing was regular and quiet, 24 per minute, but the pulse had risen from 80 per minute to 120. Some tenderness in the right iliac region could now be elicited, and still later this had become acute and had spread over the right side of the abdomen. By midnight there were signs of collapse, and definite peritonitic friction could be detected on auscultation. Operation was now decided upon and performed by Dr. T. K. Dalziel at 1-30 a.m. The perforation was readily found and sutured and the abdominal cavity irrigated with saline solution. The operation was completed shortly after 2 a.m. and half-an-hour later the patient was able to express himself as feeling very well. The temperature remained sub-normal however, never rising above 96 degrees after the operation, and death ensued at 5 p.m. on February 8th.

Autopsy.- On opening the abdomen the coils of intestine immediately

under the wound were found to be matted together, but elsewhere they shewed nothing of this. A small quantity of sanguineous lymph occupied the floor of the pelvis, and here was found the coil of intestine which had been operated upon. The edges of the sutured wound were closely approximated and subsequent examination shewed that the gut was impervious to water even under pressure. The most obvious pathological condition was the marked and general enlargement of the mesenteric glands. These on section proved to be the seat of suppurative inflammation in various stages of completion. Some of the larger glands, (about the size of a pigeon's egg), were fluctuant and contained pus. On removing the bowel and exposing its internal surface a moderate amount of ulceration was found to exist in the last three feet of the ileum. In only one ulcer had the process completely involved the muscular coat. This was found in the centre of a Peyer's patch about four inches from the site of the operation. The perforation was 18" from the

caecum. The spleen was enlarged, but otherwise not remarkable The other abdominal organs were healthy as were also the thoracic organs.

C- This group includes two cases in which the onset of symptoms of peritonitis was obscured by the general condition of the patients. In case XVI indeed, the occurrence of perforation was not suspected.

Case 15. Enteric Fever. Perforation about 14th day. Death about 22 hours later. Perforation found about 27" above the ileo-caecal valve.

James M'G. aged 13. Illness began 7 days before admission to Hospital, with sickness, vomiting, headache and abdominal pain. Had been confined to bed for three days. Temperature on evening of admission 104.6. P. 124. R 50. The symptoms in this case were severe from the date of admission, there being sharp diarrhoea, high fever, and violent delirium. These persisted and at

3-20 p.m. on the 14th day there occurred a rigor lasting ten minutes. Temperature 104.8. Pulse 140. Respirations - 44. The abdomen moved with respiration but there was some slight rigidity of the right Rectus Abdominis, and apparently some tenderness on palpation. There was also frequent eructation but no vomiting. Three motions were passed shortly after the rigor. There was wild delirium throughout the night, and on the following day patient was livid and the pulse scarcely perceptible at the wrist. There was occasional vomiting. The abdomen was now slightly distended but still moved with respiration. Death occurred at 1 p.m. on what was supposed to be the 15th day of the disease.

The temperature throughout ran between 103 and 105 deg F. but on the day of death at 6 a.m. fell to 102 deg and there after rose steadily reaching 107 deg at death. The pulse which had kept steadily at 120 per minute rose to 140 on the 14th day.

The autopsy shewed an acute general peritonitis. On opening the abdomen there was an escape of brownish fluid. The peritoneum over the parietes and intestines was slightly injected, and there was a considerable exudation of flaky lymph on the small intestines. A perforation was found 27" above the ileo-caecal valve and there were ulcerated patches to a height of 3½ feet above the valve.

Case 16. Enteric Fever. Hypostatic congestion of Lungs. Haemorrhage. Perforation in 4th week. Death. Perforation found 29" above the ileo-caecal valve.

Thomas B. aged 56. Was sent to Hospital from the City Poorhouse in what was apparently the fourth week of an attack of Enteric Fever. He had been five days in the Poorhouse, and the previous history of the case was vague. On admission the patient was in a critical condition; he was considerably emaciated, there was hypostasis of both bases, and on the day after admission three motions

were passed with small blood clots in them. Examination of the abdomen proved negative, and patient died six days later, having been in a delirious condition throughout.

At the autopsy there was found a general septic peritonitis, most intense towards the pelvis and region of the caecum. The pelvic cavity contained some grumous brown fluid. There were several ulcers in the colon, and considerable ulceration of the ileum to a height of nearly four feet above the valve. Higher up the ileum one or two small eroded patches of gut were seen. Many of the ulcers both in the ileum and colon were down to transverse musuular fibre. A pinhole perforation was found 29" above the ileo-caecal valve.

D- This last group includes only one case. In this there were symptoms simulating those of perforation, and Laparotomy was performed, but no perforation could be found.

Case 17. Patrick M'I. aged 15. Was admitted to Hospital on May 18th on the 17th day of Enteric Fever. The initial symptoms were headache, shivering, pains in the limbs and prostration. There had been diarrhoea from the onset, and pain in the abdomen for the last week. On admission the temperature was 102.2. P 112. R 24. Patient was a stout well-nourished Lad. There was some general suffusion of the face. Pupils semi-dilated, pulse of good quality, tongue moist and coated. He was slightly dull and drowsy, but intelligent when roused. The skin was somewhat dry with a few roseolae on the trunk. Heart normal. A few bubbling râles at the bases of both lungs. Urine normal. The abdomen shewed moderate general distension. No tenderness. Splenic dulness moderately increased. Liver dulness normal.

May 26th. The temperature has fallen steadily for several days and touched normal to-day. The boy is looking much better. The pulse which lately rather flagged has improved again.

May 30th. A sharp recrudescence has set in. Patient has not been looking well for the past three days, even before the temperature began to rise. He has been very restless and the intelligence has become decidedly befogged. To-day this dulness is more marked and the pulse is failing greatly.

May 31st. Patient died this morning. Yesterday about 1 p.m. he had an attack of vomiting which persisted during the day occasionally, and became more marked later. The pulse-rate increased rapidly, and his mental condition was so obscured that it was impossible to obtain an account of any subjective symptoms. In the evening the Boy was looking very pinched and collapsed, the pulse running about 124 per minute, small and compressible. The abdomen was not at all distended, rather the contrary, but the breathing was markedly thoracic in character. Perforation was thought to be probable and median laparotomy was performed at 11-30 p.m. by Dr Dalziel. No perforation or peritonitis was found and the wound was closed. The boy was not perceptibly worse after

operation but gradually sank and died at 3-15 a.m.

Autopsy.- Thorax. Heart normal. Lungs shewed some hypostatic congestion at bases.

Abdomen. Spleen moderately enlarged. No peritonitis. General injection of the ileum but no lymphoid changes until within 18" of the valve. In this part there was enlargement of the lymphoid structures and three ulcers. One of these especially was deeply punched out, exposing the serous coat in a n oval patch of about 1/2" by 3/8". No changes in the large intestine Unfortunately permission for a complete post mortem examination could not be obtained and the condition of the cranial contents is unknown.

CONCLUSIONS.

While the severity of the general symptoms in a case of Enteric Fever forms no guide as to the likelihood of perforation occurring a study of the cases recorded here, and by various Writers, seems

to indicate that there are certain symptoms which are indicative of deep ulceration, consequently of impending perforation.

Briefly stated these are:-

1. Abdominal pain and tenderness: In the majority of cases the onset of these is sudden and the diagnosis certain, but pain of a lesser degree of severity and less abrupt in onset in many cases points to the first involvment of the peritoneal coat. It is at such a stage of the ulcerative process that surgical consultation is likely to lead to greater success in the treatment of this complication.

2. Constipation as pointing to the depth of ulceration, is of more serious import than diarrhoea even if severe.

3. Abdominal distension, if great, in all probability depends upon paralysis of the bowel due to deep ulceration. The result is the collection of flatus and distension of the bowel which gives way at the most attenuated part.

4. Late haemorrhage, if copious, is in itself a not infrequent mode of death. In several of the cases recorded in which this occurred death resulted not from the haemorrhage but from a subsequent perforation.

5. Continued elevation of temperature after the third week, in the absence of any discoverable local complication usually points to progressive ulceration. Not infrequently there is an increase of the pulse rate before any change in the course of the temperature takes place.

6. The presence of tremor is stated by Murchison to "indicate deep and rapid ulceration of the bowel" and is a pre-perfora: tive symptom of considerable importance.

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TABLE OF CASES

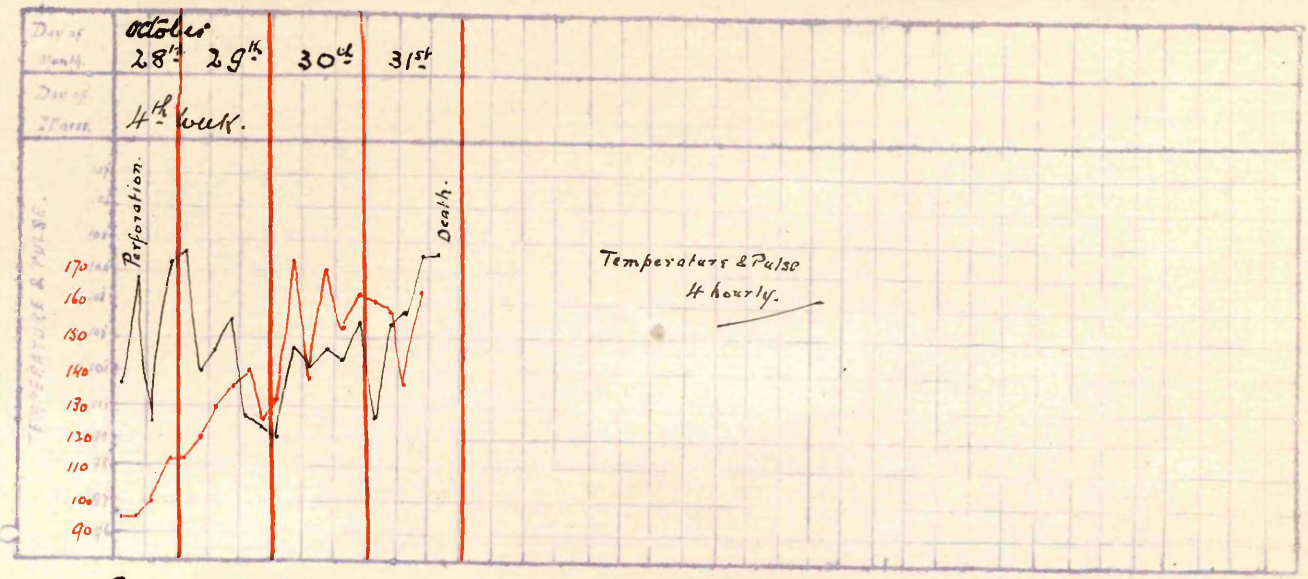
Case	Sex	Age	Date of occurrence	Interval between Perforation and Death	Situation of Lesion	Number of Perforations	Remarks
I	M	30	4th week	Three Days	Ileum, close to valve	One	———
II	F	9	26th Day	43 Hours	Six Inches above valve	One	———
III	F	51	39th Day	23 Hours	Pin-hole perforation of Caecum	One	Small repeated haemorrhages preceding perforation
IV	M	16	25th Day	Two Days	No P.M. Exam.	—	———
V	F	13	47th Day	30 Hours	No P.M. Exam.	—	———
VI	F	16	14th Day	51 Hours	Nineteen Inches above Valve	One	Laparotomy 36 hours after symptoms of Peritonitis
VII	M	23	23rd Day	3 Days	3½" and 15" above Valve	Two	Repeated haemorrhages before and after Perforation
VIII	M	17	37th Day	42 Hours	No P.M. Exam	—	Perforation on 2nd day of normal temperature
IX	F	12	34th Day	25 Hours	Nine Inches above Valve	One	———
X	F	23	37th Day	4 Days	Within 2 feet of Caecum	Two	Pregnancy 3rd month; Abortion on 22nd Day
XI	M	13	4th week	40 Hours	6" and 11" above Caecum	Two	Laparotomy 24 hours after perforation
XII	F	13	10th week at end of a relapse	—	8" above Valve	One	Laparotomy 11 hours after perforation. Recovery
XIII	F	10	35th Day	Death immediate	5½ feet above Valve	Four in one ulcer	Perforation preceded for 6 days by symptoms of Peritonitis
XIV	M	21	42nd Day	About 24 Hours	18" above Caecum	One	Laparotomy about 8 hours after perforation
XV	M	13	14th Day (?)	22 Hours (?)	27" above Caecum	One	———

CONTINUED

Table of Cases (continued)

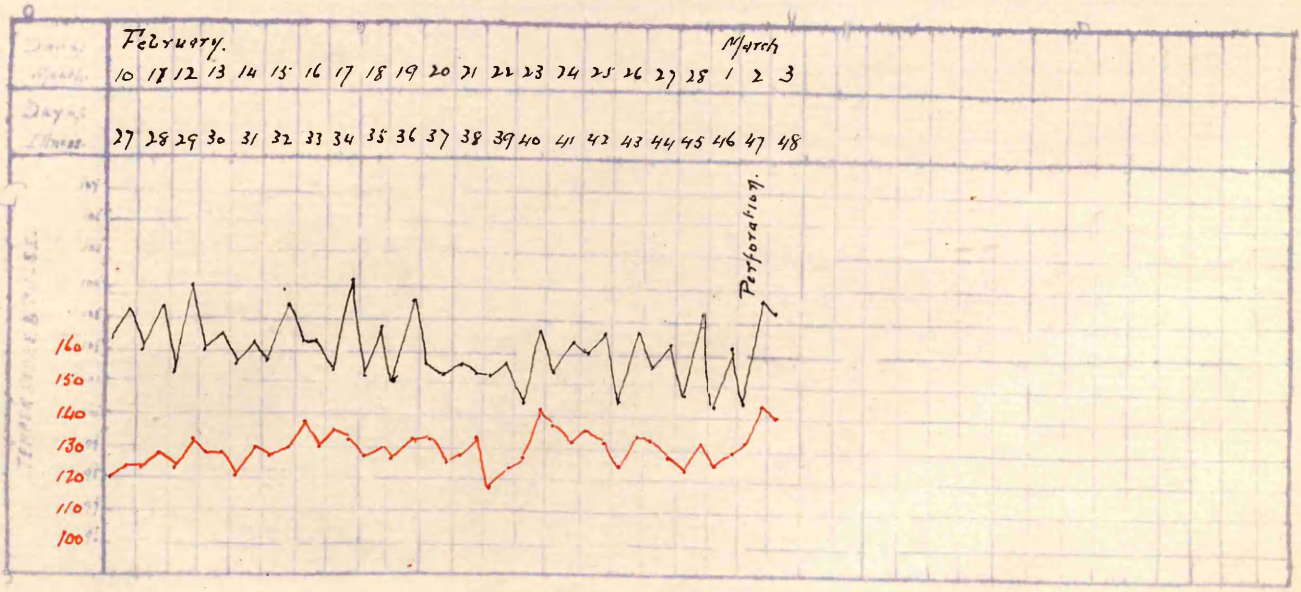
Case	Sex	Age	Date of occurrence	Interval between Perforation and Death	Situation of Lesion	Number of Perforations	Remarks
XVI	M	56	4th week	(?)	29" above valve	One	Haemorrhage & Delirium previous to onset of perforation.
XVII	–	–	—	—	——	—	——
XVIII	M	18	17th Day	about 24 hours	2½ feet above valve	One	——
XIX	M	20	30th Day	Death immediate	2 feet above valve	One	——
XX	F	22	18th Day	52 Hours	within 14" of Valve	Three	——
XXI	M	29	29th Day	3 Hours	3 feet above valve	One	——
XXII	M	15	13th Day	30 Hours	about 1 foot above valve	One	Laparotomy 7 hours after perforation.
XXIII	M	48	15th Day	nearly 48 hours	12" above valve	One	——
XXIV	M	22	29th Day	nearly 4 Days	several feet above valve	One	Laparotomy 5½ hours after perforation
XXV	M	26	4th week	——	No P.M. Exam:	—	——
XXVI	M	33	14th Day	54 Hours	8" above valve	One	Laparotomy 48 hours after perforation
XXVII	M	9	11th Day	20 Hours	No P.M. Exam.	—	——
XXVIII	M	7	29th Day	27¼ Hours	No P.M. Exam.	—	——
XXIX	M	33	11th Day	18½ Hours	28" above valve	One	——
XXX	M	21	3rd week	22 Hours	15" above valve	One	Laparotomy 16 hours after perforation
XXXI	M	8	16th Day	3½ Hours	2" above valve	One	——
XXXII	M	36	3rd week	2 Days	No P.M. Exam.	—	——
XXXIII	F	14	30th Day	26 Hours	8" above valve	One	——
XXXIV	M	8	39th Day	About 24 Hours	No P.M. Exam.	—	——
XXXV	M	12	17th Day	One Day	No P.M. Exam.	—	——

A.J.L.



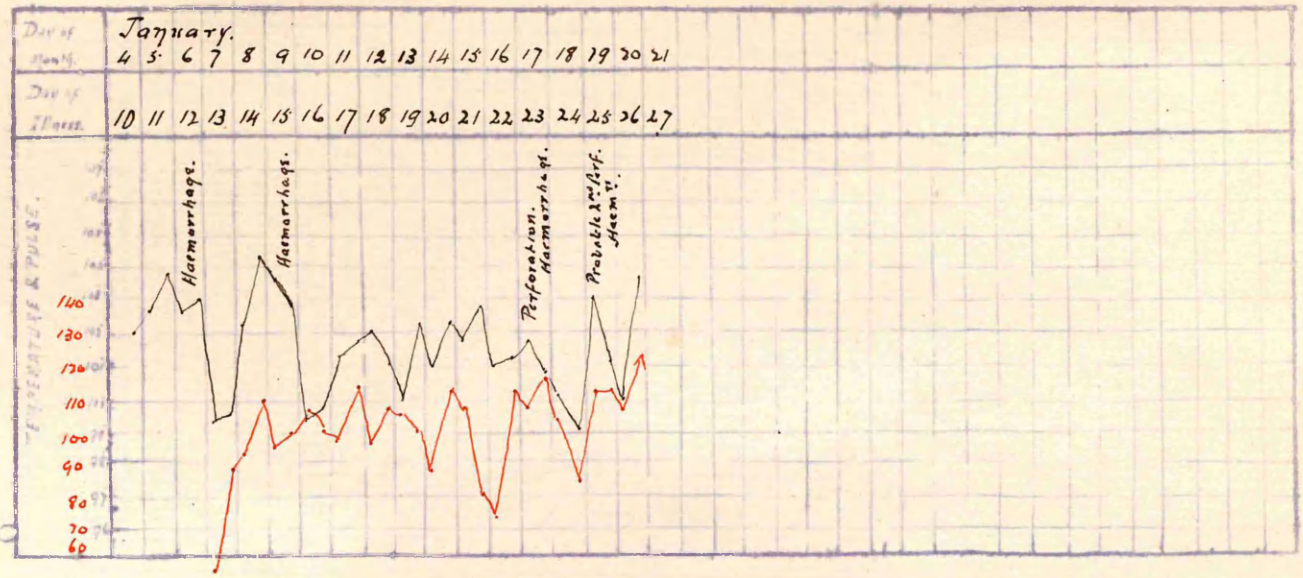
Case 1. Chart 1.

Shews initial collapse, with fall of Temperature to 99.6°F.



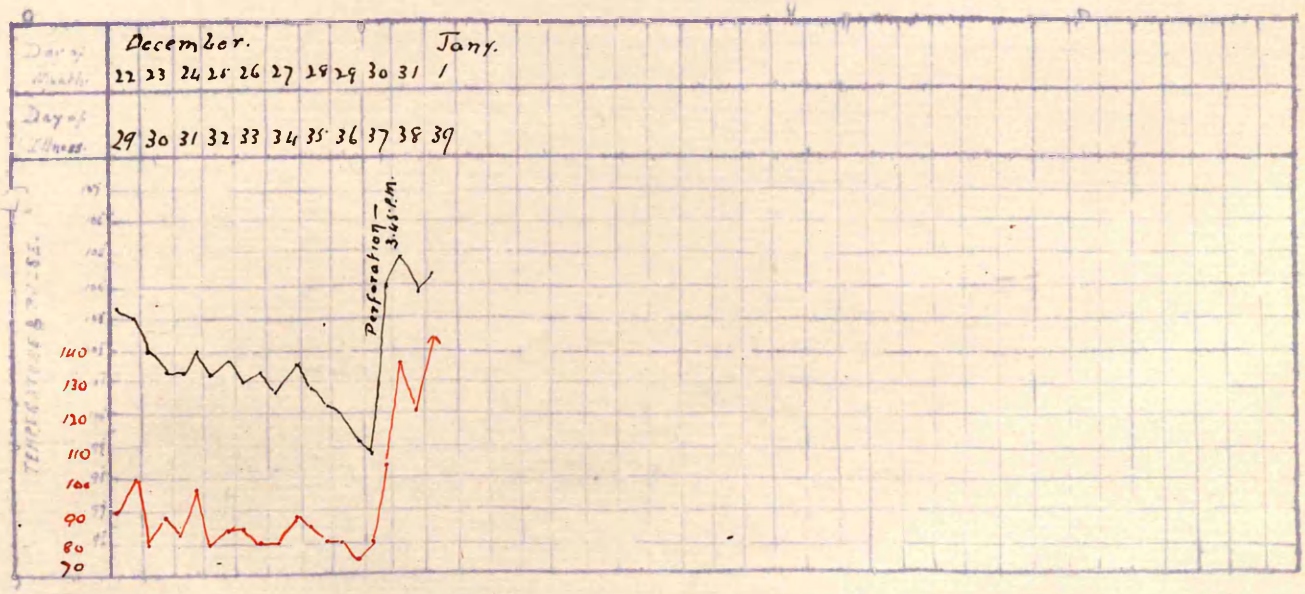
Case V. Chart II.

Long continuance of pyrexia, with rapid pulse throughout.



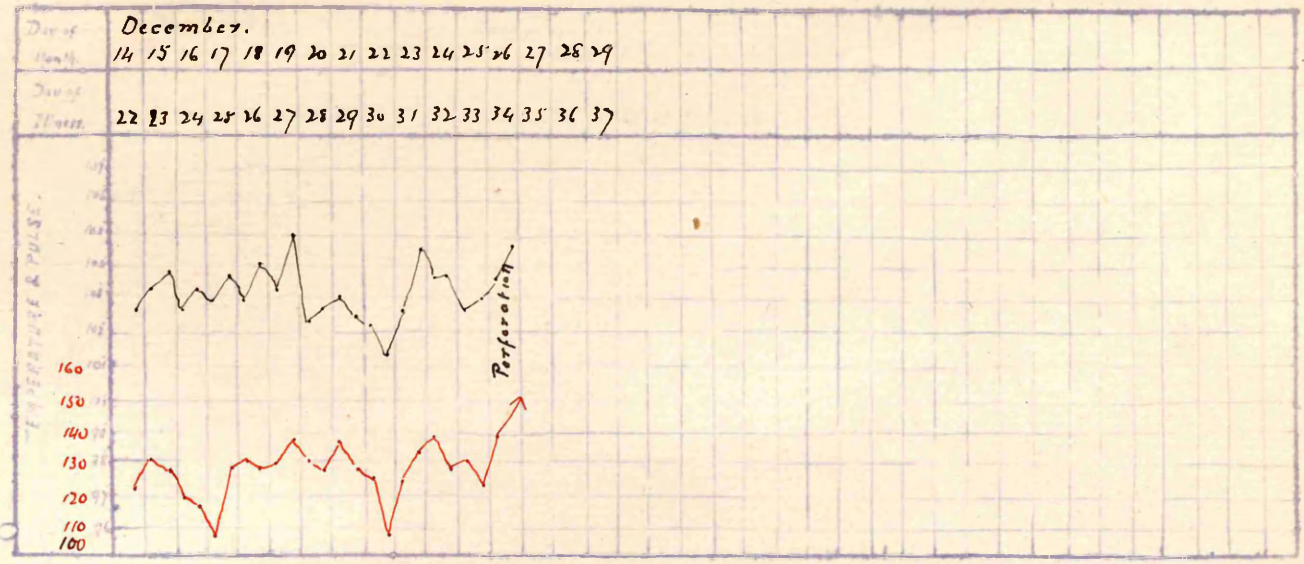
Case VII. Chart III.

Shews falls of Temperature due to repeated Haemorrhages.

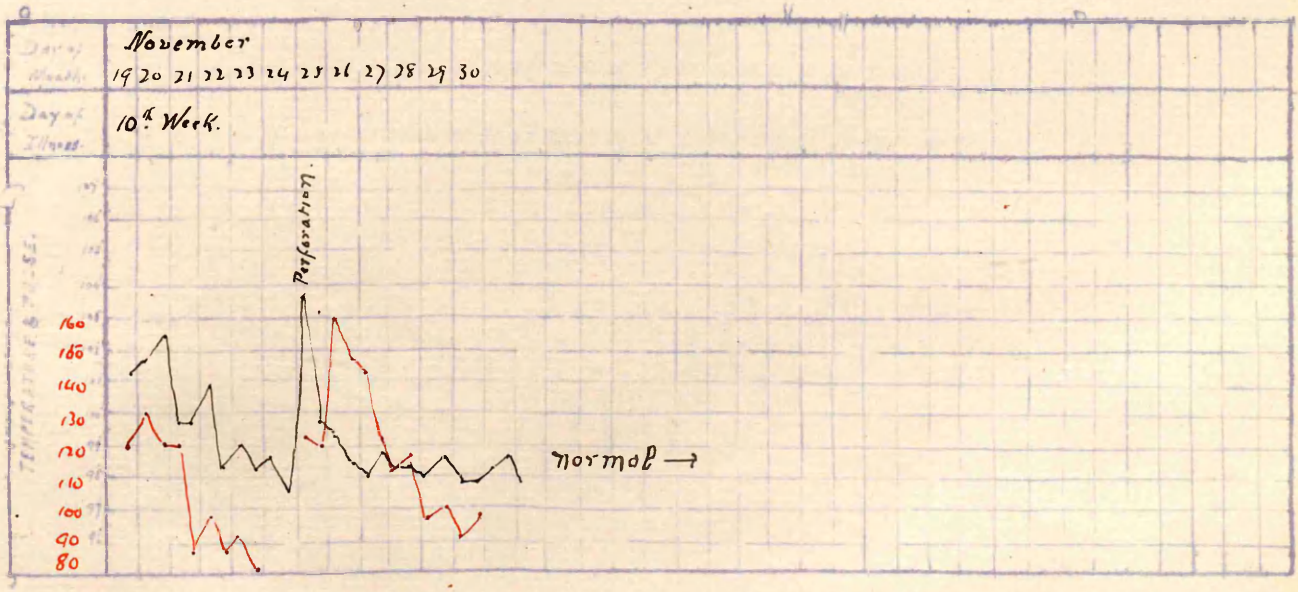


Case VIII Chart IV.

Shews rapid rise of Temperature & Pulse Rate upon the occurrence of Perforation.

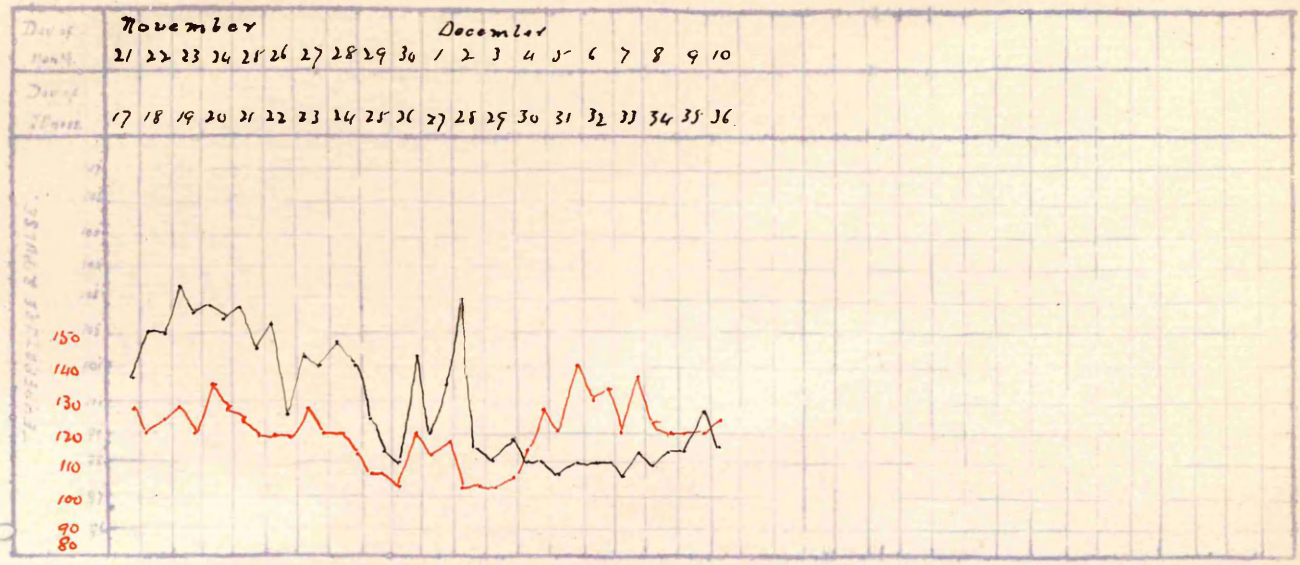


Case IX. Chart V.

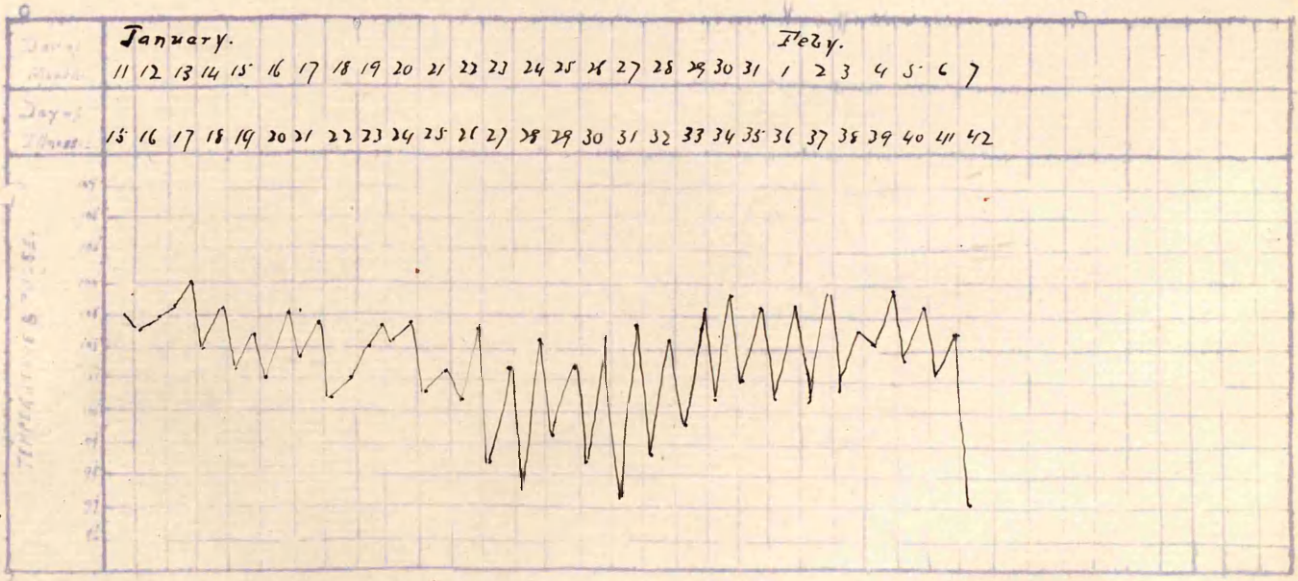


Case XII. Chart VI.

Perforation. Laparotomy. Recovery.

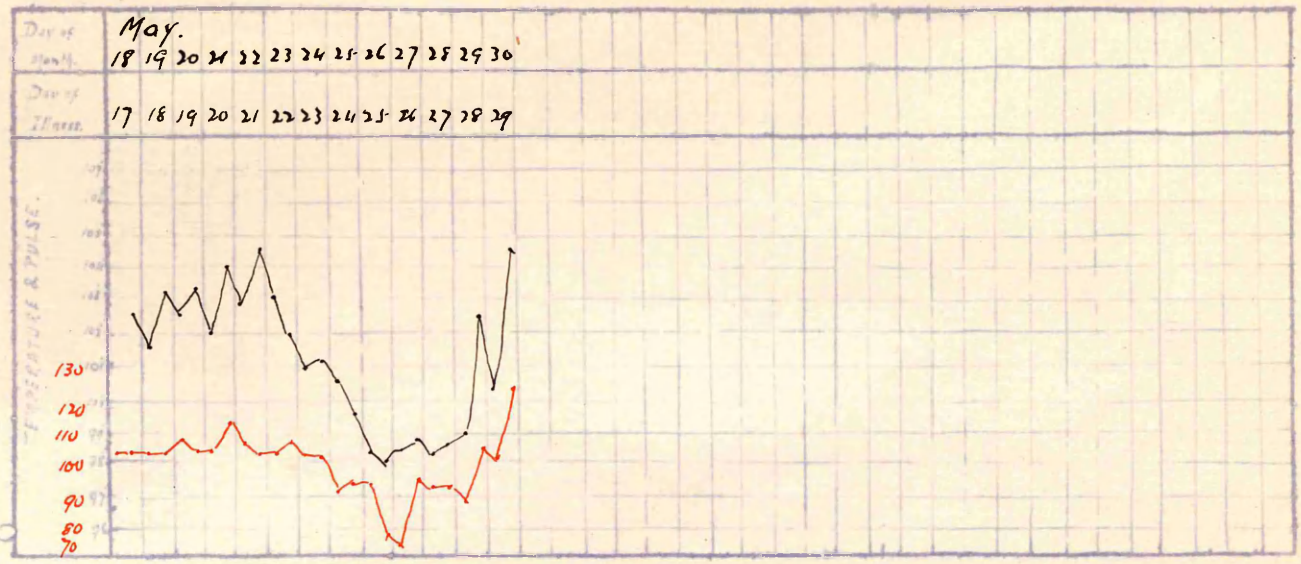


Case XIII. Chart VII.

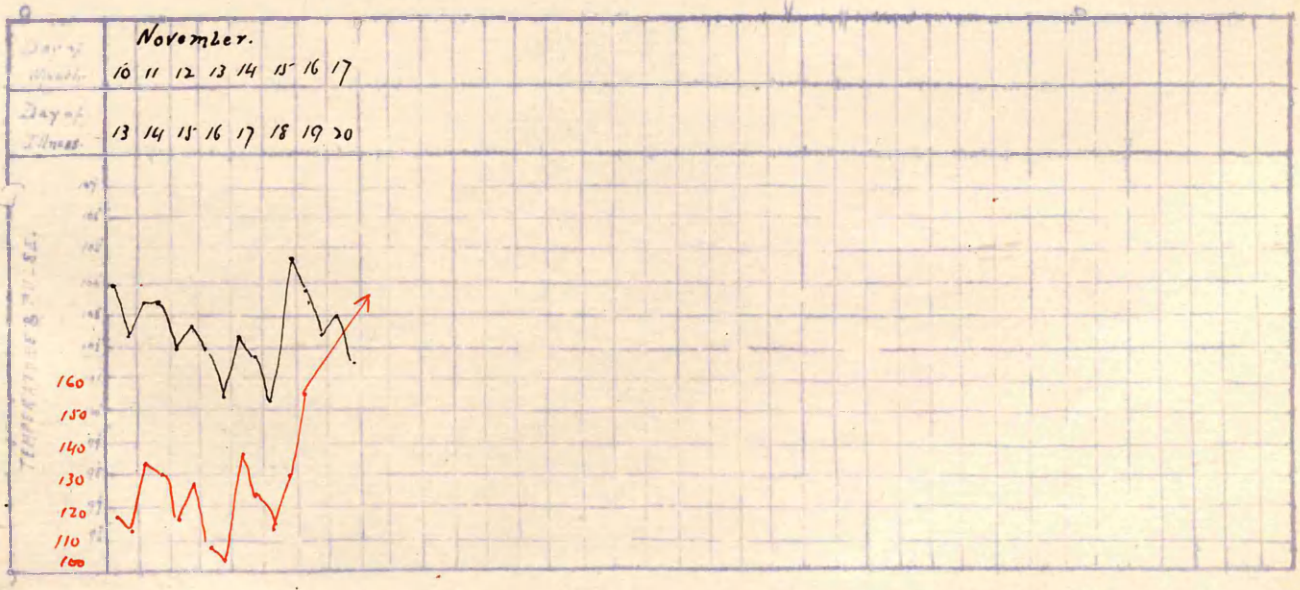


Recrudescence preceding perforation by 12 days.
Shows fall of temperature from shock.

Case XIV. Chart VIII.



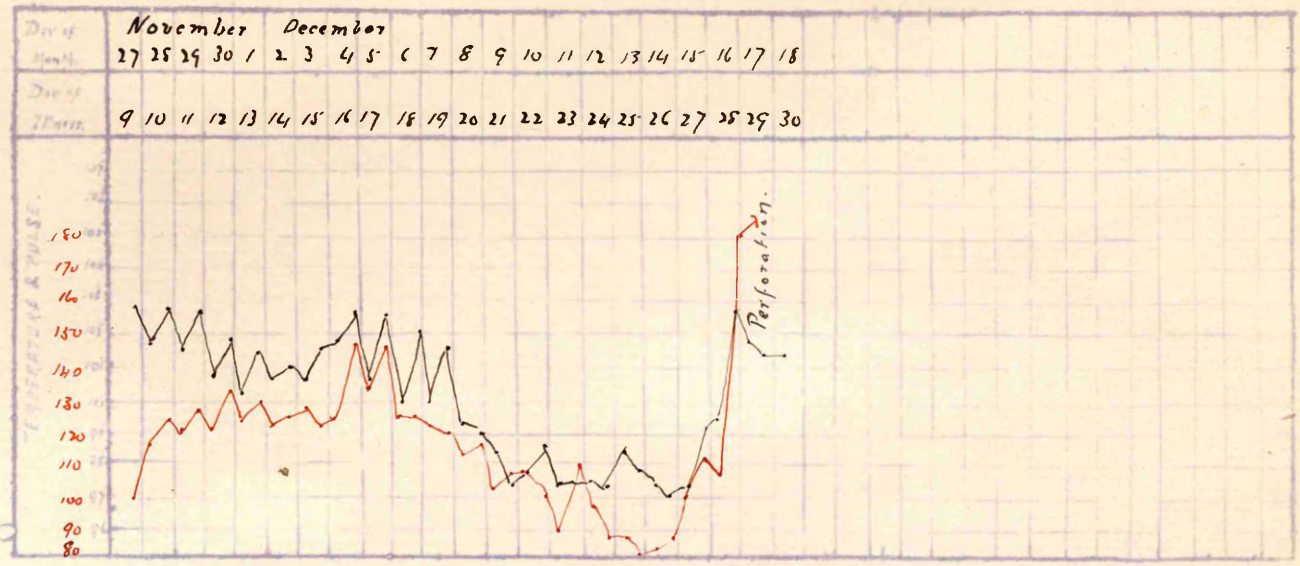
Case XVII. Chart IX.



Case XV. Chart X.

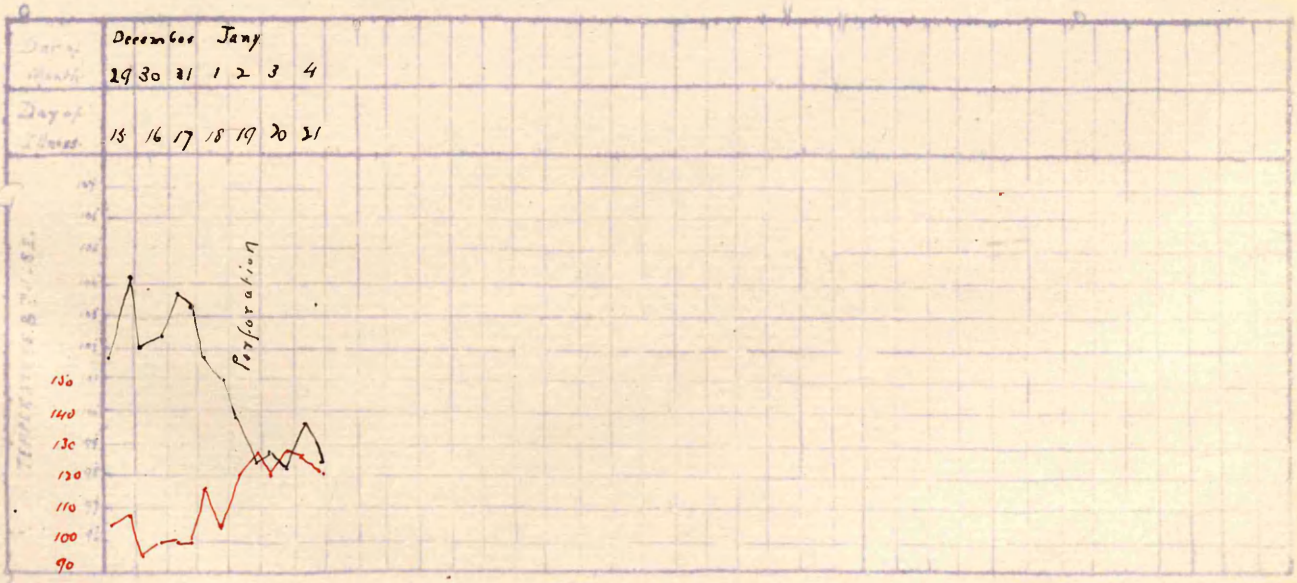
Shews rise of temperature & pulse rate with the occurrence of perforation.

Late fall of temperature before collapse.



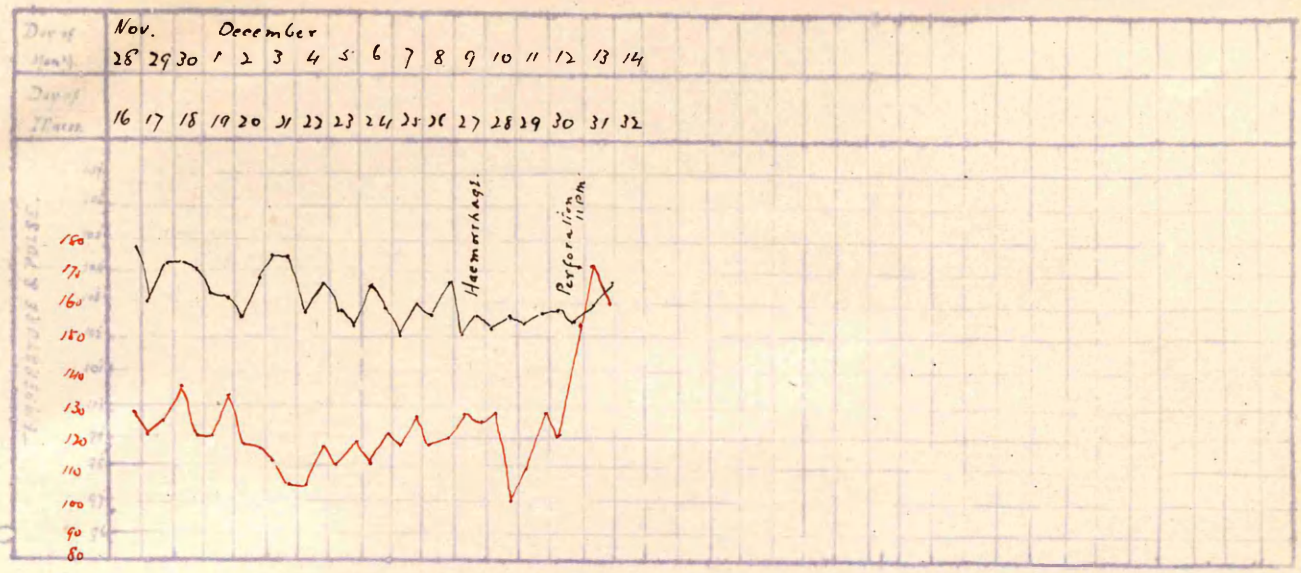
Case XXVIII. Chart XI.

Shews the occurrence of perforation after a week's normal temperature.



Case XXXII. Chart XII

Shews fall of Temperature from Collapse, with rise of Pulse Rate on day of Perforation.



Case XXXIII. Chart XIII.

Shows steady increase of Pulse Rate before the occurrence of Perforation and preceding the rise of Temperature.