tight closure of the chest wall has been effected ; in this way post-operative pneumothorax may be lessened or even obviated.

Conclusion

Enough has been said to illustrate the many advantages of positive-pressure gas anaesthesia. A warning may now be given as to its pitfalls. Gases diffuse rapidly under pressure, and a slight alteration in the oxygen percentage in the anaesthetic mixture may be followed by a marked and rapid change in the plane of anaesthesia. The anaesthetist must therefore recognize the potency of his apparatus, must be thoroughly acquainted with the signs of gas anaesthesia, and must be ever vigilant. Without these safeguards he may find his positive-pressure apparatus a rather dangerous, precisely because a highly efficient, instrument.

Further, the convenience of nasal and pharyngeal insufflation of gaseous anaesthetics has led certain anaesthetists, particularly in America, where the pressure technique was evolved, to extend its routine use into questionable fields, such as nose and throat surgery. In such operations the best safeguard for respiratory function and for the integrity of the bronchial tree is endotracheal anaesthesia, and nasal or pharyngeal administration provides neither a safe nor an adequate substitute for it. Positive pressure is a valuable, and sometimes an essential, adjuvant to gas anaesthesia, but its application should be limited always by a due discretion.

ADVANCES IN OUR KNOWLEDGE OF HYDATID DISEASE DURING THE TWENTIETH CENTURY*

BY

HAROLD R. DEW, F.R.C.S.

Hydatid disease first came into prominence as an Australian medical problem in the 'sixties of last century. As time went on, and more and more patients harboured cysts which were both old enough and large enough to produce symptoms, the frequency with which the disease was recognized rapidly increased, and it reached its peak incidence in the 'nineties. The clinicians of this time had unrivalled opportunities for its clinical study, and as this period coincided with the rise of active medical schools and with great advances in general pathology and medicine, we find that they made full use of these opportunities. They met with hydatid disease in all its manifestations, and made numerous original observations as to its clinical aspects. In addition, the revolution in surgical procedures resulting from the introduction of Listerian methods brought more patients under direct observation and led to great advances in regard to treatment. The transactions of the various medical congresses of the latter part of the century, and the files of the local medical journals, show how carefully this disease was observed and discussed, and to the student of the subject are still of extreme interest.

In spite of their great experience, however, clinicians and pathologists were still puzzled over some of the manifestations of the disease. It is therefore of interest to review shortly the steps by which, during the next thirty years, nearly all the problems of immediate practical importance were solved. As each sectional advance is dealt with I propose to indicate briefly some of the problems which still await elucidation.

The Modern Period, 1900-35

All the essential aetiological factors—the close association of sheep, dogs, and men, at times living under primitive conditions—which led to the establishment of the disease in this country still exist ; but owing to dissemination of knowledge as to the life-history, to better education in hygienic matters generally, and to active public health propaganda the disease—although still relatively common—has much diminished in frequency. It has become recognized, as in all other countries, that the most common source of human infestation is direct contact with infected dogs, and that such factors as infected water supplies, raw vegetables, etc., are of little importance.¹ There is no doubt that the disease is readily preventable, and that it should be fairly easy to control, as the parasite can be attacked in various ways at different periods of its life-cycle. It should be possible to reduce the incidence still further, and no diminution of public health propaganda should be allowed.

We still require more accurate statistical studies of incidence and distribution, and it is hoped that the Hydatid Registry of the Royal Australasian College of Surgeons will provide these in the future. In addition, experimental work is needed to throw light on such problems as the survival of ova and scolices under natural conditions, while further information as to the distribution and control of the disease in animals and as to the relative importance of the various aetiological factors is also wanted.

General Pathological Advances

Advances in our knowledge of hydatid pathology have kept abreast of those made in other countries ; in this respect we are particularly indebted to observers in France and South America. The greatest single advance in our knowledge of the pathology of the disease came when Dévé first proved experimentally the fact that secondary echinococcal disease could occur.² He proved that germinal elements in the form of relatively differentiated scolices derived from a fertile primary cyst could, if shed into tissues, into serous cavities, or even into the blood stream, undergo a complete metamorphosis and become in their turn fertile secondary cysts. That this could happen had been tentatively suggested many years before, and had been strongly maintained by a number of Australian surgeons, who had ample opportunities for observing the dissemination of hydatid disease in operation scars and in the peritoneal cavity.³ This possibility, however, had been scouted by most pathologists and helminthologists, as it seemed contrary to the rules laid down by van Beneden. The experimental work of Dévé, and later of others in Australia and South America, together with many clinical observations, abundantly proved, however, that this phenomenon was not only possible, but that it was relatively common. Recognition of this fact revolutionized our ideas about hydatid pathology, and explained many things which had hitherto seemed inexplicable. It led at once to an understanding of the difference between primary and secondary cysts, of the nature of recurrent cysts, of multiple cysts of the serous cavities and elsewhere, and of the very interesting metastatic cysts. As a result, too, it led to important modifications of the method of treatment. Another important addition to our knowledge has been a more complete understanding of the histogenesis of the parasite and its study in all stages of its development. This has led to an appreciation of its peculiar structure, its mode of growth, and its diverse pathological appearances in both man and animals. The phenomenon of daughter cyst formation and the pathology of the peculiar forms found in animals has also received much attention, although there are some interesting points, mainly of academic interest, still to be decided.⁴ It is

* Read in opening a discussion in the Section of Surgery at the Annual Meeting of the British Medical Association, Melbourne, 1935. The lecture was illustrated by lantern slides.

now well established, too, that in the great majority of cases infestation takes place in childhood, the period of relatively unhygienic habits, and that, owing to very slow growth, the cyst often does not make its presence felt until adult life is reached. This led to the important corollary that the average cyst, even in the adult, is almost as old as the patient harbouring it. That these views are correct is borne out by many correlated pathological and clinical observations, and as a result many of our conceptions of the pathology of the disease have undergone great changes.

In addition, the increased care taken in the investigation of necropsy material, as a result of the rise of active schools of pathology, led to more accurate observations on the protean pathological manifestations of the disease. These will be referred to shortly, when the disease as it affects special organs is considered.

A most important event was the recording by me in 1931 of the first case of alveolar hydatid disease occurring in Australia. This case has been fully recorded elsewhere, and must be regarded as one of the world's classical cases, because it has completely negated the geographical argument which has been for many years the main argument of the protagonists of the dualist school.⁵ The supporters of this school have always maintained that alveolar hydatid disease was due to a specific parasite distinct from that causing the common form. The full story of the interesting controversy between the two schools, which is still being carried on between Dv of Rouen and Posselt of Innsbruck, can be read in various pathological and surgical journals.⁶

Another important clinico-pathological advance has been the recognition of the anaphylactic nature of many symptoms in hydatid disease. It has been gradually realized that this is a relatively common phenomenon.

Pathology of Special Organs

When the pathology of the disease in special organs or sites is considered it is found that in about three-quarters of the cases it is only the onset of some complication, nearly always some leakage from the cyst, which produces symptoms that force the patient to seek medical advice. The importance of both mechanical and infective factors in these complications has been recognized, and their effects separated from each other in many cases. As a result there has come a better understanding of the protean clinical manifestations of the disease, some of which puzzled our predecessors.

In the liver the frequency of multiple primary cysts and the frequency of intrabiliary rupture have been accepted. The latter, which in its symptomatology so resembles cholelithiasis, is probably the commonest serious complication of hepatic hydatid seen. In that it is often the precursor of suppurative in the cyst or of infective cholangitis, it is also fraught with great danger to the patient.

The pathology and clinical aspects of intrathoracic extension of subdiaphragmatic hepatic cysts have also been elucidated, and we are now alive to all their clinical and pathological vagaries. The pathological possibilities of intraperitoneal rupture of an hepatic cyst, too, are now fully understood, and this has enabled us to comprehend completely the nature of peritoneal and pelvic hydatid disease. In the lung the frequency of intrabronchial and intrapleural rupture and their protean pathological complications are also appreciated, and, as a result, the indications for, and methods of, surgical therapy have been standardized.

The whole story of cardiac hydatid disease and its relationship to secondary metastatic cysts has been fully worked out, and, thanks to many accurately correlated

post-mortem and clinical observations, we probably know more about cysts in this situation than in any other. Hydatid disease of bone, with its peculiar structure, has also been fully studied and correlated with the other peculiar forms of the disease.

We still require, however, more information about the rate of growth of cysts, fuller figures concerning the relative distribution of primary cysts in young subjects, and more information about the incidence and nature of the various complications. It is possible that further experimental work may elucidate some of the problems of the exact route of infestation, while experimental work on artificially infected animals may throw light on the more academic problems of growth and the occurrence of parasitic variations. Particularly is it important to look for abnormal pathological forms, which may be examples of parasitic variation or transitional types.

Diagnosis

Following a better understanding of the protean pathological manifestations of the disease clinical methods improved, but it was soon realized that, in spite of the great legacy of knowledge handed down to us by the earlier clinicians, diagnosis still lagged behind somewhat. The first great advance was the advent of radiography, which, owing to the fact that the intact cyst with a high saline content throws a relatively dense shadow, revolutionized the diagnosis of pulmonary, subdiaphragmatic, calcareous, and osseous hydatid. We are greatly indebted to Australian radiographers for many original and important observations. We still need fuller observations on the rate of growth of hydatid cysts, and we look to them to supply this information.

The next advance was the introduction of various immunological tests: first the precipitin reaction, then the complement-fixation, and, later, the intradermal test of Casoni.⁷ All here present know how the introduction and careful study of these reactions have helped the clinician towards a more accurate diagnosis of the disease. It is hoped that work on these very interesting immunity reactions will continue. We still need more information as to their relative values and their fallacies, and it is possible that further experimental work may throw light upon these.

Treatment

Australian surgeons have played a great part in the development of radical surgical methods in the treatment of hydatid disease, and the files of our journals and hospital records contain many cases which illustrate the gradual development of standardized methods. The introduction of formalinization has made the management of simple cysts efficient and safe, but the time-honoured methods of marsupialization or open drainage still remain the methods of choice in many—particularly in the infected—cases. The old controversy between the protagonists of closure and drainage has more or less died down, each case being treated on its merits by one or other method.

Although our improved knowledge of pathological processes and possible complications has led to a better understanding of the correct surgical procedure, there still remain some problems about which opinions differ. The problem of the deep-seated pulmonary cyst which has become infected is an important one. The value of two-stage operations in single pulmonary cysts is another, while the management of simple cerebral cysts introduces difficulties of its own. The question of the propriety of exploring the common duct in all cases of intrabiliary rupture will always be a difficult one—and we still require

more accurate observations on this type of case. In the case of multiple secondary cysts, too, the surgeon is often faced with an apparently insoluble problem, and it is possible that we may have to wait for the discovery of some method of general intravenous therapy before we achieve complete success in their management.

Conclusion

In conclusion, I would urge that, although we have learnt a great deal about the disease, although we probably know as much about its behaviour, its clinical manifestations, and its treatment as any other disease we meet with, it would be wrong for us to become complacent and not to continue making observations and experimenting to still further elucidate problems which, although they may appear somewhat academic, may become in reality of great practical importance. In this country of Australia we all have unrivalled opportunities to investigate this disease, both in man and in animals, and it is our duty to contribute our share to future advances in its study.

AGRANULOCYTOSIS WITH PURPURA HAEMORRHAGICA FOLLOWING GOLD THERAPY

WITH A NOTE ON PREVENTION OF COMPLICATIONS

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The value of gold salts as a therapeutic measure in infective diseases such as pulmonary tuberculosis and rheumatoid arthritis is now well recognized. Complications arising from its employment are, as a rule, of a comparatively mild nature. In the course of a large experience of its use in pulmonary tuberculosis, and also of a smaller experience in rheumatoid arthritis, we have observed only one serious and fatal case, which we feel justified in reporting in view of several cases of agranulocytosis which have recently been recorded in the English literature.

Emile-Weil and Bousser,⁸ in their review of the blood dyscrasias due to gold which had appeared in the literature up to 1932, found thirty cases in all. As such a large number of cases have been treated with gold since its inception they consider that the percentage of these accidents must be very small. On the other hand, Hartfall and Garland,¹⁴ in a series of 100 cases of rheumatoid arthritis treated with crisalbine, had three deaths. One was due to agranulocytosis, and the other two to purpura haemorrhagica.

Case Record

The following is the history of a case of agranulocytosis with purpura haemorrhagica which came under our care.

History.—The patient, a woman aged 61, had suffered from rheumatoid arthritis of an advanced degree for nineteen years. The fingers, elbows, ankles, knees, sterno-clavicular, and jaw joints were all involved in the arthritic process. There was partial ankylosis of the knee- and elbow-joints. X-ray of the knees showed extensive arthritic change of the

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rheumatoid type in both joints. The blood sedimentation rate was 24 mm. in the first hour by the Westergren method.

Treatment.—The patient was given solganol B oleosum intramuscularly in weekly doses of 0.01, 0.05, 0.1, and 0.2 gram, the latter dosage being continued until 2.5 grams had been given. The joint condition had now shown marked improvement, and the sedimentation rate was down to 9 mm. After four weeks' rest a second course was started. It was only after the fifth injection of the second course that a faint erythematous rash was observed. The sedimentation rate had by this time risen to 16 mm., and the leucocyte count, which had hitherto been normal, was found to be 3,100 per c.mm. The differential white cell count (Dr. Eidinow) was: polymorphonuclears, 27 per cent.; lymphocytes, 69 per cent.; hyaline cells, 2 per cent.; eosinophils, 1 per cent.; myelocytes, 1 per cent.

A week later an extensive purpuric eruption appeared on the trunk, limbs, and buccal mucous membrane. There was a large haemorrhagic bulla on the sole of one foot, and the patient had epistaxis and slight haemoptysis. The temperature was now 100.6° F. She had previously been afebrile. The liver and spleen were not enlarged. The bleeding time was ten minutes. The leucocyte count was now 1,100 per c.mm., and the differential count was: polymorphs, 10 per cent.; lymphocytes, 87 per cent.; hyalines, 3 per cent.; eosinophils, 0 per cent. (Dr. Eidinow).

On admission to Battersea General Hospital under one of us (Ph. E.) the blood findings obtained by Dr. A. H. Haler were as follows: erythrocytes, 2,500,000; haemoglobin, 56 per cent.; colour index, 1.13; leucocytes, 800; polymorphs, 7 per cent.; hyalines, 1 per cent.; Türk cells, 1 per cent.; lymphocytes, 90 per cent.

There was some anisocytosis, slight poikilocytosis, no nucleated red cells, and no punctate basophilia; platelets were 70,000; mean cell diameter, 7.20 μ .

Progress.—Calcium gluconate and pentose nucleotide were administered, and a blood transfusion of 250 c.cm. given. Coagulen "ciba" was also given. Some definite improvement occurred after the blood transfusion, but late the same evening the patient died somewhat suddenly. A post-mortem examination was performed by Sir Bernard Spilsbury, to whom we are indebted for the report quoted below.

Post-mortem Report.—"External examination reveals oedema of the lumbar region and of the backs of the thighs. There are haemorrhages in the left conjunctiva, extensive into and above the upper lip, especially on the left side, and in the skin from the angles of the mouth down to the lower jaw. There are a few petechiae in the skin of the face, and others scattered over the front of the chest and abdomen, rather more on the arms, and numerous on the wrists and hands. There are a few on the thighs, more on the legs, very numerous on the feet, especially the left foot, close to the base of the toes. There is haemorrhage into the skin of the