the pulse-rate was 144, the respirations 44, and the temperature 96° F.; the abdomen was considerably distended, but vomiting was not urgent.

Without altering the position of the patient in bed, and under local anæsthesia, an oblique incision was made over the cæcum, saline being run into the median basilic during operation. Sero-pus was mopped out of the pelvis, and a rubber tube fixed in the cæcum. The wicking was removed from the median drainage-tube, and a little stinking pus sucked out by a syringe. At the close of the operation dissolution seemed imminent, but in spite of the gloomy outlook the patient rallied, and on the fifth day she was taking fish.

CASE 6. *Ectopic gestation; paralytic ileus with fecal vomiting; cæcostomy.*—A woman, aged 24 years, was admitted with a history pointing to rupture of an ectopic gestation three weeks earlier. She was very anæmic, the pallor having that "dirty" appearance suggesting sepsis. The pulse-rate was 136, the temperature 99·6° F., and the respirations 28.

At the operation (May 5th, 1915) the abdomen was found to be full of very dark fluid blood and clots. A fœtus, 4½ inches long with well-developed placenta, was removed, and left salpingectomy carried out. In spite of the employment of many swabs and much saline, it was found impossible thoroughly to cleanse the abdomen of clots, and finally, while the washings were still very dark, I was compelled to close the wound on account of the poor condition of the patient. The next day there was a good deal of vomiting and distension. On the following day it was reported that both these symptoms had progressively increased during the preceding night, and that fecal vomiting had set in. At 8 A.M. on this day 20 ounces of fluid had been brought up at one bout. This fluid had a strikingly fecal odour, and in every way suggested the bowel contents. Vomiting thence onwards was continuous and profuse, 18 ounces being brought up about noon, when I decided to operate. At this time the patient was in an extremely critical condition, and there seemed very little hope of recovery. The pulse was 160, temperature 96·4°, and respirations 40; the abdomen was immobile and enormously distended, the extremities were cold and tremulous, and the patient looked intensely pale and ill. On opening the abdomen over the cæcum much dark bloody fluid welled out on to the bed. It seemed to me that this fluid represented the last washings left in the abdomen at the primary operation. No attempt was now made thoroughly to get out this fluid from the abdomen, only the easily accessible surplus being mopped away. A rubber tube was purse-strung into the cæcum and connected with a bottle fixed to the side of the bed. As in the preceding cases, the wound in the parietes was closed right up to the tube. After a few hours the vomiting had ceased, and within less than 20 hours there was practically a flat abdomen, while the patient was taking milk and manifesting an interest in her dietary. A couple of days later a right basic pneumonia developed, but otherwise the progress to recovery was not seriously interrupted.

It is to be noted that in Case 6, as in the others, no serious effort was made during cæcostomy to cleanse completely the abdomen of free fluid. This is in conformity with my view that in post-operative septic peritonitis the patient, generally speaking, dies of the bowel rather than of the peritoneum.

The remarkable recoveries in the foregoing cases appear to me to supply fair proof that intestinal drainage must stand as a principle of surpassing value in the treatment of septic peritonitis. The full recognition of the importance of this principle, and its early application would, I believe, save many lives otherwise inevitably sacrificed. It would, of course, be too much to expect that, as in my present series of post-operative cases, there should always be 100 per cent. of successes. But if this treatment, on an extended scale, should achieve anything like such a high proportion of recoveries—as on theoretical and practical grounds I believe it will—then in intestinal drainage will be found the solution of a great surgical problem.

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THE SIGNIFICANCE OF PULSUS ALTERNANS AND SOME OTHER FORMS OF UNEVEN PULSE.

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OF recent years it has been taught and generally accepted that the pulsus alternans is a sign of grave omen indicative of impending catastrophe. Notes of a case in which it persisted for several years, however, have been communicated by Dr. C. O. Hawthorne¹ in a recent paper, and judging from the history of some of the cases reported below, it seems that its appearance during convalescence from sickness may be regarded, sometimes, at all events, with equanimity; from which it is to be inferred that either all the data are not yet to hand for distinguishing, with certainty, whether an alternating pulse is in fact a pulsus alternans, or, the pulsus alternans does not necessarily imply so grave a cardiac disorganisation as has been supposed.

The cases now reported are divided into those who complained of cardiac symptoms and who were, in most instances, found to be the subject of heart disease in its clinical aspects; and others who were recovering from a state of toxæmia and for the most part exhibited neither symptoms nor physical signs of cardiac disablement. The patients were of divers ages and of various occupations and positions in life; and there seems to be no condition common to them excepting that they had all been subject to strain of some kind or another. Those patients in whom the symptoms pointed primarily to a cardiac derangement were of a type that is wont to attain success by personal effort, energetic and active in mind and body, upon whom the wear and tear of a long or worrying life imposes a strain that may not be experienced by a more phlegmatic and less industrious brother; whilst in those who were making recovery from an intoxication the strain was of a temporary nature, incapacitating whilst it lasted, but ceasing with the complete elimination of the exciting cause. Of the former all were males, and three of the four are dead, the surviving case having only recently come under observation. Of the latter two of the five are women, and all are living.

FIG. 1 (Case 1).

CASE 1.—The patient was an active business man 54 years of age. When he presented himself for advice he complained of breathlessness and præcordial pain; the pulse-rate was perceptibly alternating and murmurs were audible over the mitral and aortic areas. Death ensued 20 months later.

CASE 2.—The patient was a country gentleman 74 years of age. Whilst on a visit he was seized with angina and subsequently he endured attacks of acute pulmonary oedema,

¹ THE LANCET, May 29th, 1915, p. 125.

of which an account has already appeared,² together with the tracing which was taken by Sir James Mackenzie. Death ensued within two months.

FIG. 2 (Case 3).

CASE 3.—The patient was a hard-working business man. He suffered from bronchitis and asthmatic attacks for two years before marked dilatation set in, from which he died 12 months after the tracing was taken.

In these cases the pulsus alternans was an additional sign occurring in the course of a progressive heart failure; and in two of them its detection was of value in formulating the prognosis. The special train of symptoms to which such patients are particularly liable have been described by Dr. J. D. Windle³ in his papers upon the subject in which he draws attention to the frequency with which they suffer respiratory disturbances of various kinds.

FIG. 3 (Case 4).

CASE 4.—The patient was a very busy and overwrought city man of neurotic temperament, who made complaint of præcordial discomfort, dyspnoea, and liability to palpitation. The tracing shows the pulsus alternans, but clinically there was no evidence of organic disease. Further, in a tracing taken a fortnight later by Sir James Mackenzie no alternation can be detected. In this case it is suggested that the presence of pulsus alternans with the symptoms of cardiac stress are sufficiently ominous to warrant the warning that work must be curtailed, at least to the extent of avoiding the degree of strain which conduced to his recent symptoms.

I can find no reference in the literature to the appearance of pulsus alternans, unaccompanied by serious symptoms, in persons who are convalescent from febrile or other toxic disturbances. That this may sometimes obtain, however, is demonstrated by the following cases.

FIG. 4 (Case 5, A).

FIG. 5 (Case 5, B).

CASE 5.—The patient was a man 65 years of age, six weeks convalescent from a severe attack of pneumonia.

² THE LANCET, May 27th, 1911, p. 1417.

³ THE LANCET, May 13th, 1911, p. 1260.

He made some complaint of undue shortness of breath upon exertion, but otherwise felt well. Tracing (A) was taken when the patient had been resting, and tracing (B) was taken after he had been walking for two minutes. Upon inquiry this patient sends word that, though he is in his seventieth year, he is as strong as ever; an exemplary optimist!

FIG. 6 (Case 6, A).

FIG. 7 (Case 6, B).

CASE 6.—The patient was a woman, aged 60, in whom an irregular pulse was discovered during convalescence from influenza. She had an enlarged heart, but she made a good recovery 17 months ago and is now strong and well. Pulsus alternans is evident both before and after the extrasystole at (A), being subsequently followed in the complete tracing by a series of normal beats before alternation is again discerned; but in the tracing (B) recently taken the pulse shows neither extrasystole nor alternation.

FIG. 8 (Case 7).

CASE 7.—The patient, a female aged about 42, was two days convalescent from a very short febrile attack. The tracing shows a brief period of alternation, which was induced only by considerable exertion and which endured only for a few beats, being followed by a perfectly normal pulse. This tracing was taken four years ago, and the patient has since been in good health. She is now actively engaged "somewhere in France."

FIG. 9 (Case 8)

CASE 8.—The patient was a lad, aged 17, recovering from an attack of measles, during which the temperature had risen to 104° F. Subsequently the pulse dropped to 48 per

minute and the tracing was obtained. It will be seen in the jugular tracing that there is an apparent extrasystole between each of the normal beats that reach the radial and that the small wave in the radial follows upon a longer pause than the large wave. There was no consciousness of cardiac distress. This tracing also was taken four years ago, and the patient is now serving at the front with distinction.

FIG. 10 (Case 9).

CASE 9.—The patient was a perfectly sound and healthy man, from whom a tracing was obtained during recovery from an anæsthetic. More transient phases of an alternating pulse are manifest in earlier portions of the tracing, but in the part from which this tracing is taken it is maintained for a considerable succession of beats. This was obtained at the extreme end of unconsciousness, after the patient had retched. The heart was, clinically, perfectly normal.

The above notes indicate that patients may show the presence of a pulse, indistinguishable from the pulsus alternans, without symptoms and without subsequent cardiac disability. This is no proof that whilst such type of pulse persists the patients are not in jeopardy, or that pulsus alternans is, or may be, of no account, but it denotes a modification in the ultimate prognosis according to the etiological conditions with which it was associated. On the other hand, it is within the experience of all that persons convalescent from acute fevers may, without warning or any apparent reason, succumb with tragic suddenness to an acute cardiac failure; and though it is far too speculative to assume that pulsus alternans has been present in these cases, or that the sphygmograph would sound a warning in any other form, this possibility is suggested by Case X quoted below, and it seems to be a point worthy of further investigation.

FIG. 11 (Case X, A).

FIG. 12 (Case X, B).

FIG. 13 (Case X, C).

CASE X.—The patient was a woman, aged 40, who suffered from pronounced cardiac weakness following upon a tonsillitis due to staphylococcal infection. (A) is a tracing

taken whilst the patient was at rest, and one month after grave attacks of syncope had ceased, to which she had been subject even whilst lying in bed. Owing to the distinct inequality in the value of the pulse wave the patient was not allowed to get up. One week later tracing (B) was taken, the pulse was obviously much steadier, and the patient was allowed to sit up for 20 minutes. Upon her return to bed tracing (C) was immediately taken and in it the unequal pulse values are again manifest. It is to be regretted that for some reason a jugular tracing was not obtained, though the attempt to procure it was repeatedly made. Eventually this patient made a good recovery.

FIG. 14 (Case Y).

In some tracings there occur certain weak beats which may or may not reach the radial pulse. They are not extrasystoles, they occur more or less frequently or infrequently, and present no apparent order or sequence. For example, in Case Y there occur intervals of feeble beats which are sometimes so feeble that they are not recorded in the radial tracing. It will be observed that the beats next but one preceding and next but one following upon the dropped beat are smaller than their neighbours, so that a curious sort of temporary alternation has been set up. This is from the same patient as was the tracing quoted under Case 3, which shows the pulsus alternans, the latter having been taken exactly one month later.

FIG. 15 (Case Z).

In Case Z there were but few of these weak waves and the loss of value in them was not very marked, whilst the remainder of the waves were good and equal. Whether these discrepancies are to be regarded as of any significance I do not know, although this particular patient died from heart failure 12 months later.

I confess that the interpretation of these tracings is, to me, no easy matter, and if more correct views can be given by more expert witnesses I shall receive them with gratitude. Yet, the difficulties notwithstanding, there is no doubt that the use of the sphygmograph promotes a large additional interest in every decrepit heart that comes under observation, thus both directly and indirectly leading to greater accuracy in prognosis, greater confidence in treatment, and a sense of less incomplete achievement which more than amply repay the extra time and trouble involved.

Torquay.