these successfully respond to this treatment. But the others, owing to extension of the disease, require surgical intervention, as is shown above, in approximately one in three of this type of case; and these being the worst cases, the mortality is higher, and gives the impression that this period is a peculiarly dangerous one. It does not appear to be so if immediate operation is undertaken.

Although it is a little difficult accurately to determine the day of the disease, I have done so as far as possible with these 21 fatal cases, and give for comparison the figures for all cases. The duration of the disease at the time of operation is shown in the following table.

Duration of Disease.	Deaths.	All Cases.
24 hours	2	173
48 "	7	142
3 days	1	91
4 "	2	57
5 days and over	6	137
Unknown	3	3

Of the six fatal cases shown of five days and over, one was wrongly diagnosed salpingitis and operation was delayed, and one was admitted and treated medically for ten days.

If we take the case mortality up to three days, we see that it is 9 in 315, and from three days up to five days and over it is 9 in 285; further, four of these deaths occurred in patients over the seventh day of the disease. This does not appear to be an undue preponderance in the case fatality between the third and sixth day.

If the relative figures of cases drained or sutured are taken as an index, the severity of the disease certainly appears to increase with the duration.

Table showing that the Number of Cases drained increases with the duration of the Disease.

Duration of Disease.	Closed.	Drained.
24 hours	125	48
48 "	60	82
3 days	33	58
4 "	20	36
5 days and over	36	101
Unknown	—	3

The presence of pus, however, is the indication for drainage, and we should expect to find it on the third day and over rather than in the earlier period. These figures, then, represent a pathological process rather than the severity of the disease, as it is well known that numbers of cases with abscess formation recover without surgical intervention.

In discussing the influence of immediate operative treatment on the mortality of appendicitis any other factor that is likely to influence that mortality should be taken into account, and in my opinion the method of approach is of considerable importance.

In the greater number of the cases quoted above the muscle-splitting incision was employed. The advantage of this appears to be that the diseased area is directly exposed, frequently the whole operation is conducted in a small compartment completely shut off from the general peritoneal cavity, and the natural extension of the disease, if pus be present, can be followed into the pelvis, very often without grossly soiling the rest of the peritoneum. Naturally this point is not of great importance if general peritonitis is already present, but in a number of cases this fact cannot be accurately determined before the abdomen is opened. I therefore think that McBurney's incision plays an important part in the successful treatment of acute appendicitis.

The figures I have given, showing 1.8 per cent. case mortality, excluding the general peritonitis cases, and 3.5 per cent. for all cases, appear to me to be further evidence in favour of immediate operation in acute appendicitis.

I am indebted to the surgeons at University College Hospital for permission to use these statistics.

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¹ BRITISH MEDICAL JOURNAL, April 18th, 1925. ² Brit. Journ. Surg., vol. xii, No. 46, p. 232.

ANAPHYLAXIS AND ULTRA-VIOLET LIGHT TREATMENT.

BY

ALEXANDER BRYCE, M.D., C.M.GLASG.,
BIRMINGHAM.

ANAPHYLAXIS has been defined as hypersensitiveness to foreign proteins—either direct protein extracts or the products of various micro-organisms not necessarily pathogenic, and not in themselves toxic. The alarming symptoms and depression are said to be explained by the formation of an antibody, probably a very insoluble precipitate in the blood serum of the patient, profoundly interfering, like histamine, with the capillary circulation and producing an asphyxia in the tissues themselves.

The following diseases have been attributed to its operation: asthma, bronchitis, hay fever, certain skin affections, angioneurotic oedema, cyclic vomiting, periodic diarrhoea, and the migraine-epilepsy syndrome.

Many specific methods have been used in the treatment of these disorders, but the only one common to the whole group is the use of peptone in small gradually increasing doses, never large enough to produce any pronounced reaction. The resultant immunizing action is said to be due to the detachment from the cells of antibodies which destroy the antigen in the blood. Auld, on the other hand, regards the antigen-antibody product as the cause of the anaphylactic shock. What is perhaps of more significance than either suggestion is the fact that leucocytosis is certainly produced by the reaction to peptone and other definite chemical substances, the bone marrow being stimulated to produce with great rapidity at least a double quantity of leucocytes. Though we have no very clear picture of the way in which the curative results are brought about, yet as similar results accrue from the use of ultra-violet rays in many of the maladies mentioned, and as we have some knowledge of the method whereby they do their work, it occurred to me that consideration of the facts might in some degree illumine the subject. It must be premised that by no means all cases of asthma or allied maladies are due to protein sensitization. Some may be due to nervous reflexes, some to hereditary diathesis, whilst others may require the combination of all three factors. I propose, therefore, to give the results of ultra-violet therapy in a typical case of spasmodic asthma and bronchitis of the most severe character, in a typical case of protein sensitization, and in a typical case of asthma alternating with eczema.

Miss B., aged 45, had been subject to the most violent attacks of asthma for over twenty years, each attack confining her to bed for many days and sometimes weeks, where she would lie with cyanosed countenance, struggling for breath, wheezing râles with slight expectoration being heard two or three rooms away. Sometimes slight relief was obtained by pitrethine, sometimes by adrenaline, and sometimes by morphine, but her life was a burden, and the last few attacks looked as if they might be fatal. Early in 1924 I commenced irradiation of the back and chest with the quartz mercury vapour lamp on the one and the carbon arc lamp on the other, alternating after a few minutes. From the first treatment she began to experience relief, although it was many months ere the wheezing quite disappeared. For the succeeding year a weekly treatment has enabled her to live without any discomfort or even suggestion of asthma and bronchitis.

Miss E.S. for many years had sudden violent attacks of a suffocative feeling in the throat, with a sensation as if pepper had been sprinkled over it, followed by intense wheezing inspiratory and expiratory efforts, mucous râles, and a sense of impending death. Many kinds of treatment were tried by laryngologists and physicians, including pollantine and peptone; finally adrenaline in three-drop doses subcutaneously produced relief in three minutes or less, although it left the patient in a most exhausted condition. Skin testing elicited the fact that acid fruits, and especially raw apples, appeared to engender these attacks, and care in dieting reduced the attacks considerably but not completely. For close upon twenty months this patient has been acting as my assistant in the treatment of cases by ultra-violet light rays, besides which she has had many direct irradiations over the chest and back. For over a year she has been quite free from attacks despite occasional dietetic trespasses.

Miss N.L., aged 28, has been an asthmatic from birth. The asthmatic attacks were suddenly replaced by universalized eczema, for which many kinds of treatment, both external and internal, were tried for a year without success. She then consented to try ultra-violet light, with the result that six treatments in three weeks completely cured the eczema, and she is persevering with the irradiations in the hope of completely eradicating the asthma.

I have seen many cases of neuritis and lumbago cured by the use of ultra-violet light. I believe such cases are due to a specific anaphylaxis excited by proteins absorbed from the bowel while it is in a state of catarrhal inflammation. The sudden incidence is probably due to exercise creating a local acidosis from the lactic acid produced in the muscles, which tends to make the cells more sensitive to the proteins.

At least one of the three cases I have cited was a pure example of anaphylaxis, and, in her, peptone failed completely, whilst ultra-violet irradiation was a complete success, as it was in the other cases. Now it has been demonstrated that exposure to the sun's rays causes a general hyperleucocytosis with a relative neutropenia and a strong relative lymphocytosis. I frankly admit that this is comparable with the leucocytosis produced by the injection of peptone, and it is quite possible that this helps to account for the anti-anaphylactic action of ultra-violet light rays. But it is only one of the remedial results of ultra-violet light, and probably the least effective; this doubtless accounts for the frequent failure of peptone, and in any case for the short period of protection it affords. Another valuable therapeutic effect of ultra-violet rays is their directly germicidal action on the body, increasing the bactericidal powers of the blood, thus reducing the formation of bacterial toxins.

Probably the most useful function of ultra-violet rays is their power to increase the absorption of calcium and phosphorus, which, with the formation of vitamin D from the cholesterol in the skin, is doubtless the main factor in the cure of rickets. This also leads not only to the better nutrition of the bones and nervous system, but also to the alleviation of spasm and the induction of a calmative effect on the nervous system. Nor must it be forgotten that there is an increase of iron in the blood and a decided rise of haemoglobin in the erythrocytes, diminishing the risk of dyspnoea and asphyxia, so potent a factor in asthmatic conditions.

Finally, the internal secretions of the thyroid and adrenal glands are increased, and they are both valuable in the treatment of asthma and allied conditions.

It will be observed that the ultra-violet light treatment of asthma counters the varied factors in its causation, and is valuable, not only for cure, but also for prophylaxis.

A METHOD OF ESTIMATING CARDIAC OUTPUT.

BY

I. HARRIS, M.D.,

PHYSICIAN, LIVERPOOL HEART HOSPITAL.

THE problem of the correct treatment of heart disease reduces itself largely to cardiac output. The common type of heart failure means diminished cardiac output, and we shall never be able to tackle the problem of heart failure properly unless we have a reliable method for determining the output of the heart.

The following is a description of a method for estimating cardiac output. The underlying principle is simple. The venous pressure is measured by inserting a needle, preferably in the cephalic vein of the arm. A given number of heart beats are admitted. Then the pressure is taken again, and from the increased venous pressure we calculate the output per beat, or, if desired, per minute. It will be seen that the principle underlying this method is the determination of the single output by variation of the venous pressure. Particulars are as follows.

The pneumatic tourniquet of a sphygmomanometer is placed on the arm; a needle with as wide a bore as possible is inserted in the cephalic vein and connected with a manometer containing a solution of 0.7 per cent. sodium chloride and 0.5 per cent. citric acid. The venous pressure is now taken. Then the artery is compressed very rapidly by means of the airbag so as to obliterate completely the brachial artery. The venous pressure is taken again, after which the arterial blood is allowed to enter the limb for the

space of 5, 10, or 15 beats by relaxing the airbag. At the same time the pressure must remain high enough to prevent the venous circulation from being re-established.

A record of the number of beats which were allowed to pass into the lower part of the upper extremity. It will be seen from this chart that one is able to recognize those beats which do not completely pass through and to account for them in calculation.

The pressure in the veins is now taken again. It will be seen that it is necessary to take the venous pressure three times: first, when the circulation in the veins as well as in the arteries is free; secondly, when the circulation is cut off in the veins as well as in the arteries; thirdly, after a known number of beats have been admitted, the venous circulation still being cut off. The first and the third measurements are essential for our purpose, the second serving as control only.

The following readings are typical:

Venous Pressure Experiment.

V.P.=4 inches.

After compression=9 inches.

After eight beats (see chart)=23 inches.

∴ Rise=14 inches.

=1.75 inches per beat rise.

Case of specific carditis. Wassermann reaction ++; blood pressure 145/105; pulse rate at time of experiment=120 per minute.

It remains to say a word in regard to the counting of the beats, which is not so simple as might be imagined. The only satisfactory method of getting a reliable count is to place the pad of a Mackenzie's polygraph on the radial artery and record the beat by means of the needle on a photographic slide, such as is available in the electrocardiograph.

I am indebted to Dr. Crawford, assistant physician, Liverpool Heart Hospital, for valuable assistance in carrying out the experiment.

THE PROGNOSIS IN FRACTURES OF THE OS CALCIS.

BY

P. MALPAS, M.B., CH.B., F.R.C.S.,

SURGICAL REGISTRAR, ROYAL INFIRMARY, LIVERPOOL.

IN any case of fracture two questions must be answered: How long will the patient be incapacitated for work and require compensation? and To what extent will he be permanently crippled?

The investigation here reported was undertaken to determine the duration of the disability, and the degree of final impairment of function in cases of fracture of the os calcis. Twenty-five such cases were treated at the Northern Hospital, Liverpool, in the period 1921 to 1924. Of these, only fourteen reported for re-examination after completion of treatment; they were all men, and their average age was 45 years. In every case the fracture was caused by a direct fall on the heel.

For comparative purposes the period of disability was taken as the time between the date of the accident and of the man's resumption of a permanent occupation; in most cases this was determined by proceedings under the Workmen's Compensation Act. The average was eleven months. In seven cases the period was between eight months and a year; the shortest period was three months, and the longest twenty months.

The final results were difficult to assess. All the patients were ultimately able to resume moderately heavy work. None became industrial cripples. All complained of pain in the heel when running, or walking fast on uneven surfaces, such as cobble-stones, or in damp weather. In