epithelium, neuro-epithelium, pigmented retinal cells, enamel organs, dentine-papillae, skin, hair, cartilage, ganglia, and medullated nerves. These tissues occur in the nodules which grow throughout the abdomen, and in those which grow in the substance of the liver or the lungs. Details of at least fifty examples of the malignant ovarian teratoma are available for study; many of the tumours have been investigated by competent men.

The condition I had in my mind that led me in 1896 to express my belief in the innocency of the cystic variety of ovarian embryomas was the alleged occurrence of cancer in the embryonal rudiment, especially the ovarian mamma. Several surgeons interested in the pathology as well as in the surgery of ovarian tumours sent me occasionally descriptions and sections of specimens which they believed were examples of carcinoma arising in ovarian dermoids. In all the specimens submitted to me none would bear this interpretation, and my opinion has been supported by the subsequent histories of the patients. In 1897 Professor Yamagiva, of Tokio, described a cystic teratoma of the ovary containing a mamma, which he believed had become cancerous, but the evidence is by no means convincing. Since that date we have become familiar with a subtle form of cancer dissemination known as "implantation."

Implantation Cancer.

When a woman is attacked by cancer in the gastrointestinal tract, gall bladder, breast, or Fallopian tube, the cancerous cells permeate the adjacent tissues and are shed into the belly cavity; these cells, floating in the peritoneal fluid, are dispersed throughout the abdominal cavity. If the woman be so unlucky as to have an ovarian cyst or a dermoid in her pelvis, some of the cells will be deposited on the cyst wall, and some of them grow and form blocks of secondary cancer. I exhibited and described several specimens of implantation cancer to the Society in 1910. Large numbers of cancerous cells which are shed into the abdominal cavity perish, for the peritoneum exercises a defending or prophylactic power against such marauders; but the ovaries are more easily colonized, as they lack a peritoneal investment.

This new knowledge concerning the deposition of cancerous cells on normal ovaries as well as on ovarian cysts is of importance, because it renders previous records relating to specimens of primary ovarian cancer of no account. In future descriptions it will be essential for the recorders to furnish evidence that there was no primary cancerous focus in the stomach, big intestine, gall bladder, breast, or Fallopian tubes. A very small primary cancerous focus in the colon, though it has produced a big block of cancer in an ovarian cyst, will sometimes elude the surgeon's fingers and eyes in the course of an operation. Such small contracting cancers later cause intestinal obstruction, and are found in the course of a colotomy, or at a *post-mortem* examination, weeks or months after an ovariectomy.

In considering primary cancer of the ovary and in ovarian dermoids we have to clear away old records and begin anew. The distinction between a cystic ovarian embryoma and a malignant teratoma is as sharp as the difference between a simple chondroma and a chondrifying sarcoma, but there are, as in other genera of tumours (except lipomas) described as innocent, gradation forms by which we pass from species of undoubted innocency to others of the most pronounced malignancy.

Every surgeon has pondered often and long on that common feature of cancer known as "dissemination," wherein the histologic peculiarities of the primary tumour are reproduced in the secondary nodules; but the nodules due to the dissemination of malignant teratomas contain such structures as hair, skin, nervous tissue and embryonic teeth. These can only come from the activity of a developing ovum. We know that microparasites can stimulate growth in epithelial cells, and it is possible that benign ovarian dermoids and malignant teratomas express variations in the effects produced by minute agents, which are able to provoke segmentation in mature ovarian ova, though in a more subtle way than Bataillon's styles.

BIBLIOGRAPHY.

- Baillie, M.: *Morbid Anatomy of the Human Body*. London, 1799, Plate VII.
Bataillon, E.: L'embryogénèse complète provoquée chez les Amphibiens par piqure de l'oeuf vierge, larves parthénogénétiques de

Rana fusca. *Comptes rendus des séances de l'Académie des Sciences*, Paris, 1910. Also *Arch. de Zoologie expérimentale et générale*, V. sér., T. vi, 1910.

Baumgarten: Ueber eine dermoid Cyste des ovarium mit augenähnlichen Bildungen. *Virchow's Archiv*, C. vii, 515.

Bland-Sutton, J.: Mammæ in Ovarian Dermoids. *Trans. Path. Soc.*, 1888, xxxix, 437.

Bland-Sutton, J.: Cancer of the Ovary. *BRITISH MEDICAL JOURNAL*, 1908, i, 5.

Bland-Sutton, J.: The Clinical Aspect of Secondary (Metastatic) Cancer of the Ovary. *Trans. Med. Soc. of London*, 1911, xxxiv, 27.

Clark: A Double-headed Vertebrate. *Ann. Mem. Boston Soc. Nat. History*, 1880.

Cleland, J. B.: Two Interesting Human Dermoid Cysts. *Australasian Med. Gazette*, 1910, 235.

Frank, R. T.: A Case of Malignant Teratoma of the Ovary. *Journ. of Obstet.*, 1907, iv, 348.

Gemmell, J. F.: The Development of the Starfish, *Solaster endeca*. *Trans. Zool. Soc. London*, vol. xx, pt. 1.

Giard: Castration parasitaire. *Bull. Sc. Dep. Nord*, (2) 10 Ann., xviii, 1887, p. 1.

Randall, M., and Lawrence, T. W. P.: Ovarian Dermoid with Secondary Cysts Connected with the Omentum. *Proc. Roy. Soc. of Med.*, Obstetrical Section, 1908, i, 105.

Lucy, R. H.: Double Dermoid Cyst of the Ovaries with Rupture into the Peritoneal Cavity. *Lancet*, 1910, i, 1756.

Moore, C. H.: Dermoid Ovarian and Many Piliferous Cysts; Spontaneous Opening of the Former at the Navel. *Trans. Path. Soc. London*, 1867, xviii, 190.

Shattock, S. G.: Ovarian Teratomata. *Lancet*, 1908, ii, 479.

Smith, G.: Studies in the Experimental Analysis of Sex. *Quart. Journ. Microsc. Sci.*, 1910, lv, 225.

Thomas, A. P.: The Life-History of the Liver-Fluke. *Quart. Journ. Microsc. Sci.*, 1883, xxiii, 99.

Yamagiva, K.: Zwei Fälle von Dermoid Cyste des Ovariums mit Carcinomatöser degeneration und metastasenbildung. *Virchow's Archiv*, 1897, cxlvii, 99.

Williamson, H., and Barris, J.: On the Occurrence of Carcinoma in Cystic Teratoma of the Ovary. *Journ. of Obstet. and Gyn. of the Brit. Empire*, 1911, xx, 211.

THE INFLUENCE OF AGE AND TYPE OF PATIENT UPON THE COURSE AND TREATMENT OF APPENDICITIS.*

BY

WILLIAM BILLINGTON, M.B., M.S.LOND.,
F.R.C.S.,

SURGEON TO OUT-PATIENTS, QUEEN'S HOSPITAL, BIRMINGHAM.

So much has been written about appendicitis, and the disease in all its aspects has been so carefully studied, that it would seem that there can be little left for us to learn. So common is it amongst all classes of society that every medical practitioner must frequently meet with it, and has ample opportunity of acquiring a practical as well as a theoretical knowledge of its clinical manifestations. I speak advisedly when I state that of all the acute abdominal diseases appendicitis is most promptly and most accurately diagnosed. We early recognize the disease, we are alive to its dangers, we are familiar with the signs which call for urgent surgical interference, and we continue to lose a certain percentage of our patients. That this is not due to the operative risk of simple removal of the appendix is certain, for Sir Frederick Treves has recorded 1,000 cases of appendicectomy for chronic appendicitis without a death, and in the past five years nearly 400 patients, whose ages ranged from 4 to 69, have been operated upon at the Queen's Hospital, Birmingham, during a quiescent period without a single fatality. These hospital statistics are of special value, in that they represent the work of no particular surgeon, but of several, and are free from the suspicion that any attempt has been made to improve the statistical results by submitting only those cases to operation which were likely to do well.

It is generally agreed that almost equally good results would follow removal of the appendix within the first twenty-four hours of onset of an attack of appendicitis, and ideally this is undoubtedly the best treatment. There are, however, practical difficulties in the way of operating upon many cases at this early stage. It is often difficult at such short notice to get a surgeon and make the necessary preparations, and the surroundings of the patient are often very unsuitable for an operation. The difficulties are not, however, except in rare instances, so great as to prevent operation were it certain that such is absolutely necessary. It is this doubt as to the necessity for operation at all that is responsible for the delay. That many patients recover under expectant treatment is perfectly

* Read before the Worcestershire and Herefordshire Branch of the British Medical Association.

certain. Further, many others are saved by operation at a later stage, when the necessity for it becomes obvious.

I will not discuss the general question as to whether it is better to operate immediately in all cases or to pursue a policy of "wait and see." Good reasons can be advanced in support of both lines of treatment. I do, however, wish to draw attention to the very important bearing of the personal equation of the patient upon the question in each particular case. It is failure to take this factor sufficiently into account which is responsible for most of the deaths from appendicitis at the present time.

As I have already said, we can all diagnose appendicitis accurately and at an early stage. We are all familiar with the danger signals and are quick to appreciate their significance. But in the early stages none of us can tell what course the disease is going to take. Any one who ventures upon a definite prognosis within the first twenty-four hours of the onset will meet with some rude shocks. To me it is this element of uncertainty as to its future course which constitutes the anxiety associated with appendicitis. It is easy to tell whether the patient is seriously ill or not at the moment, but it is impossible to foretell the future course of the disease. Will it subside and operation be unnecessary, or will it progress and a favourable opportunity be lost? Any light which can be thrown upon this difficult and anxious question is of the utmost value. Very little help is to be gained from the surgical textbooks or even from special works upon appendicitis, and it is because of this that I have ventured to call your attention to a few points which I regard as of great practical value.

As in all other acute affections, appendicitis must not be considered as a disease only, but as a disease affecting a particular individual. The type of person attacked influences very markedly its clinical course and prognosis, and should also influence the surgeon in deciding upon its treatment. When confronted with a case of acute appendicitis within a short time of its onset, we know that there are three possibilities ahead: (1) The attack may subside without operation; (2) operation becoming necessary at a later stage may save the patient; or (3) late operation may fail to prevent death. The last result may occur in spite of careful watching by the most experienced surgeons if definite danger signals are waited for before resorting to operation. Danger must be anticipated in some cases if it is to be avoided. The type of patient attacked must be the deciding factor in the question of delay or prompt interference.

I will say at once that in my opinion delay is dangerous and unjustifiable in the case of children under 12, and adults over 40. Operation should follow immediately when a definite diagnosis of acute appendicitis has been made in these two classes of patients. My reason for making this statement, and I wish to make it as dogmatically as possible, is not that many of these patients may not recover without operation, although the percentage of such recoveries is considerably below the average of all cases, but that the mortality associated with late operation is so great. In other words, if the disease progresses, and it is much more likely than usual to do so, many patients will die in spite of late operation.

I would point out that my remarks only apply to comparatively small groups of cases. Appendicitis is far more frequently met with between the ages of 12 and 40 than either before or after that age period. An examination of the statistics of all the cases of appendicitis, acute and chronic, admitted into the Queen's Hospital during the past five years shows that out of a total of 742 cases 168 were children under 15, and 61 adults above 40. For convenience, patients in the hospital records are grouped in quinquennial periods, but taking the higher age of 15, less than 23 per cent. were below that age and less than 9 per cent. were more than 40 years of age.

A closer examination of the hospital records reveals facts which strongly support my contention that acute appendicitis has a higher mortality in the special groups referred to than is the average for all cases. Practically every acute case was submitted to operation within an hour or two of admission, so that the differences in results can only be accounted for by differences in the recuperative powers of the patients; in other words, by the personal equation of the individual.

During the five years 360 patients were operated upon

for acute appendicitis complicated either by abscess or peritonitis. Of these, 115 were children under 15, 202 were aged between 15 and 40, and 29 were over 40. The total number of deaths was 48, a general mortality of 13.3 per cent. Amongst the 115 children, 20, or 17.8 per cent., and of the 29 cases over 40, 10, or 34.5 per cent., died. The mortality in the three groups was 17.8 per cent. for children, 9 per cent. for persons between 15 and 40, and 34.5 per cent. for adults over 40. From these statistics, therefore, it would appear that, assuming age to make no difference to the prospects of an acute attack subsiding without operation, in the event of complications developing which demand operation the chances of recovery are only half as good in the case of children, and quarter as good in the case of elderly people, as they are for young adults between 15 and 40. This in itself is a strong argument for early operation upon patients coming within the first two groups. If, in addition, as I am certain is the case, palliative treatment is less successful in children and elderly persons, the argument becomes stronger still.

So interesting and important is the influence of age upon the course and outlook in acute appendicitis that it well repays investigation, and a reference to some of the peculiarities of the disease in the young and the old may not be out of place.

Children.

Anyone who has had much experience of appendicitis cannot fail to have been impressed by the larger proportion of children amongst the more serious cases and especially amongst those ending disastrously. Everything points to the fact that appendicitis is more dangerous in children than in adults. The various stages are passed through more rapidly, less resistance is opposed to the spread of infection, and the associated toxæmia is less well borne. Many times I have been struck by the rapidity with which a child becomes seriously ill; within a few hours the clinical picture will completely change. Seen in the morning everything appears satisfactory; at night the child is extremely ill, and manifests all the danger signals. I believe that this is the reason why one sees so many "late" cases of appendicitis amongst children—they become so in less time than do adults. It is not, because the doctor has been negligent, but that he has followed the rules applicable to the adult, and has omitted to take into account the age of the patient. I have long felt that the ordinary teaching with regard to appendicitis needs considerable modification in the case of children. Over and over again I have seen cases where in adults one might reasonably expect resolution, or at worst a localized abscess, in children go from bad to worse. Some of them are indelibly stamped upon my memory as instances of mistaken judgement, the penalty for which has been lost lives.

One reason why a higher proportion of children diagnosed as suffering from appendicitis develop dangerous complications is probably due to the fact that the milder forms of the disease are more often overlooked than in adults. Attacks of abdominal pain, vomiting, and bowel disturbance are very common in young children, and catarrhal appendicitis is easily, and probably is frequently, overlooked. It is only by careful observation and repeated examinations that a correct diagnosis is possible. As a rule appendicitis is only diagnosed when there are definite objective signs of inflammation in the right iliac fossa. In other words, only the more severe forms of appendicitis are recognized, and this fact alone should make us more careful with regard to them.

A point in connexion with the pathology of acute appendicitis in children is the almost constant presence of a concretion. Kinks and strictures are less frequently met with than in older persons. In a very large proportion of children upon whom I have operated during the acute stage a concretion was present and had caused perforation of the appendix. The appendix generally may be fairly healthy, but in some place there is a concretion over which gangrene and perforation of the appendical wall has taken place. It is clearly a pressure necrosis induced by swelling of the concretion from absorption of moisture. The effect of a catarrh of the mucous membrane is increased secretion of fluid. This is absorbed by the concretion, and the effect is that it swells, just as a dried pea would, and becomes too large for the space in which it lies. Such a condition precludes the possibility of resolution. If adhesions have

previously shut off the general peritoneal cavity, or if the perforation occurs on the outer side of or behind the caecum, an abscess forms. If, however, the appendix is free and in its usual position, perforation is at once followed by an acute spreading peritonitis.

Failure to appreciate the significance of the clinical phenomena associated with these pathological events has been responsible for many mistakes. A child during the first few hours of an acute attack of appendicitis suffers from severe abdominal pain, reflex vomiting, a rise of temperature, and a rapid pulse. These symptoms *suddenly* subside—the pain disappears, or almost so, the vomiting ceases, temperature and pulse fall, and the child looks and feels much better. Gentlemen, acute appendicitis never subsides in this way; it disappears by lysis and not by crisis. Sudden improvement means rupture of the appendical wall and relief of tension. It is of ominous import, and calls for immediate operation.

One other vexed question in connexion with appendicitis in children is whether an abscess should be operated upon early or late. An interesting correspondence upon this point appeared in the *BRITISH MEDICAL JOURNAL* about a year ago. It is well known that death from profound toxæmia and collapse may occur within a few hours of operation. This result followed operation in several children of distinguished parents, and created a painful impression. The explanation appears to be that the necessary manipulations lead to an exposure of raw surface from which a lethal dose of toxin is absorbed into the system. The doctrine that it is wise to defer operation in any case of appendical abscess is a dangerous one. The safe course is to open the abscess with a minimum amount of disturbance of tissue, to insert a tube, and to postpone removal of the appendix to a later date. The danger associated with these abscesses in children is, however, only another argument in favour of early operation. Such problems would rarely arise were it accepted that the diagnosis of acute appendicitis in a child carries with it the necessity for immediate operation.

The Middle-aged and Elderly.

As I have already stated, experience, supported by the statistics given, indicates that late operation is followed by an exceptional percentage of deaths in people above 40 years of age. The death-rate at the Queen's Hospital during the past five years has been nearly 35 per cent. This is due to the fact that the resisting and recuperative power of these patients is less, and the risk of complications such as pneumonia is greater, than in the case of younger persons. An acute attack of appendicitis in a middle-aged or elderly person, especially when stout, causes great anxiety to the medical attendant, who realizes that abdominal section in such cases is a very different procedure, as regards gravity, from what it is in the case of a young adult, and his natural inclination is to await developments rather than advise early operation.

I feel strongly that this delay is fraught with grave danger. The risk is almost entirely due to the disease and not to the operation. This is supported by the fact that no death occurred amongst 32 consecutive patients above 40 who were operated upon at the Queen's Hospital during a quiescent period.

In the case of healthy young adults a waiting attitude may be adopted with a certain amount of impunity. If the patient becomes worse, operation still holds out reasonable prospects of successful rescue. But in the elderly the conditions are very different; late operation fails to save in a far larger percentage of cases. It is essential to realize that a man whose condition to-day is so grave that operation would be attended by serious risk, not so much on account of his inflamed appendix, as on account of his age, his fatness, and his general lack of resisting power, will, if his disease progresses, be so ill to-morrow that the chances afforded by operation will be poor indeed. I have known many instances where delay in such cases has led to disastrous results. When the surgeon is forced to undertake a late operation because it is obvious that expectant treatment has failed, the patient almost always dies.

No, the position must be faced and the question of operation settled at an early stage. I have no fault to find with the man who decides at an early stage that in a particular case the whole chances of the patient are better without operation than with it, but I do most strongly

deprecate vacillation and postponement of decision until to-morrow. If worse, you cannot save your patient to-morrow. Realizing this fact, there are few cases where the decision will be against operation, and if decided upon, the earlier it is carried out the better. It seems to me that logically, in these cases, to operate as soon as a definite diagnosis of acute appendicitis is made is the only safe course. Only when operation, on account of the patient's general condition, would be attended by very grave risk should the rule be departed from, and then the decision against operation should be final.

In elderly people acute appendicitis manifests peculiarities which may lead to error. My experience is that the course of the disease is very insidious. The symptoms and objective evidence furnish no certain guide to what is going on inside. The temperature, pulse, and general condition often induce a false sense of security, which is rudely disturbed too late. It is not unusual to see a man lying comfortably in bed with a comparatively slow pulse, an almost normal temperature, and who expresses himself as not feeling ill, and who yet has a gangrenous appendix and a rapidly-spreading peritonitis.

In the elderly, as in children, the pathological condition is more often such that spontaneous recovery is impossible. It is common, even at an early stage, to find the appendix gangrenous in almost all its length and with little or no evidence of an attempt to localize infection. This probably accounts for the fact that the early reflex symptoms are so little marked. These precede gangrene and disappear when it occurs. In these cases I have almost invariably found the local condition worse than was expected, and have never had cause to regret early operation. For the reasons that in elderly people it is more difficult to estimate the gravity of the disease by the clinical phenomena, that resolution is less likely to occur, and that if serious complications do develop they cannot be successfully combated, I am of opinion that it is imperative to operate as early as possible.

THE OPERATION FOR ACUTE APPENDICITIS:

PRIMARY CLOSURE OF THE ABDOMINAL WOUND.

By J. GRANT ANDREW, M.B., C.M.,
F.R.F.P.S.G.,

SURGEON TO THE VICTORIA INFIRMARY, GLASGOW.

At the discussion on the Treatment of General Septic Peritonitis which took place at the Annual Meeting of the Association in Birmingham last summer,¹ a discussion which was ably introduced by Professor Rutherford Morison, Newcastle, I—in the opinion of some of the subsequent speakers—had the temerity to make the following statement:

I desire to deal alone with the appendix as the *fons et origo mali* (of general septic peritonitis). The offending appendix—in this class of case usually gangrenous, and possibly perforated with an extruded concretion lying in its immediate neighbourhood—is removed in the usual fashion. The stump must be well buried. The bed of the appendix and the surrounding structures are swabbed with iodine (4 per cent.), mopped dry, and the gridiron wound, after similar treatment with iodine, is closed in layers. I am firmly convinced that this method of closure without drainage is sound surgery. It must be proved, however, to be not only as safe but safer than when drainage is employed. If the cause be removed much more can be left to the peritoneum than was formerly thought possible.

Seventeen cases were reported which had been dealt with in this fashion. One of these 17 cases died six hours after the operation; in 8 the wound healed primarily; in the remaining 8 there was some degree of septic infection of the wound. To obtain primary union at all with such a degree of intraperitoneal septic mischief was to me a revelation, and at the same time a stimulus to find some means of protecting the wound from infection.

In every case where the wound became infected, cutting free the superficial skin sutures was alone sufficient to check the progress of the infection.

I felt certain that in the above-mentioned cases the wound suppuration was the result of contamination by the infective material from within the abdomen, and that if one could prevent this infective material from coming